A scoping study of emergency planning and management in health care: What further research is needed?

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<th>Term</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td><strong>Business continuity plan</strong></td>
<td>Documented collection of procedures and information developed, compiled and maintained in readiness for use in an incident to enable an organisation to continue to deliver its critical functions at an acceptable predefined level.</td>
</tr>
<tr>
<td><strong>Capability</strong></td>
<td>A demonstrable ability to respond to and recover from a particular threat or hazard.</td>
</tr>
<tr>
<td><strong>Category 1 responder</strong></td>
<td>A person or body listed in Part 1 of Schedule 1 to the Civil Contingencies Act. These bodies are likely to be at the core of the response to most emergencies. As such, they are subject to the full range of civil protection duties in the Act.</td>
</tr>
<tr>
<td><strong>Category 2 responder</strong></td>
<td>A person or body listed in Part 3 of Schedule 1 to the Civil Contingencies Act. These are co-operating responders who are less likely to be involved in the heart of multi-agency planning work, but will be heavily involved in preparing for incidents affecting their sectors. The Act requires them to co-operate and share information with other Category 1 and 2 responders.</td>
</tr>
<tr>
<td><strong>Civil Contingencies Act (2004)</strong></td>
<td>Act of 2004 which established a single framework for Civil Protection in the United Kingdom. Part 1 of the Act establishes a clear set of roles and responsibilities for Local Responders; Part 2 of the Act establishes emergency powers.</td>
</tr>
<tr>
<td><strong>Civil protection</strong></td>
<td>Organisation and measures, under governmental or other authority, aimed at preventing, abating or otherwise countering the effects of emergencies for the protection of the civilian population and property.</td>
</tr>
<tr>
<td><strong>Community resilience</strong></td>
<td>Communities and individuals harnessing local resources and expertise to help themselves in an emergency, in a way that complements the response of the emergency services.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
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</tr>
<tr>
<td>Contingency</td>
<td>Possible future emergency or risk which must be prepared for.</td>
</tr>
<tr>
<td>Control centre</td>
<td>Operations centre from which the management and coordination of the response to an emergency are carried out. May cover a single organisation or emergency service, or sometimes multiple organisations.</td>
</tr>
<tr>
<td>Crisis</td>
<td>An inherently abnormal, unstable and complex situation that represents a threat to the strategic objectives, reputation or existence of a system (e.g. an organisation, community or society).</td>
</tr>
<tr>
<td>Crisis management</td>
<td>Strategically-directed activities to prevent, mitigate the effects of, respond to, and recover from a crisis.</td>
</tr>
<tr>
<td>Disaster</td>
<td>Emergency (usually but not exclusively of natural causes) causing, or threatening to cause, widespread and serious disruption to community life through death, injury, and/or damage to property and/or the environment.</td>
</tr>
<tr>
<td>Disaster cycle</td>
<td>Sequence of civil protection phases. The phases preparedness, mitigation, response and recovery are often used, but this may vary. See, for example, “Integrated Emergency Management” in this glossary.</td>
</tr>
<tr>
<td>Emergency</td>
<td>An event or situation which threatens serious damage to human welfare in a place in the UK, the environment of a place in the UK, or the security of the UK or of a place in the UK.</td>
</tr>
<tr>
<td>Emergency planning</td>
<td>Aspect of Integrated Emergency Management concerned with developing and maintaining procedures to prevent emergencies and to mitigate the impact when they occur.</td>
</tr>
<tr>
<td>Emergency Planning Cycle</td>
<td>A continuous process of assessing the risk of and preparing for emergencies, supported by procedures to keep staff in readiness and to review and validate plans and training, revising them if necessary following emergency exercises or response operations.</td>
</tr>
<tr>
<td>Emergency preparedness</td>
<td>The extent to which emergency planning enables the effective and efficient prevention, reduction, control and mitigation of, and response to emergencies.</td>
</tr>
</tbody>
</table>
Exercise  A simulation designed to validate organisations’ capability to manage incidents and emergencies. Specifically exercises will seek to validate training undertaken and the procedures and systems within emergency or business continuity plans.

Gold – silver – bronze command  Hierarchical structure used by UK emergency services of the United Kingdom for the command and control of major incidents.

H1N1  A type of influenza virus. A new strain of H1N1, originating in pigs, popularly known as swine flu, spread worldwide in 2009, causing many deaths.

Hazard  Accidental or naturally occurring (i.e., non-malicious) event or situation with the potential to cause death or physical or psychological harm, damage or losses to property, and/or disruption to the environment and/or to economic, social and political structures.

Hazardous Area Response Teams (HART)  Specially recruited and trained personnel who provide the ambulance response to major incidents involving hazardous materials, or which present hazardous environments, that have occurred as a result of an accident or have been caused deliberately.

Health Protection Agency (HPA)  The Agency identifies and responds to health hazards and emergencies caused by infectious disease, hazardous chemicals, poisons or radiation. It also makes sure the nation is ready for future threats to health that could happen naturally, accidentally or deliberately.

Impact  The scale of the consequences of a hazard, threat or emergency expressed in terms of a reduction in human welfare, damage to the environment and loss of security.

Incident  Event or situation that requires a response from the emergency services or other responders.

Incident commander  The nominated emergency services officer with overall responsibility for tactics and resource management at the tactical level.
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Level of emergency</td>
<td>Cabinet Office (2010) Central Government Arrangements for Responding to an Emergency defines three levels of emergency of national significance. These are, in descending order of magnitude, catastrophic emergency (Level 3); serious emergency (Level 2); significant emergency (Level 1). Below the national level there is a further category, local emergency, the response to which is conducted by local responders, where necessary in conjunction with local government.</td>
</tr>
<tr>
<td>Local Resilience Forum (LRF)</td>
<td>Process for bringing together all the category 1 and 2 responders within a police force area for the purpose of facilitating co-operation in fulfilment of their duties under the Civil Contingencies Act.</td>
</tr>
<tr>
<td>Major incident (for the NHS)</td>
<td>Any occurrence which presents a serious threat to the health of the community, disruption to the NHS, or causes (or is likely to cause) such numbers or types of casualties as to require special arrangements to be implemented by NHS organisations.</td>
</tr>
<tr>
<td>Mass casualty incident</td>
<td>An incident (or series of incidents) causing casualties on a scale that is beyond the normal resources of the emergency services.</td>
</tr>
<tr>
<td>Medical Emergency Response Incident Team (MERIT)</td>
<td>Team of appropriately trained and equipped medical and/or nursing staff provided by a local acute trust or foundation trust hospital to attend the scene of an emergency.</td>
</tr>
<tr>
<td>Mutual aid</td>
<td>An agreement between Category 1 and 2 responders and other organisations not covered by the Act, within the same sector or across sectors and across boundaries, to provide assistance with additional resource during an emergency.</td>
</tr>
<tr>
<td>National Risk Register (NRR)</td>
<td>A publicly available statement of the assessment of the likelihood and potential impact of a range of different risks that might directly affect the UK.</td>
</tr>
</tbody>
</table>
Personal protective equipment (PPE)  
Protective clothing, helmets, goggles or other garment designed to protect the wearer’s body from injury.

Planning assumptions  
Descriptions of the types and scales of consequences for which organisations should be prepared to respond. These will be informed by the risk assessment process.

Post-traumatic stress disorder (PTSD)  
The most destructive form of stress. Comes about as a direct result of unresolved critical incident stress and typically requires mental health intervention to overcome it.

Preparedness  
Process of preparing to deal with known risks and unforeseen events or situations that have the potential to result in an emergency.

Primary and community care services  
Medical and other health services, provided by health professions and local authority social services departments, particularly during the response phase of an emergency, but also in the longer term recovery phase if on-going monitoring and treatment are required.

Rapid onset emergency  
Emergency which develops quickly, and usually with immediate effects, thereby limiting the time available to consider response options (in contrast to rising tide emergency).

Recovery  
The process of rebuilding, restoring and rehabilitating the community following an emergency.

Regional Resilience Forum (RRF)  
Forum established by a Government Office to discuss civil protection from the Regional perspective and to liaise between local and central government on resilience.

Resilience  
Ability of the community, services, area or infrastructure to detect, prevent, and, if necessary to withstand, handle and recover from disruptive challenges.

Response  
Decisions and actions to protect life, contain and mitigate the impacts of the emergency and create the conditions for a return to normality.

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Rising tide emergency Event or a situation that develops into an emergency or major incident over a period of days, weeks or even months (such as health pandemic, flooding, industrial action), the final impact of which may not be apparent early on (in contrast to rapid onset emergency).

Risk Measure of the significance of a potential emergency in terms of its assessed likelihood and impact.

Risk assessment A structured and auditable process of identifying potentially significant events, assessing their likelihood and impacts, and then combining these to provide an overall assessment of risk, as a basis for further decisions and action.

Situational awareness The state of individual and/or collective knowledge relating to past and current events, their implications and potential future development.

Standard operating procedures (SOPs) Agreed, planned and rehearsed set of procedures which should be adopted in response to specific events and features that may arise during an emergency.

Triage Assessment of casualties and allocation of priorities by the medical or ambulance staff at a casualty clearing station and/or a receiving hospital.

Vulnerability Susceptibility of individuals or community, services or infrastructure to damage or harm arising from an emergency or other incident.

Abbreviations

A&E Accident and emergency
AAR [USA] After Action Review
ACP Antiviral collection point
AGMA Association of Greater Manchester Authorities

* [USA] denotes abbreviations specific to the United States of America

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<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AHRQ [USA]</td>
<td>Agency for Healthcare Research and Quality</td>
</tr>
<tr>
<td>ASPR [USA]</td>
<td>Assistant Secretary for Preparedness and Response</td>
</tr>
<tr>
<td>ASTHO [USA]</td>
<td>Association of State and Territorial Health Officials</td>
</tr>
<tr>
<td>BCM</td>
<td>Business continuity management</td>
</tr>
<tr>
<td>BIP [USA]</td>
<td>Biennial Implementation Plan</td>
</tr>
<tr>
<td>CAS</td>
<td>Cumbria Ambulance Service NHS Trust</td>
</tr>
<tr>
<td>CBRNe</td>
<td>Chemical, biological, radiological, nuclear or explosives</td>
</tr>
<tr>
<td>CCA</td>
<td>Civil Contingencies Act</td>
</tr>
<tr>
<td>CCAEP</td>
<td>Civil Contingencies Act Enhancement Programme</td>
</tr>
<tr>
<td>CCS</td>
<td>Civil Contingencies Secretariat</td>
</tr>
<tr>
<td>CORDIS</td>
<td>Community Research and Development Information Service of the European Union</td>
</tr>
<tr>
<td>CDC [USA]</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>COBR</td>
<td>Cabinet Office Briefing Room</td>
</tr>
<tr>
<td>CQC</td>
<td>Care Quality Commission</td>
</tr>
<tr>
<td>CRR</td>
<td>Community Risk Register</td>
</tr>
<tr>
<td>DHS [USA]</td>
<td>Department of Homeland Security</td>
</tr>
<tr>
<td>DH</td>
<td>Department of Health</td>
</tr>
<tr>
<td>ESRC</td>
<td>Economic and Social Research Council</td>
</tr>
<tr>
<td>EPC</td>
<td>Emergency Planning College</td>
</tr>
<tr>
<td>EPLO</td>
<td>Emergency Planning and Liaison Officer</td>
</tr>
<tr>
<td>EPSRC</td>
<td>Engineering and Physical Sciences Research Council</td>
</tr>
<tr>
<td>EPRR</td>
<td>Emergency planning, response and recovery</td>
</tr>
<tr>
<td>ESAR-VHP [USA]</td>
<td>Emergency System for Advance Registration of Volunteer Health Professionals</td>
</tr>
<tr>
<td>FEMA [USA]</td>
<td>Federal Emergency Management Agency</td>
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<tr>
<td>FRC</td>
<td>Flu Response Centre</td>
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<tr>
<td>GAO [USA]</td>
<td>Government Accountability Office</td>
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<td>Acronym</td>
<td>Description</td>
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<tr>
<td>NRR</td>
<td>National Risk Register</td>
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<tr>
<td>NWAS</td>
<td>North West Ambulance Service</td>
</tr>
<tr>
<td>OPHPR</td>
<td>Office of Public Health Preparedness and Response [USA]</td>
</tr>
<tr>
<td>PAS</td>
<td>Publicly available specification</td>
</tr>
<tr>
<td>PCT</td>
<td>Primary Care Trust</td>
</tr>
<tr>
<td>PERCC</td>
<td>Preparedness and Emergency Response Research Center [USA]</td>
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<tr>
<td>PHEP [USA]</td>
<td>Public Health Emergency Preparedness</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal protective equipment</td>
</tr>
<tr>
<td>PRP</td>
<td>Policy Research Programme of the Department of Health</td>
</tr>
<tr>
<td>PTSD</td>
<td>Post-traumatic stress disorder</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and development</td>
</tr>
<tr>
<td>RRF</td>
<td>Regional Resilience Forum</td>
</tr>
<tr>
<td>RWJF [USA]</td>
<td>Robert Wood Johnson Foundation</td>
</tr>
<tr>
<td>SARS</td>
<td>Severe acute respiratory syndrome</td>
</tr>
<tr>
<td>SHA</td>
<td>Strategic Health Authority</td>
</tr>
<tr>
<td>SOPS</td>
<td>Standard operating procedures</td>
</tr>
<tr>
<td>VA</td>
<td>US Department of Veterans Affairs</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organisation</td>
</tr>
<tr>
<td>7/7</td>
<td>Terrorist attacks in London on 7th July 2005</td>
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<tr>
<td>9/11</td>
<td>Terrorist attacks in New York on 11th September 2001</td>
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Executive summary

Background

The 21st century has seen substantial changes in how countries plan for and manage emergencies. Events such as terrorist outrages and the swine flu pandemic have focused attention on the need for emergency preparedness across health care systems. Even without such events there are challenges arising from climate and socio-economic changes, and from system failures arising from the ever increasing complexity of society. Aside from changes in the pattern, type and scale of emergency, in the case of health care there is ongoing development of medical knowledge and skills, and of treatment, information and communication technologies. There is thus a need to reflect upon and evaluate the potential for improvements in emergency planning and management.

Aims

This report describes a scoping study of research and development needs with regard to emergency planning and management in health care. It provides a state of the art review, drawing on learning and experiences from local, regional, national and international contexts. The main aim is to identify areas for research, but it also identifies aspects of good practice that might be shared.

Methods

The study comprised several strands: a broad, structured literature review; a range of interviews with various practitioners and stakeholders; and an exploration of incident debriefs of incidents and of larger case studies. For pragmatic reasons, a proportion of the non-literature review material was drawn from sources in the North West of England. To minimise potential bias, both urban and rural areas within the North West were studied, and findings were triangulated with those originating from other geographical areas. Findings were also discussed with an advisory group of leading academics and practitioners, and at seminars and conferences.
From these a conceptual model of emergency planning and management was developed (see figure 2 below).

![Conceptual model of health emergency planning](image)

**Figure 2: Conceptual model of health emergency planning**

One issue had not been anticipated in the original proposal: namely, the advent of a new government with a reforming agenda for the National Health Service (NHS). For much of the project’s fourteen months there has been great uncertainty as to the ultimate organisational structure of the NHS, particularly in relation to management structures that relate to the coordination of emergency planning across trusts and other providers. Moreover, the uncertainty has been increased by wider reorganisation across local government and other emergency responders, driven mainly by financial stringency, but also by political imperatives. This uncertainty made many of the investigations difficult: future organisational structures were unclear, and interviewees were uncomfortable and uncertain about their personal careers. Nonetheless, a range of very helpful advice and
evidence was obtained, although to achieve this, the balance of interviews and other investigations changed somewhat from the original plan. It had been intended to investigate practices in a European neighbour with a similar health care system to the UK. However, the move towards a more diverse health care economy in the planned reorganisation, and a recognition that the USA was already very active in research on health emergency preparedness, led to a decision to undertake comparisons of the UK and USA health systems instead. Research from outside the healthcare sector was considered, but only when it explicitly addressed issues having some connection with health.

Having accumulated a substantial range of evidence, the implications for research, development and the sharing of good practice were considered, and 18 potential research topics taken to a prioritisation workshop. At the workshop a range of practitioners, senior managers, health care consumer representatives and academics, the majority of whom had had no previous contact with the project, discussed how and, importantly, the reasons that they would prioritise the topics for research. This facilitated a much clearer understanding of the imperatives that should drive such work. The topics were also considered by others via a survey, and discussed with the advisory group.

Findings and recommendations

Taking all the evidence and advice into account, four clusters of research topics are suggested as the basis of future research commissioning:

**Cluster 1: Affected public**

- Recovery of the public, including long-term health impacts
  - How are recovery issues best factored into the early stages of response?
  - How can social support networks be supported in the recovery phase?
  - How can the needs of vulnerable groups be identified and addressed?
  - What are the best interventions for preventing and addressing psychosocial health problems?
- Engagement with community groups and vulnerable populations
  - How can vulnerable populations be identified pre-, during and post-event?
  - What are the relationships between community resilience and wellness following disasters?
- How can access to community health care services be maintained when key infrastructures are significantly disrupted by a major incident (e.g., health care provision in emergency shelters)?
- What is the potential for active community, voluntary sector and business involvement in emergency planning and management, and how can it be developed?

- **Public risk communication and information dissemination**
  - How effective are risk communication efforts during particular events?
  - What are the levels across the workforce of competencies in crisis risk communication?
  - How do communities generate and use information?
  - How will technology innovation and adoption by the communication and health care fields influence emergency planning and management, and how can the system best anticipate and plan for these changes?

- **Use of social networking**
  - How should social networking be used to communicate with the public during and after an event?
  - During an incident how can social networks be monitored most effectively for intelligence on what is happening?
  - Can social networking be used to build trust between the authorities and the public?

**Cluster 2: Inter- and intra-organisational collaboration**

- **Collaboration across multiple organisations**
  - What are the cultural, structural and organisational issues which affect communication and planning between different organisations and sectors and across the response and recovery phases?
  - What are the factors that enable and inhibit standardisation/interoperability across organisations, including the contribution of training and exercising?
  - How does multi-agency working differ between routine operations, planned large events, and major emergencies?
  - How can the collaborative spirit engendered during incidents be built upon?
  - How can coordination across a “mixed economy” of relatively autonomous health care organisations be maintained and improved, especially during the response and recovery phases?
  - How do responders in one organisation locate information, support, etc. within another responding organisation in the face of different jargons etc.?
- What is the potential for productive linking of emergency planning and management with other strategic and operational planning and management?

**Cluster 3: Preparing responders and their organisations**

- **Learning and quality improvement**
  - What approaches and systems are effective in facilitating learning from good practice, exercises, and incidents of all sizes - at local, regional and national levels?
  - What constitutes quality in emergency preparedness and how can this be measured and assessed?
  - What approaches (internal processes or external regulation) are effective in producing continuous, sustainable quality improvement in emergency preparedness?

- **Exercises and training**
  - What makes for effective and cost-effective education, training and exercise design?
  - What are the connections between training, competency and capability, and outcomes, e.g. with regard to decision-making during response?
  - How do we train and share best practice among emergency planners?
  - How can ICT and simulation be used most effectively in training and education of health care responders?

**Cluster 4: Prioritisation and decision making**

- **Priority and resourcing given to emergency planning and management**
  - What characteristics (capabilities, capacities etc.) make for an effective emergency planner/planning function in NHS organisations?
  - Which factors (e.g. professional background of senior managers, political, social and administrative contexts, funding sources, targets etc.) have the greatest impact on the resources (staff, financial, equipment etc.) that organisations devote to preparedness?
  - What is the right balance between emergency preparedness and tackling existing public health issues?

- **Issues relating to organisational change**
  - How to maintain emergency planning and management capability and effectiveness during periods of organisational change?
  - How does the emergency planning system provide sufficient consistency and leadership for emergencies covering a wide geographical area?

- **Social, administrative and political contexts**
- What constitutes effective and fair systems for commissioning, contracting and performance management of emergency preparedness and response (e.g. taking account of the costs and knock-on impacts of response)?
- What would constitute appropriate, devolved systems for decision-making during a pandemic, and how could they be put in place?
- What is the impact of political imperatives on decision-making with regard to emergency preparedness, response and recovery?

- Leadership and decision support systems during crises
  - What competencies and training are needed for NHS managers who may take on command and control roles?
  - How are decisions taken during emergencies, and what use is made of decision support data and of emergency plans?

Further information about these clusters is provided in Section 8.4, and about other topics considered at the prioritisation workshop in Appendix 17.

The findings of this study may usefully be compared with those produced by the National Institute for Health Research (NIHR) Health Services and Delivery Research programme (HS&DR) project 09/1005/03. There would also appear to be scope for collaboration between research commissioners, including UK government departments and commissioners in the USA, to compare research priorities, coordinate commissioning and develop commissioning models. Consideration should also be given to strengthening capacity to conduct research on health care emergency planning and management in the UK.
The Report

1 Background

Emergency planning is a key responsibility of health and social care organisations. The National Health Service (NHS), local authorities and most other providers of health and social care in the private and voluntary sectors are required to prepare contingency plans in the event of an emergency such as pandemic disease, flooding, extreme climate changes or terrorist attacks.

The preparedness of health care systems at times of crisis is important in two ways. Firstly, the needs of those people directly affected must be met; and secondly, in the face of this increased demand on capacity, routine patient care must be maintained as far as is possible, so that there is not a broader adverse impact on the quality of care. This requires health care organisations to plan and work collaboratively with a range of public, voluntary and private sector organisations on which the NHS depends for basic infrastructure such as power and transport, for equipment and supplies, and for social support for patients.

The 21st century, despite being barely a decade old, has seen substantial changes in the way in which the UK and other countries plan for and manage emergencies. Iconic events such as the terrorist attacks of 9/11 in New York and 7/7 in London have focused attention on the need to be prepared for major events that have outcomes across all domains, including almost inevitably health care. Challenges are also being posed by the ever increasing complexity of society, which in itself can make catastrophic failures more likely to occur. With the ongoing process of globalisation making the world more interconnected, infectious diseases can spread more rapidly and widely, raising the spectre of a global pandemic which might decimate the population. And although subject to some uncertainty, climate change may produce more frequent and more extreme weather events such as heat waves and storms, which pose a threat to people’s health.

In addition to changes in the pattern, type and scale of emergency, in the case of health care there is a continual development of triaging criteria and treatment regimes as medical knowledge and skills advance. This is true both in respect of the treatment of severe trauma and of disease outbreaks.
and pandemics. The organisation of health care is also changing, with trends such as those towards larger organisations and greater concentration of specialist skills and equipment in trauma centres and the like. Many of these changes have been introduced with a view to improving everyday outcomes and efficiency rather than being better able to manage emergency incidents. Yet they will have implications which emergency planning in health care needs to understand and respond to. Furthermore, as for other functions, there is continual pressure to improve the effectiveness and efficiency of emergency planning functions.

The organisational landscape of emergency planning is also changing. The Civil Contingencies Act (CCA) of 2004 set new frameworks and loci of control for emergency planning within the UK in order to meet many of the pressures as perceived then. These are being reviewed by means of an ongoing Civil Contingencies Act Enhancement Programme (CCAEP), alongside which changes are being made as part of a reorganisation of the NHS as a whole. This continually changing situation implies a potential need for research to understand the nature of the changes, and their implications for emergency planning in health care.

1.1 Aims and objectives

The main aim of the scoping study described in this report was to identify good practice, gaps in current knowledge and concerns about current practices in order to produce a prioritised research and development (R&D) agenda for addressing these gaps and concerns. The research brief, was for the study to:

- Conduct a literature review of existing research;
- Identify emergency planning research within health and non-health sectors within the UK and other countries (where relevant);
- Highlight gaps in the existing evidence base;
- Engage with relevant stakeholders to identify issues of practice and policy relevance and where further evidence is needed;
- Ensure the review is relevant to the current UK context;
- Recommend themes for further research.
In doing this, the study endeavoured to pay particular attention to a range of issues regarded as likely to face emergency managers and responders in handling health care crises, including:

- Changes that have occurred since the CCA;
- The effects of social networking and location aware tools such as Twitter, Facebook and mobile phones, on behaviour during crises and how crises are handled;
- Inter- and intra-agency relationships and sensitivities that can occur in a multi-agency response, and their import for coordination, command and management;
- Different patterns of work both between different responding individuals and organisations and also between normal and emergency working for a single organisation or individual;
- The potential need for services and resources to be reconfigured to deal with the crisis and recovery, and the resulting impact on normal health care activities and priorities;
- Different scales of emergency planning and management requirements at different levels of the NHS and other agencies and organisations involved;
- Communication with the public, particular stakeholder groups and the media, including when and what to communicate;
- The transition from response to recovery, including business and NHS continuity.

1.2 Structure of the report

The remainder of the report is organised as follows. In Chapter 2, various definitions and models of emergency planning are explored in order to provide a conceptual foundation for the study. Chapter 3 describes the range of hazards affecting the UK, and the organisational arrangements for emergency planning and management. A comparison is also made with the USA, to aid judgements about the relevance of the largely USA-focused research literature to the UK.

The following chapters are organised around the various methods which were used in order to achieve the study aims and objectives, including\(^b\):

\(^b\) In addition to these methods, an advisory group provided an invaluable sounding board for ideas and draft documents, extending the expertise of research team members. Advisory group members included leading researchers, together with senior practitioners who provided up to date experiences from a range of organisational perspectives, including the Police, Fire and Ambulance Services, the Department of Health, the Health Protection Agency, Strategic Health Authority,
• A literature review that incorporated a structured search of the academic literature from a range of databases, grey literature from the UK, and a survey of researchers (Chapter 4);
• Semi-structured interviews with practitioners and policymakers drawn from a range of local, regional and national organisations, within the health sector and in other sectors (Chapter 5);
• An exploration of debriefs of both small-scale and major incidents, the latter being developed into larger case studies through analysing additional academic articles and grey literature (Chapter 6);
• A prioritisation workshop attended by a range of practitioners, senior managers, health care consumer representatives and academics (Chapter 7).

Each chapter begins by detailing the methods which were used to collect and analyse data. The information collected is then described, and the findings from the data analysis are reported.

The final chapter synthesises the results from the preceding chapters in order to produce overall findings, to propose appropriate priorities for research on emergency planning and management in health care, and to suggest how future research might best be commissioned.

Primary Care Trust and NHS Trusts. Two members provided international perspectives: one a practitioner from the USA; the other a researcher from the Netherlands. Discussions took place both in group meetings and through individual phone conversations and email correspondence outside of meetings. The research team also drew on presentations and opportunistic discussions at a number of seminars and conferences, including the conference of the International Community on information systems for crisis response and management (ISCRAM) and the Health Policy and Politics Network (HPPN) conference.
2 Emergency planning concepts and models

Understanding the meaning of terms used in relation to emergency planning is important if the scope of research on the topic is to be delineated, and also if coherent multi-agency working among practitioners is to be enabled and assessed. A wide range of definitions and meanings have been given to emergency planning itself, and to associated concepts such as hazard, disaster, risk and vulnerability. Indeed some researchers have used “hazard” and “disaster” interchangeably.

This scoping study has endeavoured to relate material to the language, structures and processes of emergency planning in England, and the English health care system in particular, so that it will be more accessible to practitioners and policymakers. Definitions for terms not defined in this chapter are provided in the Glossary. The basis for many of these definitions is the Lexicon of UK Civil Protection Terminology; others are based on definitions used in the USA and by researchers.

2.1 Incidents, disasters and crises

The study attempted to cover a wide range of incidents that might require an emergency response, going beyond business as usual. At one end of the scale are events at least as serious as what the NHS has defined to be a major incident:

"Any occurrence which presents a serious threat to the health of the community, disruption to the NHS, or causes (or is likely to cause) such numbers or types of casualties as to require special arrangements to be implemented by [one or more NHS organisations]."

Such incidents include:

- Major incidents, such as multi-vehicle motorway crashes, which individual NHS trusts can handle within longstanding plans, generally without reducing usual levels of service;
- Mass casualty incidents, which require the involvement of several neighbouring trusts;
- Catastrophic incidents, which exceed the collective capability of local NHS organisations.

The Department of Health definition was widened slightly by replacing “hospitals, ambulance trusts or primary care organisations” with “one or more NHS organisations”.

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This categorisation also reflects a distinction between disasters and emergencies that is made in some of the academic literature. According to this view, disasters not only cause harm, but also encompass social or organisational disruptions which cannot be addressed with existing resources and plans\textsuperscript{12-13}. Generally in this report, the term major incident will be used as a broad "catch all" term which includes disasters, mass casualty and catastrophic incidents.

Whether an incident constitutes a disaster depends both on the nature of the hazard and on the capacity of organisations and groups to anticipate, cope with, resist and recover from the impact of the hazard\textsuperscript{14}. Indeed, a disaster can be regarded as a mismatch between resources and demands\textsuperscript{15}. Emergency planning should therefore address both supply and demand issues.

While large-scale disasters are likely to both increase demand for health care and decrease the health care resources available, this study also aimed to consider smaller scale incidents, usually confined to a single health care organisation, where there is no increase in demand for health care, but a decrease in the health care resources available (e.g. a fire or a power cut within a hospital). Such incidents, which concern the continued functioning of a service or organisation, typically also fall within the remit of emergency planning staff employed by an organisation, and are referred to as business continuity incidents.

The idea of vulnerability of organisations, groups and their environments to disasters has interested many researchers\textsuperscript{16}, and led in turn to the idea of vulnerability management or mitigation strategies. These build both resilience – the ability to cope flexibly with a range of incidents when they occur; and resistance - making incidents either less likely to occur or less hazardous when they do occur\textsuperscript{17}.

This social vulnerability conception of disaster extends a previously existing patterns of war conception, which saw disasters as caused solely by external agents\textsuperscript{18}. It recognises that disasters, even so called “natural” disasters, are a product not only of natural events, but also of social, political and economic environments\textsuperscript{14}. Social processes determine unequal access to opportunities, locations and resources for human activities; and unequal exposure to hazards affecting human activities.

Taking this a step further, the uncertainty conception of disasters sees them as resulting from the complexity of society itself, triggered by communication problems, proliferation of data, and actors and structures beginning to operate at the limits of their competence\textsuperscript{18}. Adopting such a
A closely related concept is that of a crisis. When a low probability, high impact event which threatens the viability of a system is characterised by ambiguity of cause, effect, and means of resolution, and by perceptions that decisions must be made swiftly, then this constitutes a crisis. Crisis management, also known as risk management, attempts to avert crises and to effectively manage those that do occur. Such management might usefully be informed by three different perspectives. A psychological view of crisis suggests that individuals play an important role: the causes of a crisis can be the behaviours or cognitive limitations of individuals; and consequences may include the shattering of employees' basic assumptions about themselves or the organisation. A social-political perspective regards crises as being caused by collective breakdown in sensemaking and role structuring, with breakdown of social order resulting. After the crisis, old practices and relationships should be changed. A technological-structural perspective cautions against reliance on high-risk technologies which may interact with social and other systems in unpredictable ways.

Some early definitions (e.g. Fritz et al.) regarded disasters as being concentrated in space and time, with little or no warning, but it is now recognised that there are disasters which do not have these characteristics. Thus, in addition to “big bang” incidents such as transport accidents or explosions, NHS emergency planning also distinguishes “rising tide” incidents, such as a developing infectious disease epidemic, or a staffing crisis; and “cloud on the horizon” threats such as a major chemical or nuclear release developing elsewhere and needing preparatory action. Threats such as the increasing prevalence of obesity in developed countries, which has been termed an “obesity epidemic”, are not however generally regarded as being within the remit of emergency planning, perhaps on account of their long timescales.

There are many types of risk which may lead to crises or disasters, including:

- Economic – labour strikes, shortage, unrest; major decline in stock price and fluctuations; market crash; decline in major earnings;
- Informational – loss of proprietary and confidential information; false information; tampering with computer records; loss of key computer information with regard to customers, suppliers etc.;
- Physical – loss, breakdown or major disruption to key equipment, plants, facilities and material supplies;
- Human resource – loss of key personnel; rise in absenteeism; rise in vandalism and accidents; workplace violence;
• Reputational – slander; gossip; sick jokes; rumours; damage to corporate reputation; tampering with corporate logos;
• Psychopathic acts – product tampering; kidnapping; hostage taking; terrorism; workplace violence;
• Natural disasters – earthquake; fire; floods; explosions; typhoons; hurricanes.

2.2 Emergency planning

Despite there being a large range of possible risks, many cause similar types of problems, commonly requiring activities such as warning, evacuation, medical care and community recovery to be performed by the different agencies responsible for them. An “all hazards” approach to emergency planning, which has been recommended by sociologists, uses common principles, models and systems to facilitate better collaboration and coordination among these organisations. Plans to deal with unique issues associated with particular risks then build on this common foundation.

The core foundation of much emergency planning is a stage model of pre- and post-incident activities which need to be planned for and then managed. Perhaps the most prevalent is a four stage model:

• Mitigation or prevention: building a safety culture, capacity/resistance or social capital, hazard or risk assessment and reduction;
• Preparedness: developing resilience through planning, public education, training and exercises;
• Response: the provision of emergency response, such as evacuation, rescue, triage etc.;
• Recovery: longer term efforts to assist, or rebuild the affected community or organisation, addressing physical, social, psychological, political and financial consequences of the incident.

The management challenges that arise during the response and early recovery phases are likely to vary between organisations because of differing demands for their tasks and structure to change. Four types of organisation in a crisis situation have been identified:

• Established organisations perform the same tasks as they do in normal times (e.g. ambulance and fire services, police);
• Expanding organisations expand in size during the crisis and become involved in activities which are different from their everyday tasks (e.g. Red Cross, Cruse Bereavement Care);
Extending organisations retain their pre-disaster organisational structure but commence unfamiliar disaster-related tasks (e.g. social services departments and mental health services);

Emergent organisations – private citizens who work together in pursuit of collective goals relevant to actual or potential disasters but whose organisation has not become institutionalised.

Variants on the stage model (e.g. Pearson and Mitroff 27) may add a phase concerning signal/threat detection and warning; and a learning phase, turning the model into a cycle (Figure 1).

![Figure 1: The Five Phases of Crisis Management 27](image)

One model posits that disasters occur when precipitating events are not noticed because they contradict accepted assumptions about hazards and how to avoid them 28. Inquiries into disasters may therefore produce “double loop” learning 29, which transforms underlying assumptions, potentially producing radical new insights. By implication, ongoing questioning of assumptions is important to disaster prevention.

Emergency planning can thus be regarded as preparatory work, informed by learning, to reduce the adverse impacts of future incidents 30 through developing resistance and resilience. Preparedness and learning, as defined above, are elements of emergency planning, but emergency planning is more than these. In the USA, the term Public Health Emergency Preparedness (PHEP) is commonly used. Building on the definition of PHEP suggested by an expert panel 31, and combining it with the NHS definition of a major incident above, health emergency planning can be defined as:

"A coordinated, cyclical process of planning, implementation, evaluation and learning which aims to increase the capability of society to prevent, protect against, respond to, and recover from any occurrence which:

a) presents a serious threat to the health of the community,
b) disrupts the health care system, or

c) causes (or is likely to cause) such numbers or types of casualties as to require special arrangements to be implemented by one or more health care organisations”.

A conceptual model of health emergency planning and management based on this definition was developed to inform this scoping study (Figure 2). It takes an organisational perspective, which is consonant with the purposes of the National Institute for Health Research (NIHR) Health Services and Delivery Research programme (HS&DR), the commissioner of the study. The model draws attention to a number of systems. Major incidents both increase demand for health care and reduce the supply of health care, with the impacts varying according to the nature of the incident and the vulnerability of the supply and demand systems to the incident. Emergency planning thus aims to increase the resistance and resilience of the health care supply and demand systems.
Figure 2: High level conceptual model of health emergency planning and management

Demand for healthcare
- Incidence + prevalence of illness
- Service user expectations

Supply of healthcare
- Structures
- Processes
- Resources
- Governance

Emergency planning system
- Structures
- Processes
- Resources
- Governance

Preparedness
- Prevention + mitigation
- Warning
- Response
- Recovery

Implementation

Evaluation and learning

Vulnerability

Resistance and resilience

Major incident

Vulnerability

Resistance and resilience
To achieve this, the emergency planning system needs to have structures, processes, resources and governance which enable it both to develop suitable plans, and to implement those plans effectively. As Nelson et al. observe, emergency planning requires an ability to execute preparedness tasks and continuous improvement of plans through regular exercises and drills. In other words there needs to be a learning system, and this should ideally engage in “double loop” learning (see above). By considering how the emergency planning system learns, this scoping review cannot only identify potential research topics, but also ways in which research can have an impact on the practice of emergency planning, thus increasing the value of the review. The systems in place in England and the USA are described and analysed in Chapter 3.

It has been suggested that for society to be prepared for health emergencies, there are 18 key capabilities which the emergency planning system needs to develop and maintain (Table 1). These capabilities fall into three main areas: pre-planned and coordinated rapid-response capability, expert and fully staffed workforce, and accountability and quality improvement.

**Table 1: Key elements of health emergency preparedness**

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
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<tbody>
<tr>
<td>Pre-planned and coordinated rapid-response</td>
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<td>capability</td>
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<tr>
<td>Health risk assessment</td>
<td>Identify individual, community, and structural hazards and vulnerabilities to inform plans.</td>
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<td>Legal climate</td>
<td>Identify and address legal and liability barriers to effectively monitor, prevent or respond to emergencies.</td>
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<td>Roles and responsibilities</td>
<td>Clearly define, assign, and test responsibilities in all sectors and at all levels, and ensure each group’s integration.</td>
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<tr>
<td>Incident Command System (ICS)</td>
<td>Develop, test, and improve decision-making and response capability using an integrated ICS at all response levels.</td>
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<tr>
<td>Public engagement</td>
<td>Educate, engage, and mobilise the public to be full and active participants in preparedness.</td>
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<tr>
<td><strong>Epidemiology functions</strong></td>
<td>Maintain and improve the systems to monitor, detect, and investigate potential hazards, particularly those that are environmental, radiological, toxic, or infectious.</td>
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<tr>
<td><strong>Laboratory functions</strong></td>
<td>Maintain and improve the systems to test for potential hazards, especially chemical, biological, radiological nuclear or explosives (CBRNe) events.</td>
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<td><strong>Countermeasures and mitigation strategies</strong></td>
<td>Develop, test, and improve community mitigation strategies (e.g. isolation and quarantine, social distancing) and countermeasure distribution strategies when appropriate.</td>
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<tr>
<td><strong>Mass health care</strong></td>
<td>Develop, test, and improve the capability to provide mass health care services.</td>
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<tr>
<td><strong>Public information and communication</strong></td>
<td>Develop, practice, and improve the capability to rapidly provide accurate and credible information to the public in culturally appropriate ways.</td>
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<tr>
<td><strong>Robust supply chain</strong></td>
<td>Identify critical resources for emergency response and practice and improve the ability to deliver these resources throughout the supply chain.</td>
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<td><strong>Expert and fully staffed workforce</strong></td>
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<tr>
<td><strong>Operations-ready workers and volunteers</strong></td>
<td>Develop and maintain a workforce that has the skills and capabilities to perform optimally in an emergency.</td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>Train, recruit, and develop leaders (e.g., to mobilise resources, engage the community, develop inter-agency relationships, communicate with the public).</td>
</tr>
<tr>
<td><strong>Accountability and quality improvement</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Testing operational capabilities</strong></td>
<td>Practice, review, report on, and improve emergency preparedness by regularly using real public health events, supplemented with drills and exercises when appropriate.</td>
</tr>
<tr>
<td><strong>Performance management</strong></td>
<td>Implement a performance management and accountability system.</td>
</tr>
<tr>
<td><strong>Financial tracking</strong></td>
<td>Develop, test, and improve financial systems to track resources and ensure adequate and timely reimbursement.</td>
</tr>
</tbody>
</table>

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Project 09/1005/01
It is important to distinguish between emergency planning processes and emergency management activities, such as response and recovery, which are the subjects of the emergency plans produced by the planning processes. Theory suggests that they may be very different in nature (Table 2).

### Table 2. Theoretical ideals appropriate for planning/mitigation and management/response of natural disasters

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Planning</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchy:</td>
<td>Structuration</td>
<td>Bureaucracy</td>
</tr>
<tr>
<td>Approach:</td>
<td>Bottom-up</td>
<td>Top-down</td>
</tr>
<tr>
<td>Practitioner:</td>
<td>Reflexive</td>
<td>Reflective</td>
</tr>
<tr>
<td>Operational:</td>
<td>Heuristics</td>
<td>Rules, procedures</td>
</tr>
<tr>
<td>Decision impetus:</td>
<td>Theories</td>
<td>Models</td>
</tr>
<tr>
<td>Governance:</td>
<td>Democratic</td>
<td>Autocratic</td>
</tr>
<tr>
<td>Patterns:</td>
<td>Discursive</td>
<td>Recursive</td>
</tr>
</tbody>
</table>

### 2.2.1 Relationship between emergency planning and research

Planning can be regarded as a bridge between theory, ideally derived from robust research, and action. Theory can sensitise emergency planning to a range of perspectives on what constitutes "reality", thus helping to make planning better informed and response activities more flexible. The extent to which planning theory influences planning, and planning influences performance, may depend however on a variety of factors. The theories themselves may be inadequate or irrelevant, for example, or there may be...
so many uncertainties that the application of any chosen theory will be suspect. Common sense and wisdom may be regarded as more important than theory, despite evidence to the contrary. Political reality may also trump theory through, for example, lack of resources for mitigation of low probability events, or greater commitment to addressing issues such as terrorism than to others, such as potential future natural disasters. In addition to commitment, dimensions of planning that may influence performance include implementation, formality, completeness, intensity, comprehensiveness, flexibility and quality 33.

A wide range of theories are potentially relevant to emergency planning, including chaos, communitarian, critical, cultural, deconstruction, Marxist, populist, pragmatist, rational, social constructivist, political control of bureaucracy, theories of bureaucratic politics, public institutional theory, theories of public management, postmodern theory, decision theory, rational choice theory, and theories of governance 30.

Theories of emergency planning can however be classified into four types according to the extent to which they are strategic rather than being concerned about tools, and the extent to which they are concerned with outcomes rather than the means of and methods of action Table 3 34.
Table 3. Categories of Disaster Administration Theory

<table>
<thead>
<tr>
<th>Concern for process</th>
<th>Low (utilitarian outcomes)</th>
<th>High (means and methods of action)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concern for tools</strong></td>
<td><strong>High</strong> (tactical)</td>
<td><strong>Decision theories</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rational approaches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Policies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standard operating procedures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Basic heuristics / satisficing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Geographical Information Systems (GIS)</td>
</tr>
<tr>
<td><strong>Low</strong> (strategic / abstract)</td>
<td></td>
<td><strong>Economic theories</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resource Allocation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic Impacts Systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is important that research investigates influences and dimensions such as those highlighted above, so that emergency planning does not neglect potentially important factors. The extent to which research does this is one consideration for this scoping study.
3 Emergency planning policy and practice

This chapter describes the main hazards that may lead to emergency incidents, and the risks that they pose. It then explains how services are organised to plan for and respond to such incidents. The USA is covered in addition to the UK because much of the published research on emergency planning in health care originates from the USA (see Chapter 4). Furthermore, plans to reorganise the NHS in England will likely produce a more diverse health care economy, increasing the challenges of coordinating emergency planning and of maintaining business continuity. Such challenges are writ large in the USA, so there is potential for learning from USA-focused research, although careful assessment of its relevance is needed, taking account of how the UK and USA compare in terms of hazards, and organisational and social structures.

3.1 Risks to the UK

Since 2008 the UK government has published assessments of the main risks with high potential consequences that might affect the country. This National Risk Register (NRR) aims to increase awareness of the kinds of risks that the UK faces, and to encourage individuals and organisations to think about their own preparedness.

The most recent NRR was published in 2010\textsuperscript{35}. This presents potential hazards in a visual matrix which situates them relative to one another in terms of their likelihood and impact (see Figure 3). Local Resilience Forums (LRFs) use the NRR as the basis for developing community risk registers for local areas (see Section 3.1.8). Health care service providers and the commissioners of those services can then check that a full range of mitigations and plans are in place against key local risks.
Figure 3: An illustration of the risks posed by high consequence hazards facing the United Kingdom

The main hazards and their relevance to the UK and UK health care are outlined in the following sections, with some illustrative examples.

### 3.1.1 Pandemic human disease

Pandemic human disease is both the highest impact risk on the NRR matrix and also one of the most likely risks to occur. Health care organisations have major roles in the prevention, mitigation and response to such outbreaks. The swine flu outbreak of 2009-10 was declared to be a pandemic, although the estimated 474 resulting deaths across the UK fell far short of the worst-case scenario of 750,000 deaths. A case study of this outbreak is given in Section 6.4.
The inter-pandemic years provide an opportunity to prepare for future pandemics by revising strategies, building up stocks of antiviral drugs, and vaccinating those groups who were shown to be at greatest risk from previous outbreaks.

3.1.2 Flooding

Coastal flooding is the second highest impact risk on the NRR risk matrix. Inland flooding can also arise from severe weather in the form of heavy rainfall, leading to rivers breaking their banks or drainage systems being overwhelmed. There was widespread flooding across England in the summer of 2007, and floods in Cumbria in 2005 and 2009 are described in more detail in the case study in Section 6.5. Without engineering and social preventative measures, the rising temperatures and sea levels associated with climate change are likely to increase the risk of flooding in the UK.

Although floods in the UK do not usually lead to large numbers of deaths, there can be significant short- and long-term impacts, particularly on psychosocial health. Flooding can also have a significant and widespread impact on people, businesses, infrastructure and essential services, with potential knock-on effects on health and on health care services. Loss of electricity due to flooding can have adverse health impacts, for example, particularly during extremely cold weather, for vulnerable groups of people who are less able to help themselves (see Section 3.1.3).

3.1.3 Severe weather

The main types of severe weather that the UK plans for are: storms and gales, low temperatures and heavy snow, and heat waves. Although vulnerability can vary depending on a variety of factors, groups of people at risk of adverse health impacts typically include existing NHS patients and social care clients, in both community and institutional settings; plus people with chronic health conditions and older people.

The winter of 2009–10 saw a prolonged spell of cold weather lasting for approximately a month. Only 25 deaths were directly attributed to this cold weather, but there were higher than average attendance rates at accident and emergency (A&E) departments and in primary care, and it has been estimated that over the course of a typical winter there are many thousands of “excess deaths.” A cold weather plan for England was published in November 2011.

The hot summer of 2003 is estimated to have resulted in over 2,000 “excess” deaths, mainly among vulnerable populations. Such vulnerable
populations can include hospital patients, a high number of whom died during the 2005 French heat wave. A Heat-Health Watch system has since been introduced by the Meteorological Office, and the Department of Health (DH) has provided more specific guidance on how to protect health and reduce harm, including advice for hospitals regarding hydration of patients and maximum room temperatures. During the hot weather of July 2006, 680 excess deaths were recorded, significantly fewer than in 2003.

During heat waves there are greater numbers of admissions to hospital and consultations with GPs, due to sunburn, heat exhaustion, respiratory problems and other illnesses associated with the hot weather, such as food poisoning. This additional demand on the health service may cause the cancellation of elective surgery and routine procedures.

3.1.4 Animal disease

Foot and Mouth Disease in 2001 and Avian Influenza (Bird Flu/H5N1) in the mid-2000’s have been the most notable recent examples of animal disease in the UK. The main impacts were on farming, the food industry and tourism, and on animal and bird health. When humans are infected, however, they may have little immunity and the disease can be very serious, with the potential for a pandemic if the virus is easily transmitted from person to person. Owing to continual mutations of viruses, highly transmissible strains in the future cannot be ruled out. Prevention focuses on good animal husbandry and hygiene, which can be particularly problematic in poor countries. Similarly, surveillance is an international activity.

3.1.5 Major industrial accidents

In most cases industrial accidents have a very limited impact outside of the industrial plant and can be dealt with locally, but the Chernobyl nuclear incident and the Bhopal chemical incident show that in rare cases it is possible for there to be more significant consequences.

Larger incidents in the UK include the fire at the Buncefield Oil Storage Terminal in Hemel Hempstead in 2005, which was the largest peacetime fire in Europe. No deaths resulted, but there were a number of injuries, and considerable demands were placed on the Health Protection Agency (HPA) and public health departments in tracking the effects of the smoke plume. In 2008 a gas explosion in Haslingden left 18,000 homes without gas or electricity for up to 5 days over the Christmas period. Health services worked with other agencies to identify vulnerable people and address their personal and health needs during this time. In 2006 water supply areas
were accidentally contaminated with diesel, affecting 2,500 properties in the Exeter area. There were however no reported effects on health.

3.1.6 Major transport accidents

Transport accidents occur across the UK on a daily basis, and well-practised plans are in place to deal with these. Major incidents requiring a national level response are rare, but significant additional demands can be placed on local ambulance services and hospitals, with follow-up psychosocial care also commonly required.

In 1989 a Boeing 737 airplane crashed close to the M1 Motorway near Kegworth, killing 47 passengers. 80 passengers survived the immediate impact, but 10 were seriously injured. There was no loss of life on the ground. The last major accident involving a UK flagged ship was the sinking of The Herald of Free Enterprise in 1987, which resulted in 193 deaths out of 533 passengers and crew on board. In 2007 a train crash at Grayrigg killed one person.

3.1.7 Malicious attacks

The UK faces a serious and sustained threat from terrorism, which may take the form of an ambition to cause large numbers of casualties without warning. The methods used might be conventional weapons; non-conventional weapons such as chemical, biological, radiological and nuclear (CBRNe) substances; or more novel methods such as cyber attack which can cause systems to fail.

Crowded places and some transport systems are an attractive target for a terrorist attack because they have little or no protective security. The 7/7 attacks on London rush hour trains and buses in 2005 produced 56 dead and over 700 injured within a single day, placing massive short-term demands on ambulances and hospitals, and then a large task to provide follow-up psychological care. Terrorists in the UK have previously attacked, or planned to attack, national infrastructure such as Bishopsgate, London, in 1993 and South Quay in London’s Docklands in 1996. These attacks resulted in widespread damage and disruption but relatively few casualties.

There have been relatively few examples of attacks using CBRNe materials, but the sarin gas attack on the Tokyo underground system is one example. Contamination makes recovery from a CBRNe attack significantly more challenging than recovery from other terrorist atrocities, despite ambulance services and acute trusts being equipped with equipment to carry out patient decontamination.
3.1.8 Community Risk Registers

The impact and likelihood of risks identified in the NRR will vary from place to place within the UK. London, for example, as the nation’s capital and host to many of the 2012 Olympic Games events, may be at greater risk of terrorist attacks, and more vulnerable due to the relatively close proximity and interdependence of facilities in a large, built-up environment.

Community Risk Registers (CRRs) are developed in order to provide an agreed position on the risks affecting each local area and on the priorities for planning and resourcing preparedness. The local impact and likelihood of each risk from the NRR (see Figure 3) should be scored. The scale for impact runs from 1 (insignificant) to 5 (catastrophic) and the scale for likelihood runs from 1 (negligible) to 5 (probable).

Comparison of the 2010 Greater Manchester Risk Register and the 2011 Northumbria Risk Register demonstrates that CRRs are not standard in design. Northumbria defines categories of impact as health, social, economic and environmental and the impact scoring scale reflects this, whereas Greater Manchester does not define impact, only likelihood. The descriptions for likelihood also vary, with Northumbria using terms such as low, medium and high and Manchester using negligible, unlikely and probable.

Of the 66 risks identified in Greater Manchester CRR, health organisations such as the Health Protection Unit, Primary Care Trust, or Ambulance Service are the lead agency for six: biological substance release from a facility where pathogens are handled and during an unrelated work activity or industrial process; influenza type disease; emerging infectious disease; localised legionella/meningitis outbreak; loss of cover due to industrial action by workers providing a service critical to the preservation of life; and loss of emergency services.

Health organisations are the lead agency for 10 of the 74 risks identified in the Northumbria CRR. These risks include influenza type disease (epidemic and pandemic); severe acute respiratory syndrome (SARS) type disease; legionella outbreak; meningitis outbreak; food poisoning; heat wave; accidental release of radioactive material; biological substance release; and human disease west nile virus. The lead agency for heat wave planning in Northumbria is a primary care trust (PCT), whereas in Greater Manchester it is the local authority.

3.1.9 Health care business continuity risks

It is likely to be prudent for any business to identify and plan for business continuity risks that might adversely affect their business operations, and
health care organisations are no exception. In addition to planning how their services will manage increased demand for health care when there is an emergency incident, health care organisations also need to consider the supply side of keeping their services functioning during incidents, both large and small, that may impair that functioning.

Business continuity risks are identified by individual organisations, often in the organisation’s risk register, but the following risks or associated actions are covered by general NHS plans and are subject to NHS performance management:

- Heat wave (an internal management issue for large buildings such as hospitals);
- Snow;
- Lockdown (i.e. restricting access to or exit from a site or building in response to a threat or hazard);
- Evacuation of buildings;
- Loss of staff, including industrial action;
- Supply chain;
- Fuel shortage;
- Flooding.

The Care Quality Commission Standard 10H indicates the need for mitigations to be in place for electricity, water or gas supply failure; fire, flooding and IT or communication systems failure.

Similar risks may be likely in major incidents, in which case major incident plans can provide the basis for business continuity planning. Thus lockdown and evacuation may form part of major incident processes, loss of staff and supply chain planning are key components of pandemic flu planning, and fuel shortage planning and flooding are driven respectively by the National Emergency Plan-Fuel and the Environment Agency on surface water flooding.

Nevertheless most business continuity incidents are relatively small scale, so are only reported locally or internally. One exception is a fire which broke out in the Royal Marsden Hospital in London in 2005. All patients and staff were evacuated safely, with two staff and two patients having to be treated for the effects of breathing in smoke.

An indication of the frequency of business continuity risks and their trends is provided by an annual survey of UK businesses, which includes a small number of NHS organisations (see Figure 4).
Despite being relatively small-scale compared to major incidents, the significance of business continuity to NHS operations is nevertheless great. If admissions, investigations and discharges take place on a just-in-time basis, then the prompt and efficient treatment for a large number of patients can be badly interrupted by a business continuity incident, particularly taking into account knock-on impacts on other NHS organisations. There can also be adverse financial implications. It is this type of incident which forms the greater part of the day-to-day work done by emergency planners in health care organisations.
Figure 4: Proportion of businesses experiencing business continuity disruptions each year

<table>
<thead>
<tr>
<th>Disruptions experienced in previous years</th>
<th>Covered by BCM%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2002</td>
</tr>
<tr>
<td>Extreme weather e.g. flood/high winds</td>
<td>18</td>
</tr>
<tr>
<td>Loss of IT</td>
<td>19</td>
</tr>
<tr>
<td>Loss of people</td>
<td>-</td>
</tr>
<tr>
<td>Transport disruption</td>
<td>-</td>
</tr>
<tr>
<td>Loss of access to site</td>
<td>5</td>
</tr>
<tr>
<td>Loss of telecommunications</td>
<td>-</td>
</tr>
<tr>
<td>Supply chain disruption</td>
<td>19</td>
</tr>
<tr>
<td>Loss of key skills</td>
<td>33</td>
</tr>
<tr>
<td>School/childcare closures</td>
<td>-</td>
</tr>
<tr>
<td>Loss of electricity/gas</td>
<td>-</td>
</tr>
<tr>
<td>Employee health &amp; safety incident</td>
<td>13</td>
</tr>
<tr>
<td>Negative publicity/coverage</td>
<td>24</td>
</tr>
<tr>
<td>Damage to corporate image/ reputation/brand</td>
<td>15</td>
</tr>
<tr>
<td>Loss of water/sewerage</td>
<td>-</td>
</tr>
<tr>
<td>Customer health/product safety incident</td>
<td>11</td>
</tr>
<tr>
<td>Environmental incident</td>
<td>9</td>
</tr>
<tr>
<td>Pressure group protest</td>
<td>10</td>
</tr>
<tr>
<td>Industrial action</td>
<td>-</td>
</tr>
<tr>
<td>Fire</td>
<td>6</td>
</tr>
<tr>
<td>Malicious cyber attack</td>
<td>-</td>
</tr>
<tr>
<td>Terrorist damage</td>
<td>2</td>
</tr>
</tbody>
</table>

Base: 1053 respondents (2011)
The concept of business continuity planning is fairly new to the NHS, with the first mention being made in the 2005 NHS Emergency Planning Guidance. Some further interim advice was provided in 2008, and there is also brief mention of business continuity systems in the British Standards Institution publicly available specification (PAS) 2015: Framework for health services resilience. Intelligence suggests that formal, in-depth business impact analysis is not generally conducted by operational units within NHS organisations due to competing pressures on managers’ time and the lack of specialist support – in many organisations one person takes responsibility for both emergency planning and business continuity. Nevertheless it would appear likely that most NHS organisations have, via other planning processes, clearly identified the need to maintain urgent care and essential life saving services, and developed plans to do this.

3.2 Organisation of emergency planning in the UK

Emergency planning in the UK is coordinated at a national level by the Cabinet Office’s Civil Contingencies Secretariat (CCS), and is regulated through the Civil Contingencies Act 2004 (CCA) and specific NHS guidance. The CCA comes with statutory guidance - Emergency Preparedness – which is currently under review.

Organisations which are at the core of the response to most emergencies, such as emergency services, local authorities, NHS Trusts providing hospital and community services, PCTs and the HPA, are termed Category 1 responders. The main requirements are to:

- Assess the risk of emergencies occurring and use this to inform contingency planning;
- Put in place emergency plans;
- Put in place Business Continuity Management (BCM) arrangements;
- Put in place arrangements to make information available to the public about civil protection matters and maintain arrangements to warn, inform and advise the public in the event of an emergency;
- Share information with other local responders to enhance coordination;
- Cooperate with other local responders to enhance coordination and efficiency;
- Provide advice and assistance to businesses and voluntary organisations about business continuity management (local authorities only).

Category 2 organisations, which include Strategic Health Authorities (SHAs), the Health and Safety Executive, and transport and utility...
companies, have fewer duties. They are required to cooperate and share relevant information with other Category 1 and 2 responders.

Category 1 and 2 organisations come together to form Local Resilience Forums (LRFs) in order to facilitate coordination and cooperation at the local level. The LRFs are based on police areas, of which there are 53 across England and Wales. These are typically counties or large conurbations such as Greater Manchester, which contain several NHS organisations within them. Direct input by all of those organisations would be unwieldy, so in practice, non-ambulance NHS input into meetings of the Strategic Coordinating Group that leads the development of policy and strategy for each LRF has usually been provided by a single lead PCT with delegated responsibilities from the SHA. SHAs usually provides NHS input into Regional Resilience Forums (RRFs), which exist to improve the coordination of planning between localities and the region, between regions, and between the region and the national government.

Guidance for NHS organisations is provided by the NHS Emergency Planning Guidance 2005 and an increasing range of associated documents, covering issues such as mass casualty incidents, pandemic influenza, heat waves, radiation and radiological incidents, fuel supply disruption, blast injuries, burn injuries, psychosocial health and care, religious and spiritual needs, critical care, evacuation of patients, blood shortages, stock reserves, strategic command arrangements, Medical Emergency Response Incident Teams (MERITs). The main prescriptions for NHS organisations are:

- Use of an integrated framework for emergency planning (see Figure 5), together with associated techniques such as risk management and business impact assessment.
- Generic plans covering major incidents, CBRNe, business continuity and pandemic flu.
- Specific plans depending on the site regarding flooding, fuel, heat wave and cold weather.
- Appropriate training in respect of the above: “awareness” training for all staff and “role specific” training for key posts such as communications and command staff, and those likely to be involved in responding to CBRN incidents.
- Exercising of new plans within three months of inception, a “live” exercise every three years, an annual key table-top exercise and a twice yearly communications exercise. Exercises are often carried out via the EMERGO methodology, which introduces notional patients into the system and determines clinical outcomes for them based on response times.
• Improvement of plans from debriefs after incidents and exercises, and external recommendations from organisations with standing in the field.
• Business continuity systems which are parallel to British Standard 25/999, plus evidence of a structured approach to business continuity across the organisation.
• Evidence of working together with other Category 1 and 2 responders in LRFs and other opportunities such as exercises and mutual aid.
• Response and recovery provision in relation to all plans.
• A lead officer for emergency planning and business continuity, and a board level director lead and sponsor.

All individual organisations are encouraged to review their capabilities with regard to people, plans and processes. SHAs maintain a local overview, and a national picture is provided by a bi-annual cross-departmental National Capabilities Survey.

Some aspects of NHS emergency preparedness are regulated by “arms length” national agencies that are not part of the Department of Health (DH). The Care Quality Commission (CQC) and the NHS Litigation Authority, for example, seek evidence from NHS bodies as to their compliance with good practice. Figures from the CQC suggest that about 95% of NHS organisations were compliant with the national core standard C24 on emergency preparedness between 2005 and 2009. Other national bodies which can provide support and advice to NHS organisations include the National Counter Terrorism and Security Office (NaCTSO), whose Project Argus initiative simulates a terrorist attack; the Centre for the Protection of the National Infrastructure, which provides advice to the DH about maintaining “critical” health infrastructure assets; and the UK Government Decontamination Service, which recovers contaminated infrastructure.

The HPA provides independent scientific and public health advice and operational support to the NHS and other organisations to help their preparedness and response to a variety of incidents. The also HPA plays a major role with regard to flu pandemic planning and response, through, for example, providing ongoing surveillance data about the nature and spread of the disease.

In the event of a national or regional crisis, the Cabinet Office Briefing Room (COBR) crisis management facility is activated, and relevant agencies and departments send representatives to it. The DH, through its Emergency Preparedness Division, controls the deployment of NHS
resources via its own control centre. SHAs coordinate the NHS response within regions, reporting to the DH control centre.
Figure 5: The cycle of emergency planning (Figure 5.1, page 54)
3.2.1 Reorganisation of emergency planning in England

The Health and Social Care Bill going through parliament during the research period proposes among other things to abolish PCTs and replace them with clinical commissioning groups; abolish the HPA and integrate its functions into the National Public Health Service; and abolish SHAs. It is envisaged that from 2013 the NHS Commissioning Board will lead the NHS input into emergency planning, response and recovery (EPRR) in England. This responsibility will be discharged through 38 Local Health Resilience Boards which will map onto existing LRF boundaries, underpinned by a national risk implementation strategy and a national EPRR assurance framework. During the transition period to the new arrangements a priority is to maintain capacity from the old system. At the time of writing, clusters of PCTs have been formed, and where there is more than one PCT Cluster per LRF area, one PCT Cluster should be nominated as the lead, mirroring the previous lead PCT arrangements. In a major emergency, when required to do so by the SHA, the lead PCT Cluster must play a full part in the response, arranging the provision of mutual aid and prioritising the work of NHS Trusts as necessary.

Four SHA Clusters have also been formed: London, North, Midlands and South. The clusters are coterminous with the Department of Communities and Local Government resilience hubs with which they must liaise to ensure that the NHS contributes fully to the multi-agency strategic planning for significant and widespread incidents.

3.3 Risks and organisation of emergency planning in the USA

The USA is subject both to the risks identified in the UK National Risk Register (NRR) (see Section 3.1) and to some additional risks, including earthquakes, hurricanes and tornadoes. Incidents declared to be federal disasters that require intervention beyond the state level are most commonly caused by extreme weather. During the 10 years to 2010, 560 federal disaster declarations were made, including 400 severe storms, 48 hurricanes and 23 floods. Recent high-profile disasters include Hurricane Katrina in 2005, which resulted in at least 1,800 deaths, and the terrorist attack on the Twin Towers in New York, which killed over 3,000 people.

In the USA disaster response and recovery is a state and local government responsibility, and the role of federal government is primarily supportive, intervening only when states request assistance. States are seen as superior venues for policy making, as they are more likely to understand and appreciate the diverse needs of their population and be better prepared
to respond to these needs in a flexible manner. Arrangements for emergency planning and management therefore vary across different states and cities. Similarly, in the absence of a national health service, structures and processes for health care organisations to input into planning are determined locally.

While planning structures vary, there are however national standards and systems which aim to facilitate a unified approach. The National Response Framework provides guiding principles across all levels of government and the private sector, defining the roles that should be played. The National Incident Management System (NIMS) provides a common template for the management of incidents across prevention, mitigation, response and recovery phases. All federal departments and agencies must use NIMS, as must other organisations if they are to receive federal assistance for preparedness, such as grants.

A “target capabilities list” has also been published. This consists of 37 core capabilities deemed necessary in order to be prepared for all types of emergencies. The list is intended to be used to support organisations to develop appropriate capabilities through suitable planning, organisation, equipment, training and exercises. The Homeland Security Exercise and Evaluation Program (HSEEP) constitutes a national standard for exercise design, conduct, evaluation and improvement planning. There are also several knowledge management websites intended to facilitate learning in relation to emergency planning, such as the Department of Homeland Security’s (DHS) Lessons Learned Information Sharing Site and Responder Knowledge Base.

The first draft of a National Health Security Strategy (NHSS) was published in 2009. It aimed to address considerable variation in the extent to which states are prepared to address large-scale health threats, and to improve coordination between the health care system and the emergency response system. A biennial implementation plan outlines federal-level activities and provides guidance to inform the planning of other organisations.

The Federal Emergency Management Agency (FEMA) is the primary federal agency responsible for responding to emergencies. FEMA does not possess the authority or power to direct local government or other organisations operating in an emergency, but is charged with trying to achieve a coordinated disaster response on the ground anyway. FEMA is part of the DHS, which is responsible for assessing the nation’s vulnerabilities and providing information to organisations and individuals. This includes substantial information on individual, family, and community preparedness.
The Assistant Secretary for Preparedness and Response (ASPR) within the Department of Health and Human Services (HHS) oversees the federal response to major health incidents, including the National Disaster Medical System (NDMS), which temporarily supplements other organisations at all levels by providing specialised public health and medical capabilities. The Centers for Disease Control and Prevention (CDC) also provides information and advice in relation to emergencies, in a role analogous to that of the HPA in the UK.

ASPR is responsible for the Hospital Preparedness Program (HPP)\(^3\), which provides grants to states in order to improve the preparedness of the health system, with the remit no longer limited only to hospitals. CDC, through its Public Health Emergency Preparedness (PHEP) cooperative agreements, provides funding for public health departments to strengthen their abilities to respond to public health incidents and build more resilient communities. 15 target capabilities for public health emergency preparedness have been identified\(^4\), and these guide the provision of funding.

The Joint Commission\(^5\) is an independent organisation which accredits and certifies more than 19,000 health care organisations and programmes in the USA. Its standards require organisations to identify potential emergencies which could affect them and to develop a plan addressing four phases of emergency management activities.

In conclusion, in the USA there is much greater variation than in the UK with regard to the structures, functions and governance of the organisations involved in emergency planning and management. While in both countries the national government provides guidance about processes and the capabilities that should be developed, there is much more variety in the arrangements for multi-agency working in the USA compared with the UK, where a uniform structure of LRFs and RRFs spans the whole country. Resources for developing the preparedness of local health care organisations would however appear to be more tightly monitored and controlled in the USA. Proposed changes to the UK health care system are likely to increase the variety of organisations needing to be involved locally, which will bring the UK closer to the USA situation, but the other differences will remain. This means that when assessing the relevance of USA research to the UK, care should be taken to consider the likely impact of these organisational differences. Furthermore, given the potentially large community component of emergency planning and management, social differences between the two countries (and between different parts of the UK) also need to be considered.
4 Literature review

The aim of the literature review was to cover a wide range of research on emergency planning and management relevant to UK health care, in sufficient detail to identify key characteristics of current research and identify possible gaps. This chapter describes the methods used in the review and then reports the findings of each element of the review.

In addition to looking at UK research, it was originally planned to focus on research from European countries with broadly similar health care and emergency planning systems to the UK, as this would be most relevant. It quickly became clear from preliminary searching, however, that there was relatively little easily accessible research from European countries, while there was a great deal of readily available USA-based research.

Another important early discovery was the existence of several previous scoping reviews, all of them emanating from USA researchers, and all oriented to some degree to addressing issues in health care emergency planning in the USA. In addition to this preponderance of research from the USA, it was realised that plans to reorganise the NHS in England would likely produce a more diverse health care economy, presenting emergency planners with new coordination challenges. These new challenges would be similar in some respects to those that planners in the USA have already been grappling with in a healthcare system where there is a much greater variety of organisations and organisational forms, and governance relies more on local networking, agreements and contracts than on a hierarchical, bureaucratic system of planning (see Section 3.3). This prompted a decision to focus on research from the USA rather than from Europe.

In order to manage the large volume of material found, searches of the academic literature were restricted in various ways (see Section 4.1.1). One effect of this was to limit the consideration of research from outside the healthcare sector. The multi-agency and multi-sectoral nature of much emergency planning and management meant that research from other sectors and non-health focused academic disciplines (E.g., sociology, information science, management science, organization theory etc.) was accessed, but only when it explicitly addressed issues having some connection with health. While this may possibly have limited the uncovering of novel potential research directions, this considered to be acceptable on account of the large number of research gaps that were being identified.

The findings from previous scoping reviews are presented and analysed in Section 4.2. Similarities and differences between the patterns of material...
found by the current review and previous scoping reviews of health care emergency preparedness, as highlighted by an analysis of citations, are given in Section 4.3.

Having provided this context, Section 4.4 presents findings from the largest element of the review, that of the literature indexed in academic databases, paying particular attention to UK-focused research. The remaining sections of the chapter report the findings from a researcher survey, a grey literature search, and a search of research funding databases, all of which aimed to some extent to provide more up to date information than could be obtained from the review of the academic literature review.

4.1 Methods

In order to inform the search strategy, concepts and models relevant to emergency planning (see Chapter 2) were identified through an initial scan of the literature. This helped to identify topic areas to be covered by the review, keywords to be used in searches, and gave a sense of the volume of literature to be analysed.

Searches were conducted on the academic literature, grey literature and research registers. Additional materials were sought by emailing researchers who had authored publications or been awarded research grants, and contacts in interest groups and professional associations.

4.1.1 Academic literature search

Keyword searches were conducted on the following databases: Applied Social Sciences Index and Abstracts; British Nursing Index; EMBASE; Environmental Sciences and Pollution management (restricted to Health and Safety Science Abstracts, Pollution Abstracts and Risk Abstracts); GEOBASE; Health Management Information Consortium; IEEE Xplore; Medline; National Criminal Justice Reference Service Abstracts; PAIS International; Psycinfo; Scopus.

The keyword search was applied to the title, abstract and keywords of each article. Relevant controlled vocabulary terms were used where available in order to give increased precision. The general form of the search combined the following elements:

1. Terms for emergency planning and management (e.g. “emergency management”).
2. Generic terms for disasters or emergencies (e.g. “disaster”), plus specific types of emergency identified in the National Risk Register (NRR) \(^{86}\), particularly those prioritised in the National Security
Strategy and those with major implications for health services (e.g. “terrorism”, “pandemic”).
3. Terms for planning or management that are commonly used in emergency planning (e.g. “resilience”).
4. Either “effectiveness” or “efficiency” occurring together with terms for emergency response activities (e.g. “triage”).
5. Terms for developing countries and types of emergency not currently particularly relevant to the UK (e.g. “earthquake”, “famine”, “HIV/AIDS”).

according to the boolean expression: (1. OR [2. AND (3. OR 4.)]) NOT 5.

In other words, citations found by the search would not be limited solely to those specifically mentioning emergency planning. Citations referring generically to disasters or to a particular type of disaster would also be found, provided that they also used some of the language of emergency planning or concerned effectiveness/efficiency of particular emergency response activities. Any research on developing countries or emergencies not relevant to the UK would however be excluded. Any citations not written in English were also excluded.

The search identified several thousand citations in some databases; too many to be processed within the resources available to the study. Priorities were therefore set, and corresponding search terms developed and applied, with a view to:

- retaining all literature reviews;
- restricting citations from GEObase, IEEE Xplore, Psycinfo and Scopus to those focusing on health or health care;
- restricting citations from BNI, EMBASE and Medline to those focusing on the UK;
- restricting non literature review citations with no specific focus on the UK to those published from 2006 onwards.

The exact search used for each database is given in Appendix 1.

The contents pages of five journals were scanned in order to check for articles which may have been missed by the initial search (see Table 4). To choose the journals, first a shortlist was determined based on the volume of citations found by the search and the proportion of those citations which had been judged to be very relevant (see Section 4.1.4). Journals noted by two previous scoping reviews were then added to the list for consideration: Acosta et al. noted that the three most common sources for the literature they reviewed were Biosecurity and Bioterrorism, Journal of Public Health Management and Practice, and Prehospital and Disaster Medicine; Yeager et al. used ten journals for their review: American Journal of Public Health,

The contents pages of the journal issues published from May 2010 to the date of the hand search (5 May 2011) were scanned, including “in process” articles where available. Issues of Prehospital and Disaster Medicine were however only available up until the end of 2010. The relevance of articles assessed was based first on their title and then on the abstract of articles with apparently relevant titles. The numbers of abstracts judged to be very relevant are given in Table 4. A special issue of Disaster Medicine and Public Health Preparedness on the allocation of scarce resources in an improvised nuclear device incident was found, together with a special issue of the Journal of Public Health Management and Practice on the H1N1 pandemic.

### Table 4: Journals hand searched and numbers of additional articles found

<table>
<thead>
<tr>
<th>Journal</th>
<th>Found by initial search</th>
<th>Found by hand search</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Relevant</td>
</tr>
<tr>
<td>Public Health/BMC Public Health</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>Disaster Medicine and Public Health Preparedness</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Prehospital and Disaster Medicine</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>American Journal of Public Health</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Journal of Public Health Management and Practice</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

### 4.1.2 Grey literature search

In view of the amount of time that searching the grey literature can take, it was decided to focus on the UK. Including grey literature from the USA was judged to be less important, especially as some of this had been explored by previous scoping reviews. Savoia et al. 88, for example, searched for grey literature from Abt Associates, the Agency for Healthcare Research and Quality (AHRQ), the Government Accountability Office (GAO), the Institute of Medicine (IOM), and the RAND Corporation.

The Emergency Planning College (EPC) online library ([http://epcollege.com/epc/knowledge-centre/library/](http://epcollege.com/epc/knowledge-centre/library/)) was searched during October 2010, using the keywords “health” and “planning”. 287 records
were found. Of the 76 documents judged to be relevant based on their title, 55 were guidance documents or plans produced by government departments, the majority of which concerned pandemic flu. Some other documents were not published recently enough to be included in the review. Documents judged not to be relevant included the major incident plans of various health care organisations.

Relevant sections of the following websites were browsed or searched:

December 2010
- Department of Health (DH) ([www.dh.gov.uk](http://www.dh.gov.uk)). The emergency planning section was browsed, and the website was searched using the following terms: *preparedness and (research or evaluation)*; advanced search: *emergency planning; disasters, major incidents, NHS resilience, National Capability Survey*.
- Health Protection Agency (HPA) ([www.hpa.org.uk](http://www.hpa.org.uk)). The emergency preparedness and response publications section was browsed.
- UK Resilience and Cabinet Office ([www.cabinetoffice.gov.uk/ukresilience](http://www.cabinetoffice.gov.uk/ukresilience)). The website was searched using the terms *research or evaluation*.
- Royal United Services Institute ([www.rusi.org](http://www.rusi.org)) and RUSI journal and Newsbrief. These were searched using the term *health care*.

19 and 20 January 2011
- NHS Evidence ([www.evidence.nhs.uk/](http://www.evidence.nhs.uk/)). Relevant sections of the Emergency and Urgent Care Collection, Infectious Diseases Collection and the Infections Collection were browsed, and the website was searched using the terms *disaster, resilience, command and control*.

16 March 2011
- Centre for Public Scrutiny ([www.cfps.org.uk](http://www.cfps.org.uk)). The library of local authority scrutiny committee review reports was searched using the following search terms: *emergency planning, flu, emergency, terror, heat wave, weather, preparedness, resilience, casu*...

Documents that appeared to be relevant and were easily available online were downloaded. Pre-2005 material was not downloaded: there was only a small amount of such material, and it was decided that much of this might have been superseded by more recent documents, especially in view of the advent of the Civil Contingencies Act (CCA) in 2004.
4.1.3 Research registers

The following research registers and websites were searched during January 2011:

- NHS National Research Register Archive (www.nihr.ac.uk/Pages/NRRArchive.aspx)
- UK Clinical Research Network Portfolio Database (http://public.ukcrn.org.uk/search/)
- NIHR SDO (www.sdo.nihr.ac.uk/)
- ESRC (www.esrc.ac.uk/impacts-and-findings/research-catalogue/index.aspx)
- EPSRC (http://gow.epsrc.ac.uk/)
- Department of Health Policy Research Programme (www.dh.gov.uk/en/Aboutus/Researchanddevelopment/Policyresearchprogramme/)
- Health Foundation (www.health.org.uk/)
- European Research Council (http://erc.europa.eu/)
- National Institutes of Health Research (USA) (http://projectreporter.nih.gov/reporter.cfm)
- Robert Wood Johnson Foundation (USA) (www.rwjf.org/)
- Disaster Information Management Research Center and Resource Guide for Public Health Preparedness (USA) (http://disaster.nlm.nih.gov/)

As the search interfaces were less sophisticated than the academic databases, repeated simpler searches were conducted using selected keywords and phrases. Records of research projects judged to be relevant were saved, particularly those awarded in recent years whose outputs would be unlikely to have had time to be published in the academic literature. Research reports were downloaded where the research register provided links to them, but this was atypical. Only research funded from 2007 onwards was included in the analysis (pre-2007 research was included in the researcher survey), on the basis that most research would report within five years.

4.1.4 Filtering

Decisions about whether to include material in the analysis were made by examination of the titles and abstracts of citations. Citations were not excluded on the basis of publication source, be it an academic journal, practitioner publication, or government guidance document. The sole exception was to include material relating to health system development and research in public health in the domains of emergency preparedness and response.

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4 Now at www.netscc.ac.uk/hsdn/
criterion beyond those inherent in the search was relevance to the topic. Each citation was classified as either:

1. very relevant
2. possibly relevant
3. not very relevant
4. not relevant.

Literature reviews were considered first, as each would report on a range of research studies and potentially obviate the need to obtain and analyse the original articles. All reviews judged to be very relevant were obtained and data extracted. A citation search was conducted using Scopus and Google Scholar, and citing articles judged to be very relevant on the basis of the information provided by Scopus/Google scholar were included in our analysis. Where there were no citing articles found (e.g. because the review was recent), a similar articles search was conducted in Google Scholar. Once the literature review article had been obtained and read, previous articles cited in the text that were judged as potentially providing useful additional information were included in our analysis.

Citations having a UK focus were next to be considered, then finally non-literture review citations without a UK focus. The volume of material judged to be very relevant was too great for all of it to be obtained and fully analysed. Decisions about whether to obtain an article were made on the basis of whether it appeared to cover a different area of knowledge to those addressed by articles considered so far, or whether it appeared likely to update an area of knowledge by virtue of being significantly more recent than the articles considered so far.

4.1.5 Data extraction

All citations and research project outlines judged to be very relevant were categorised using a multidimensional framework with categories for: country/area of the disaster; phase of the emergency; hazard type; research method; and element of preparedness (see Appendix 9). In order to facilitate comparisons with previous scoping reviews, the elements of preparedness were chosen to match those from Acosta et al. 32 (see Appendix 5) and the research methods were based on those used by Abramson et al. 89. Additional categories were pilot tested, but not used, either on account of being difficult to code consistently (analytic unit – cf. Abramson et al. 89) or because of lack of time to conduct the coding: organisation/service, organisational tier/scope of incident, community/demographic characteristics, academic discipline.
Government guidance or policy documents were read, but no data was formally extracted. For all other documents obtained, data was extracted regarding:

1. Issues identified, theories developed and claims made;
2. Actions suggested:
   a. to improve practice
   b. further research;
3. Evidence provided or cited in support, including the research methods used and the participants included in the research.

### 4.1.6 Researcher survey

A list of relevant researchers and their email addresses was compiled from those citations (both articles and grants) judged to be either very relevant or possibly relevant which also contained the corresponding author’s email address. This list was supplemented by searching the web for the email addresses of authors of articles deemed to be of particular interest. In February 2011 each researcher on the list was sent a personalised email which noted the researcher’s most recent relevant publication or grant from our database and asked if the researcher could let the research team know about any other of their recent publications or research relevant to emergency planning in health care, so that these could be included in the review. Researchers were also asked for their views about priority areas for future research.

### 4.1.7 Analysis

Citations were analysed by calculating frequencies, cross tabulations and correlations of framework categories. In interpreting the results, account was taken of the way in which the search strategy structured the citations that were identified.

Data extracted from documents was tabulated in a variety of ways, again making use of the framework categories, and themes identified regarding the research that had been conducted and potential research gaps.

Most UK-USA comparisons were based on a coding of the country or countries within which the emergency incident being investigated took place or whose emergency planning or management functions were being researched. More conceptual or general articles and literature reviews were thus excluded from UK-USA comparisons of counts of articles. Where such articles were considered as part of the identification of potential research gaps/themes, some account was taken of their country focus by considering the focus of the references/evidence cited, the location of the practical issues being addressed, and the location of the authors/researchers.
4.2 Previous scoping reviews

Other researchers have attempted to identify gaps in research on emergency planning, in health care and more generally, and identify priorities for future research. These attempts were methodologically diverse, but they have been grouped together as scoping reviews because of their similar intent.

4.2.1 Health/Health care specific scoping reviews

US Centers for Disease Control and Prevention

During 2005 the US Centers for Disease Control and Prevention (CDC) developed an agency-wide research agenda via workgroups, public participation meetings and public consultation. One of the major research areas was “Promote Preparedness to Protect Health”. The research themes within this area are listed in Appendix 2.

Abramson et al.

A literature review that searched MEDLINE and PubMed databases for articles dated between January 2002 and March 2007 which contained the phrases “disaster medicine” or “public health preparedness” in the title, subject, body, or key words. The Prehospital and Disaster Medicine journal was also hand searched. 303 articles met the inclusion criteria and were coded.

Frequent topics included disaster response and recovery system improvement, as well as the need to develop cross-jurisdictional or non-traditional partnerships. Only a small proportion of articles focused on mitigation/prevention or recovery; most focused on organisations or individuals rather than on broader social or political issues. Most were about preparedness or response. The authors suggested therefore that research should broaden its focus beyond preparedness and response, using an ecological framework that incorporates multiple levels from the individual through to the social.

20 areas for research were suggested (Appendix 3), although these were not intended to be comprehensive, and some were specific to the USA.

Altevogt et al.

Recommendations of an expert committee of the USA Institute of Medicine (IOM), informed by the views of a public meeting and a workshop of invited
experts. The aim was to set out near-term research priorities for emergency preparedness and response in public health systems to be conducted by the Centers for Disease Control’s (CDCs) Preparedness and Emergency Response Research Centers (PERRCs) (see Section 4.7.2). The research should have impacts within three to five years. Special attention was paid to issues of protecting vulnerable populations in emergencies, strengthening response systems, preparing the public health workforce, improving timely emergency communications, and improving information management to increase use. It was recommended that research should be conducted that:

1. Enhances the usefulness of training - create best practices for the design and implementation of training (e.g. simulations, drills, and exercises) and facilitate the translation of their results into improvements in public health preparedness.

2. Improves communications in preparedness and response – identify and develop communications in relation to preparedness and response that effectively exchange vital and accurate information in a timely manner with diverse audiences.

3. Creates and maintains sustainable preparedness and response systems - identify the factors that affect a community’s ability to successfully respond to a crisis with public health consequences, and the systems and infrastructure needed to foster constructive responses in a sustainable manner.

4. Generates criteria and metrics to measure effectiveness and efficiency - generate criteria for evaluating public health emergency preparedness, response, and recovery and metrics for measuring their efficiency and effectiveness.

Suggestions of specific research questions are listed in Appendix 4. All of the research should address or be aware of issues regarding vulnerable populations, workforce, behavioural health, and the use and integration of new technologies.

Savoia et al. 

A systematic review of literature on public health emergency preparedness produced in the USA from 1997 to 2008. 547 articles met the inclusion criteria. The number of articles grew by about 33% per year from 2001 onwards. However, most studies lacked a rigorous design, raising questions about the generalisability and validity of their results.

The researchers were able to classify 314 articles (57%) into at least one of the four emergency preparedness research goal areas identified by the
Institute of Medicine (IOM) 91 (see above): 11% addressed usefulness of training; 7% addressed communications in preparedness and response; 35% addressed sustainable preparedness and response systems; 7% addressed criteria and metrics to measure effectiveness and efficiency.

Most studies that did not fall into any of the IOM priority areas focused primarily on health care delivery systems.

The least developed category among the four concerned the development of criteria and metrics, which is meant to propose benchmarks and standards against which to evaluate the existing literature.

Acosta et al. 32

Facilitated discussion and consideration of a pre-circulated literature review paper by a panel of 13 experts representing diverse perspectives, which met in September 2008. The aim was to formulate a public health systems research agenda for emergency preparedness in the USA, building on that of Altevogt et al. 91 but not restricted to the PERRCs.

The literature review was informed by the approach of Abramson et al. 89, extending the coverage by searching additional fields of study, such as behavioural science, and more recent research. Team science, decision sciences, systems engineering, information science, the broader literature on syndromic surveillance, and the study of learning were not fully covered however. 169 peer-reviewed empirical research citations published in English between 1 January 2004 and 15 June 2008 were included. Literature reviews were excluded and there was no grey literature search.

The degree to which the literature appeared to address the priorities identified in key policy documents was assessed – there appeared to be a fair amount of congruence. It was concluded however that the literature constituted an extremely limited empirical evidence base. More multidisciplinary research using a wider variety of methods may be needed.

Most research was observational and descriptive. It focused primarily on all-hazards or an unspecified threat, with terrorism being the next most common focus. A sizable minority of studies focused on natural disasters and infectious-disease outbreaks/pandemics. In terms of emergency management phases, the primary focus was on preparedness, followed by response, with recovery rarely being studied (Appendix 5). Operations-ready workers and volunteers were studied most frequently, followed by countermeasures and mitigation strategies, and health risk assessment. Frequently studied areas had not necessarily been the focus of high-quality studies however. Research on inter-agency communication and coordination appeared to be of relatively low quality, while research on
epidemiology functions, psychosocial outcomes and community resilience was of relatively high quality.

Ten research areas were identified which would benefit from continued research to address limitations. Several of these areas (inter-agency communication and coordination, training, community and special needs populations, measurement, risk communication) overlap with the priorities outlined in Altevogt et al. But others do not, namely countermeasures and mass health care, health care providers and public health workforce, surveillance, psychological impact and legal climate.

The authors judged however that the literature review had limited impact on the priorities selected by the panel. This may have been partly due to the limited evidence base, and the exclusion of grey literature.

Twenty research priorities and illustrative research questions were identified within four research areas:

- planning and other pre-incident activities
- key response capabilities
- resources, infrastructure, and legal frameworks
- accountability and quality improvement.

Short-term and long-term priorities were distinguished. The research priorities and illustrative questions are listed in Appendix 6. It was noted however that this initial research agenda was necessarily general in nature, and that additional effort would be needed to further refine potential research topics in each of the 20 areas.

Recommendations made to the research commissioners to support the implementation of the agenda included:

- secure adequate funding and research capabilities to execute the research by establishing strong intra- and extramural partnerships;
- ensure that research priorities translate into executable research (e.g. require multidisciplinary partnerships to fund research priorities that are likely to require collaboration for successful execution);
- monitor agenda implementation to determine the outcomes and impact of the research investment and revisit the agenda regularly (e.g. every two to four years) to update and revise the priority areas;
- promote sustainability of the research outcomes or interventions (e.g. through research that emphasises the integration of Public Health Emergency Preparedness (PHEP) into more routine public health capabilities, agency accreditation, or sustainability of outcomes as part of performance measures or funding criteria).
Yeager et al. 87

A systematic review of PHEP articles published in 10 relevant journals from 2000 through to 2008. 823 abstracts were reviewed (articles were not obtained). During this period there was a significant expansion in the PHEP literature as a result of world attention on terrorism and disasters.

The PHEP literature was found to be dominated by non-empirical studies (68%), and most studies focused on the preparedness phase of the disaster life cycle. A significant portion of the literature was concerned with exercises and training (12%), primarily focusing on table-top and field exercises; planning (12%); and risk communication. 81% of the articles originated in the USA.

Concludes that there is a need for more research, especially regarding the mitigation phase, but also regarding the response and recovery phases. Particular gaps in the recovery literature include legal/civil liberties, risk/crisis communication, and collaboration. There is also a gap concerning communication/warning systems and evacuation. Articles concerning public information/education were absent from the response and recovery areas. Emergency operations and vulnerability assessment is an important area for future research.

Kelen and Sauer 92

Categorisation of articles published in peer-reviewed medical journals that published at least five relevant articles per year from 1996 to 2006 - one public health journal was also included for the sake of comparison. The most frequent area of publications overall was bioterrorism/pandemics (36%). The next most popular overall publication focuses were preparedness and response (18%).

4.2.2 Scoping reviews not specific to health care

McEntire 93

A synthesis of research findings about disasters, compiled primarily to assist emergency management practitioners and policymakers, also assessed anticipated research needs across a wide range of relevant disciplines. These disciplines included geography, meteorology, engineering, sociology, journalism, psychology, anthropology, social work, political science, public administration, international studies, comparative politics, management, gerontology, public health, criminal justice, economics, law, environment, communications, business, and information.
sciences. Some disciplines, such as history and computer science, were noted as being relevant, but not covered.

An “expert” scholar from each discipline was asked to write a chapter responding to a common set of questions, including “What are the gaps in knowledge in your discipline?” and “What recommendations do you have for your discipline and others in the future?” While each author used their discretion in answering the questions, the editor regards the information provided as impressive. A summary of the chapters is provided, focusing particularly on gaps in interdisciplinary knowledge, and this makes recommendations for future research.

Potential areas for future research are listed in Appendix 7. Many of these do not explicitly concern health or health care, but almost all of them make sense in a health or health care context, and so might be relevant.

While noting the potential barriers posed by disciplinary boundaries, the editor also argues for more multi- and interdisciplinary research, because this can provide a holistic picture of greater relevance to policymakers and practitioners: “the major holes in disaster studies today exist across disciplines and not necessarily within them.”

A review of research on disasters from the perspective of the discipline of history, commended by McEntire, argues that there is a need for more research looking at the perceptual, social and cultural historical contexts of hazardous events in order to better understand what processes create disasters. Such historical contexts also partly determine how disasters are perceived, represented, remembered and forgotten. In an increasingly complex, globalised world, there is a need to understand how the relationships between societies and their changing environments develop over time, and the effects on resilience and vulnerability.

Sementelli (see also Table 3)

An “extensive” literature review. It found that the greatest volume of academic literature on disaster management is informed by decision theories, followed in turn by administrative theories, social theories and economic theories. Decision theory-based research mostly consists of directly applying concepts such as satisficing to the development of heuristics or tools, with little theoretical development. Research based on administrative theories also tends to focus on specific managerial challenges, and is inhibited by the weakness of leadership theories. Various risk-based models to achieve the best outcomes have been developed using economic theories, and there is scope for more research here, but this may reinforce status quo approaches and their emphasis on tools. The greatest potential for research may therefore be through
applying social theories. These might provide insights into the social, economic, administrative and political contexts within which tools and decision rules are applied.

### 4.2.3 Analysis of previous scoping reviews

The priorities identified by previous health/health care specific scoping reviews were mapped onto one another visually using the CMapTools knowledge modelling kit. Links were drawn between priorities if they were judged to be either the same as, similar to, or related to one another; or if one was a part of or an aspect of another. Where a review had grouped some priorities within wider topic areas, then both areas and priorities were included in the map, making use of the software’s hierarchical nesting facility. No distinction was made between areas and priorities when drawing links, as one review’s priority could be another review’s area on account of differing levels of detail. Then the software’s autolayout facilities were used to help arrange the priorities and areas into clusters. These clusters are set out in Table 5, arranged in order of the number of priorities and areas within the cluster (giving areas twice as much weight as priorities). This gives a rough indication of the consensus regarding the cluster. For brevity, priorities and areas judged to be merely aspects or part of others in the cluster have been omitted from table, as have the constituent priorities of included areas.

#### Table 5: Clusters of priorities indicated by previous health/health care specific scoping reviews

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Priorities and Areas&lt;sup&gt;5&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rev</td>
<td>ID/ level</td>
</tr>
<tr>
<td>Aco</td>
<td>L7</td>
</tr>
<tr>
<td>Aco</td>
<td>R4a</td>
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</tbody>
</table>

<sup>5</sup> Key for reviews: Abr = Abramson et al; Aco = Acosta et al; Alt = Altevogt et al; CDC = US Centers for Disease Control and Prevention; Sav = Savoia et al; Yea = Yeager et al. Every ID/level code and a fuller description is listed in Appendix 8. These were obtained by coding the priorities and areas identified in the reviews – see Section 4.2.1, Appendix 2, Appendix 3, Appendix 4 and Appendix 6 for more information about these priorities and areas.
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Alt</td>
<td>3</td>
<td></td>
<td>Generate criteria and metrics to measure effectiveness and efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD</td>
<td>6</td>
<td></td>
<td>Outcome measurement for improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sav</td>
<td></td>
<td></td>
<td>Generate criteria and metrics to measure effectiveness and efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abr</td>
<td>4</td>
<td></td>
<td>Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aco</td>
<td>L6</td>
<td></td>
<td>Psychological impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aco</td>
<td>R2h</td>
<td></td>
<td>Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yea</td>
<td>6</td>
<td></td>
<td>Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abr</td>
<td>2</td>
<td></td>
<td>Prevention/mitigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aco</td>
<td>L9</td>
<td></td>
<td>Countermeasures/mitigation and mass health care</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yea</td>
<td>2</td>
<td></td>
<td>Mitigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aco</td>
<td>L4</td>
<td></td>
<td>Inter-agency communication and coordination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alt</td>
<td>2</td>
<td></td>
<td>Improve communications in preparedness and response</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yea</td>
<td>4</td>
<td></td>
<td>Collaboration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aco</td>
<td>R1a</td>
<td></td>
<td>Improving public health emergency preparedness planning and organisational structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alt</td>
<td>4</td>
<td></td>
<td>Create and maintain sustainable preparedness and response systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD</td>
<td>2e</td>
<td></td>
<td>Local and regional operational strategies for managing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yea</td>
<td>3</td>
<td></td>
<td>Response</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aco</td>
<td>L8</td>
<td></td>
<td>Risk communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>communication</td>
<td>Aco</td>
<td>R2c</td>
<td>Risk communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-----</td>
<td>-----</td>
<td>--------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD C</td>
<td>5a</td>
<td>Risk communication and information dissemination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yea</td>
<td>7</td>
<td>Risk/crisis communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Training/exercise</td>
<td>Aco</td>
<td>L3</td>
<td>Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aco</td>
<td>R3b</td>
<td>Workforce and training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alt</td>
<td>1</td>
<td>Enhance the usefulness of training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD C</td>
<td>3a</td>
<td>Scientific rigour for exercises</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Community/special needs</td>
<td>Aco</td>
<td>L1</td>
<td>Community and special needs populations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aco</td>
<td>R1b</td>
<td>Engagement of diverse groups and populations in PHEP efforts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aco</td>
<td>R2f</td>
<td>Special needs populations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD C</td>
<td>1</td>
<td>Vulnerable communities and populations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Legal framework</td>
<td>Aco</td>
<td>L5</td>
<td>Legal climate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aco</td>
<td>R3c</td>
<td>Legal framework</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yea</td>
<td>5</td>
<td>Legal/civil liberties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Surveillance</td>
<td>Aco</td>
<td>L2</td>
<td>Surveillance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aco</td>
<td>R2a</td>
<td>Improving epidemiology and surveillance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD C</td>
<td>4a</td>
<td>Health surveillance systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Laboratories/diagnostics</td>
<td>Aco</td>
<td>R2b</td>
<td>Public health laboratory systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CD C</td>
<td>4b</td>
<td>Rapid clinical diagnostic capabilities during public health emergencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This may be regarded as suggesting a total of nine clusters of priorities, as the final two in the list, Surveillance and Laboratories/diagnostics, can also be thought of as aspects of Prevention/mitigation.

4.3 Analysis of journal article citations judged to be very relevant

Citations judged to be very relevant were categorised, then frequencies and cross-tabulations of categories were calculated. The multiple response groups feature of SPSS statistical analysis software was used because more than one category could be selected within each dimension of the categorisation framework (see Appendix 9).

The analysis aimed to compare the current review with previous scoping reviews and to identify patterns within the UK-focused research from the current review, compared with research not focused on the UK. Some parts of this second comparison did also look at previous scoping reviews because only a small proportion of their data was drawn from the UK.

Account was taken of the way in which the search strategy structured the citations that were identified (see Section 4.1.1). When looking at the current review overall, only the 283 citations of journal articles published after 2005 and not found in Medline, Embase or BNI were included in the comparisons, to adjust for bias towards UK-focused research. But most analyses looking at the patterns within the UK-focused research relaxed these restrictions, leaving 119 UK-focused journal articles available for analysis. Detailed statistics relating to the analysis are given in Appendix 10.

4.3.1 Comparisons with previous scoping reviews

The pattern of research methods used in the citations included in the current review is generally similar to that in previous reviews, except that there is a smaller proportion of case studies (Table 26). This difference is likely to be because case studies and reports drawn from practice in other countries (predominantly the USA), were often judged not to be very relevant to the current review, with its focus on the UK, on account of differences in structures, cultures etc. between the countries (see Chapter 3). Of the "other" methods found by the current review, simulation or other modelling accounted for 16% of all methods, and expert consensus studies (e.g. Delphi) for 12%. The comparisons that can be made with other scoping reviews suggest that modelling and consensus studies are more common in the current review. Operational
research/computer modelling accounted for only 1% of methods in Abramson et al. and consensus studies for no more than 4%, while mathematical modelling accounted for only 1% of methods in Savoia et al. The consensus studies discrepancy is not substantive because the figure in the current review is boosted by several papers published in a special edition of Intensive Care Medicine during 2010. The apparent discrepancy in modelling studies does not appear to be due to an increase in such publications in recent years; it may be due to the current review searching a wider range of subject areas.

The current review appears to include a smaller proportion of research related to terrorism than previous reviews (Table 27), and looking at the trend in citations suggests that there may have been a decline in research related to terrorism over recent years (Table 6). A plausible explanation for this is the passage of time since the occurrence of major terrorist incidents in Western countries, such as 9/11 in New York and 7/7 in London. There is also an increasing proportion of citations studying influenza - particularly swine flu and flu pandemics generally – rising to over 40% of the citations in 2010 (Table 7). This reflects the advent of the swine flu pandemic in 2009.

Table 6: Trend in proportion of citations focused on terrorism

<table>
<thead>
<tr>
<th>Year</th>
<th>No</th>
<th>Yes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>27</td>
<td>9</td>
<td>25%</td>
</tr>
<tr>
<td>2007</td>
<td>50</td>
<td>11</td>
<td>18%</td>
</tr>
<tr>
<td>2008</td>
<td>57</td>
<td>5</td>
<td>8%</td>
</tr>
<tr>
<td>2009</td>
<td>75</td>
<td>7</td>
<td>9%</td>
</tr>
<tr>
<td>2010</td>
<td>42</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>251</td>
<td>32</td>
<td>11%</td>
</tr>
</tbody>
</table>
Table 7: Trend in proportion of citations focusing on swine flu or flu pandemics

<table>
<thead>
<tr>
<th>Year</th>
<th>No</th>
<th>Yes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>33</td>
<td>3</td>
<td>8%</td>
</tr>
<tr>
<td>2007</td>
<td>52</td>
<td>9</td>
<td>15%</td>
</tr>
<tr>
<td>2008</td>
<td>54</td>
<td>8</td>
<td>13%</td>
</tr>
<tr>
<td>2009</td>
<td>60</td>
<td>22</td>
<td>27%</td>
</tr>
<tr>
<td>2010</td>
<td>24</td>
<td>18</td>
<td>43%</td>
</tr>
<tr>
<td>Total</td>
<td>223</td>
<td>60</td>
<td>21%</td>
</tr>
</tbody>
</table>

Table 8: Comparison of phase of emergency between previous scoping reviews and the current review

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning structures and processes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10%</td>
</tr>
<tr>
<td>Prevention</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5%</td>
</tr>
<tr>
<td>Threats, signal detection, warning and surveillance</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6%</td>
</tr>
<tr>
<td>Mitigation</td>
<td>8%</td>
<td>-</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>Preparedness</td>
<td>61%</td>
<td>54%</td>
<td>44%</td>
<td>40%</td>
</tr>
<tr>
<td>Response</td>
<td>19%</td>
<td>31%</td>
<td>39%</td>
<td>25%</td>
</tr>
<tr>
<td>Recovery</td>
<td>13%</td>
<td>15%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>Learning</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6%</td>
</tr>
</tbody>
</table>
The current review also appears broadly comparable with Acosta et al. in terms of the elements of preparedness covered (Table 28). There are however greater proportions of citations on testing operational capabilities and on the legal climate. In the current review, articles evaluating the preparedness of services were coded as testing operational capabilities, in addition to articles concerning exercises and drills, which may account for this discrepancy. There is no obvious trend in citations on these elements of preparedness over time; the apparent discrepancies with regard to the legal climate may be simply chance fluctuations or perhaps due to the current review searching a wider range of subject areas.

Looking at the country where the incident being studied occurred indicates that the current review has a similar geographical coverage to previous scoping reviews, with a preponderance of USA-focused citations (Table 29).

While not definitive, the trend in citation numbers (Table 9), which is broadly in line with previous scoping reviews, suggests that the amount of research being conducted has increased between 2006 and 2010.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-2006</td>
<td>58</td>
</tr>
<tr>
<td>2006</td>
<td>36</td>
</tr>
<tr>
<td>2007</td>
<td>61</td>
</tr>
<tr>
<td>2008</td>
<td>62</td>
</tr>
<tr>
<td>2009</td>
<td>82</td>
</tr>
<tr>
<td>2010 (part year)</td>
<td>42</td>
</tr>
<tr>
<td>Total</td>
<td>341</td>
</tr>
</tbody>
</table>

The general commonality of coverage compared with previous scoping reviews suggests that the current review covers similar ground, and that the main findings from across previous reviews (see Section 4.2.3) can be carried over into this review.

### 4.3.2 Patterns in the UK-focused citations

A greater proportion of the UK-focused citations used surveys as a research method (Table 30). The smaller proportion of literature reviews is not surprising, as many literature reviews do not focus on a particular country.
The hazards addressed are similar between UK-focused and other citations, except that a smaller proportion of UK-focused citations consider heat waves, hurricanes, tornadoes or other extreme weather (Table 10). This is to be expected given the relatively moderate and temperate UK climate.

Table 10: Comparison of hazard between UK-focused citations and other citations

<table>
<thead>
<tr>
<th>Hazard</th>
<th>UK-focused</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Flood</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Heat wave</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>Hurricane or tornado</td>
<td>2%</td>
<td>12%</td>
</tr>
<tr>
<td>Other extreme weather</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>Infectious disease outbreak or pandemic</td>
<td>41%</td>
<td>35%</td>
</tr>
<tr>
<td>Terrorism</td>
<td>27%</td>
<td>19%</td>
</tr>
<tr>
<td>CBRNe</td>
<td>21%</td>
<td>19%</td>
</tr>
</tbody>
</table>

There appear to be relatively few UK-focused citations looking at recovery, but relatively more looking at mitigation (including threats, signal detection, warning and surveillance) (Table 11).
Table 11: Comparison of emergency phases between UK-focused citations and other citations

<table>
<thead>
<tr>
<th>Phase</th>
<th>UK-focused</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning structures and processes</td>
<td>18%</td>
<td>9%</td>
</tr>
<tr>
<td>Prevention</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>Threats, signal detection, warning and surveillance</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Mitigation</td>
<td>9%</td>
<td>2%</td>
</tr>
<tr>
<td>Preparedness</td>
<td>32%</td>
<td>41%</td>
</tr>
<tr>
<td>Response</td>
<td>22%</td>
<td>26%</td>
</tr>
<tr>
<td>Recovery</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>Learning</td>
<td>3%</td>
<td>6%</td>
</tr>
</tbody>
</table>

This is reinforced by looking at the elements of preparedness, where the main apparent difference is that a much greater proportion of UK-focused citations looked at countermeasures and mitigation strategies (Table 12).
Table 12: Comparison of elements of preparedness between UK-focused citations and other citations

<table>
<thead>
<tr>
<th>Element of preparedness</th>
<th>UK-focused</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations-ready workers and volunteers</td>
<td>15%</td>
<td>18%</td>
</tr>
<tr>
<td>Countermeasures and mitigation strategies</td>
<td>27%</td>
<td>6%</td>
</tr>
<tr>
<td>Health risk assessment</td>
<td>3%</td>
<td>9%</td>
</tr>
<tr>
<td>Psychosocial outcomes and community resilience</td>
<td>3%</td>
<td>7%</td>
</tr>
<tr>
<td>Mass health care</td>
<td>3%</td>
<td>8%</td>
</tr>
<tr>
<td>Public information and communication</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>Testing operational capabilities</td>
<td>13%</td>
<td>14%</td>
</tr>
<tr>
<td>Inter-agency communication and coordination</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>Epidemiology functions</td>
<td>3%</td>
<td>6%</td>
</tr>
<tr>
<td>Roles and responsibilities</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>Robust supply chain</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Incident Command System (ICS)</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Public engagement</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Laboratory functions</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Legal climate</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>Performance management</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Leadership</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Financial tracking</td>
<td>0%</td>
<td>1%</td>
</tr>
</tbody>
</table>

4.4 Analysis of articles found by the literature search of academically oriented databases

An analysis of the full text articles obtained suggested a number of themes, that are described briefly in the following sub-section, referring to relevant literature reviews and illustrative articles. The research on each established theme was not covered comprehensively; rather, efforts were devoted to identifying new themes and briefly exploring them. Greater priority was
given to trying to identify UK research articles, particularly recent articles, in order to identify potential research gaps relevant to the UK. Practical issues and potential research gaps within themes were identified based primarily on issues highlighted in articles and suggestions for further research made explicitly by article authors. As far as possible, the research gaps based on more recent, UK-based research have been listed first.

From a UK point of view, some whole themes where there appears to be little or no UK-based research may potentially represent research gaps. This is hard to assess because of the generally low volume of UK-focused research found and insufficient time within the study to fully explore links between themes and alternative theme structures. Similarly, elements of our conceptual model and various other frameworks/categories where there was little or no research found beyond descriptive accounts, may represent research gaps. Some suggestions have been made within some of the following sections and in particular in Section 4.4.11.

In developing the themes and potential research gaps, account was also taken of emerging findings from the interviews, which were being conducted in parallel. Thus, possible themes that related to issues highlighted by interviewees were more likely to be considered and developed.

### 4.4.1 Standards and levels of preparedness

Perhaps the largest group of UK-focused studies identified through the literature review assessed the preparedness of various health care and related services. Such assessments require standards against which to judge levels of preparedness, and a relatively large number of articles found addressed aspects of what is needed in order to prepare and respond effectively to different types of mass casualty emergency. The emergencies considered included terrorism 99 and mass fatality CBR incidents 100, contaminated mass casualties 101, mass casualty burns 102 and pandemics 98 103-104.

Standards for preparedness to increase the supply of health care - surge capacity have been considered for hospitals and intensive care units (ICUs) 105. Triage systems to manage demand have also been studied, including admission to and discharge from health care services and associated ethical issues 106. Ethical principles have also been considered with regard to the allocation of scarce resources more generally (e.g. vaccination and other treatment), and with regard to infringing on freedoms (e.g. quarantine) 107. Standards and recommendations have typically been based on expert agreement rather than on well-designed primary empirical research.
 Assessments of preparedness typically found that services are not well-prepared for some disasters or aspects of disasters. For example, although acute medical responses to the 7/7 attacks in London earned praise, ambulances were hampered by not having digital radio when the mobile phone network collapsed.

Less than half of 100 NHS organisations surveyed had plans for dealing with a loss of IT, and even fewer were prepared for severe weather. 62% of the NHS organisations had business continuity plans. Potentially serious deficiencies have been found in the preparedness of many PCTs, including low participation in live exercises and vague plans. Many A&E departments were found not to have adequate isolation facilities for managing patients with potential infectious diseases. There were also concerns about shortfalls in planning budgets and integration, and in training for staff. There is consensus that hospitals are not well prepared for a terrorist attack involving radioactive materials. Major inconsistencies have been found in the preparedness of A&E departments to manage chemical incidents, with plans either lacking or inaccessible in over half of the departments and 40% not having a training programme in chemical incident management. The authors suggest that a lack of time and finance, reflecting higher priority being given to other issues, may be at the root of the problem.

A study of care homes found that they lacked contingency plans for pandemic flu, and that there were significant gaps in thinking and proactive planning with regard to business continuity, case management and infection control. There are also likely to be shortcomings with regard to heat waves.

Health care organisations in the USA have also been found to be unprepared to cope with major terrorist incidents, particularly those involving biological agents. They also lack equipment, supplies and training to treat and care for children during disasters.

Lack of resources (see Section 4.4.2) and lack of training (see Section 4.4.3) are commonly identified issues.

**Potential research gaps**

Authors highlight various potential research gaps within their own areas of interest, but these fall into two main areas:

- Methods of measuring and assessing preparedness, including developing evidence-based standards using more rigorous research methods. Standard development should include primary and
community care services, as most research has been focused on secondary health care facilities such as hospitals and ICUs.

- Authors generally suggest larger or further studies to assess levels of preparedness, including observational studies to describe and evaluate key practices during actual incidents, both small and large.

4.4.2 Priority and resourcing given to emergency planning and management

There has been criticism that increases in resources devoted to biodefence and emergency response in the USA have been at the expense of other public health services and efforts to address the social and political determinants of health threats. There is also mixed evidence from the USA as to whether central government funding and other incentives have improved the preparedness of local organisations. The support and leadership of senior managers is likely to be important.

Having specialist local leadership of preparedness programmes would appear to be an important driver. It is considered good practice for PCTs to employ an Emergency Planning and Liaison Officer (EPLO), yet a regional survey in 2006 found that only 60% of PCTs had an EPLO, and there are concerns about the priority given to emergency planning by PCTs.

There has been some criticism in the UK about over-reacting to swine flu at the expense of addressing other infectious disease, but more views were found relating to insufficient resourcing. A subsequent review of the swine flu pandemic, for example, found that the response was proportionate. PCTs have also been criticised for not giving sufficient priority to emergency preparedness, with the Department of Health (DH) not providing guidance on investment. Access to budgets and resources for security is a problem in many organisations, and concern about the financing of preparedness appears to permeate many plans, with the assumption generally being that resources will be rationed rather than augmented.

Potential research gaps

- What is the right balance between emergency preparedness and tackling existing public health issues?
- Investigate the factors (e.g. professional background, funding sources, policy mechanisms, levels of resources etc.) (cf. Stangeland) which affect the priority organisations give to preparedness, and
whether this displaces core public health programmes. Consider the pros and cons of having a central body with responsibility for ensuring effective cooperation in major incidents, which can distribute resources and enforce implementation. FEMA in the USA might be an interesting comparator.

- Investigate the impact of Emergency Planning and Liaison Officers in NHS organisations, and of the impact on decision-making of personal experience or training in aspects of response (e.g. fire).

### 4.4.3 Training and exercises

UK-focused academic research on training and exercises is scarce, but there is a relatively substantial literature overall, particularly with regard to drills in hospital settings. The methodological quality of many studies has however been poor.

Emergency plans need to be tested through drills and exercises, whether tabletop, simulated or "live". NHS organisations are required to undertake live exercises every three years; a tabletop exercise every year and a test of communications cascades every six months. Educational principles suggest however that this is not often enough to ensure individual competence, particularly as only a small proportion of staff will be involved in any given exercise. It has been recommended that hospitals should participate and evaluate one full-scale exercise annually plus one review exercise annually. One-off infection control training is unlikely to be sufficient to prepare ward staff for using personal protective equipment during a pandemic, for example Phin et al. Furthermore, exercises are expensive, disrupt service provision and their effectiveness in improving staff response skills is unclear.

Hospital drills have been shown to enable staff to become familiar with emergency procedures, to identify problems in different components of response and to apply lessons learned. Drills can thus facilitate both organisational and individual learning, the latter building on the foundation for appropriate action provided by staff training and education. Effective education and training may also increase staff willingness to work during CBRNe incidents and to participate in emergency planning. Considerable progress has been made in identifying core competencies, which may assist the planning and provision of a suitable range of training and education to meet individual needs. A lack of educational programmes for nurses in the USA has been noted however, with insufficient nursing faculty members able to teach about emergency preparedness and
response. Promoting emergency preparedness in the daily routines of staff may also be helpful.

Potential research gaps

- Carefully designed research studies of the effectiveness and cost-effectiveness of education, training and drills, to include both pre- and post-testing and control or comparison groups. Multi-agency training and its scope for promoting inter-organisational learning should be considered as part of this. There should also be further studies to compare drills with computer simulations and tabletop exercises, and to assess how frequently training and testing is needed. Valid and reliable instruments to measure individual preparedness may need to be developed.

- Development and evaluation of training and education methods and materials for health care workers, including nurses, and also volunteers. Potential gaps include rare, high impact events, heat waves, and disaster mental health, including preparedness training to prevent adverse psychological reactions among staff. Research assessing nurses’ roles and needs when responding to emergencies may be needed in order to inform the content of training and education.

- Systematic studies of the influence of emergency preparedness training and of levels of education, knowledge and competency on willingness to work.

4.4.4 Collaboration across multiple organisations

Coordination between organisations is needed from local through to regional, national and international levels, depending on the nature of the incident. The coordination may be between different organisations within the health care sector, such as when hospitals within a region collaborate during the response to a major mass casualty incident which exceeds the resources of a single hospital (e.g. ICU resources). Such coordination may concern the distribution of patients, staff or supplies, or decisions to alter standards of care to make better use of the resources available. This can be supported by the implementation of interoperability standards for communications, equipment, procedures, planning, training, exercising, qualifications and staff. Interoperability is primarily about people and processes, and only secondarily about technology. Joint training and exercising can help organisations to understand each other’s needs. Benefits of regional coordination, together with various barriers
have been identified. A conceptual framework and checklist for assessing regional preparedness have been developed, with an emphasis on cross-border collaboration.

Organisations from different sectors may also need to collaborate, and thus plan for such collaboration. This is a common occurrence at local level for the police, fire and ambulance services when responding to incidents of various sizes, but may take on new aspects for major incidents. For example, the police may have to enforce quarantining during a disease outbreak or protect health care facilities from people unhappy with lack of access to health care during a mass casualty incident. Coordination at international and other cross-border levels between governments and agencies is also needed with regard to tasks such as communicable disease surveillance and allocation of resources during an emergency.

Coordination may be hard to achieve, as tensions may arise due to differences in culture, priorities, values, jurisdictions, structures, processes, communication systems and available resources. Particular barriers include jargon and a lack of a common language, and leaders unwilling to commit staff and other resources. Regular interactions between those involved can help, including joint training and a "liaison" model where staff work in other agencies for periods of time, but there is a need for guidance about how to develop and sustain partnerships.

The introduction of the CCA and systems such as Local Resilience Forums (LRFs) has improved coordination, but LRFs cannot ensure that policy decisions are always implemented. Coordinated emergency responses by the fire, ambulance and police services are hampered by the lack of standardised operational procedures, plus a lack of standardisation with regard to technology acquisition, training and exercising, and sharing lessons.

**Potential research gaps**

- Investigate ways in which standardisation and coordination between different organisations can be improved. For example, a priority in the short-term could be social science research to better understand the factors, including human factors, that enable and inhibit interoperability. Consideration could also be given to investigating the value of having a central body with responsibility for ensuring effective cooperation in major incidents, which can distribute resources and enforce implementation. FEMA in the USA might be an interesting comparator.
• Understand how multi-agency working differs between routine operations, planned large events, and major emergencies, in order to understand what solutions from one arena can be carried over to another 124.
• More research is needed into the role of training and exercising as drivers of interoperability, and how academic study and vocational training can best contribute 124.
• More research needs to be carried out into the way emergency responders communicate during multi-agency working so that their technological needs can be properly assessed 124.
• Investigate how to develop and sustain partnerships 120.

4.4.5 Staff availability

Health care service provision relies on a team of staff drawn from a range of disciplines, the absence of any of which may compromise quality or capacity. Indeed, availability of staff may be the limiting factor on surge capacity in some incidents, rather than equipment or drugs 149. The availability of staff results from a combination of the ability of staff to attend for work, which may be reduced because of the impact of an incident on transport infrastructure, for example, and the willingness of staff to work 150-151.

Willingness to work is affected by a variety of factors, including conflicting obligations to others, and the expected levels of support and protection provided by employers 130. Thus staff may be less likely to be willing to work during CBRNe incidents or infectious disease outbreaks, when they perceive dangers of being infected or contaminated at work 140. There is however considerable uncertainty in the staff availability estimates used in preparedness plans 150. Some of this uncertainty is an unavoidable part of making predictions, but model parameters are also uncertain due to an insufficient empirical research basis, with the applicability to the UK of studies conducted in other countries not having been investigated.

Willingness to work can be increased through appropriate actions to address the factors that affect it, such as encouraging individual staff to develop “at home” preparedness plans 130. Not all such factors have been identified however, nor the efficacy of potential actions thoroughly investigated 140.
Potential research gaps

- Evaluate interventions to influence willingness to work among health care workers \(^{150}\), particularly during CBRNe incidents or pandemics, including looking at the impact of providing: vaccination \(^{150}\), information, transport, accommodation, and protection from litigation \(^{151}\); protective equipment and education \(^{140}\).
- Multi-nation studies on willingness to work \(^{140}^{150}\).
- Assessing the influence of various factors on willingness to work, based on appropriate conceptual modelling \(^{140}\). Factors might include, for example, gender, other socio-demographic characteristics, immunisation status, organisational culture, ethical and legal implications, knowledge of potential adverse physical and mental consequences \(^{140}\).

4.4.6 Health problems arising from incidents

A number of research studies have investigated the incidence of health problems following disasters of various types, and hence the demand for treatment during the response and recovery phases. Risk factors and the potential for prevention and mitigation have also been investigated. A high proportion of studies have focused on mental health problems \(^{152}\) such as post-traumatic stress disorder (PTSD) \(^{153}\) and other mental health problems \(^{154}\), and access to treatment via outreach screening programmes \(^{155}\). The psychosocial needs of disaster survivors are the responsibility of local authorities, and without special financial and referral arrangements being put in place, access to appropriate mental health services may be problematic. Rates of referral and actual service use tend to be low when compared with estimates of morbidity levels \(^{138}\).

PTSD is often accompanied by other health problems such as depression, anxiety and substance misuse. Some studies have looked at other health impacts, including the physical health implications of post-disaster relocation \(^{152}\) and the impacts of floods \(^{37}^{156}\). There can be a variety of short-, medium- and long-term impacts from floods, both direct and indirect (e.g. associated with evacuation or loss of health infrastructure such as drugs). Health problems include hypothermia, injuries and infections, poor mental health, chronic disease and disability.

The mental health of responders, both professional and volunteer, may also be adversely affected by exposure to traumatic events, high levels of work demand, and separation from home and family \(^{136}^{139}\), with this in turn affecting the functioning of health care organisations. Ambulance staff may be at risk because of the higher frequency of their involvement in incidents,
but a variety of other health care staff may also be affected. Mental toughness may be built up in advance, and "psychological first aid" may be useful, but despite much research already, this, and other approaches, such as critical incident stress debriefing and preparedness training, require further evaluation 157.

**Potential research gaps**

- Research into post-disaster mental health services: programme evaluation, and ways of increasing access through, for example, marketing and redesigning services to make them more acceptable and appropriate 138 154 158.
- Evaluation of the efficacy of preparedness training, psycho-education, psychological first aid, skills for psychological recovery, skills for critical incident stress debriefing and other preventative and treatment approaches in various situations, using rigorous research designs 138-139 157. Verify the validity of PTSD screening and assessment instruments 125.
- Determine health impacts over time 158, evaluating indirect health impacts which result from the breakdown of health and social care services and supporting infrastructure 159.
- Evaluations of interventions to protect relocated populations 152.
- Identify those factors which predict which people will suffer mental health problems in which situations 139 154 156, including consideration of cultural differences 136 and exploration of the inter-relationships between pre-trauma, peri-trauma and post-traumatic factors 153

### 4.4.7 Vulnerable groups and community involvement

If groups of people who are particularly vulnerable to adverse health impacts from major incidents can be identified and their needs assessed, then emergency planning can take this into account and appropriate measures taken with regard to different incident phases. This may sometimes be difficult in practice, however as the vulnerability of an individual may vary during the course of an incident such as a heat wave 160.

Without appropriate measures, existing health inequalities can translate into morbidity and mortality inequalities 161. People already receiving or likely to need health or social care services, such as people with mental health problems or with chronic diseases, are potentially vulnerable, for example because access may be disrupted by the effects of an incident 162.
Other potentially vulnerable groups considered by researchers have included older people, people in care, children, pregnant women and women more generally.

Public communications need to be tailored to make them equally effective with all population groups. For example, using graphics as well as text for people with low literacy levels, and making materials available in different languages. Given the diversity within communities, there will be limits to the extent to which this can be done during a crisis, suggesting the value of prior capacity building among some communities in order to enable them to interpret general communications.

Inclusive and collaborative planning processes are important if suitable plans and measures are to be developed. Such processes also facilitate access to social capital, one of four key resources underpinning community resilience (economic development, social capital, information and communication, and community competence) that have been identified, and which contribute to wellness following a disaster. Existing community and organisational networks are also important in disaster response. Yet flu pandemic plans, for example, have had little input from the public, and operational staff may also have insufficient input.

Personal and household preparedness are also potentially important, and members of the public can perform important roles during response and recovery. Indeed, disaster victims themselves are frequently the “first responders”, with individuals and local groups coming together as emergent temporary organisations, frequently acting on the basis of information not known to officials, facilitated by new ICTs. Volunteers can relieve pressure on health care staff, replacing ambulance crews for “routine” emergencies for example. Consideration has also been given to the potential for retired health care staff to be brought back into service to supplement existing staff, but this is a complex issue.

Potential research gaps

USA researchers (e.g. Norris et al., Eisenman et al.) would appear to have given more attention than UK researchers to the active roles that communities and individual citizens can play in emergency planning and all of the phases of emergency incidents. While this may to some extent reflect the differences between the two countries, such as culture, geography and health care provision, it is suggestive of a lack of UK-focused research.

- Investigate the likely scope of benefits from active community and citizen involvement in emergency planning and in addressing the
various phases of emergency incidents, the barriers to such involvement, and initiatives that might overcome those barriers.

- Theoretically informed research which investigates the nature and strength of relationships between wellness following a disaster, elements of individual and community resilience/vulnerability, and population characteristics such as gender, disability and ethnicity.\(^{163,166,172}\)

- What kind of information is being generated and distributed through computational media by members of the public in times of crisis? How do people self-organise around this information? How can publicly-available, grassroots, peer-generated information be deemed to be trustworthy, secure and accurate, so that it can be leveraged and aligned with official information sources for optimal, local decision-making by members of the public?\(^{167}\).

- Evaluation of specialist activation, credentialing and competency testing and larger national volunteer team activation across health care.\(^{132}\)

### 4.4.8 Modelling and simulation

Modelling of complex systems can assist decision-makers to determine cost-effective strategies by taking account of the many interdependencies between system components, which are otherwise difficult to grasp and to evaluate through empirical research.\(^{173}\). While there are many such complex systems related to emergency planning, the UK-focused articles found all considered the strategic modelling of disease outbreaks or pandemics. The models assessed the impacts and cost-effectiveness of various strategies concerning vaccination, school closure, isolation, quarantine, contact tracing use of antivirals\(^ {174-177}\). It is important that models can be calculated and updated quickly to facilitate learning and respond to new information about the nature of an outbreak as it progresses.

Other types of simulation model have been developed for staff training and exercising, where key research questions are how to measure effectiveness, and the relative merits of such models as against live and tabletop formats (see Section 4.4.3).

### Potential research gaps

- The development of further and more extensive models of health care organisational and inter-organisational systems in order to
assess the resilience of such systems and inform strategies for mitigation, response and recovery 173.

- Disease outbreak models also need to be made more sophisticated: modelling higher-order clusters in human contact networks, such as households, workplaces, residential institutions and social groups 175-176; taking account of feedback effects such as behavioural responses to perceived risk of infection 175; considering logistical constraints 175 178; and modelling multi-species transmission 177.

4.4.9 Disease outbreaks, pandemics and release of biological agents

A significant proportion of research gaps identified by authors of UK-focused research concerned infectious diseases – particularly a flu pandemic, but also the deliberate or accidental release of biological agents (cf. Section 4.3.1 and Section 4.3.2). While the communicable disease surveillance and containment functions in the UK may be relatively well resourced, there is a lack of capacity across the EU, and the system is only as good as the weakest link in it 145. Good practice, issues and potential research gaps related to emergency planning for pandemics are considered further in Section 6.4 2009/10 swine flu (H1N1) outbreak.

Potential research gaps

Some gaps have been included above in Section 4.4.5 Staff availability and Section 4.4.8 Modelling and simulation. Other more specific research gaps include:

- Assessing the impact of personal protective equipment (PPE) use during a flu pandemic 103.
- Investigating the preparedness of care homes for pandemic flu 115.
- What types of cooperation across the EU are needed for different types of communicable disease 145?

4.4.10 Heat waves

Heat waves were considered in some articles focusing on the UK, and in a further article which took a pan-European perspective including the UK. The core elements of heat health action plans include coordinated responses; accurate and timely alert systems; avoidance or reduction of heat exposure; particular care for vulnerable populations; provision of
health care, social services and infrastructure; heat-related health information; real-time health surveillance; and monitoring and evaluation.

Some actions contained in plans may not however be feasible to implement. Identifying and contacting vulnerable people during a heat wave can be difficult, as can communications between organisations and staff, especially out of normal office hours. Hospitals may find it difficult to provide cool areas and many care homes may not provide suitable environments.

**Potential research gaps**

- Establish clear evidence identifying the most effective and cost-effective measures to include in heat wave planning in community settings, particularly in targeting the most vulnerable. Innovative, multifaceted interventions should be designed and evaluated.
- Improvement of real-time heat wave surveillance systems, including prompt analysis of mortality data.
- Investigation of heat-health risk perception in the public, in order to develop more effective and targeted communication strategies.

4.4.11 **Other research areas and potential gaps**

Areas where only very few or no relevant health care-specific UK-focused articles were found included:

- Public information and communication;
- Logistics and the supply chain;
- Primary and community care roles (e.g. GPs, pharmacists) in preparedness and response.

Further consideration related to these areas is given in Section 6.4 2009/10 swine flu (H1N1) outbreak. With regard to public information and the media, a literature review of risk communication was found which suggested the need for some further research:

- In-depth evaluation of the effectiveness of event-specific crisis risk communication efforts, through systematic media monitoring before, during and after an event, for example.
- Determine current crisis risk communication competencies and the degree to which they are embedded in public health agencies’ overall workforce.
Some of the potential research gaps in previous sections also concern communication of information to the public.

Little research was found on business continuity management of health care services, or coping with internal disasters – a situation noted previously. Hospital fires have been considered to some extent, highlighting the importance and complexity of actions such as evaluation and the high cost of false alarms, but no research was explicitly suggested.

A handful of articles mentioned leadership, decision-making and decision support information systems during crises, with suggestions for research including:

- Examine the emergence of crisis leaders in different types of crises,
- Explore the development of a crisis leadership inventory instrument,
- Assessing the effectiveness of decision support data used in response to emergency incidents,
- Observational research to develop process models of emergency management and decision making.

Numerous forms of ICT have been introduced and are being developed to support collaboration and communication of information. Numerous technical articles with an emphasis on engineering were excluded from this review, leaving only a few articles to touch on the potential of ICT systems such as telehealth, electronic health records and prescriptions, and social networking technologies.

One or two articles suggested the potential for learning from other countries such as Israel, e.g. Singer et al., and a few articles discussed emergency planning with regard to large public gatherings, principally major sporting events such as the Olympics or World Cup, e.g. Yancey et al. Looking at our conceptual model (Figure 2), another gap found in the research would appear to be with regard to learning from exercises and incidents. Although generally not the main focus of their papers, a few authors did refer to this as an issue, suggesting that greater standardisation of reporting, perhaps collected in a central repository, would be beneficial. An online collection of “promising practices” has also been reported, and a collaboration between a university and disaster mental health services in order to improve evaluation practice.

In common with previous scoping reviews, much of the research found was descriptive, and many empirical studies had shortcomings, with few being grounded in a theoretical framework. The UK-focused research
followed a similar pattern, so that the coverage of high-quality research studies appears to be limited with regard to most dimensions, such as types of incident, organisation, profession or community. The relative lack of critical social science research into the political, social and administrative contexts, highlighted by Sementelli 34, was also apparent.

4.5 Researcher survey

270 researchers were sent emails. 27 emails were not delivered, either because the email address was no longer valid or because the researcher had left the organisation. 95 replies were received, a response rate of (95/243=35%). 18 respondents made suggestions about priority areas for future research. These suggestions were analysed by grouping them into categories.

Suggestions most often concerned preparedness and response, particularly with regard to infectious disease outbreaks/pandemics and CBRNe incidents: specific topics suggested included containment, secondary contamination and the examination of issues concerning the use of PPE. Other preparedness and response topic areas highlighted, often in the context of pandemics, included:

- Logistics and the supply chain;
- Learning through evaluation of organisational/systems preparedness and embedding research into response systems;
- Willingness to respond, at individual and organisational levels.

Other groupings of suggestions which did not exclusively concern preparedness and response or CBRNe/pandemics included:

- Risk communication and public information (e.g. as part of mitigation);
- Community resilience;
- Long-term mental health impacts and recovery;
- Vulnerable groups.

Two suggested research questions which did not appear to fall into a larger category concerned ethical frameworks and psychogenic illness.

While it is plausible that the specific research questions suggested by researchers represent knowledge gaps, it may be less certain that the wider groupings of suggestions above correspond to gaps. There were many more suggestions relating to pandemics than to other groupings, for example, but this might simply be an indication that more research is
already being conducted on this topic, and so there are more researchers to respond and to make suggestions.

It is natural for the volume of research being conducted to reflect the occurrence of large, high-profile disasters, because politicians and policymakers naturally want to know what went wrong and how policy and practice can be improved. Hence more funding is available for research into these disasters. Furthermore, when disasters occur they may give some researchers an opportunity to study “real life” events rather than exercises or modelling, further increasing the amount of research related to such types of disaster. Such patterns in the amount of research being conducted can be seen with regard to Hurricane Katrina and more recently with regard to flu pandemics (first avian flu and then swine flu).

4.6 Grey literature

The search of the Department of Health website identified a large number of government guidance documents and “Dear colleague” letters. The HPA, UK Resilience, Cabinet Office and Royal United Services Institute websites produced a handful of relevant documents between them.

757 unique records dated before 2005 were downloaded from NHS Evidence for closer inspection. About one third of the records related to the swine flu pandemic of 2009-10, typically short media and media release type documents, together with guidance documents. Sorting these in order of publication helped to give a detailed picture of the sequence of events of the swine flu pandemic, which was used to inform the description and analysis of the corresponding case study conducted as part of this research (see Section 6.4). There were also many records giving details of organisations and associations whose websites might have been incorporated into the grey literature search given more time, and who might be contacted as part of dissemination. There was however little information which added to the guidance and other documents found through directly searching the DH’s website.

The most useful information found was from Overview and Scrutiny Committee reviews submitted to the Centre for Public Scrutiny. The reports found are described and analysed in the next section.

4.6.1 Overview and scrutiny committee reviews

Overview and scrutiny committee reviews most commonly concerned flooding. One review considered evidence that the mental health effects of flooding can be significant and long lasting. Psychological issues can
arise as a result of the stress of the event, difficulties coping with the recovery process, financial concerns, and anxiety over future events. Common concerns reported by flood victims include anxiety whenever it rains, increases in stress, and problems with sleeping, and such concerns were found among residents attending the review’s public drop-in sessions. This was the review’s most significant concern regarding the recovery process, as it believed the relevant authorities were providing insufficient support, such as counselling, for people with psychological and emotional needs. The Ambulance Trust highlighted to the review that it, and other health care organisations were unable to recover the costs of responding to such exceptional events from central government, and that this was a problem.

Five reviews of emergency planning arrangements were also found, two of which contained relevant information. One review was concerned that debrief reports should be spread more widely, perhaps necessitating the development of information sharing protocols to enable wider distribution of multi-agency debriefing reports. It recommended that the audit trail for changes to plans and activities arising from post-incident debrief and exercise review be improved. As part of this it recommended the creation of a virtual library of exercise evaluation reports and post-incident debriefs, which would also improve the sharing of lessons learnt. Processes for addressing the special needs of vulnerable people during an incident could also be both more systematic and more tailored to the diversity of individual needs. Much more could also be done to raise awareness amongst the public as to the preventative steps they themselves should take, rather than relying on mainstream services to help, and to educate them on the best courses of action to follow in an emergency. This would however require additional resources for implementation and monitoring.

The other relevant review of emergency planning arrangements noted that there had been a steep learning curve in establishing the role of the then newly formed PCTs in emergency planning, and the importance of partnerships to the PCTs, in particular with social care. This committee was also unconvinced that arrangements for communicating with the public engaged effectively with all sections of the community so that they could contribute to the arrangements for an emergency response. There were also questions as to whether training exercises truly tested cross-boundary capabilities.

Two reviews concerned pandemic flu. One was analysed as part of the swine flu case study (see Section 6.4). The other provided little information about local emergency planning, although it did praise the PCT’s contribution to a Strategic Health Authority (SHA)-wide contingency plan and the PCT’s own business continuity plan.
Two relatively recent reviews concerned the impact of heavy snowfall on Hampshire in the winter of 2009-10 and on London in early 2009. Both noted that there were significant impacts on the NHS, including cancellations of hospital outpatient appointments because of difficult or dangerous travelling conditions. In Hampshire, there were increased falls and fractures, and difficulty accessing vulnerable patients in their own homes for days after partnership emergency arrangements had been stood down, as the snow and ice took time to thaw. In London, ambulance staff had to carry equipment and patients considerable distances between their homes and main roads as other roads were not passable. A prolonged disruption of three to four days would have had a substantial impact on health care delivery.

Both reviews noted room for improvement with regard to coordination between agencies. In Hampshire, the NHS and Social Services could have increased access to priority patients living in the community through coordinated use of 4x4 vehicles. The PCT should also give consideration to contributing to the local authority’s gritting budget to support additional gritting routes including footways, in order to reduce falls and missed appointments, as had been done by another PCT. In London, it was subsequently decided to give greater priority than before to gritting routes and accesses to ambulance stations and NHS premises.

4.7 Current and upcoming research

4.7.1 UK and EU

As of 31/1/2011, the DH Policy Research Programme (PRP) included six swine-flu related projects and a research project on pre-pandemic flu vaccines. All were either completed or due to have been completed. Three of the projects concerned vaccines; the others were investigating baseline prevalence, active prospective surveillance, virus shedding, and the development of a triage tool (SWIFT).

The UK Clinical Research Network Portfolio Database contained five further research projects related to pandemic flu, concerning: the needs of people with existing respiratory conditions; vaccine effectiveness and primary care reporting; emergency department triage methods; behavioural and biological determinants of transmission; and health care worker attitudes to working. Reports and articles have been published from at least some of these studies. Only one relevant project did not concern pandemic flu: “Assessing the effect of a UK flooding disaster on the glycaemic control of diabetes patients”.

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Project 09/1005/01
The NHS National Research Register Archive contained two relevant projects: “A controlled trial of cognitive therapy and supportive counselling in the treatment of post-traumatic stress disorder” and “Evaluation of the NHS Trauma Response programme following the London bombings”.

EPSRC has funded a number of projects in recent years. While not all of these projects directly concern health care, all of them have potential implications for health care emergency planning. Two of the projects concern disease outbreaks and five concern the weather, including two about how hospitals can cope with the demands resulting from weather events. The projects include:

- “MetSim: a Hospital Simulation Support Tool Using Meteorological Information to Improve the Planning and Management of Health Services” (2010-2012).
- “Data Driven Network Modelling for Epidemiology in Dynamic Human Networks” (2010-2015), which aims to better understand human interactions so as to develop advanced models of epidemic spread.
- “IDEAS Factory - Resilient Futures” (2010-2013), which will consider the implications for resilience of current and future UK energy and transport infrastructure.
- “Spatio-temporal knowledge representation for emergency management” (2010-2011), which considers how to transform data from heterogeneous sensor sources into useful information for decision-makers.
- “Game Theory and Adaptive Networks for Smart Evacuations” (2010-2012), which will develop models to inform tailoring of communications to the public.
- “Adaptive Co-ordinated Emergency Response to Rapidly Evolving Large-Scale Unprecedented Events (REScUE)” (2009-2012), which will develop methods to quickly determine appropriate response teams/units to cope with fast-changing events.
- “Design and delivery of Robust Hospital Environments in a Changing Climate” (2009-2012), which will develop strategies for refurbishing existing hospitals to cope with heat waves.
- “Infrastructure and the 21st century infectious diseases” (2009-2014), which will create a Health Infrastructure Research Centre to look at how infrastructure can be redesigned to combat diseases such as flu and SARS.
- “WISP (Weather impact ‘What-If?’ Scenario Portal)” (2008-2011), which will support local community resilience by developing a web portal for mapping likely extreme weather events and their impacts.
- “Community resilience to extreme weather events through improved local decision making” (2008-2011), which will develop an integrated
decision-making framework so that the actions of local stakeholders result in improved resilience.

- "Identification and assessment of coping measures for extreme weather events" (2008-2011), which will assist communities in choosing appropriate coping measures.

ESRC has funded fewer relevant projects. In 2009 ESRC funded a project on behavioural responses to infectious disease outbreaks, having in 2007 funded research on recovery following the Hull floods.

No relevant research funded by EU or other European institutions was found.

During 2011 the National Institute for Health Research (NIHR) issued a call for research on pandemic flu. The main focus was the prevention, diagnosis or immediate management of patients with flu during a pandemic. This might include community or hospital care. The research itself would not start until a pandemic occurs and affects the UK, and would produce evidence to guide clinical and public health policy during the same pandemic.

The PRP has also invited tenders for research on behavioural interventions to assist the response to a flu pandemic in the UK, covering the following areas:

- What behavioural interventions would inform and optimise the use of antiviral medication and other flu treatments in a flu pandemic?
- What do members of the public want and need to know in order to manage and empower their own response to a pandemic?

Funding of up to £500,000 in the current and following two financial years is available to support pandemic flu research, but it is not anticipated that this tender will allocate all of those funds. Research is expected to commence before July 2012.

In 2011 the EU issued a call for proposals for projects on:

- Public health preparedness and response planning in the field of pandemic flu and other serious cross-border health threats, including bio-threats. €500,000 was available to fund this.
- Crisis communication in the area of risk management, building on lessons learned from the response to the H1N1 pandemic. €300,000 available.

The deadline for submissions was 27 May 2011.

The European Commission also called for proposals on prevention, awareness-raising and closer cooperation in civil protection and marine
pollution, although no particular health care component was specified. €2,000,000 was available for prevention projects and €1,600,000 for preparedness projects.

4.7.2 USA

In 2000, the Agency for Healthcare Research and Quality (AHRQ) was funded to support and conduct research to improve capacity to respond to bioterrorist and other emergency incidents, by providing evidence-based resources for use by health care providers; state, local, and tribal governments; and communities. Reports were produced on the regionalisation of bioterrorism preparedness and response, training hospital staff to respond to a mass casualty incident, and the implications of paediatric anthrax for bioterrorism preparedness. A protocol for a systematic review on the allocation of scarce resources during mass casualty events was published in May 2011. No funding for research was available from 2004, however, and the Public Health Emergency Preparedness Research Program (PHEP) was discontinued in 2011. Support for aspects of the programme is to be provided by other federal agencies, such as CDC and the Office of the Assistant Secretary for Preparedness and Response (ASPR).

The greatest amount of recent research found was funded by the USA Office of Public Health Preparedness and Response (OPHP), which is part of Centers for Disease Control and Prevention (CDC). OPHP’s Extramural Research Program established Preparedness and Emergency Response Research Centers (PERRCs) to conduct research to evaluate the structure, capabilities, and performance of public health systems for preparedness and emergency response, addressing the four research priority recommendations identified in the Institute of Medicine Letter Report (see Section 4.2.1):

- Enhances the usefulness of training;
- Improves communications in preparedness and response;
- Creates and maintains sustainable preparedness and response systems;
- Generates criteria and metrics to measure effectiveness and efficiency.

Seven PERRCs were established in 2008, and a further two in 2009, all funded until 2013. Each PERRC consists of three or four investigator-initiated research projects and an administrative core. A list of the 32 research projects found is given in Appendix 11. Some PERRCs also fund pilot projects. A list of peer-reviewed publications produced by the PERRCs
The number of articles in various research priority areas is shown in Table 13.

Table 13: Number of articles produced by PERRCs by research priority area (as of 27/7/2011)

<table>
<thead>
<tr>
<th>Research priority</th>
<th>Number of articles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institute of Medicine Priorities</strong></td>
<td></td>
</tr>
<tr>
<td>Enhance the usefulness of training</td>
<td>1</td>
</tr>
<tr>
<td>Improve communications in preparedness and response</td>
<td>7</td>
</tr>
<tr>
<td>Create and maintain sustainable preparedness and response systems</td>
<td>24</td>
</tr>
<tr>
<td>Generate criteria and metrics to measure effectiveness and efficiency</td>
<td>9</td>
</tr>
<tr>
<td><strong>Cross-cutting priorities</strong> (also included in the above totals)</td>
<td></td>
</tr>
<tr>
<td>Vulnerable populations</td>
<td>5</td>
</tr>
<tr>
<td>Workforce</td>
<td>6</td>
</tr>
<tr>
<td>Legal and ethical Issues</td>
<td>9</td>
</tr>
</tbody>
</table>

The PERRCs were due to be evaluated during 2011, but an evaluation report has not yet been published.

A further six research projects on various topics are listed in the National Institutes for Health Research database. The Robert Wood Johnson Foundation (RWJF) provided funding for projects in two areas. The Forum on Medical and Public Health Preparedness for Catastrophic Events was established in 2007, and holds regular meetings to foster dialogue among stakeholders. The Forum explores new approaches for resolving problem areas and increases the visibility of medical and public health preparedness in broader research communities. RWJF has also funded a programme to improve cooperation between federal, state and local leaders when responding to disasters. This consists of “meta-leadership” training in collaborative approaches for senior leaders during 2010 and 2011, and an evaluation of the initiative, due to report in 2012.

The USA National Health Security Strategy explicitly seeks to ensure that all systems that support national health security are informed by the best
available science, evaluation, and quality improvement methods. A coordinated research and evaluation agenda was being developed, building on a previous scoping review (see section 4.2.1), and was due to be published in 2011 as part of the Biennial Implementation Plan for the strategy.

Research priorities for assessing health effects of the Gulf of Mexico oil spill in 2010 have been suggested. The five priorities include research on: the psychological and behavioural impacts; on communication and engagement methods for disaster and disaster-preparedness research; and the framework needed to deploy a rapid research response for future disasters. The National Institutes of Health (NIH) and CDC plan two long-term studies, one of which is underway, to follow up the health impacts on clean-up workers. NIH is also funding academic consortia to look at the long-term health impacts on vulnerable populations.

In 2010 the USA Department of Health and Human Services (HHS) announced that it would award grants to implement up to five Emergency Preparedness Special Initiatives for people with developmental disabilities. The initiatives should address provisions to link people with developmental disabilities and their families with emergency/disaster related services and programmes, and include training for personnel of emergency response agencies. It was not clear whether there was a research component, although dissemination activities were expected. A total of $750,000 funding was available.

HHS also announced availability of funds to develop, refine, and maintain existing Emergency System for Advance Registration of Volunteer Health Professionals (ESAR-VHP) Programs. Again, it was not clear if there was a research components, but “lessons learned” were to be documented and findings disseminated.

The USA National Science Foundation has an ongoing Infrastructure Management and Extreme Events (IMEE) grants programme. The IMEE programme focuses on the impact of large-scale hazards on civil infrastructure and society and on related issues of preparedness, response, mitigation, and recovery. The programme supports research to integrate multiple issues from engineering, social, behavioural, political, and economic sciences. It supports fundamental research on the interdependence of civil infrastructure and society, development of sustainable infrastructures, and civil infrastructure vulnerability and risk reduction. One project is investigating how to optimally dispatch emergency medical units to geographically dispersed customers during an extreme weather event. Most projects do not appear to have a specific health care component however, although some could impact on public
health, e.g. providing knowledge and tools for water utility managers to minimise sickness and deaths arising from contamination of water supplies.
5 Interviews

As planned in the study proposal, a programme of interviews was conducted with personnel from a range of organisations at local, regional and national levels in order to gain their insights on issues for policy, practice and research. During the course of the study, it became apparent from the literature review that a high proportion of past and recent research emanated from the USA, but also that some of the findings might not be readily applicable to the UK. It was therefore decided to devote some study resources to seeking to interview research administrators and strategy makers from the USA in order to learn about their experiences of developing research priorities and commissioning and managing research programmes to deliver those priorities. Such learning about research processes might be useful to the National Institute for Health Research (NIHR) Health Services and Delivery Research programme (HS&DR) and to other UK research funding bodies.

5.1 UK interviews

The organisations covered in these interviews were the Ambulance Service in the North West and London, Strategic Health Authorities (SHAs) in the North West and London, the Health Protection Agency (HPA), the Department of Health (DH), the Fire Service, a local authority, a university, the Salvation Army and Disaster Action, a charity founded by survivors and bereaved people from UK and overseas disasters. Many interviews proved difficult to arrange within the time available to the study, due to competing demands on interviewees and the lengthy and time consuming process of having to arrange contracts with the organisations of interviewees who were NHS employees. Specific individuals working for the following organisations or belonging to the following stakeholder groups were emailed, but interviews did not result: general practice, social services, coroner, Hillsborough Group, NHS Scotland Resilience, Welsh Assembly Health Emergency Planning, Northern Ireland Department of Health, Social Services and Public Safety, EU Health Threat Unit and EU Global Health Security Initiative. A total of 12 interviews were conducted, of which 9 were face to face and 3 were telephone interviews. One interview was a group interview with 2 interviewees.

Potential interviewees were sent a consent form and an information sheet (see Appendix 12) prior to the interview. The interviews were semi-structured. A set of questions was formulated, together with suggested follow-up prompts (see Appendix 13), and the interviewers were expected to cover these, but sufficient time was allowed for the interviewers to...
explore a question in further depth if that seemed to be productive, or to pursue previously unconsidered lines of inquiry which came up during the interview. The first three interviews were conducted by pairs of researchers so that a common understanding and approach could be developed. Subsequent interviews were then conducted by only one interviewer, in order to make efficient use of study resources and to encourage a less formal atmosphere where interviewees would be more open. It was noticeable at various points in two of the early interviews that interviewees chose their words very carefully and were inclined to present the ‘public face’ of their organisations rather than be critical.

Notes of each interview were made on a standard pro forma pre-printed with the questions and prompts, which also had space for noting any follow-up actions to take after the interview. Although they were not transcribed, recordings of the interviews were also made, so that the primary data could be referred back to during the analysis if need be. Typed up notes of the interview were emailed back to each interviewee as soon as possible, and generally within a few days, so that they could add comments and correct any errors.

Most of the interviews were conducted fairly early in the study so that they could inform the topics covered at the prioritisation workshop (see Chapter 7). Four interviews took place following the workshop, partly in response to specific suggestions of additional interviewees made by workshop participants. These interviews used a cut down version of the interview template which focused on issues, good practices and knowledge gaps using modified versions of questions 2, 3 and 8 from the original interview protocol (see Appendix 13).

5.1.1 Themes from the UK interviews

The interviews highlighted the importance of the human side of emergency planning and management. While structures and plans are an important foundation, it is through human agency that action happens. A key theme was the need to have staff with appropriate expertise and access to resources. In addition to having a sufficient number of skilled emergency planners, organisations also need senior managers who have the abilities to take effective command and control decisions during emergencies and who provide strategic leadership with regard to emergency planning. Without such leadership, emergency planning is likely to be marginalised, lack resources and find it difficult to bring about organisational change. This applies across the health care system – not just to health care providers, but to commissioners of emergency preparedness too; and also to the Department of Health, Public Health England and the National Commissioning Board. The expertise that is needed can be developed
through receipt of competency-based training, involvement in exercises, and sharing of learning.

Effective inter-organisational learning is underpinned by trusting, open and honest relationships, as is the wider partnership working, coordination and communication needed to plan for large and complex incidents. Such relationships can be facilitated by the social interactions provided by multi-agency structures such as Local Resilience Forums (LRF)s.

An appropriately engaged and supported public and third sector also enhance emergency planning and management, as the statutory sector cannot do everything on its own, e.g. with regard to protecting vulnerable people and enabling recovery from the adverse psychosocial impacts of incidents.

The current reorganisation of the NHS and budget pressures represent threats to maintaining appropriate capabilities and capacity for health care emergency planning and management, particularly in the short to medium term. Problems highlighted were organisational and individual churn, increasing system complexity, the removal of Strategic Health Authority (SHA) coordination and a move towards a contract culture. In the medium to long term, however, it is possible that the reorganisation may have some beneficial impacts: the Department of Health and Public Health England may give more direction, and contracts may provide a tool for incentivising action on emergency preparedness and response.

Actual practices in relation to these themes, and interviewees’ perceptions of the likely future following NHS reorganisation are summarised in Table 14.
Table 14: Interviewees' perceptions of good practices, actual practices and the likely future following the NHS reorganisation

<table>
<thead>
<tr>
<th>Good practices indicated</th>
<th>Actual practices</th>
<th>The future following NHS reorganisation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior managers with appropriate expertise who provide leadership across the system</td>
<td>Command and control practices and results vary widely. National occupational standards are being developed by the Ambulance Service, and training delivered accordingly. Engagement with emergency planning and business continuity varies among directors and organisations. By contrast, private sector providers such as BUPA are very good at business continuity planning because their income would be more directly affected by being unable to provide a service. Emergency planning can easily fall down the agenda if there hasn’t been a high-profile disaster for a while, because it isn’t seen as part of the “day job”. Business continuity and resilience needs more attention in GP practices. Commissioning of ambulance services emergency preparedness by PCTs varies widely.</td>
<td>The Olympics may provide a focus for emergency planning, within London at least. There may be an opportunity for contracts to be used to provide incentives, but this will require the NHS Commissioning Board to provide direction and support to Clinical Commissioning Groups.</td>
</tr>
<tr>
<td>Emergency planners with appropriate expertise, commitment and organisational influence and resources</td>
<td>Resources for health care emergency planning vary greatly between organisations, and the professionalism of planning practice also varies, with many different local interpretations of national policy. Local work on risks may not be sufficiently rigorous and systematic. There is funding for CBRNe and terrorism related work. This is</td>
<td>Emergency planning may be seen as a “back room” activity and cut back to save money. There will be fewer full time emergency planners, on lower grades, not directly linked in to senior managers.</td>
</tr>
</tbody>
</table>
applicable for CBRNe, because of concerns about the ability of NHS organisations to deal with biological and chemical agents, but there may be an over-emphasis on terrorism. Access to training is reducing. There are opportunities for professional development through the Emergency Planning Society, Emergency Planning College and some formal education courses. Emergency planning sometimes comes across as an obscure “black art” not relevant to everyday practice, conducted by a close knit group of people.

| Inter-organisational learning | There is informal sharing of learning through LRFs, but this varies from forum to forum. Some organisations can be defensive about their performance, and there can be a tendency to be “head down” rather than learning from others’ plans. Debriefings are not usually facilitated or validated by an independent organisation. While lessons may have been identified, there can be many barriers to organisational change. There is no formal national system for learning from debriefs, though the Ambulance Service nationally is adopting a system of formal structured briefings and “action trackers”. | More formal, contract-based relationships may inhibit the openness and honesty that underpins learning. |

| Partnership working | Emergency planners in different organisations generally know each other well through LRF meetings, incidents, exercises and organising multi-agency training. They trust each other and “come up with the goods” in an emergency situation, e.g. cooperation during the flu pandemic was generally good. Multi-agency exercises have been helpful in developing knowledge of how | As people and organisations change, networks will be inhibited and understanding and trust lost. Attendance at meetings, training and exercises will decrease. The multiplicity of Foundation Trusts and independent service providers |
| **Engaged and supported public and third sector** | different organisations operate, and the constraints on them. NHS organisations do not however always function as an integrated system. | will make planning and communication more difficult. The abolition of SHAs and regional government offices will adversely affect coordination and oversight unless the Department of Health, the National Commissioning Board and Public Health England provide greater direction and support. |

| | In contrast to countries like New Zealand and Sweden, there is more of a tendency for emergency planners in the UK to “know what our public wants” and plan for them, rather than the public being supported to make their decisions and take the initiative. Both statutory and voluntary organisations have put much effort into trying to meet the needs of vulnerable people during an emergency, but it is a very difficult task which may need neighbours to play a more active role. There is a lack of clarity about the organisation of practical and psychological support services to help people recover from the psychosocial impacts of incidents. Social networking can be an important influence on people’s knowledge and attitudes. | [Interviewees did not comment explicitly about this, but one might expect greater emphasis on community-led services due to organisational cutbacks and the Big Society policy. This might however be done without providing sufficient support due to a lack of resources and know-how.] |
5.1.2 Research gaps

The following pieces of research would appear to be potentially useful in addressing the issues raised by the UK interviews:

- Development and evaluation of competency-based training for NHS managers who may take on command and control roles. There are national professional standards for ambulance services, which individuals can use to demonstrate that they have the necessary expertise. Similarly there are tools and training for decision-makers in the Fire Service. What standards are being used across the NHS? Would other NHS organisations benefit from having such standards? Should there be a common set of standards (what would they be?) or do they need to be different for different organisations?
- Study of the dynamics of NHS leaders’ engagement with emergency planning and preparedness (e.g. motivators and barriers) and subsequent impact on organisational preparedness. What convinces leaders of the value of good exercises, or of emergency planning more generally?
- Exploration of the boundary between emergency planning and other strategic and operational planning (e.g. winter pressures), with a view to seeing how greater linkage and interaction can be enabled, reducing the marginalisation of emergency planning and planners.
- Evaluation of the impact of NHS reorganisation and budget cuts on emergency planning capabilities and capacity.
- Exploration of effective systems of commissioning and contracting for emergency preparedness.
- Developing measures of health care emergency preparedness to inform investment in resources and support quality improvement at service, organisation and system levels. Some research on this has however been commissioned in the USA (see Section 4.7.2).
- Sustainable systems of emergency preparedness. Some research on this has however been commissioned in the USA (see Section 4.7.2).
- Supporting and developing appropriate public engagement in planning, preparedness and response (e.g. by exploring cultural barriers, or through international comparative research with countries such as New Zealand, Sweden and the USA to consider models of engagement that might suit the UK).
- Developing appropriate systems and relationships between national and international organisations to address global hazards such as pandemics.
5.2 USA Interviews

Two group telephone interviews were conducted with key staff in USA federal agencies, in order to learn more about the development and management of research programmes to support public health emergency preparedness. The first interview, with two members of staff from Office of Public Health Preparedness and Response (OPHPR), aimed to find out what might be learned from OPHPR’s experience of managing the programme of research being conducted by Preparedness and Emergency Response Research Centers (PERRCs) (see Section 4.7.2). Interviewees felt that the PERRC model was generally working well, providing critical mass and links to teaching in each institution. Practitioner involvement was encouraged as a means of making the research useful for practice, through mechanisms such as practitioners as co-investigators, advisory groups, summits to present results to practitioners, a CDC programme to encourage state health departments to reach out to PERRCs, and publications aimed at practitioners as well as academic articles. Anecdotally, while such involvement was found challenging by some researchers, it had also provided valuable new perspectives to others. The PERRCs were due to be formally evaluated in 2011.

The second interview was with four members of staff from ASPR, and concerned research and evaluation activities and plans in support of the 2009 National Health Security Strategy (NHSS) (see Section 3.3). One of NHSS’s 10 strategic objectives seeks to ensure that all systems supporting national health security are informed by the best available science, evaluation, and quality improvement methods. A coordinated research and evaluation agenda had been developed by HHS/ASPR working with a range of partner organisations. At the time of the interview, the inaugural Biennial Implementation Plan (BIP) for the strategy was due to be published within a couple of months.

Interviewees regarded the ability to collect information for scientific inquiry during and following emergencies as an important area for development. Although there are still some constraints on what can be done, mainly due to unintended side effects of legislation, the establishment of a National Institutional Review Board (NIRB) to complement the review boards at individual institutions now provides a national structure to approve research proposals rapidly. The National Biodefense Science Board is also investigating how knowledge gaps and research might be better dealt with during responses to future public health emergencies. This will include consideration of what must be done in advance, the specification of the major components of a science response, and how this response might be operationalised.
ASPR provides both real-time and after the event feedback on activities conducted in response to federal-level emergencies, and also on exercises and training. Identified challenges are considered by subject matter experts in order to decide on appropriate remedies. Formal After Action Review (AAR) processes are now much better at state and local levels, partly triggered by federal funds (from 2002) which required a formal process after events and exercises, including small events. There have also been improvements in the sharing of local, regional and national debriefs between levels. The Association of State and Territorial Health Officials (ASTHO) maintains a collection of documents detailing promising practices in public health and health system preparedness from across the United States. There can however be some reluctance to share information about things that didn’t work well.

Interviewees also noted that the US Department of Veterans Affairs (VA) has been doing interesting work on emergency preparedness. VA forms a single payer, coordinated health care system – they have a regional structure plus a centralised system of quality control.

5.2.1 Research gaps

The following pieces of research would appear to be potentially useful in addressing the issues raised by the UK interviews:

- Consider the potential of the PERRCs model to UK research commissioning;
- Evaluation of systems for learning from debriefs/AARs in the USA (or other countries as appropriate) and comparison with the UK.

In conclusion, many of the UK interviews were influenced by the ongoing reorganisation of the NHS. This was already affecting emergency planners and their organisations, and there was much concern about the future effectiveness of emergency planning in health care. Sometimes indeed it seemed that the issue dominated interviewees’ thinking, and hindered wider exploration. While this may be a limitation of conducting a study during this period of large-scale change, this scoping study was aware of the danger of bias, and the researchers consciously tried to keep a sense of perspective and explore additional issues, both during the interviews themselves and in the analysis. In particular, the reorganisation was used to sensitise the study to more general good practices and associated issues, rather than purely regarding the reorganisation as an issue in its own right.

Although the interviews did tend to highlight policy and practice issues and good practice more directly than they highlighted research gaps, they did provide new perspectives, such as the importance of human aspects of emergency planning and management, which had not been particularly
emphasised by the literature review. The USA interviews, although primarily about research strategy and commissioning, provided an interesting comparison. The need for inter-organisational learning, for example, was highlighted in both sets of interviews, and would appear to be a common issue.
6 Case studies and debriefs

The main purpose of developing case studies and analysing debriefs was to identify issues, good practices and research gaps. Activities drawn from the conceptual model of health care emergency planning and management (see Figure 2), such as planning, preparedness, response, recovery and learning were used as a framework.

![Figure 2: Conceptual model of health emergency planning](image)

Emergency incidents and training exercises can provide a test of these activities, and thus opportunities for services to improve their practices. The vehicles for learning are typically debrief meetings held shortly after an incident or exercise, where involved staff reflect on the experience, and reports of those meetings. The debrief reports are generally short, summarising what happened during the incident, what went well and what didn’t go so well. The reports often have a “lessons learned” or "suggestions for changes in practice section” which proposes improvements. For larger incidents involving multiple agencies there will also be a multi-agency debrief process and associated report, written for a coordinating body such as a Local Resilience Forum (LRF). A debrief report of the recovery process may also be produced.
6.1 Debrief and case study selection and data collection

Various considerations were taken into account when selecting debriefs and case studies to analyse. Data from which to build case studies is more readily available with regard to larger incidents. Such incidents are likely to have been covered in the media, been the subject of academic research, and to have generated multiple debrief reports containing a variety of perspectives, because of the larger number of agencies from different sectors involved in the response. Written information reflecting different perspectives is less likely to have been produced for smaller incidents which have been addressed through the business continuity planning of a single health care organisation. Consideration of reports of a series of such reports of smaller incidents occurring over a period of time does however have potential to shed light on the extent to which organisations actually learn from their experiences. Some large-scale incidents such as flooding and extreme winter weather are fairly regular occurrences, and may even affect the same community or organisations repeatedly. When this happens it affords an opportunity for comparing and contrasting organisational practices between broadly similar incidents and assessing the extent of learning.

It is important to study both large- and small-scale incidents because they both form part of the remit of emergency planners, and their different natures may highlight different issues. Incidents also differ in other ways. For example, as observed in Section 2.1, the speed of onset of an emergency may vary greatly, affecting the extent to which warnings may be useful and mitigation measures can be developed. In selecting the case studies the aim was to cover both a “big bang” type incident and a more gradual onset “rising tide” or “cloud on the horizon”. It was also desirable that a variety of hazards were covered. While post-Civil Contingencies Act (CCA) experiences may be particularly relevant to current and future practice, consideration also had to be given to being able to access information with regard to recent incidents, where documents might be withheld for legal reasons and official inquiries might not be completed until years after the event. Pre-CCA experiences might also be useful in providing an opportunity to compare pre- and post-CCA practices, and to look at longer-term recovery from the incident.

Some consideration was given to studying a large exercise, such as the recently conducted Watermark exercise, but this was judged not to have a sufficiently large health care component, and it was decided that exercises might provide less relevant information than actual incidents because of their very artificiality. Another variant would have been to compare themes arising from an exercise with themes arising from an
actual incident, but comparing two similar incidents was decided to be preferable.

6.1.1 Debriefs of smaller incidents

During October 2010, a member of the team searched the Emergency Planning College (EPC) online library\(^6\) using the keyword “debrief”. This simple search found only 11 debrief reports, which mostly concerned major incidents and were not particularly recent. Two debriefs reported on the Carlisle storms and flooding of 2005, and were included in the corresponding case study (see Section 6.5). Others concerned:

- Exercise Equinox in Wiltshire (2008);
- Flooding in South Yorkshire (2007) and in York (2000);
- Avian flu in Norfolk (2006);
- The 7/7 terrorist attacks in London (2005);
- The Buncefield oil storage depot explosion and fire (2005);
- The Dunblane primary school shooting (1998);
- A tanker incident on the A19 road (1996);
- A fire affecting British drug houses in Poole (1988).

On this basis it was decided that the EPC library was not a promising avenue for identifying recent reports of small incidents. Instead, about 20 debrief reports were identified by the two emergency managers on the research team, drawn from the stocks of reports in their filing cabinets, selected on the basis that they covered a range of organisations and incidents and were likely to contain some learning points. The documents had been written by a number of organisations, coordinating groups and multi-agency teams in the North West:

- Major incident multi-agency teams
- Association of Greater Manchester Authorities PCTs
- East Lancashire NHS
- East Lancashire Teaching PCT
- Greater Manchester NHS
- Wigan, Wrightington and Leigh NHS Trust
- Wigan Council.

These covered the following incidents:

- Exercises
- Gas and similar explosions
- Fires at health centres
- Flooding at a hospital
- IT/Telecoms outages

\(^6\) http://epcollege.com/epc/knowledge-centre/library/
• Potential chemical incident
• Snow and bad weather events
• Swine flu response
• An incident caused by a disruptive patient.

To illustrate the nature of the incidents and of the debrief documents, Figure 6 shows the issues identified in two sample debriefs. The documents themselves were three to five pages long and provided more details of the incident, its timeline and the responding team, but these cannot be reported in order to maintain confidentiality. Note that the debriefs represent the perspectives of the Trusts concerned; others may have seen the issues differently. For instance, in the first incident the Primary Care Trust (PCT) was pleased that electronic patient data was available again within a few days. When such an eventuality was discussed with GPs known to the research team, they suggested that they would regard the inability to access patient data for any period as serious, and for a few days as very serious.
Figure 6: Two anonymised examples of debriefs indicating the learning points identified by the debrief authors

Incident/Issue: Internal response to Fire Incident at XXXX Health Centre
NHS Trust/Body: XXXX PCT

Brief description
Fire at health centre caused by roofing contractors completing building project. Fire @ 2.30pm. Building evacuated.

What went well
- Good communications with PCT and other agencies
- IT business continuity worked well. IT patient data – “available within a few days”.

What went not so well
- Notification of on-call Director via txt – not correct channel?
- Hesitation on what scale of incident to declare?
- Slow to contact NHS Ddirect.
- Incident room not large enough
- Different times on logs.
- Media coordinated well at site but not at PCT HQ

Incident/Issue: Snow events
NHS Trust/Body: XXXX Hospital NHS Trust

Brief description
Snow made it difficult for staff to get to hospital

What went well
- Operation of control room and information gathering/communication
- Good staff spirit
- Essential services continued
- Good media support/relations

What went not so well
- Working out ‘who got in’
- Need register of 4x4 owners
- Other back-office parts of NHS did not see the same priorities as the patient-facing services.
- Food would have been an issue if things had continued
6.1.2 Case studies of larger incidents

Candidate case studies were identified through considering the Cabinet Office’s database of major incidents and through discussion with advisory group members. Two case studies were developed in full: the 2009-10 swine flu (H1N1) outbreak and the Cumbria floods of 2005 and 2009. Preliminary work was also carried out in preparation for potential case studies of the Grayrigg rail crash of 2007, which also occurred in Cumbria, and of the Bradford football stadium fire of 1985. The swine flu outbreak began as a “cloud on the horizon” and then took on some of the characteristics of a “rising tide” incident, although it varied in impact between different parts of the country. The incident had national and international scope and consumed massive amounts of health care resources and newspaper column inches! The Cumbria floods affected a more limited geographical area with a response phase lasting a few days, while the Bradford stadium fire and the Grayrigg rail crash were “big bang” incidents, very focused in space and time, although the rail crash was not as big as first feared, so had some of the characteristics of a “health scare”.

The Cumbria floods case study afforded opportunities to compare incidents in urban and rural areas, as the county is predominantly rural, but a city and small towns were particularly affected. The case study also permitted an assessment of what had been learned in the intervening period and consideration of longer-term recovery. A similar comparison of the 2009/10 swine flu outbreak with swine flu in 2010/11 might also have been instructive, but could not be accommodated within the resources available for this research study.

The Grayrigg incident occurred when an express train from London to Glasgow was derailed by a defective set of points. There were 111 passengers and 4 crew on board. One passenger died shortly after the accident and 22 people were taken to hospital, including the driver; 5 were admitted, 3 of whom were in a critical condition. It seems however that there were few health care issues. The casualties were received by three different A&E departments and this spreading of the impact meant that there was no significant increase in workload for any of the hospitals involved, and the casualties were treated with no detriment to other patients. There is some evidence that there were concerns about dealing with the emotional trauma for the responders, operating company personnel and their families who were caught up in the event. A member of staff from the Salvation Army, interviewed as part of this study, indicated that there had been some problems because the media and the public perceived the incident to be a major one, but the hospitals concerned did not fully activate their media relations teams and did not allow for more relatives than normal arriving at the hospitals over the subsequent day. The vast majority of studies of the crash focused on failings within the rail
companies and their contractors to inspect and maintain the points, and especially on the lack of a safety culture \(^{208-209}\), so there was insufficient material for a case study.

The Bradford stadium fire began as a small fire in the main stand during a football match, but it spread rapidly throughout the stand in only a few minutes, and many escape routes were blocked by locked turnstiles \(^{210}\). More than 50 people died, and over 250 people required hospital treatment, almost all of them for burns injuries. The response to the disaster was aided by it occurring near to a hospital used to dealing with burn injuries and possessing all the equipment needed to at least initiate treatment. Access to burns supplies did become a problem though, and other problems included keeping a record of the controlled drugs required, tracking patients’ property, the switchboard jamming due to the many enquiries, and tracking patients and matching them to relatives arriving at the hospital \(^{211}\). It was hoped that the fire might have highlighted pre-CCA issues and long-term treatment of burns injuries and psychosocial issues, and also have had some relevance with regard to other sporting events. However, virtually all of the reports found focused either on the immediate response period (e.g., Sharpe et al. \(^{210}\), Sharpe and Foo \(^{212}\)) or on non-health care issues (such as the Popplewell Inquiry into crowd safety at sports grounds \(^{213}\)), and most debrief reports could not be accessed owing to the long time period since the incident and changes in staff and in the organisational landscape during that time.

Relevant academic literature was obtained by searching within the citation database from the main study search (see Appendix 1) and by conducting additional keyword, related articles and citation searches within Google Scholar. Grey literature was also obtained through general internet searching. The types of documents sought were external or internal evaluations, such as select committee reports, overview and scrutiny committee reviews, public inquiries, coroner’s investigations, ombudsman’s reports, reports made to board meetings of involved organisations and media articles.

Key informants were identified through a snowballing process, starting with relevant advisory group members, existing contacts of research team members and actors prominent in the literature. Informants were contacted by email in the first instance and subsequently by telephone, in order to identify and obtain access to documents containing information about issues, good practices and knowledge gaps, including internal documents such as debriefs. Informants were also asked to give pointers to key issues, good practices and knowledge gaps; and to further informants, particularly those who might have different perspectives or information to that already obtained (see protocol in Appendix 14).
Text highlighting issues, good practices and knowledge gaps, particularly with regard to health care organisations and health issues, was extracted from the documents into a spreadsheet, together with any supporting evidence or rationale. If a concrete example was described which illustrated the general issue, good practice or knowledge gap, then this text was also extracted. Perhaps understandably, considering that an untoward incident had occurred, the greatest quantity of text extracted concerned issues raised by the incident, although typically some good practices were also highlighted. Understandably again, given the focus of organisations on providing services, very little of the grey literature explicitly identified knowledge gaps, still less research gaps; academic articles were more likely to do this. Debriefs typically identified issues and expressed actions in the form of “action must be taken to address this issue” without always conducting a deeper analysis of causes, or expressing any doubts that action would be feasible and effective, which might have required research.

6.2 Data analysis and results

A thematic analysis of the issues and good practices was conducted, organising them into common themes which could then be regarded as constituting inferred or implicit good practices. Potential research topics were developed by problematising the actions identified in debrief and subsequent strategy documents and integrating these with the relatively sparse direct suggestions made in academic articles. The themes from all of the case studies and debriefs were then compared with each other, and with the components of emergency planning and management from the conceptual model, in order to identify further gaps.

Findings from the set of debriefs are reported in the next section, followed by the two fully developed case studies. For each of the full case studies some contextual background is given via a brief chronological account of key events occurring during the incident, including the roles undertaken by health care organisations and the impacts on health. This is then followed by the findings from the thematic analysis in the form of a table of good practice themes, actual practices and suggested actions to address issues. More details of each theme, including references to documents, are provided in Appendix 15 and Appendix 16.

6.3 Findings from the analysis of debriefs

The key finding from the exploration of debriefs, supported by what was said by interviewees (see Chapter 5), is that they represent a resource that is underused across the NHS and other agencies. There may be great benefit in gathering debriefs together from across all responding organisations in the health economy and “data-mining” these to see what

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trends and issues emerge as common across regions and the country as a whole. This may warrant further research to confirm the potential and determine what methods and mechanisms would be effective in garnering useful learning from debrief reports. The National Learning and Reporting System for patient safety incidents may provide a model for this.

Issues arising from incidents and some lessons that should be learned had been noted in debrief reports. These had been discussed in the organisations and bodies directly concerned and may have resulted in practices being changed. Generally however, the documents had then been filed and not consulted again. If another agency had asked to see any documents then they had been shared, but there was no programme to revisit them, say, once a year and draw out issues that arise frequently or growing trends; nor to share the material more widely. The relatively small proportion of debriefing documents held by the EPC (or at least easily identified online) means that there is no obvious easy means for local debrief reports to be accessed, and may even be an indication that such reports are not seen as an important resource. Yet the research team identified issues even from the small sample of documents studied that could have highlighted potential issues worthy of further consideration.

For instance, the growing reliance on IT support and the convergence of information and communication technologies mean that any outages in these have severe implications for the treatment of patients. This is particularly the case for GP practices since their use of electronic records has generally been more advanced than in the majority of hospital trusts. Losing access to patient records means, for instance, that a GP prescribing is not automatically reminded of, say, penicillin allergy and, of course, the patient concerned assumes the GP knows this because of earlier illnesses. Many laboratory results and similar are now solely delivered electronically, meaning significant delays when the system fails. From two of the debriefs on fires at health centres which led to system outages for several days, it was clear that this greater reliance on IT systems was not appreciated by large trusts somewhat removed for general practice. The impact of the outage of EMIS, one of the main GP information systems nationally, in August 2011 provides evidence that such outage severely impair general practice. This is not to suggest that IT outages are not significant in hospitals; only that in the case of reliance on electronic patient records, GPs “got there first”. In other areas, hospitals are more reliant on IT systems. For instance, the convergence of communications and information technology and the effects of this were felt by a hospital trust which lost almost all its external phone system through power failure which took out the computing systems. Had there been a system for comparing debriefing documents on a regular and national basis, these risks might
have been identified somewhat earlier and risk management procedures anticipating their possibility put into place earlier.

Other issues that arose from reading this material were:

- The importance of inter-organisational working and especially communication. In almost all cases this had worked well: people knew each other and shared appropriately.
- The level of an incident. Different participating organisations recognised the significance of an incident differently. A major fire might be significant to the fire service but lead to little impact on the health services in terms of demands on A&E or on the Ambulance Service. A blanket declaration of a “major” incident and the diversion of significant resources from all responders might unnecessarily impact their other activities.
- Back-office and patient-facing parts of the NHS may have different priorities in relation to business continuity. To some extent this is evidenced by the remarks on IT outages after fires at GP Health Centres. But a snow event which caused difficulty in getting staff, patients and visitors to a hospital also surfaces some differences in priorities.

6.4 2009/10 swine flu (H1N1) outbreak

6.4.1 The course of the outbreak

In mid-March 2009, Mexican authorities began picking up outbreaks of flu-like illnesses, and a month later they notified the World Health Organisation (WHO) of a swine-flu outbreak. At the end of April WHO raised its alert level first to phase four, where human-to-human transmission could cause outbreaks in communities, with a significant risk of a pandemic; and then to five, where a global pandemic is believed to be imminent. The first case in England was also announced at this time.

The starting point for the UK response to the outbreak was based on the UK national framework published in 2007. The devolved nations of Northern Ireland, Scotland and Wales had developed their own preparedness plans in line with the framework. A key feature of the framework was a plan for a national pandemic flu service (NPFS) to assess people’s symptoms over the phone or using the web, and then authorise antiviral treatment, which could be picked up by a friend from a local

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antiviral collection point. This would enable people to stay at home, reducing opportunities for transmission of the virus and pressures on primary care and A&E services. Other key features included “sleeping” contracts to purchase vaccine from vaccine manufacturers and a stockpile of antivirals.

A swine flu information campaign and an information line were put into operation at the end of April, and information campaigns such as “Catch it, bin it, kill it” and “Choose well” were begun. For the next two months there was a general policy of “containment”, i.e. trying to slow the spread of the disease across the population while learning more about its characteristics. Actions included: laboratory testing of swabs taken from individuals suspected of having contracted swine flu; tracing and giving antiviral treatment to their contacts; selective closure of schools; and self-isolation of cases in the community.

The containment actions were moderated from mid-June onwards as they were very labour-intensive. Furthermore, at this time WHO also raised its alert level to six, the highest level, triggering the advance purchase agreements for vaccines. During June and July there was a move to a treatment strategy. GPs rather than labs would diagnose swine flu, all sufferers would be offered antivirals, and contacts would no longer be traced. By the start of July almost 8,000 cases had been clinically confirmed, and 4 deaths and 105 hospitalisations had been reported. The NPFS went live in mid-July.

From August to October, when the initial peak of cases had subsided, preparations for vaccination were made in anticipation of a second peak. Certain high-risk groups, notably pregnant women, and frontline health and social care workers would be vaccinated first, then vaccination would be offered to the general healthy population. GPs would give the vaccinations for a fixed fee per patient. In mid-October, once a vaccine had been licensed, the vaccination programme began. By December there was consensus among modellers that the pandemic had now effectively peaked. There had been a gradual reduction of cases, although intensive care admissions remained high. In January 2010 it was decided not to vaccinate beyond the priority groups, and in mid-February the NPFS was stood down. By mid-March 2010 a total of 457 deaths related to the swine flu virus had been recorded across the UK as a whole. Overall mortality was lower than in some flu seasons, but the disease did disproportionately affect young people. In early April antiviral collection points in England were closed, the swine flu information line ceased and treatment of people with flu-like symptoms returned to normal practice.
6.4.2 Analysis of the organisational response to the outbreak

Thematic analysis of the data collected suggested a number of good practices. There should be clear plans that are implemented appropriately, with clear, consistent messages being communicated to the public and to staff. Such clarity and information supports the horizontal and vertical coordination and collaboration between organisations on which the implementation of plans relies. Implementation also requires sufficient input of resources of an appropriate quality, building on existing resources, where possible, rather than setting up new systems. Actual practices during the outbreak are compared with these suggested practices in Table 15, and described in more detail in Appendix 15.
### Table 15: Comparison of actual practices during the outbreak with suggested good practices and the learning informing a proposed new Department of Health strategy

<table>
<thead>
<tr>
<th>Good practices indicated</th>
<th>Actual practices</th>
<th>Proposed new strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear plans, implemented appropriately</td>
<td>Existing plans covered most aspects of the outbreak, and the National Pandemic Flu Service (NPFS) functioned well, but plans had not always been developed in sufficient detail. The fluid and heterogeneous nature of the outbreak indicated that plans should be implemented flexibly depending on local circumstances, but centralised control by national agencies was maintained. Planning for the worst case wasted resources and risked the outbreak being regarded as over-hyped.</td>
<td>A flexible, agile response to address local hotspots and the speed of spread. Gather accurate and detailed surveillance data at an early stage to determine the severity of the illness. A review of the process by which the assessments for events such as a pandemic are undertaken is underway in order to better match planning and preparation efforts to the risk. An analysis of the operation of the NPFS is to be published.</td>
</tr>
<tr>
<td>Communicating clear, consistent messages to the public and staff</td>
<td>Communication with the public was good on the whole, but there were some unclear and inconsistent messages and more information could have been provided. The impact on behaviour appeared limited however. Communication with staff, or their organisations at least, was problematic in some instances.</td>
<td>Frequent, consistent and coordinated communications to meet demands for information. Further work is underway to consider how best to communicate risk during a pandemic.</td>
</tr>
<tr>
<td>Coordination and collaboration between agencies – horizontally and vertically</td>
<td>On the whole there was good coordination and collaboration between agencies at local level and between local organisations and regional bodies (SHA, Government Office), although resource shortages (see below) sometimes impacted adversely on this. Working with the social care sector was challenging because of its disparate nature. There was good communication between national governments in the devolved nations and in England. The response was however overly top-down (see above) and some national professional bodies could have worked more collaboratively.</td>
<td>A coordinated response requiring close working and mutual support across different sectors and organisations. A supporting document for NHS and social care providers is to be developed in order to assist them in their planning.</td>
</tr>
<tr>
<td>Adequate resourcing – quantity and quality</td>
<td>Dedicated teams worked well but there was over-reliance on key individuals and resources were not maintained sufficiently through the recovery period.</td>
<td>Robust arrangements to support individuals involved in the response over what may be a lengthy period.</td>
</tr>
<tr>
<td>Build on existing resources</td>
<td>Some familiar systems were overlooked in favour of new systems, which necessitated learning and did not always function effectively and efficiently (e.g. Flu Response Centres, Stock Management System).</td>
<td>“The response ... built on, and enhanced, the response to more routine pressures”. “Response plans should be based on existing systems and processes wherever possible”.</td>
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6.4.3 Knowledge gaps and potential research topics

The commissioning and funding of urgent research during the pandemic was done effectively \(^{215}\), and the pandemic provided useful learning which should be beneficial with regard to any future pandemics \(^{222}\). The NHS Operating Framework 2010/11 required Boards of NHS organisations to assure themselves that identified elements of an effective response were in place, and encouraged local reviews of planning and preparedness \(^{220}\). Some informants mentioned aspects that had improved by the outbreak of 2010-11. During 2011 the Department of Health consulted on a new, UK-wide strategic approach to flu pandemic planning and response \(^{221}\). The learning from the pandemic which the new strategy aims to take account of maps closely onto good practices indicated in the above analysis (see Table 15). Although detail is lacking, the strategy also contains actions indicated by the national review \(^{215}\), including making more use of social networking and digital technology to reach specific sections of the public and planning for dealing with the number of bodies that would be produced in more severe pandemics, which is given as a task to local authorities.

The strategy identifies needs for further research, including research into how people are likely to think, feel and behave during a flu pandemic, as this affects responses to information campaigns, the uptake of medicines and interactions with health services \(^{221}\). This might perhaps usefully be extended to explicitly consider the decision-making and behaviour of staff and high-risk groups, and the influence of the mass media \(^{223}\).

An independent review of the UK response to the 2009 swine flu outbreak \(^{215}\) having been commissioned and a revised strategy developed, it would appear that systems for learning from high-profile nationwide incidents like pandemic flu outbreaks are fairly good. However, the lack of detail at various points in the strategy makes it difficult to determine whether significant action is taking place to address the issues that have been addressed, and some areas for action or research may still remain. Although the strategy states at one point that existing systems and processes should be built on, this appears to be regarded as being an unproblematic continuation of existing practice rather than being a gap, so our analysis would suggest that further research in this area may be warranted. While an evaluation of Flu Response Centres (FRCs) at a national level may have been suggested \(^{224}\), this would cover only one introduction of an unanticipated resource. It might be more useful to conduct research into the more general issue of why decision-makers depart from existing strategies and plans during a crisis in favour of untested new initiatives.
The strategy focuses on horizontal coordination and collaboration between agencies rather than on vertical coordination. The strategy indicates that there will be local flexibility to take account of local patterns of spread of infection, but it continues to emphasise a consistent, UK-wide approach, and is not totally clear about which decisions will be taken locally, regionally and nationally. This may be a reflection of “realpolitik” between the Department of Health (DH) and national politicians – research on this relationship might be of interest, although difficult to conduct. Other research might investigate more devolved systems for decision-making during a pandemic and their likely consequences, given the structures, cultures and resources of local, regional and national organisations. One informant suggested that a comparison with the more integrated Swedish or Canadian systems might be instructive. The need for research regarding collaboration between NHS and social care organisations was identified by one informant, particularly with regard to tackling barriers to sharing data in order to identify vulnerable people. The need for such research may depend on the content of the supporting document for NHS and social care providers which is to be produced. It has also been suggested that the benefits of GP clustering/buddy arrangements might be explored, particularly for single-handed GPs.

Preventing local resource shortfalls was highlighted as an issue by the outbreak, including difficulties in obtaining funds, either in advance or through reimbursement. The strategy also acknowledges that the recovery phase may well be a long, slow process, but provides no guidance for managing this process. Such difficulties are only likely to increase in the current economic climate and with moves towards more of a market in health care. Research might consider the costs of different elements of response, such as purchasing additional storage for flu drugs, perhaps in conjunction with the benefits of some options, such as antiviral collection points (ACPs) open 24/7; and the medium-term impact on the “everyday” performance of health care providers and how this might be taken account of in performance management and funding regimes.

6.5 Cumbria floods of 2005 and 2009

6.5.1 The course of the 2005 floods

Following a week of very heavy rain, a storm with hurricane force winds and torrential rain began to affect Cumbria on the evening of Friday 7 January 2005. The storm was much more severe than had been predicted by the Meteorological Office. First reports of flooding were received before midnight, and by morning it was apparent that a large part of Northern Cumbria was seriously affected by widespread flooding, with an
estimated 500,000 trees also having been blown over. At 08.00 the Police declared a Major Incident, and at 08.30 a major public health incident for health services was declared. At around that time flooding in Carlisle became extremely serious, with around 1900 homes, the Civic Centre, Fire and Police Stations and many commercial properties being flooded. The water levels were a metre higher than in the previous highest flooding levels, recorded in 1822. The focus of the response was centred on search and rescue in Carlisle as many people were trapped by rising flood waters. A Reception Centre was established at North Cumbria Technology College (NCTC) together with around 15 other “ad hoc” centres. At about 11.00 a power failure led to the whole of Carlisle being without electricity for around 36 hours. Many outlying areas were also without power, some remaining off supply for five days. At around 14.00, mobile phone reception in Carlisle failed and at 18.00, the north of the city briefly lost all landline telephone services. All this hampered emergency and recovery operations. Three people died as a direct result of the storm.

The flooding in some areas reached seven feet deep and took four days to subside. The County Council Control Centre was operational for the six days of the response phase, when command and control was handed over from the Police to the City Council; following which the Control Centre was then used for around six weeks to support recovery in the Carlisle area.

During the response period Cumbria Ambulance Service NHS Trust (CAS) carried out its normal duties of transporting and treating members of the public requiring medical assistance. CAS also: asked the British Red Cross and St John Ambulance Service to facilitate support at NCTC; received assistance from neighbouring Ambulance Trusts, including Air Ambulance Services; and assisted the other emergency services with the evacuation of people affected by the floods. In addition to its normal role, CAS supplied blankets and a generator to the NCTC to provide warmth and lighting for those members of the public that had been displaced from their homes.

The three PCTs in North Cumbria made qualified staff available at Reception Centres, and tried to ensure that people attending the centres had access to any medicines they needed. District Nurses addressed the needs of vulnerable patients in the community, by, for example organising generators for those with electric beds. The PCTs also liaised with all care homes so that residents had access to the food, clothing and bedding they needed. The Health Protection Agency (HPA) assisted in making decisions that would have an impact on public health, providing information and advice about health risks to staff and the public.

A mobile centre was used for eight weeks to provide information and advice sessions, including on sexual health and relationships, to young people.
affected by the closure of a flooded community centre in Carlisle. The mobile was also used as a base for community health outreach work.

While the immediate flood was shocking and frightening, research indicated that the most stressful period by far was the months of drying out and home renovation. Some people returned to live in unhealthy and unsafe conditions in their flooded homes because of a lack of alternative accommodation options, to protect their properties from looting, and to keep an eye on the builders refurbishing them. The practices of building contractors, insurers and loss adjusters exacerbated and prolonged the distress that people suffered. Anxiety, anger, sadness and disgust were all reported, with symptoms lasting for years among a proportion of the population, although there may have been some decline over time. The social relationships of some of the people who left their homes were damaged on account of the dislocation, but there was also evidence of community bonding during and after the floods, through the shared negative experiences.

6.5.2 The course of the 2009 floods

On 19 November 2009, more than a foot of rain fell on Cumbria in less than 24 hours, the highest level of rainfall ever recorded in 24 hours in the UK. More than 2,200 properties were flooded, over 80% of these being people’s homes and about 20% commercial premises. Transport infrastructure was badly affected, with 3 road bridges and 3 foot bridges being lost completely and many others temporarily closed due to damage, with landslides affecting many other routes.

Access to health care services became more difficult on account of the transport disruption, with around 7,000 people in North Workington unable to access their GP surgery for a period. Cockermouth’s two GP surgeries, which served 15,000 people, were also flooded out. Services were relocated to the town’s community hospital, where temporary buildings were erected and special flu vaccine clinics established.

In order to maintain emergency and routine cover, North West Ambulance Service (NWAS) drafted in additional resources to augment the local staff, who were under increasing pressure to negotiate the disrupted road network to reach patients. Extra staff and vehicles were planned to be kept in the area until a temporary bridge had replaced the collapsed bridge at Workington. HART teams from NWAS and Yorkshire Ambulance Service and the Patient Transport teams from all over Cumbria helped with rescues, welfare checks and evacuations to rest centres for medical and welfare support. Over 200 people were evacuated to safety, including elderly people from nursing homes. Community hospitals were able to accommodate elderly residents evacuated from a county council residential
home in Keswick. Later NWAS helped to return people to their homes. NWAS also provided a cleaning facility for those exposed to contaminated floodwater.

Health risks identified in Cockermouth and assessed by the HPA included: gastro-intestinal infections due to contaminated water; flu and flu-like illnesses due to large numbers of people coming together in reception centres; people missing medication; accidents due to people trying to repair buildings (this was learned from 2005); and carbon monoxide poisoning from the use of space heaters. Concerns about the possible spread of disease led to a localised vaccination programme being carried out in Cockermouth.

In the year following the floods about 200 people in the affected areas sought psychological help through an NHS “First Step” service offering support to people experiencing mild emotional problems such as sleep problems, mild depression, or panic attacks. Most referrals were made either by GPs, or by individuals themselves.

6.5.3 Analysis of the organisational response to the floods

Thematic analysis of the material collected suggested both good practices similar to those identified through the swine flu case study, and some additional good practices. Collaboration between organisations during planning and at all stages of the incident was a common theme in both the 2005 and 2009 floods. Compared with the swine flu case study there was a much greater emphasis on the good practice of community and voluntary organisation involvement. This did however link to the previous themes of building on existing resources and of adequate resourcing because communities, together with local staff, were regarded as the most important resource available, particularly in the 2009 floods, and as such needed to be supported (e.g. through provision of training).

Clear, consistent, public communications (but not particularly staff communications) were also identified as good practices, although there was perhaps less emphasis on these in the documents studied because they had been regarded as functioning well. Business continuity planning was highlighted as a good practice in both the 2005 and 2009 floods, but providing support for vulnerable people was emphasised more in 2005 than in the 2009 floods, perhaps because two elderly ladies died in the 2005 floods whereas no members of the public died in 2009. Such differences bring out the methodological point that while good practices highlighted in a particular case may be candidates for being good practices more generally, their prominence may be related to being regarded as having been unsatisfactory in that case and hence a focus for organisational deliberation and reporting. An absence of a good practice from documents...
regarding a case might be an indication that it was not important in that case, or it might be that the practice was followed in that case and hence taken for granted, or it might simply be that documents found did not cover that aspect of the case.

Comparing organisational responses to the 2005 and 2009 floods suggests an additional good practice – learning. A lack of learning was highlighted explicitly in one of the documents, as a reflection on organisational issues arising in the 2009 floods which had also arisen previously in 2005. Another additional good practice is appropriate support for the emotional problems of individuals.

Actual practices during the floods are compared with these suggested practices in Table 16, and described in more detail in Appendix 16.
### Table 16: Comparison of actual practices during the floods with suggested good practices, and the actions proposed to improve practices

<table>
<thead>
<tr>
<th>Good practices indicated</th>
<th>Actual practices</th>
<th>Proposed actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-agency collaboration, facilitated by prior multi-agency planning and training</td>
<td>Relationships and inter-agency working between responding organisations were good. There were however shortcomings in planning, such as a lack of longer-term and exit strategies for organisations involved in recovery that would maintain continuity of service provision. There was no process in place to deal quickly with the many offers of help, and data collection to inform recovery planning lacked coordination and consistency. There was poor attendance at multi-agency training by some staff and organisations.</td>
<td>Testing all aspects of an incident, from initial response through recovery. A more gradual handover from response to recovery that is sensitive to the situation. A more proactive and pre-planned approach to managing offers of help. Obtaining full multi-agency attendance at training.</td>
</tr>
<tr>
<td>Involvement of community and voluntary organisations</td>
<td>The people and expertise within affected communities were key resources, especially when groups were already organised prior to the floods. But public sector organisations had provided variable levels of support and their plans did not always take sufficient account of the activities of voluntary</td>
<td>Review plans to so that there is coordination across all reception centres, including ad hoc centres. Review training provision for larger voluntary organisations on command and control structures used during an incident. Explore the formation of a network of</td>
</tr>
<tr>
<td>Support for vulnerable people</td>
<td>In 2005, two elderly ladies died, support for elderly people in clearing up was poor, and some care homes suffered from a loss of power.</td>
<td>Improve methods for quickly identifying vulnerable people and providing them with information and support. Plans should explicitly consider vulnerable groups and care homes should have their own business continuity plans.</td>
</tr>
<tr>
<td>Business continuity planning</td>
<td>In 2005 power outages hindered internal and public communications, with some media organisations unable to function. In 2009 two GP practices were flooded and could not access their emergency response plans.</td>
<td>Media organisations should review their business continuity plans. GP practices should be involved in emergency response planning, particularly with regard to business continuity. Similarly for care homes (see above).</td>
</tr>
<tr>
<td>Appropriate support for the emotional problems of individuals</td>
<td>Many people suffering mental health problems did not seek help from the NHS and did not receive prompt psychological and practical support. Voluntary organisations were under-resourced and lacked expertise.</td>
<td>Statutory agencies should consider different methods of providing assistance in conjunction with local community-based organisations. [These actions were suggested by researchers; proposals for action by public sector organisations were not found].</td>
</tr>
<tr>
<td><strong>Communication to the public</strong></td>
<td>Public communications in 2005 were hampered by the lack of electricity, but were generally effective and timely in 2009, although the clarity of reports could have been improved.</td>
<td>Consider alternative media to provide public health messages, including billboards and social networking technologies.</td>
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<tr>
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</tr>
<tr>
<td><strong>Adequate resources</strong></td>
<td>In 2005 some organisations had difficulty in providing full 24/7 cover in gold command. Months of dedicated staff time were required to organise the response and recovery. Not all costs to local organisations were covered.</td>
<td>Central government should provide more detail about what Bellwin will cover, and consider use of Bellwin for the recovery phase.</td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td>Much was learned from the 2005 flood, but not all of the identified issues were addressed, such as effective cascading of information about the declaration of a major incident. Experiences of working together sometimes accelerated beneficial cross-agency integration of services.</td>
<td>No particular actions to improve learning were proposed in the documents studied.</td>
</tr>
</tbody>
</table>
6.5.4 Knowledge gaps and potential research topics

Few direct suggestions for further research were made. Nesbitt suggested exploring whether qualitative appraisals of mental health following a flood might predict emotions and subsequent symptoms, and investigating “traumatic growth” – the positive impacts of emergency incidents, such as people making new friendships and recognising new priorities in their lives. This might inform the provision of more appropriate support services. Convery suggested that research on the 2009 Cumbrian floods might consider:

- How do we “learn to live with floods”?
- How to plug the recovery gap?
- What does recovery look like?
- Building resilience
- Paucity of research re children’s experience of flooding
- What “spaces” do people need for recovery and how to best facilitate...schools, pubs, post offices?
- Do we need closer working between statutory & non-statutory agencies?

Analysis of the case study material suggests the following research topics:

- How to maintain and build on the collaborative spirit engendered by working together during the response and recovery phases in order to improve both future emergency planning and management, and future general service provision?
- Facilitating the greater involvement of communities, voluntary organisations and businesses in emergency planning, response and recovery. This might extend to exploring ways in which local communities rather than agencies might take more of a lead and responsibility (e.g. for protecting vulnerable community members), and how inequalities in the resilience of communities might be addressed.
- Investigate ways of increasing the resources which organisations and staff who are not emergency planning specialists devote to emergency planning and preparedness – for example, how to increase take-up of training and involvement in exercises, especially multi-agency training and exercises; and the development of business continuity plans that are fit for purpose across all providers of health and social care and the organisations on which they rely to provide infrastructure and supplies.
- Develop and evaluate the provision of mental health support within community-based services whose main purpose is delivering practical support services during the response and recovery phases.
- Explore the provision and gathering of information/data using new ICT technologies.
• Explore the cultural, structural and organisational issues which affect communication and planning across the response and recovery phases and the different organisations which have take lead roles in each. This should focus particularly on relationships between the “blue light” organisations such as the Ambulance Service and the “non-blue light” organisations which are very involved in the response phase, and those such as community health care and mental health care services which are typically more involved in the recovery phase. It should also include consideration of communication and planning across public sector and voluntary sector organisations.

In conclusion, the debriefs and cases studies did enable the formulation of various potential research gaps, but this required analysis and interpretation by the researchers. It was rare for debrief documents to explicitly identify needs for research, and although some academic articles were more explicit, they gave only a partial view because they had focused only on particular aspects of the incident. The documents provided a plentiful source of practice issues; there was less emphasis on good practice, but this could be inferred. The Cumbria floods case study suggests that comparison of similar incidents at different points in time can be enlightening, and it may have been instructive to compare 2010/11 swine flu with 2009/10, however time constraints prevented this.

Collaboration was a common theme across the case studies. Learning was also emphasised in the interviews and the Cumbria floods case study, and pointed to in the swine flu case study by the good practice of building on existing resources (i.e. ongoing learning rather than ignoring past work). This conjunction of collaboration and learning suggests that a knowledge management perspective might be useful. This provides concepts, skills and tools for learning and sharing across organisations (see, e.g., Dalkir 239). Four mechanisms have been suggested by which knowledge is created, explored and shared 240:

• Socialisation - sharing tacit knowledge in communities through mentoring, discussion, collaboration etc.;
• Externalisation - articulating tacit knowledge explicitly in words, tables, charts, diagrams, models, expert systems and so on;
• Combination - drawing together and systematising explicit knowledge into more generic, simpler, and more widely applicable forms;
• Internalisation - intuitively understanding the implications of generic explicit knowledge and deploying this tacit understanding in our behaviour and decision making.

While much of emergency planning and management may be based on explicit knowledge, some of the knowledge is tacit, and this may be particularly the case with regard to the actions to take during the turmoil of a crisis or emergency response. There is a need to build relationships so that emergency planners can collaborate and share tacit knowledge.
7 Prioritising research topics

The research team ran a workshop to prioritise the research gaps, questions and practice issues that were identified through the literature review, interviews, reading of critical debriefs and case studies, and advice from the advisory group. The purpose of the workshop was to generate a list of priorities to focus the remaining work of the study and to inform its recommendations to National Institute for Health Research (NIHR) Health Services and Delivery Research programme (HS&DR).

The workshop was held on 30 June 2011 at Manchester Business School (MBS) and involved 16 people, drawn from a range of stakeholder groups (see Section 7.1.3). Following the workshop it was decided that further work should be conducted in order to increase confidence in the prioritisation, and to that end a further 16 people were surveyed by email.

This chapter analyses the prioritisations produced by the workshop and the survey, the discussions that took place between workshop participants as they considered the prioritisation, and comments made by survey respondents. Section 7.1 describes the workshop planning, giving the reasons for the design decisions. Section 7.2 describes the workshop itself summarising the discussion that occurred and Section 7.3 presents an analysis of the workshop results and the views of the participants. Section 7.4 analyses the combined workshop and survey results and comments made by survey respondents.

7.1 Workshop preparation and planning

7.1.1 Identification of possible research gaps and questions

In mid-April 2011 the research findings to date were considered by the research team with a view to identifying a “longlist” of key research gaps and practice issues that might be brought to NIHR HS&DR’s attention at the end of the study. It was recognised that any list would only be a preliminary one, because only preliminary analyses of the data collected through the various study components had been conducted. The workshop was expected to produce additional insights which would then be used to complete the data collection and analysis, so some further items might become apparent while others might lose their relevance. Two research team members went through the literature review, transcripts of interviews, issues identified from the reading of critical debriefs and notes of other discussions in order to identify topics and associated key research questions. A preliminary list was circulated to all the research team for further discussion and items added and others recast. This list was written up with brief summaries of the evidence which underpinned each item. It was then discussed at an advisory group meeting, following which modifications were made to some items. The 18 potential research topics
and associated research questions which resulted are listed in Table 17. Some further background about each topic is given in Appendix 17.

**Table 17: Potential research topics and associated key research questions discussed at the prioritisation workshop**

<table>
<thead>
<tr>
<th>Short Name</th>
<th>Topic</th>
<th>Research Questions</th>
</tr>
</thead>
</table>
| **COLLABORATION** | Collaboration across multiple organisations | • How can coordination across a “mixed economy” of relatively autonomous health care organisations be maintained and improved, especially during the response and recovery phases?  
• How do responders in one organisation locate information, support, etc. within another responding organisation in the face of different jargons etc.? |
| **REORGANISATION** | Issues relating to reorganisation | • How to minimise the effect of NHS reorganisation on capability and effectiveness?  
• Does the emergency planning system provide sufficient consistency and leadership for emergencies covering a wide geographical area?  
• Does the system have the capacity to deal with long running events requiring 24 hour management over several days? |
| **LEARNING** | Learning and quality improvement | • What approaches and systems are effective in facilitating learning from good practice, exercises, and incidents of all sizes - at local, regional and national levels?  
• What constitutes quality in emergency preparedness and how can this be measured?  
• What approaches (internal processes or external regulation) are effective in producing continuous, sustainable quality improvement in emergency preparedness? |
| **PRIORITY** | Priority and resourcing given to Emergency Planning and Management | • What characteristics (capabilities, capacities etc.) make for an effective emergency planner/planning function in NHS organisations?  
• Which factors (e.g. professional background of senior managers, political, social and administrative contexts, funding sources, targets etc.) have the greatest impact on the resources (staff, financial, equipment etc.) that organisations devote to preparedness? |
<table>
<thead>
<tr>
<th>Short Name</th>
<th>Topic</th>
<th>Research Questions</th>
</tr>
</thead>
</table>
| INCIDENT LEVEL | Distinctions between major incident/national emergency, smaller business continuity issues and the "day job" of Accident and Emergency (A&E) and acute health care | • How should the level of an incident be defined and declared so as to elicit appropriate and proportionate actions from all relevant organisations, recognising that a single level may not be appropriate for all?  
• Which factors are important in determining whether an incident is escalated/declared to be a major incident by a health care organisation?  
• What makes for successful management of business continuity (as opposed to major incidents) in NHS organisations? |
| RISK COMMUNICATION | Public risk communication and information dissemination | • How do the public perceive risks and how can we develop more effective and targeted communication strategies to advise them?  
• Is good practice in risk and public communication embedded in all health care responders and agencies?  
• How should reasonable expectations about the length and efficacy of the response be communicated to the public? |
| SOCIAL NETWORKING | Use of social networking | • How should social networking be used to communicate with the public during and after an event?  
• During an incident how can social networks be monitored most effectively for intelligence on what is happening?  
• Can social networking be used to build trust between the authorities and the public? |
| ICT DEVELOPMENTS | Making best use of new information and communication technologies (ICT) | • How will technology innovation and adoption by the communication and health care fields influence emergency planning and response, and how can the system best anticipate and plan for these changes?  
• How can ICT be used most effectively in training and education of health care responders?  
• Can location aware "smart phones" be used in a valuable way by responders? |
| ICT RESILIENCE | Resilience to ICT outages | • Which parts of health care systems are most at risk from an ICT outage?  
• What is the systems resilience of NHS-Net (as opposed to the technical resilience)?  
• What is the systems resilience of the National Resilience Extranet? |
| TRAINING | Exercises and training | • What makes for an effective exercise design?  
• What are the connections between training, competency and capability, and outcomes?  
• How do we train and share best practice among emergency planners? |
<table>
<thead>
<tr>
<th>Short Name</th>
<th>Topic</th>
<th>Research Questions</th>
</tr>
</thead>
</table>
| WILLINGNESS TO WORK | Willingness of staff to work                                         | • What factors (e.g. individual, organisational and incident characteristics) influence the willingness of staff to work during incidents?  
• How can willingness to work be increased? |
| PUBLIC RECOVERY     | Recovery of the public                                               | • How are recovery issues best factored into the early stages of response?  
• How can social support networks be supported in the recovery phase?  
• How can the needs of vulnerable groups be identified and addressed? |
| SYSTEM RECOVERY     | Recovery of health care systems                                       | • What is the most effective way for health care systems to recover and return to normal operations?  
• What are the best ways of preventing adverse impacts on responders and helping them to recover from their involvement in an incident? |
| COMMUNITY GROUPS    | Community and vulnerable/special needs populations, including engagement in preparedness plus effective service response | • How do we identify vulnerable populations pre-, during and post-event?  
• How can access to community health care services be maintained when key infrastructures are significantly disrupted by a major incident (e.g. health care provision in emergency shelters)?  
• What are the potential roles of the public in emergency planning, prevention, preparedness, response and recovery? |
| SURVEILLANCE        | Prevention and mitigation/countermeasures, particularly health surveillance systems and also laboratory/diagnostic capabilities | • How can we increase laboratory systems’ ability to provide timely information to decision-makers during a large-scale and rapidly spreading emergency?  
• How do we develop better data sources on environmental conditions (e.g. heat waves)?  
• Is such information useful to decision-makers? |
| INFECTIOUS DISEASES | Pandemics and release of biological agents                           | • How do we predict the impact and epidemiology of large-scale pandemics, particularly those arising from new strains?  
• How do we assess the risks of cross-species transmission, resulting in pandemics?  
• Where does bioterrorism and the deliberate release of infective agents fit into health care emergency planning? |
| STRATEGIC MODELLING | Strategic modelling to inform preparedness and response              | • What are criteria for good modelling and the constructive use of modelling?  
• How can good modelling and constructive use of models be achieved?  
• What local NHS good practice is there with regard to strategic modelling (for surge capacity and otherwise)? |
<table>
<thead>
<tr>
<th>Short Name</th>
<th>Topic</th>
<th>Research Questions</th>
</tr>
</thead>
</table>
| INTERNATIONAL RESEARCH | Ability to generalise from US (and other countries’) findings to the UK context | • What aspects of research findings and good practice are transferable to the UK, bearing in mind differences of culture, legal systems and governance systems?  
• What scope is there for multi-nation research to generate more robust findings? |

### 7.1.2 Development of protocol

Within the field of strategic decision support, it is well recognised that one first supports divergent thinking processes to explore possibilities and then subsequently convergent thinking to build conclusions. In the case of this prioritisation workshop, the divergent thinking phase took place before the workshop, through the literature review, reading of incident debriefs, interviews, advisory board involvement and the research team’s ongoing discussions. The workshop itself was designed to support convergent thinking, as the relatively large amount of information that needed to be processed by participants meant there was insufficient time for large amounts of further divergent thinking if conclusions were to be reached. The entire workshop was therefore run in plenary (without break-out groups) so that all participants shared in the same experiences. Moreover, a fairly strict protocol and agenda for the day was designed, which encouraged wide discussion but maintained a focus on the research gaps and questions. Broadly, the day was divided into four phases:

- Presentation of the 18 potential research gaps and practice issues.
- General discussion of these 18 items.
- General discussion of the criteria on which the items should be ranked.
- Three ranking exercises to capture the participants’ prioritisation of the items:
  - A plenary discussion to produce consensus rankings of items against each of the criteria that the group had identified in the third phase.
  - Each participant would be provided with 10 small stickers and asked to allocate the stickers to the 18 items which were posted on the wall of the room. They were to allocate these stickers to represent their personal view of the importance of each item. They might allocate 1 sticker to each of the 10 items they would rank highest or distribute them in any other way over fewer than 10 items. If they felt an item had overwhelming importance they could allocate all 10 stickers to it.
  - Each participant would be provided with 18 cards, one summarising each item, and asked to put the cards into a rank order that best represented their personal assessment of overall order.
Ideally a full multi-criteria decision making exercise would have been conducted, with the items being scored and the criteria weighted, but there was insufficient time for this. Notes of the event were taken by two scribes and through the use of group maps (similar to cognitive maps, but for groups) built with Decision Explorer software.

Shortly before the event each participant was sent a briefing document. This emphasised the objectives of the prioritisation workshop and the importance of confidentiality on both sides. The 18 items identified for prioritisation were also listed. These were presented in the format show in Table 18.

Table 18: Example showing the format for presenting the topics to be prioritised at the prioritisation workshop

<table>
<thead>
<tr>
<th>Topic</th>
<th>Collaboration across multiple organisations</th>
<th>Short Name: Collaboration</th>
</tr>
</thead>
</table>
| Research Questions | • How can coordination across a “mixed economy” of relatively autonomous health care organisations be maintained and improved, especially during the response and recovery phases?  
• How do responders in one organisation locate information, support, etc. within another responding organisation in the face of different jargons etc.? | |

**Background and Description of Issues**
The literature on collaboration, team work and sharing knowledge suggests strongly that there is a need for teams to meet and know each other personally in order to collaborate effectively. Building trust is much easier if you know someone. The issue here is that, even before the current reorganisation, it was becoming difficult for cross-organisational teams to have enough personal contact and familiarity to be sure that they could work together as effectively as they might in an event. Moreover, contacts are through Local Resilience Forums (LRFs); and generally “planners” build the relationship not the “responders”. What happens about events that require a response beyond the LRF or have a non-geographical linkage?

**Notes:**
(i) Many of these issues have been discussed under the heading of interoperability though that often has a more technical interpretation relating to “kit” working together.
(ii) There are some common issues with RE-ORGANISATION below

Similar tables for the other 17 items are given in Appendix 17.

### 7.1.3 Attendance

In deciding who to invite to the ranking workshop the research team sought to involve a range of stakeholders and also participants who had little or no previous involvement with the study. The organisations from which the 16 participants were drawn were a Strategic Health Authority (SHA), two NHS hospital trusts, a Primary Care Trust (PCT), an NHS mental health care trust, the Health Protection Agency (HPA), NHS Blood and Transplant, the Department of Health (DH) (3 participants), the British Red Cross, the Emergency Planning College (EPC), a social services department, a local authority, a university and the charity Disaster Action, which was founded by survivors and bereaved people from UK and overseas disasters. 10 of the participants were members of staff from organisations with a specific health or health care remit, and 6 were based in the North West of England.
Most participants either had a specific responsibility for emergency planning within their organisation or had substantial experience of being involved in response and recovery operations. There was a mix of local, regional and national perspectives.

While the 16 participants covered many perspectives both within the health care sector and outside it, the Police, Fire and Ambulance services were not represented, and neither was general practice, the Care Quality Commission (CQC) nor the Civil Contingencies Secretariat. Greater representation of voluntary sector organisations, victims, patients and the public would also have been desirable. Logistics, clashing diaries and other pressures and imperatives were such that many people were not able to take up their invitations to attend. None of the participants had previously been involved in the study in any way except for one person who was a member of the advisory group. He had however not attended any meetings, although he had received all the materials that had been circulated to the advisory group.

7.2 The workshop

7.2.1 Introduction

The workshop was held on 30 June 2011 from 10.30 to 16.00. The room was a substantial one allowing freedom of movement. Participants were seated "cabaret" style on three tables to encourage informality. There was no seating plan: participants chose their own table and position at it. The walls of the room were largely free, allowing flip charts and other materials to be posted for reference. There was also central computer projection.

The event began with a welcome, introductions, matters of housekeeping, discussion of the confidentiality expected on both sides and a brief outline of the agenda. There was then a short presentation going through the 18 items to be prioritised, elaborating each a little and sketching the evidence base behind it. The discussion then began in earnest. Notes were taken by two scribes sat on either side of the room to ensure the greatest chance that at least one would hear every comment, and one member of the research team sat at each table to be available to answer participant queries and observe. Simultaneously, group maps of the discussion were built by a third scribe.

7.2.2 Discussion of possible research gaps and questions

The discussion opened with several participants expressing concern that the study and subsequent research programmes might duplicate work going on in other institutes and groups across government and the health care sector. It was important to make contacts with these programmes of work. Moreover, the research needed to be set in a wider context of the community, social care and government responses alongside those in the...
health sector. The health care community did not respond in isolation, but in communication with partner agencies, including the voluntary sector. It was noted that the study recognised this: at this stage the intention was to inform NIHR HS&DR’s thinking so that it could negotiate and plan with other partners across the research funding and government sectors.

Another point that came to the fore early was that in many events with significant health impacts, issues were complex and large volumes of information need to be mustered. This itself can have negative effects, swamping many of those involved with too much data and potentially leading to mixed messages being given to the public regarding risks and impacts. Alongside the difficulty of handling the volume of data, some participants also voiced a concern that national and regional bodies did not always confine their efforts to strategic issues, but had a tendency to micro-manage and usurp local management. It was argued that this had happened in the response to swine flu. It was also noted that at more local levels, senior managers in trusts also showed a tendency to work at too low a level and not delegate. Part of the issue here was that the more senior members in a trust or authority do not have time to attend training and exercises, but when events happen they do need to respond.

Cultural issues in commissioning were of concern to several participants. It was recognised that response required teams to form and work together quickly, but it is far harder to engage with others in the team if their response is in part driven by contractual requirements. How does one build a single culture within a response team? There is also a need for a common language so that communication within teams is not hampered by the use of different jargons. It was noted that a lexicon is in production to assist cooperation and better working together of staff. Emergencies also have a habit of breaking the neat boundaries assumed within contracts. Furthermore, informal information sharing across teams is often more effective than a more rigid, structured approach assumed in formal contracts. Such informal processes were said to be working well across Greater Manchester.

In relation to communication with the public and building reasonable expectations on their part of how the response might develop, it was noted that “people in incidents don’t have expectations, they just have views on what happens in the aftermath”.

There was some discussion of vulnerability and what it meant. Generally this served to emphasise the complexity of the issue. Vulnerability is contextual: an individual’s level of vulnerability changes during an incident. Moreover, some vulnerable people remain unidentified. It would be nice to have a database of the vulnerable, but many cannot be identified in advance. On a related issue, it was noted that good service delivery of social care meant that many would not need a health care response during the event. Similarly the voluntary sector could and did provide support; and the public themselves may self-organise elements of the response.
It was felt important to understand what might be required in terms of ICT in emergency planning and management. It needed to help these functions, rather than being “all singing and dancing”: simple, practical solutions were needed. But when used appropriately ICT could enable the most effective response. The value and use of social networking was not clear to many in the room. Could it be it used to send formalised messages?

Discussion turned to resilience and its measurement. It was felt that regulators paid little attention to resilience, not understanding the issue and what emergency planners struggled with. Several participants talked about how governance, audit and regulation might be used as ways of encouraging and ensuring that people and organisations “do the right thing” with regard to emergency planning. At the same time however they seemed to doubt the efficacy of current governance, audit and regulatory systems. It was difficult to see how to reward resilience. The item on strategic modelling needed to address the issue of measuring resilience in a practical, informative way.

Lastly several participants felt that US health care systems were so different from the UK’s that little could be learnt and translated from them into the UK context.

Figure 7 summarises part of the discussion in a group map, the arrows showing how some of the key ideas related to each other.

7.2.3 Discussion of the criteria which might be used to rank the items

The facilitators intervened to move the discussion forward to the criteria on which the 18 research gaps and issues of practice might be ranked. What qualities might make one more important than another to prioritise in terms of effort and resources? The initial discussion was wide-ranging, covering the urgency of the issue, cost of research, wider contribution or impact, feasibility of the research and susceptibility to achieving a result, whether they are underpinning or infrastructure issues, fit with statutory or regulatory requirements, addressing respectively citizen, staff and patient need, support for the concept of emergency preparedness as a day-to-day utility.
The group map in

Figure 8 summarises the discussion, during which five broad criteria emerged:

- Can research meet the need?
- Will governance structures enable change based on research findings to be implemented?
- Would addressing the gap enable improvement in other connected areas that are important?
- Does it address organisations’ needs?
- Does it address people’s needs?

These criteria were accepted by the group as being an accurate overview of their more detailed conversation.

7.2.4 Ranking of the possible research gaps and questions

The next step was to rank the topics in terms of importance against the five criteria. In the event the group did not consider the rankings against whether research could address the topic and whether the topic was needed as an enabler of others. The group felt strongly that they did not have the expertise to do this, but that the study team did. Thus an action was put on the study to consider the ranking against these criteria over the coming weeks. With regard to enabling improvement in other areas, the group did note that better understanding of and support for collaboration was an important enabler: without collaboration, one can do little.

The group first categorised the topics according to whether research could address the needs of people (i.e. citizens, patients, etc.) and the needs of health care organisations. The process was deliberately a rough one to build an understanding of the group’s thinking without pushing for what might be a false precision.

Essentially the group were asked to categorise the topics according to whether their importance in addressing the criteria was high, medium or low.

Figure 9 indicates their rough categorisation, the left hand side referring to people’s needs and the right hand side to organisations’ needs. It is clear that the categorisations are distinct: e.g. research into the impact of NHS reorganisation was not seen as particularly important in terms of the direct impact on people’s needs, but much more important in terms of organisations’ needs. On the other hand, further research and development of public risk communication methods was seen as important to both needs. The group found it difficult to categorise four of the topics (ICT resilience, learning, surveillance and training) in terms of their importance for people’s needs.

Turning to whether governance structures would enable the results of research to be implemented, the group arrived at the categorisation in Figure 10.
Figure 7: Group map of discussions about research gaps at the prioritisation workshop

41. Previous history of health working in a silo in government thinking
39. Some of this is a central government responsibility so NIHR needs to link to that
40. Link to others eg Association of Directors of Social Services
48. Are the themes appropriate/pitched at the right size
51. There may be themes that you will not have seen because of the location of the hidden literature (John)
70. What is vulnerability
66. CCS is working on a lexicon - regulating the use of language
65. Lexicon - a language for EPs
68. What is EP in health - the boundary
85. How do we measure resilience
86. Pushing critical events down to be emergencies
88. Incident levels

42. Social care/ displaced people response needs to be sufficient to bring people into the health care (and help people to avoid healthcare)
50. Learning from international examples of practice
57. Leadership and coordination (info as a security blanket)
58. Embedding plans
64. Usable plans
55. Responders should be patient/delivery focused, not email focused
56. At the strategic level - the standards and people need to be capable/ focused
63. Involving the wider partnership (85% of social care is outsourced)
62. Involvement of the private sector
60. How do we get people to do training
53. Command and control during health emergencies needs examination
52. Business continuity and emergency management eg NHS response to infection

47. Ensure that the research themes are appropriate
61. Need to think about the unintended consequences (eg lack of blood)
43. How much of this is emergency planning and how much is general research
44. Need to concentrate on the structural issues rather than in the detail of the response
49. USA healthcare systems is dramatically different to the UK
46. Health linking with its partner agencies more effectively
45. Health community does not respond in organisation, multi-agency partnership
38. Health should not diverge to go on their own direction
37. Must link into the other research programmes eg capabilities
39. Some of this is a central government responsibility so NIHR needs to link to that
36. USA healthcare systems is dramatically different to the UK

Figure 8: Group map of discussions about prioritisation criteria at the workshop

71 What criteria can we use to rank the potential themes?

74 On this theme . .

75 The ability of the research to meet the expectations of the theme (aims/objectives)

81 The simplicity of the solution to the problem (its potential to be implemented)

73 Are we under a statutory obligation

89 Can research meet the need?

90 Will governance structures enable it to be implemented?

82 Its practicality/ability to support responders

83 Benefits to the users of health systems

76 What can we pressure the regulators to attend to (enforceability)

78 Proximity of the problem (how close it is to us or operations in topic and time)

84 Its contribution to the ability to manage incidents at a level where they are not major incidents (e.g., winter planning, infection control)

87 How this complements usual daily working

92 Does it address organisations’ needs?

93 Is it an enabler of something that is important?

91 Does it address people needs?

75 Its connectedness (e.g., is it an enabler or subset)

80 The ability of the research to answer citizen problems

77 Does this bring resilience onto the national agenda (e.g., CQC)

88 Incident levels

115 Direct users versus people who are potentially impacted by it

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Project 09/1005/01
Figure 9: Prioritisation workshop categorisation of research topics according to impact on people's needs and organisations' needs

91 Does it address people's needs? 107 Community groups 105 Public recovery 106 System recovery 99 Risk communication

100 Social networking 109 Infectious diseases 110 Strategic modelling 94 Collaboration

101 ICT developments

111 International research 95 Re-organisation 104 Willingness to work 97 Priority

102 ICT resilience 96 Learning 108 Surveillance 103 Training

92 Does it address organisations' needs?

112 high 20 Re-organisation (15) 22 Priority (9) 28 Training (20)

30 Public recovery (10) 35 Strategic modelling (7)

114 medium

27 ICT resilience (6)

32 Community groups (8) 25 Social networking (2)

33 Surveillance (5) 34 Infectious diseases (health protection) (5)

113 low

29 Willingness to work (7) 36 International research (1)

26 ICT developments (3) 23 Incident level (3)
Figure 10: Prioritisation workshop categorisation of research topics according to whether governance structures would facilitate implementation of findings

<table>
<thead>
<tr>
<th>90 Will governance structures enable it to be implemented?</th>
</tr>
</thead>
<tbody>
<tr>
<td>112 high</td>
</tr>
<tr>
<td>96 Learning</td>
</tr>
<tr>
<td>97 Priority</td>
</tr>
<tr>
<td>106 System recovery</td>
</tr>
<tr>
<td>102 ICT resilience</td>
</tr>
</tbody>
</table>

| 114 medium | 99 Risk communication |
| 104 Willingness to work |

| 113 low | 105 Public recovery |
| 100 Social networking | 111 International research |
| 107 Community groups | 101 ICT developments |
| 95 Re-organisation |

Figure 11: Photograph of workshop participants prioritising research topics through voting

The next step was to consider overall rankings. The group were given some time to work individually on developing their personal ranking of the topics.
They were encouraged to do this by sorting their topic cards into a rough order of priority. Then they were given 10 small stickers as votes. They were asked to stick their votes to the 18 topic cards that were fixed to the wall (see Figure 11). They were allowed to allocate more than one sticker to a single topic if they thought it particularly important. The results of this plenary voting are given in Table 19.

Table 19: Ranking of research topics by plenary voting at the prioritisation workshop

<table>
<thead>
<tr>
<th>Rank</th>
<th>Topic</th>
<th>Number of sticker votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Collaboration</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Training</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Risk communication</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>Reorganisation</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>System recovery</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Public recovery</td>
<td>10</td>
</tr>
<tr>
<td>7=</td>
<td>Priority</td>
<td>9</td>
</tr>
<tr>
<td>7=</td>
<td>Organisational learning</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>Community groups</td>
<td>8</td>
</tr>
<tr>
<td>10=</td>
<td>Strategic modelling</td>
<td>7</td>
</tr>
<tr>
<td>10=</td>
<td>Willingness to work</td>
<td>7</td>
</tr>
<tr>
<td>12</td>
<td>ICT Resilience</td>
<td>6</td>
</tr>
<tr>
<td>13=</td>
<td>Surveillance</td>
<td>5</td>
</tr>
<tr>
<td>13=</td>
<td>Infectious diseases</td>
<td>5</td>
</tr>
<tr>
<td>15=</td>
<td>Incident level</td>
<td>3</td>
</tr>
<tr>
<td>15=</td>
<td>ICT developments</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>Social networking</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>International research</td>
<td>1</td>
</tr>
</tbody>
</table>

Finally the participants were asked to finish sorting the 18 topic cards to indicate their personal ranking of importance. Participants were assured that their confidentiality would be protected throughout. In particular, no individually identifiable ranking would be published.

The workshop ended with the study team thanking the participants for their help, a reminder about mutual confidentiality until the conclusion of the study and an agreement that the study team might contact individuals in the coming weeks for clarification or further thoughts on the issues. Feedback sheets were completed and collected from the participants as they left.
7.2.5 Actions arising directly from the workshop

The 18 topic areas and associated research questions and issues of practice were accepted by the group, but the discussion at the workshop also identified a number of themes and issues that might usefully be factored into them:

- Should the training item include something on leadership and management development, etc.?
- How useable are plans during an event? Is there a tendency for “good” or “rational” ideas to sit on the shelf?
- How do different definitions and conceptions relating to emergency planning shape thoughts, plans and actions?
- Should there be broader inclusion in planning and prevention beyond the local resilience forums and during recovery – particularly non-health care, social care and voluntary sector organisations?
- What is the relationship between emergency planning and other areas of work and day-to-day activities, e.g. infection control, winter pressures? How might an appropriate and productive relationship be established or maintained?

In addition to integrating these ideas into the topic areas, it was also suggested that the research team should:

- Talk with some participants about unpublished and classified research, such as on bioterrorism, and about the research agendas of government departments.
- Identify current progress on a national lexicon of emergency planning and management terminology.
- Consider conducting interviews with people from key stakeholder groups not represented at the workshop, and with specific individuals suggested by participants who might offer valuable perspectives.

7.3 Post-workshop analysis

Immediately after the workshop the team began to explore the rankings, their consistency and whether any informative clusters or groupings could be discerned.

7.3.1 Comparison of individual ranking and the overall ‘sticker vote’ ranking.

The individual rankings and overall sticker ranking were compared to assess their consistency (see Table 20). There was a very high negative correlation between the average ranking from the individual topic cards and the summed number of stickers from the wall posters (Spearman’s $\rho = -$
0.963, p<0.001). This was as expected and suggests that there were no major issues regarding openness about priorities.

Table 20: Workshop rankings and categorisations of research areas according to various criteria

<table>
<thead>
<tr>
<th>Research Area</th>
<th>Stickers</th>
<th>Ordering cards</th>
<th>Categorisations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of stickers</td>
<td>Average Rank</td>
<td>People's Needs</td>
</tr>
<tr>
<td>Collaboration</td>
<td>30</td>
<td>1.9</td>
<td>2</td>
</tr>
<tr>
<td>Training</td>
<td>20</td>
<td>5.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Risk communication</td>
<td>17</td>
<td>6.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Reorganisation</td>
<td>15</td>
<td>7.1</td>
<td>1</td>
</tr>
<tr>
<td>System recovery</td>
<td>11</td>
<td>7.1</td>
<td>3</td>
</tr>
<tr>
<td>Public recovery</td>
<td>10</td>
<td>7.8</td>
<td>3</td>
</tr>
<tr>
<td>Learning</td>
<td>9</td>
<td>7.4</td>
<td>0.5</td>
</tr>
<tr>
<td>Priority</td>
<td>9</td>
<td>9.1</td>
<td>1</td>
</tr>
<tr>
<td>Community groups</td>
<td>8</td>
<td>10.1</td>
<td>3</td>
</tr>
<tr>
<td>Strategic modelling</td>
<td>7</td>
<td>11.1</td>
<td>2</td>
</tr>
<tr>
<td>Willingness to work</td>
<td>7</td>
<td>11.6</td>
<td>1</td>
</tr>
<tr>
<td>ICT resilience</td>
<td>6</td>
<td>8.9</td>
<td>0.5</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>5</td>
<td>11.7</td>
<td>2</td>
</tr>
<tr>
<td>Surveillance</td>
<td>5</td>
<td>12.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Incident level</td>
<td>3</td>
<td>11.7</td>
<td>1</td>
</tr>
<tr>
<td>ICT developments</td>
<td>3</td>
<td>12.1</td>
<td>1.5</td>
</tr>
<tr>
<td>Social networking</td>
<td>2</td>
<td>13.2</td>
<td>2</td>
</tr>
<tr>
<td>International research</td>
<td>1</td>
<td>16.2</td>
<td>1</td>
</tr>
</tbody>
</table>

Note that p values are no more than indicative here since the conditions for applying Spearman’s ρ are not fully satisfied.
Next the average rank given by individuals was compared with the rough categorisations given by the group during the workshop under the three criteria:

- Will governance structures enable it to be implemented?
- Does it address organisations’ needs?
- Does it address people’s needs?

The rough rankings were scored at 3 for high, 2 for medium, 1 for low and 0.5 for unranked (see Table 20). There was a clear correlation between the average individual ranking and the organisations’ needs assessment (Spearman’s $\rho = -0.843$, $p<0.001$), but much less with the other two scales. This might reflect that individuals weighted organisational needs much more highly in forming their individual rankings. Indeed one participant said that the “discussion inevitably was organisationally focused”.

Next the individual rankings were used as a basis for a hierarchical cluster analysis of the topics. Stopping the process when there were two clusters suggested a division of the topics into ones to be considered further as potential priorities, and others which have would have a lower priority:

- Higher priority topics: Collaboration, Training, Risk communication, Reorganisation, System recovery, Learning, Public recovery, ICT resilience, Community groups.

A graphical representation of the topic area priorities was produced using a 2-dimensional scaling analysis with a Euclidean distance model (see Figure 12). One dimension was highly correlated with the organisations’ needs assessment (Spearman's $\rho = 0.820$) and the other dimension was relatively highly negatively correlated with the people’s needs assessment (Spearman’s $\rho = -0.557$), so interpreting the dimensions as corresponding to these two different needs assessments is at least plausible. The overall priority given to a topic would vary depending on the relative weights given to these two needs, but topics in the top left hand quadrant of the diagram would always have a relatively low priority, irrespective of the weights, and topics in the bottom right hand quadrant would always have a relatively high priority. The priorities given to topics in the other two quadrants would be particularly dependent on the relative weight given to people’s and organisations’ needs.

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9 15 participants provided individual rankings, as one person had to leave prior to this.
Further cluster and other analyses were conducted to see if there were any potentially interesting groupings of the participants. These are not reported in any detail here, partly because the results were indicative rather than conclusive, and partly in the interests of maintaining confidentiality of individual participants. The analyses suggested that participants with a national or large organisational focus might rank some topics differently from participants with a more local, community or recovery focus. These differences were broadly in line with organisations’ versus people’s needs differences outlined above, reinforcing that interpretation of the data. Such differences appeared to have greatest scope for making a difference to the priority status of Reorganisation, Community groups, ICT resilience and Priority. Collaboration, Training, Risk communication, System recovery, Public recovery and Learning consistently featured as high priorities. Strategic modelling, Willingness to work, Infectious diseases, Surveillance, Incident level, ICT developments, Social networking and International research were generally given lower priorities.
Closer examination of the original hierarchical cluster analysis revealed an interesting set of clusters when the process was stopped at 6 clusters:

- Strategic modelling + Surveillance + Infectious diseases
- ICT developments + Social networking
- Training + Learning
- System recovery + Public recovery
- Priority + Incident level + Risk communication
- Other topics.

These clusters appear to consist of related topics, which may indicate that there was too much information for participants to be able to process all of it when ranking topics. Participants may have based their rankings largely on the broad topic headings rather than on the suggested research questions associated with the topic areas.

7.3.2 Feedback from the participants

At the end of the workshop all participants were provided with a short questionnaire to obtain their perspective on the value of the day and the effectiveness of their involvement. The questionnaire involved six closed questions (on a 1-5 scale, where 5 is ‘strongly agree’) plus two open questions for writing comments.

13 completed feedback sheets were received from the 16 participants. All except one were broadly happy with the workshop. S/he strongly disagreed with five of the six statements, and disagreed with the 6th. His/her comment was "Discussion inevitably was organisationally focused and led to some diversion off topic".

The order of the ratings (average rating values) was:

- Participants had sufficient opportunities to contribute (4.2) (11/13 agreed or strongly agreed). "Smaller working groups to allow open discussion” were suggested by one participant.
- The facilitators were impartial (4.2) (11/13 agreed or strongly agreed)
- Overall, this was a useful event (3.9) (10/13 agreed or strongly agreed): "The event was well organised and well run. Perhaps too broad to produce definitive result."
- The time allocated to presentations and discussion sessions was appropriate. (3.7) (10/13 agreed or strongly agreed): "Too much time discussing criteria for prioritising. Too little time on discussion of the priorities."
- The event met its stated aims and objectives (3.6) (9/13 agreed or strongly agreed): "Depends on what you can make of the discussion!"; “Don’t know yet as decisions not taken.”
- The research priorities produced by the event are robust (3.3) (6/13 agreed - no one strongly agreed): "Not a sample weighted by importance"; "If you always do what you've always done, then you'll
always get what you've always got (i.e. focus on the value of new and emerging)."

In response to the open-ended question on what respondents would change in any future workshop, several points were made:

- "I would have set firmer rules and definitions in advance - less discussion on ... wide issues initially (i.e. shorter morning session)."
- "Greater distinction between deciding which issues are important and which are important as research topics."
- "More input from emergency planning specialists."

One point that several respondents made in comments, verbal and in writing, was that they felt that breakout sessions might have been used to allow wider discussion. As noted earlier, the design of the workshop protocol had consciously kept participants in a single group. Firstly, the primary aim was to facilitate convergent rather than divergent thinking and there is a wide view among facilitators that this is best served by working in plenary sessions so that all participants hear all comments. Secondly, the day was somewhat constrained by time and there are considerable temporal overheads in breaking into smaller groups and then re-forming and reporting back.

### 7.3.3 Actions arising from the post-workshop analysis

The analysis suggested various areas where further work might be beneficial:

- Obtaining topic rankings from a greater number and wider range of individuals in order to cover stakeholder groups not represented at the workshop and to check the robustness of the rankings.
- Exploring the apparent differences in rankings between some subgroups of participants to understand whether these reflected general differences between these groups of stakeholders and how such differences might impact on the priorities given to topics. Priority, Community groups, ICT resilience and Reorganisation appeared most suitable for such exploration.
- Considering the specific research questions within the highest ranking topics which it would be most useful to answer. Collaboration, Training, Risk communication, System recovery, Public recovery and Learning appeared most appropriate for such consideration.

Further topic rankings were subsequently obtained via an email survey. An update to the workshop analysis provided by incorporating the data from this survey is given in Section 7.4.
7.4 Analysis incorporating additional rankings from the survey

The 18 research topic cards were emailed to a convenience sample of individuals for them to rank. 16 people responded to the survey. Most had had some previous contact with the study: as an advisory group member (six respondents\textsuperscript{10}), as an interviewee (four respondents) or as someone who had been invited to the workshop but had been unable to attend (four respondents). The remainder were either suggested by workshop participants as having interesting perspectives or were found by web searching. Particular efforts were made to try to obtain rankings from staff of “blue light” organisations, because none of these organisations had been represented at the workshop. Two respondents worked for the Police, one for the Ambulance Service, and another had worked for the Fire Service previously in his career. Three respondents were university researchers, two respondents worked in the voluntary sector and two respondents worked for SHAs. There was thus some overlap with the original workshop in terms of types of organisation and profession represented, but also some significant differences.

The patterns of rankings produced by the survey and the workshop were broadly similar (see Table 21). There was a high negative correlation between the average ranking from the survey cards and the summed number of stickers from the wall posters at the workshop (Spearman’s $\rho = -0.628$, $p<0.01$) and also between the survey and workshop average rankings (Spearman’s $\rho = 0.682$, $p<0.01$). There was also a strong correlation between the average rankings from the survey and the organisations’ needs assessment from the workshop (Spearman’s $\rho = -0.538$, $p<0.02$), but much less with the other workshop scales. Such correspondences between the rankings from two independent samples of respondents increase confidence in the results.

\textsuperscript{10} Note that some of these categories of respondent overlap (e.g. two advisory group members were also interviewed, etc.).
Table 21: Workshop and survey rankings of research areas

<table>
<thead>
<tr>
<th>Research Area</th>
<th>Workshop</th>
<th>Survey</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of stickers</td>
<td>Average Rank</td>
<td>Average Rank</td>
</tr>
<tr>
<td>Collaboration</td>
<td>30</td>
<td>1.9</td>
<td>5.3</td>
</tr>
<tr>
<td>Reorganisation</td>
<td>15</td>
<td>7.1</td>
<td>5.8</td>
</tr>
<tr>
<td>Training</td>
<td>20</td>
<td>5.2</td>
<td>8.2</td>
</tr>
<tr>
<td>Risk communication</td>
<td>17</td>
<td>6.7</td>
<td>6.8</td>
</tr>
<tr>
<td>Learning</td>
<td>9</td>
<td>7.4</td>
<td>7.3</td>
</tr>
<tr>
<td>Priority</td>
<td>9</td>
<td>9.1</td>
<td>7.6</td>
</tr>
<tr>
<td>Public recovery</td>
<td>10</td>
<td>7.8</td>
<td>9.0</td>
</tr>
<tr>
<td>System recovery</td>
<td>11</td>
<td>7.1</td>
<td>9.9</td>
</tr>
<tr>
<td>Community groups</td>
<td>8</td>
<td>10.1</td>
<td>7.4</td>
</tr>
<tr>
<td>ICT resilience</td>
<td>6</td>
<td>8.9</td>
<td>9.0</td>
</tr>
<tr>
<td>Incident level</td>
<td>3</td>
<td>11.7</td>
<td>8.9</td>
</tr>
<tr>
<td>Social networking</td>
<td>2</td>
<td>13.2</td>
<td>8.0</td>
</tr>
<tr>
<td>Strategic modelling</td>
<td>7</td>
<td>11.1</td>
<td>11.7</td>
</tr>
<tr>
<td>ICT developments</td>
<td>3</td>
<td>12.1</td>
<td>10.9</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>5</td>
<td>11.7</td>
<td>13.0</td>
</tr>
<tr>
<td>Willingness to work</td>
<td>7</td>
<td>11.6</td>
<td>13.8</td>
</tr>
<tr>
<td>Surveillance</td>
<td>5</td>
<td>12.2</td>
<td>13.6</td>
</tr>
<tr>
<td>International research</td>
<td>1</td>
<td>16.2</td>
<td>14.8</td>
</tr>
</tbody>
</table>

A 2-dimensional scaling analysis of the topic area priorities from the survey was similar to that from the workshop, with one dimension again relatively highly correlated with the organisations’ needs assessment (Spearman’s $\rho = 0.462$) and the other dimension again relatively highly negatively correlated with the people’s needs assessment (Spearman’s $\rho = -0.484$) (see Figure 13).

<sup>11</sup> The group for each research area was allocated by the research team based on the trend in the overall average ranking.
Infectious diseases, surveillance and willingness to work were again in the top left hand quadrant of the diagram, reinforcing the idea that they could be regarded as having a relatively low priority.

Two respondents noted the importance of engaging with communities:

- “the need to work with our communities – if Emergency response is what we do with them not to them we need to get better at engaging with them early, identifying risks, plans and contingencies. Social media is an underused tool in incidents, and we need to learn how to listen and broadcast.”
- “There is ... [no] point designing wonderful systems to track pandemics, identify the virus, practice emergency drills etc etc, if when it comes to the crunch, the public just aren’t interested in helping. Until we solve that, everything else is pointless. (Well, not quite, but you get my drift!).”
Analyses of respondent groupings, not reported in detail here, suggested that the inclusion of respondents from “blue light” services might have lowered the priorities given to system recovery and public recovery, which might be expected given their generally greater involvement in the response phase. Some of the comments respondents made were suggestive that they had given higher rankings to areas they were more familiar with:

- “I think getting one’s own house in order is a priority – and working out what works/how it works/how it will deliver ... I have no strong views after those [high priorities] – they are all equally valid, and some I do not feel qualified to comment on!”
- “I have shamelessly put my own area, risk communication, first ... a couple of ones in black at the end which I didn't feel I understood.”
- “After that [the high priorities] the order becomes a little "confused", as it will depend on the individual's place in the organisation.”
- “All of the elements are important, and often interdependent.”

Given the many similarities between the rankings produced by the workshop and the survey it would appear that pooling the two datasets should give more robust results, reflecting a greater number of responses and a wider range of stakeholders. Doing this and performing a hierarchical cluster analysis suggested six clusters of similar or related topics:

- Surveillance + Infectious diseases
- System recovery + ICT resilience
- Training + Learning + Collaboration
- Public recovery + Community groups
- Priority + Incident level
- Social networking + ICT developments.

The combined data suggests Collaboration, Reorganisation, Training and Risk communication as the highest priorities, and that Strategic modelling, ICT developments, Infectious diseases, Willingness to work, Surveillance and International research are the lowest priorities (see Table 21).

Topics where there was most variability in the rankings, and the greatest difference between the scores for organisations’ needs and people’s needs in a two dimensional scaling analysis (see Figure 14, where they lie furthest from the diagonal from top left to bottom right) were Reorganisation, Incident level, Community groups and Social networking. Reorganisation and Incident level may be ranked as relatively important from an organisational perspective, but less important from a community perspective. Conversely, Community groups and Social networking may be ranked as relatively important from a community perspective, but less important from an organisational perspective.
The two-dimensional scaling also suggests four high priorities from a community perspective: Community groups, Risk communication, Public recovery and Social networking; and two high priorities from an organisational perspective: Collaboration and Reorganisation. For quite a wide range of weightings for the two perspectives, Training and Learning would also be relatively high priorities.
8 Overall findings and recommendations

In this chapter the findings from the previous chapters are brought together and analysed further in order to arrive at overall conclusions and recommendations. Consideration is given to the robustness of the findings, taking account of limitations in the process, inherent uncertainties in the data, and differences of view that have been identified. Finally, suggestions for future action are made.

8.1 Methods used for the analysis

The framework used for this concluding analysis consists of three dimensions:

- **Existence**: Is there a knowledge gap? Does it require research to be conducted, or simply wider sharing of current knowledge?
- **Importance**: How important is it to try to fill that gap? What would be the potential impact on policy and practice? In particular:
  - Does the gap relate to aspects of policy and practice that are regarded as important, such as good practices?
  - Does the gap relate to aspects that are regarded as problematical issues?
  - Whose values or interests should be given priority?
- **Practicality**:
  - How feasible and expensive would it be to conduct research to fill a gap?
  - What is the likelihood of research findings being implemented?

The dimensions were developed inductively based on the information collected by the study (on research, good practice, policy and practice issues, etc.) and on the criteria identified by the prioritisation workshop (Section 7.2.3). Logically, all three dimensions are necessary if research which improves NHS practice is to be commissioned, as is the aim of National Institute for Health Research (NIHR) Health Services and Delivery Research programme (HS&DR). If research is infeasible or unaffordable then it is a non-starter; if it does not fill a gap, then it will not generate new knowledge; if the new knowledge generated is not relevant to policy or practice issues then it will not even be potentially useful; and if the new knowledge is ignored then it will not have an impact.

The study described in this report has used a range of different methods to explore different aspects of emergency planning and management in health care and shed light on the answers to the above questions about the existence of research gaps and their importance for practice. As part of the process it has also identified a range of good practices, which are detailed primarily in Table 14, Table 15 and Table 16.
A broad review of the academic literature highlighted common research topics, and gave an indication of what researchers have suggested as research gaps (Chapter 4). This was brought more up to date by considering ongoing and future research projects and surveying researchers. The identification of previous scoping reviews provided an opportunity to build on that work, which gave an indication of overall research gaps and USA priorities for future research.

A UK perspective on research gaps was added by specifically analysing UK-focused research. Interviews with people drawn from a range of stakeholder groups (Chapter 5), together with analyses of debriefs and case studies (Chapter 6), provided information principally about good practices and problematic issues. A prioritisation workshop and subsequent survey (Chapter 7) highlighted the sometimes differing interests of organisational and community actors, provided some indicative priorities from those different perspectives, and some initial views on the likelihood of research findings being implemented.

To facilitate an overall synthesis, findings from the literature review, interviews, case studies and debrief analyses were tabulated in a single table. An initial list of potential research topics was derived from the clusters indicated by previous health/health care specific scoping reviews (Table 5). Then key findings from each chapter of the report were added, in the form of identified research topics, evidence of the existence of research gaps, and evidence of the practical importance of research topics or gaps. Some of the original research topics were expanded so that they could incorporate related findings (e.g. the “measurement” cluster was expanded to the topic “learning and quality improvement”), and additional topics were added when findings unrelated to existing topics were found.

In order to assess the relative priority claims of the various potential research topics, the evidence for the existence (E) of a gap and for the importance (I) of the gap was considered. Unfortunately, consideration of the practicality questions was not included in the study plan and it was not possible to undertake additional work to assess practicality within the resources available to the study. Prioritisation workshop participants did identify the importance of mechanisms to support implementation of research findings by practitioners, and provided a scoring of potential research topics in this regard, but this by no means constituted a comprehensive analysis (see Section 7.2.3 and Figure 10). Practicality issues are discussed briefly below with regard to research gaps that have been judged to exist and to be important, but it may be that further work on this would be useful going forward.

One approach to determining the final priorities to be given to the potential research topics would have been to allocate them an overall score by adding up the number of items of evidence in support of each topic and subtracting the number of items of evidence that challenge giving that topic priority. The method actually used was slightly more sophisticated than this,
because each item was given an individual score as per Table 22, to reflect the research team’s judgement of the relative weight that should be accorded to that item of evidence. While the overall scores derived in this way are rough indicators, they do facilitate broad comparisons between potential topics.

The total existence and importance scores for each potential research topic were calculated, and correlated with the rankings of identical or comparable topics produced by the prioritisation workshop and survey. For example, the scores for the “staff availability” topic were associated with the ranking for the “willingness to work” workshop topic. The scores and rankings are not totally independent because a small number of the interviewees also provided rankings, but any effect should be small, so analysing correlations is reasonable.

Table 22: Scores for each item of evidence relating to the existence (E) and importance (I) of potential research topics

<table>
<thead>
<tr>
<th>Item of evidence</th>
<th>Score</th>
<th>Rationale for the Scoring Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic identified as a priority by clustering previous scoping reviews</td>
<td>E=+++, ++, or +</td>
<td>The clusters were based on a large quantity of evidence, but they were USA- rather than UK-focused. Owing to major differences between UK and USA health care systems, the clusters were interpreted as evidence of existence of research gaps rather than of the importance of research gaps. The highest priority clusters were scored as +++, medium priority clusters as ++, and relatively low priority clusters as +.</td>
</tr>
<tr>
<td>Other indications of the topic being a research gap or priority</td>
<td>E=++ or +</td>
<td>The extent of the evidence was more limited, but sometimes it was UK specific. Scored as ++ for UK specific indications, + otherwise.</td>
</tr>
<tr>
<td>Quality of research on the topic</td>
<td>E=+ or 0</td>
<td>If research is of relatively low quality then there may be more of a gap than indicated by the quantity of research. As judgements of quality of research are difficult and sometimes controversial, a relatively low weight of + was given to this. Where research was of relatively high quality this was scored as 0 rather than a negative score, because of the moderating effect of facilitating future high-quality research.</td>
</tr>
<tr>
<td>Continuing research in the UK on the topic</td>
<td>E=-</td>
<td>Scored as a relatively small negative because such research may fill gaps.</td>
</tr>
</tbody>
</table>
Amount of continuing research on the topic by Preparedness and Emergency Response Research Centers (PERRCs) | E= 0 or - | PERRCs are conducting a significant amount of research. This may fill gaps, but is USA-focused, so was given a low weight. Scored as 0 where low numbers of publications are being produced, and as - where numbers are relatively high.

Practice issues within the UK have been identified with regard to the topic | I=++ | There is scope for the research on the topic to improve UK practice.

The topic is regarded as constituting an element of what should be good practice in the UK | I=+ | The way these good practices were identified, principally through the case studies, means that there are likely to be practice issues related to the topic in the UK. This is however less definitive than direct identification of practice issues, hence a lower weight.

### 8.2 Findings

The tabulation of findings from the literature review, interviews, case studies and debrief analyses is given in Table 23. The total evidence scores for each potential research topic are given in Table 24, along with the corresponding overall average ranking from the prioritisation workshop and survey, where a comparable topic had been ranked.

There were wide ranges of evidence and importance scores, so that even given the imprecise nature of these scores, judgements about the relative extent of research gaps and of the importance of research to fill those gaps can fairly confidently be made by comparing high and low scoring topics. Thus, for example, it would appear that there are more research gaps, and that those gaps are of more practical import, with regard to learning and quality improvement than with regard to extreme weather.

The total importance score for each potential research topic was highly negatively correlated with the overall average priority ranking from the prioritisation workshop and survey (Spearman’s ρ = -0.640, p<0.01). This increases confidence that they are measuring related things. On the other hand, the total existence score was not strongly correlated with the overall average ranking. Taking these two things together suggests that either the ranking was reflecting the importance of topics for practice rather than the need for research, or the existence score was not actually measuring research gaps. The former would appear to be the more likely, given the fact that most workshop and survey participants were not researchers but practitioners and policymakers, and that there was little time during the
workshop to engage them with specific research questions (see Section 7.3.1).

Furthermore, the total importance score was also correlated with the organisations’ needs assessment from the workshop (Spearman’s $\rho = 0.521$, $p<0.05$), suggesting that these scores may have been an indicator of organisations’ needs rather than people’s needs. On reflection, this is not surprising, given the preponderance of organisational stakeholders among the interviewees and the authors of debrief reports that made up a significant proportion of the case study material. The total importance and existence scores were also highly correlated with each other (Spearman’s $\rho = 0.720$, $p=0.001$). One possible explanation for this is that the existence scores measure not so much the existence of research gaps but the existence of a body of research on a topic, with that research being conducted in response to the recognition of policy or practice issues and the consequent funding made available by policymakers. Researchers will more readily identify research gaps within an existing body of research than a whole new area where research is lacking, and scoping reviews such as this one have reflected and reinforced this tendency. This might be an appropriate and symbiotic relationship, or it might tend to exclude newer, less established areas of research. Against this, the evidence score for infectious diseases and biological agents is low, despite there being a significant amount of research on this topic (see Table 7 and Sections 4.3.2 and 4.7.1).

The Existence-Importance-Practicality framework and the analysis above suggest that priorities for research should take account not just of the overall rankings, which may be similar to Importance scores and Organisations’ needs, but also of Existence scores and People’s needs. Ideal candidate topics to be regarded as priorities for research would score highly with regard to all of these measures; robust candidate topics would not have low scores with regard to any measure dimension; while other plausible, but perhaps more risky candidate topics would have a mixture of low and high scores. It may also be that the People’s needs measure should be given particular attention, in case the other measures are biased towards organisations’ needs or existing bodies of research. On this basis it would appear that there are no ideal candidate topics, but that the following topics would be robust candidates, subject to practicality considerations:

- Learning and quality improvement
- Coordination/collaboration
- Training/exercises
- Public recovery
- Community involvement and vulnerable groups
- Public information and communication.

Priority and resourcing, Reorganisation and Social networking would be plausible candidates.
It would be difficult to pick out a single topic as deserving priority over all of the others, but if forced to do so, perhaps the strongest candidate for this is Learning and quality improvement. Organisational and inter-organisational learning were highlighted by the literature review, the interviews and the case studies. There are obvious links to collaboration, and also to training, exercises and business continuity incidents, which are key potential vehicles for learning. A wider, more constructive analysis of debriefs from small as well as large incidents, for example, should help to make policy and practice more grounded and realistic, rather than being uninformed or based on the most recent high-profile incident, and provide a useful mechanism to pick up emerging trends in the future absence of Strategic Health Authorities (SHAs). From a researcher perspective there may also be a need to try to capitalise on the large volume of research that is being conducted outside of the UK. Cross-sector and cross-country comparisons and learning, which are currently regarded as being highly dubious, could be facilitated by higher quality research which is consciously and explicitly grounded in theory.

8.3 Limitations

It is in the nature of scoping studies that they attempt to cover a wide range of material, and thus there is always likely to be a tension regarding the depth with which they are able to examine the research and practice issues. Too much depth and the study may miss important areas of research; too much breadth and the study may be superficial. These tensions became apparent in the current study when the initial literature searches found large numbers of citations, whereupon various heuristics were used to limit the amount of material to be processed. It subsequently also became clear that the UK research base is very limited and so there are a great many gaps. Rather than uncovering even more gaps, through additional searches of research topics such as high reliability organisations, further interviews and case studies, it was decided to focus on trying to assess the relative importance of conducting research to fill the gaps already identified. This in itself proved to be a complex undertaking which raised new issues and uncertainties, not all of which could be resolved within the timeframe for the study.

Thus, following the prioritisation workshop there was insufficient time to further explore the apparent differences in rankings between some subgroups of participants, and to explicitly consider priorities among specific research questions (see Section 7.3.3). Additional rankings were obtained through a survey, but only a relatively small convenience sample was possible.

Some potential research topics were not given priority rankings because they had not been developed at the time of the workshop. Most of these, but not all, had relatively low scores for existence and importance. The four highest scores were for Business continuity planning and management;
Leadership and decision support systems during crises; Social, administrative and political contexts; and Logistics and the supply chain.

While there is insufficient evidence to regard these topics on their own as high priorities for research, some of them can be readily connected with other candidate topics. Thus, for example, the priority and resourcing given to emergency planning and management is likely to reflect the social, administrative and political contexts and the leadership provided by senior managers and politicians.

In view of the limitations and uncertainties with regard to some of the evidence outlined above, it would seem prudent to set priorities for research at a more general level than the topics which have been worked with so far. The existence of various clusters of topics has already been noted in Sections 7.3 and 7.4, and with these in mind, four clusters are suggested in the next section as the basis for the commissioning of future research on health care emergency planning and management. These clusters are composed of topics which were assessed to be either robust or plausible candidates for further research together with other related topics (see Table 25). This table also demonstrates the relationship between the clusters and academic research themes and gaps identified in Section 4.4, which is important, as it is further academic research that this study hopes to inform. Some possible research questions are also suggested. While these questions are likely to correspond to knowledge gaps and practical issues, their relative value has not been assessed, and there may well be other research questions which would be equally valuable.

The practicality of conducting research on these topics and implementing the findings has not been taken into account in suggesting these priorities. In most cases, research feasibility is perhaps better assessed at the more specific research question level, but a few general observations are possible. Planning and preparedness processes can more easily be investigated than response and recovery processes and outcomes. Activities such as training and exercises, for example, are relatively accessible because they are undertaken regularly, in a planned way. The unpredictability of actual incidents makes them harder to research, particularly “big bang” events where there is little warning and substantial impact on health care. During the response phase in particular, services are likely to be stretched and stressed, with little time for researchers, and there may be ethical issues about obtaining informed consent from participants. Because they occur relatively frequently, are likely to be contained within a single organisation, and are smaller scale, business continuity incidents would be more amenable to research than responses to major incidents.

The current NHS reorganisation as a whole would be hard to research because its impact is already being felt, so any study would have to be at least partly retrospective, which would be limiting. Studies of the impact of
organisational change on emergency planning within individual organisations might be more feasible.

The take-up of research findings is likely to some extent to be serendipitous, although strategies such as involving practitioners and policymakers in the research process may help. All other things being equal, findings which can be implemented by a single organisation rather than requiring multi-agency action have fewer barriers in their way. Participants at the prioritisation workshop assessed the likely implementation of research topics in terms of auditability (see Section 7.2.3), on the basis that a system of monitored targets with meaningful penalties for non-achievement might facilitate compliance by organisations. While this might possibly be the case, it would still rely on decision-makers deciding to give priority to emergency planning and setting up such a system, which researchers are unlikely to have much influence over.
<table>
<thead>
<tr>
<th>Potential Research Topic</th>
<th>Evidence [E=Existence score, I=Importance score]^{12}</th>
</tr>
</thead>
</table>
| Learning and quality improvement                | • Measurement is the 1<sup>st</sup> priority cluster indicated by previous health/health care specific scoping reviews (Table 5) [E=+++].  
  • Of the priorities identified by the Institute of Medicine \(^9^1\), criteria and metrics are the least developed \(^8^8\) [E=++]  
  • UK research assessments of preparedness typically found that services are not well prepared for some disasters or aspects of disasters (Section 4.4.1) [I=++]  
  • Learning from exercises and incidents was not a research focus, although identified as an issue by a few authors (Section 4.4.11) [E=++, I=++]  
  • Sharing of debrief reports can be an issue in the UK (Section 4.6) [I=++]  
  • Debriefs are an underused resource across the NHS and other agencies (Section 6.3) [I=++]  
  • UK good practice includes learning within and across organisations (Sections 5.1.1 and 6.5.3) [I=++]  
  • Suggested as a research gap by UK researchers (Section 4.5) [E=++]  
  • There is continuing research in the USA into generating criteria and metrics to measure effectiveness and efficiency – 2<sup>nd</sup> highest number of recent articles published by PERRCs (Section 4.7.2) [E=-]                                                                 |
| Community involvement and vulnerable groups      | • Community/special needs is the 8<sup>th</sup> priority cluster indicated by previous health/healthcare specific scoping reviews (Table 5) [E=+]  
  • The Institute of Medicine identified issues regarding vulnerable populations as a cross-                                                                 |

^{12} Depending on its nature, each item of evidence may have either an existence score, an importance score, or both.  See Table 22 for further information about the scoring scheme.
| Recovery (including long-term health impacts) | Cutting priority \(^{01}\) \([E=+\]

- Disaster victims are often the first responders (Section 4.4.7) \([I=+\]
- Existing health care clients are likely to be vulnerable in the event of an emergency incident (Section 4.4.7) \([I=+\]
- Addressing special needs of vulnerable people can be an issue in the UK (Section 4.6) \([I=++\]
- UK good practice includes providing support for vulnerable people (Section 6.5.3) \([I=+\]
- Engaging with the public/raising public awareness and action can be an issue in the UK (Section 4.6) \([I=++\]
- UK good practice includes an engaged, involved and supported public and third sector (Sections 5.1.1 and 6.5.3) \([I=++\]
- Community resilience and vulnerable groups suggested as research gaps by UK researchers (Section 4.5) \([E=+++\]
- There is some continuing research in the UK/EU into public engagement/empowerment in response (Section 4.7.1) \([E=-\]
- There is continuing research in the USA regarding vulnerable people and volunteer health professional accreditation (Section 4.7.2) \([E=-\]
- Research on community resilience has been of relatively high quality \(^{32}\) \([E=0]\)

- Recovery is the 2\(^{nd}\) priority cluster indicated by previous health/health-care specific scoping reviews (Table 5) \([E=+++\]
- There has been relatively little research on the recovery phase, compared with response and preparedness (Table 8) \([E=+++\]
- There appear to be relatively few UK-focused citations looking at recovery (Table 11) \([E=+++\]
- UK good practice includes providing appropriate support for people’s emotional problems (Section 6.5.3) \([I=+\]
- Both survivors and responders may have psychological, emotional and practical needs, but access to appropriate support services may be problematic in the UK (Sections 4.4.6 and 4.6) \([I=+++++\]
- Long-term mental health impacts and recovery suggested as research gap by UK researchers \([E=++\]

\(^{01}\) Trending priority, \([E=+\] indicates it may become a priority in the future. \(I=\) Impact, \([E=\) level of evidence. \(^{32}\) Reference.
| **Coordination/collaboration** | • Coordination/collaboration is the 4th priority cluster indicated by previous health/health care specific scoping reviews (Table 5) [E++]  
  • Coordination and collaboration are important, but may be hard to achieve. Collaboration during incidents may take on new aspects and be hampered by lack of standardisation (Section 4.4.4) [I++]  
  • Multi-agency support to keep health services functioning during an incident has been highlighted as a concern in the UK (Section 4.6) [I++]  
  • UK good practice coordination and collaboration in all phases between agencies – horizontally and vertically – facilitated by prior multi-agency planning (Sections 6.4.2 and 6.5.3) [I++]  
  • UK good practice includes inter-organisational learning (Section 5.1.1) [I+]  
  • Research on inter-agency communication and coordination has been of relatively low quality 32 [E+] |
| **Priority and resourcing** | • Research from the UK and USA suggests that specialist and senior leadership are important, and that resources may be lacking (Section 4.4.2) [I++]  
  • Willingness to respond suggested as research gap by UK researchers (Section 4.5) [E++]  
  • UK good practice includes senior managers who provide leadership across the system (Section 5.1.1) [I++]  
  • UK good practice includes emergency planners with appropriate expertise, commitment and organisational influence and resources (Section 5.1.1) [I+]  
  • UK good practice includes adequate resourcing – quantity and quality (Sections 6.4.2 and 6.5.3) [I++] |
<p>| <strong>Training/exercises</strong> | • Training/exercises is the 7th priority cluster indicated by previous health/health care specific scoping reviews (Table 5) [E++] |</p>
<table>
<thead>
<tr>
<th>Section</th>
<th>Details</th>
</tr>
</thead>
</table>
| UK research is scarce and many studies elsewhere have been of poor quality | (Section 4.4.3) [E=++]  
 UK good practice includes multi-agency training (Section 6.5.3) [I=+]  
 Multi-agency exercises have been highlighted as a concern in the UK (Section 4.6) [I=++]  
 There is continuing research in the USA into the effectiveness of training, but few articles have been published recently by the PERRCs (Section 4.7.2) [E=0] |
| Business continuity planning and management                            | Little research on this was found (Section 4.4.11) [E=++]  
 UK good practice includes business continuity planning (Section 6.5.3) [I=+]  
 Business continuity may not be given a high priority by front-facing parts of the NHS (Section 6.3) [I=++] |
| Reorganisation of the NHS                                              | Many of the concerns of interviewees were crystallized in the reorganisation (Section 5.1.1) [I=++]  
 UK good practice is to build on existing resources (Section 6.4.2) [I=+] |
| Staff availability                                                     | Availability of staff may be the limiting factor on surge capacity in some incidents (Section 4.4.5) [I=++]  
 The Institute of Medicine identified issues regarding workforce as a cross-cutting priority [91] [E=+]  
 Willingness to respond suggested as research gap by UK researchers (Section 4.5) [E=++] |
| Communication and public information                                  | Risk communication is the 6th priority cluster indicated by previous health/health care specific scoping reviews (Table 5) [E=++]  
 Risk communication and public information suggested as research gap by UK researchers (Section 4.5) [E=++]  
 UK good practice includes communicating clear, consistent messages to the public and staff (Sections 6.4.2 and 6.5.3) [I=++]  
 There is some continuing research in the UK/EU into public communication (Section 4.7.1) [E=-] |
There is continuing research in the USA into improving communications in preparedness and response – 3rd highest number of recent articles published by PERRCs (Section 4.7.2) [E=-]

**Leadership and decision support systems during crises**
- Little research on this was found (Section 4.4.11) [E=++]
- UK good practice includes senior managers with appropriate expertise (Section 5.1.1) [I=+]
- UK good practice includes having clear plans, implemented appropriately (Section 6.4.2) [I=+]

**Incident level**
- A major incident may be declared when there is little impact on health care (Section 6.3) [I=++]

**New ICTs**
- Growing reliance on ITCs makes services more vulnerable to ICT outage (Section 6.3) [I=++]

**Simulation and other modelling**
- May not have been considered by previous health/health care scoping reviews (Section 4.3.1) [E=0]
- Complex systems are difficult for decision-makers to understand (Section 4.4.8) [I=+]
- UK research largely limited to disease outbreaks (Section 4.4.8) [E=++]
- There is some continuing research in the UK/EU (Section 4.7.1) [E=-]

**Social, administrative and political contexts**
- Abramson et al. suggest researching higher level social and political issues 89 [E=+]
- Bankoff suggests the need for research on perceptual, social and cultural historical contexts 95 [E=+]
- Sementelli suggests investigating social, economic, administrative and political contexts 34 [E=+]
- Relatively little critical social science research found by the current review (Section 4.4.11) [E=++]

**Logistics and the supply chain**
- Little research on this was found (Section 4.4.11) [E=++]
- Suggested as research gap by UK researchers (Section 4.5) [E=++]
<table>
<thead>
<tr>
<th>Topic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary and community health care</strong></td>
<td>Little research on this was found (Section 4.4.11) [E=++]</td>
</tr>
</tbody>
</table>
| **Prevention/mitigation (including surveillance and laboratories/diagnostics)** | Prevention/mitigation is the 3rd priority cluster indicated by previous health/health care specific scoping reviews (Table 5) [E=++]  
There appear to be relatively more UK-focused citations looking at mitigation (Table 8) [E=-]  
Research on epidemiology functions has been of relatively high quality 32 [E=0] |
| **International comparative research** | Preponderance of USA-focused research (Section 4.3.1), which may have limited applicability to the UK [E=+]  
One or two articles suggested learning from other countries (Section 4.4.11) [E=0] |
| **Systems** | Systems is the 5th priority cluster indicated by previous health/health care specific scoping reviews (Table 5) [E=++]  
There is continuing research in the USA into sustainable preparedness and response systems – highest number of recent articles published by PERRCs (Section 4.7.2) [E=-] |
| **Legal framework** | Legal framework is the 9th priority cluster indicated by previous health/health care specific scoping reviews (Table 5) [E=+]  
Greater proportion of citations on the legal climate found in the current review (Table 27) [E=0] |
| **Infectious diseases and biological agents** | UK researchers identified gaps with regard to infectious diseases and release of biological agents (Sections 4.4.9 and 4.5) [E=++]  
Increasing proportion of citations studying influenza (Table 7) [E=-]  
There is continuing research in the UK/EU into pandemic flu and disease outbreaks (Section 4.7.1) [E=-] |
| **Extreme weather** | There is continuing research in the UK/EU into extreme weather (Section 4.7.1) [E=-] |
### Table 24: Comparison of research topic evidence scores and priority rankings

<table>
<thead>
<tr>
<th>Topic</th>
<th>Net Existence score [E]</th>
<th>Net Importance Score [I]</th>
<th>Average Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning and quality improvement</td>
<td>8</td>
<td>10</td>
<td>7.3</td>
</tr>
<tr>
<td>Community involvement and vulnerable groups</td>
<td>2</td>
<td>9</td>
<td>8.7</td>
</tr>
<tr>
<td>Recovery (including long-term health impacts)</td>
<td>9</td>
<td>7</td>
<td>8.5</td>
</tr>
<tr>
<td>Coordination/collaboration</td>
<td>3</td>
<td>7</td>
<td>3.7</td>
</tr>
<tr>
<td>Priority and resourcing</td>
<td>2</td>
<td>7</td>
<td>8.3</td>
</tr>
<tr>
<td>Training/exercises</td>
<td>4</td>
<td>3</td>
<td>6.7</td>
</tr>
<tr>
<td>Business continuity planning and management</td>
<td>2</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Reorganisation of the NHS</td>
<td>0</td>
<td>3</td>
<td>6.4</td>
</tr>
<tr>
<td>Staff availability</td>
<td>3</td>
<td>2</td>
<td>12.7</td>
</tr>
<tr>
<td>Communication and public information</td>
<td>2</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Leadership and decision support systems during crises</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Incident level</td>
<td>0</td>
<td>2</td>
<td>10.3</td>
</tr>
<tr>
<td>New ICTs</td>
<td>0</td>
<td>2</td>
<td>11.5</td>
</tr>
<tr>
<td>Simulation and other modelling</td>
<td>1</td>
<td>1</td>
<td>11.4</td>
</tr>
<tr>
<td>Social, administrative and political contexts</td>
<td>5</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Logistics and the supply chain</td>
<td>4</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Primary and community health care</td>
<td>2</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Prevention/mitigation (including surveillance and laboratories/diagnostics)</td>
<td>1</td>
<td>0</td>
<td>12.9</td>
</tr>
<tr>
<td>International comparative research</td>
<td>1</td>
<td>0</td>
<td>15.5</td>
</tr>
<tr>
<td>Systems</td>
<td>1</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Legal framework</td>
<td>1</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Infectious diseases and biological agents</td>
<td>0</td>
<td>0</td>
<td>12.4</td>
</tr>
<tr>
<td>Extreme weather</td>
<td>-1</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>
8.4 Recommendations

8.4.1 Priorities for future research

Four clusters of research topics are suggested as the basis for NIHR HS&DR to commission future research on health care emergency planning and management:

- Affected public
- Inter- and intra-organisational collaboration
- Preparing responders and their organisations
- Prioritisation and decision making.

The aim of health care emergency planning is to protect the public’s health and maintain services to treat people’s illnesses. Therefore the communities to be served should be central to such planning. Yet it would appear that not enough is known about communities and how to support them, and the potential for active partnership between communities and services has not been fully realised.

Constructive partnership working between a broad range of agencies has been recognised as being vitally important to both planning and response, and is a focus for policymakers and practitioners. There is room for improvement however, and NHS reorganisation is also changing the organisational landscape. Research is needed to better understand multi-agency working, and what promotes and impedes it. And within organisations, research is needed to explore the apparent lack of integration between emergency planning and other operational and strategic planning.

UK research studies typically indicate shortfalls in the emergency preparedness of health care services. Training and exercises are a major component of developing preparedness, but knowledge is lacking regarding their effectiveness. And there may also be untapped potential, which research could explore, to learn from past experiences and to make use of quality improvement methods.

The priority and resources devoted to planning, preparedness and response are also important. There is little point in knowing how to design effective training, for example, if there are insufficient funds to deliver it to staff, or if staff attendance is poor. The wider administrative and political context is influential in this regard, as highlighted by concerns about the NHS reorganisation. Yet little is known about exactly how wider systems impact on emergency planning and management, and about the decision making processes of health care leaders.

Particular research questions for each cluster are given below, together with a description of associated policy and practice issues. Table 25 tabulates assessments of the extent to which the topics constituting each cluster are
candidates for further research, together with relationships to existing academic research themes.

**Cluster 1: Affected public**

- Recovery of the public, including long-term health impacts
  - How are recovery issues best factored into the *early* stages of response?
  - How can social support networks be supported in the recovery phase?
  - How can the needs of vulnerable groups be identified and addressed?
  - What are the best interventions for preventing and addressing psychosocial health problems?

Recovery often seems to be seen as the poor cousin of emergency planning and management. Yet unless good support for recovery swings into action as the emergency is being dealt with, there is a lot of evidence that long-term problems can be created. Thus recovery teams need representation at the “top table” to observe throughout response. The recovery itself needs to recognise that some groups are more vulnerable than others. Moreover, since social, psychological and political issues can impact stress-related health care needs, recovery needs to address the broad range of issues that concern victims, their families and the broader public in an integrated way with health care issues. Issues of indirect or vicarious trauma are among the most widely identified gaps in research noted in non-UK studies.

- Engagement with community groups and vulnerable populations
  - How can vulnerable populations be identified pre-, during and post-event?
  - What are the relationships between community resilience and wellness following disasters?
  - How can access to community health care services be maintained when key infrastructures are significantly disrupted by a major incident (e.g., health care provision in emergency shelters)?
  - What is the potential for active community, voluntary sector and business involvement in emergency planning and management, and how can it be developed?

There are many issues relating to vulnerable populations, i.e. populations whose health, economic circumstances or similar make them more susceptible to the effects of an event/pandemic and populations who are made vulnerable by the event itself. Identifying these can be difficult. Even if, for example, social services have a database, there are issues about gaining access to it during an emergency, ranging from finding the gatekeeper to persuading them that the information can be released. Many thought knocking on doors and asking neighbours the most effective way of identifying vulnerable groups.

Within the health care system the treatment of acute victims can reduce availability of resources for other patients, e.g. awaiting elective surgery or simply suffering a chronic illness and needing attention.
• Public risk communication and information dissemination
  - How effective are risk communication efforts during particular events?
  - What are the levels of across the workforce of competencies in crisis risk communication?
  - How do communities generate and use information?
  - How will technology innovation and adoption by the communication and health care fields influence emergency planning and management, and how can the system best anticipate and plan for these changes?
  - Can location aware “smart phones” be used in a valuable way by responders?

In the 1990s there were a lot of issues relating to public information and health scares. These seem to have been addressed well. Indeed, there is little evidence in the UK of information provision to the public being an issue for discussion with practitioners. There is a recognition that it is an element of good practice. However, the literature still points to it being a major issue requiring further research. Moreover, the rise of social networking (Facebook, Twitter, etc) means that the communication channels that the public use are changing.

• Use of social networking
  - How should social networking be used to communicate with the public during and after an event?
  - During an incident how can social networks be monitored most effectively for intelligence on what is happening?
  - Can social networking be used to build trust between the authorities and the public?

There is a growing use by the public and affected groups to use social networking (Twitter is the current tool) to share information and learn what is happening. As mobile technologies evolve this is likely to grow significantly. Such social networking offers many opportunities: the ability to communicate with the public quickly; more data to monitor the course of an event; geographical awareness allows one to target and analyse information according to location. Moreover, the responders can use social networking tools to build trust and awareness between themselves before, during and after any incident.
Cluster 2: Inter- and intra-organisational collaboration

- Collaboration across multiple organisations
  - What are the cultural, structural and organisational issues which affect communication and planning between different organisations and sectors and across the response and recovery phases?
  - What are the factors that enable and inhibit standardisation/interoperability across organisations, including the contribution of training and exercising?
  - How does multi-agency working differ between routine operations, planned large events, and major emergencies?
  - How can the collaborative spirit engendered during incidents be built upon?
  - How can coordination across a “mixed economy” of relatively autonomous health care organisations be maintained and improved, especially during the response and recovery phases?
  - How do responders in one organisation locate information, support, etc. within another responding organisation in the face of different jargons etc.?
  - What is the potential for productive linking of emergency planning and management with other strategic and operational planning and management?

The literature on collaboration, team work and sharing knowledge suggests strongly that there is a need for teams to meet and know each other personally in order to collaborate effectively. Building trust is much easier if you know someone. The issue here is that, even before the current reorganisation, it was becoming difficult for cross-organisational teams to have enough personal contact and familiarity to be sure that they could work together as effectively as they might in an event. Moreover, contacts are through Local Resilience Forums (LRFs); and generally “planners”; build the relationship not the “responders”. What happens about events that require a response beyond the LRF or have a non-geographical linkage?

Many of these issues have been discussed under the heading of interoperability though that often has a more technical interpretation relating to “kit” working together

Cluster 3: Preparing responders and their organisations

- Learning and quality improvement
  - What approaches and systems are effective in facilitating learning from good practice, exercises, and incidents of all sizes - at local, regional and national levels?
  - What constitutes quality in emergency preparedness and how can this be measured and assessed?
  - What approaches (internal processes or external regulation) are effective in producing continuous, sustainable quality improvement in emergency preparedness?
All NHS Trusts and responding organisations debrief after any significant incident. These debriefs are written up in-house or within the group of organisations which responded to the event. Typically, they contain a very short summary of the event/issue and its chronology, a list of “what went well”, a list of “what did not go well”, and perhaps some recommendations. They may be circulated at LRFs and particular recommendations and learning points may be followed up locally. This discussion may be delayed waiting for coroner’s verdicts and by other “legal” issues. Generally, however, debriefs end up filed and no structured attempt is made to compare them at a larger scale to learn from them. They represent an underused resource to improve practice, to recognise business continuity issues and also to identify emerging threats and patterns.

There is a need to recognise that for larger, thankfully rarer incidents the evidence base will be more anecdotal and case study oriented.

- Exercises and training
  - What makes for effective and cost-effective education, training and exercise design?
  - What are the connections between training, competency and capability, and outcomes, e.g. with regard to decision-making during response?
  - How do we train and share best practice among emergency planners?
  - How can ICT and simulation be used most effectively in training and education of health care responders?

Training and exercises are key for at least two aspects of emergency planning and management. Firstly, they train the participants to deal with specific features of events. Secondly, they build teams and create trust and understanding. But conventionally, exercises tend to rehearse well-anticipated events that “run to plan”. Conjunctions of events that can destroy emergency plans are seldom addressed. Moreover, if an exercise involves senior managers, there is a presumption that the “worst will happen” to make it worth the managers attending, but that the exercise will finish in the allotted time with most of the issues addressed. Finally there is a tendency to exercise every functionality “while all the responders are together” even if this means that the exercise is superficial in all its details in order to achieve this coverage.

Generally there is an issue of professional training for emergency managers and ways of sharing best practice. In interviews, no clear mechanisms were identified for this other than membership of certain professional bodies (e.g. Emergency Planning Society, International Association of Emergency Managers), taking part in exercises and attending LRFs. In many cases senior emergency planners have worked their way up from being “blue light responders”. This provides them with a valuable wealth of experience, but how should they be provided with the behavioural and management competencies that they will also need.
Cluster 4: Prioritisation and decision making

- Priority and resourcing given to emergency planning and management
  - What characteristics (capabilities, capacities etc.) make for an effective emergency planner/planning function in NHS organisations?
  - Which factors (e.g. professional background of senior managers, political, social and administrative contexts, funding sources, targets etc.) have the greatest impact on the resources (staff, financial, equipment etc.) that organisations devote to preparedness?
  - What is the right balance between emergency preparedness and tackling existing public health issues?

Many smaller organisations assign the emergency planning portfolio as part of the job description of a manager or management team. The other parts can relate to activities with constant demands which inevitably divert attention away from emergency planning. Moreover, in the reorganisation and the ensuing “back-office savings” there is a possibility that attention will be further diverted away from emergency planning. Chief Executives may be required to ensure that it is given priority but practice may not follow intention. Self-regulation which is largely the de facto practice in this area despite the de jure role of the regulator is not conducive to prioritising resources to deal with “rare” events.

In exercises, there is a folklore that the real decision-makers always send their deputies, meaning that in a real incident they themselves are not sensitised to many of the issues (“top people do not engage”).

Targets and other “day-to-day” management practices can get in the way of emergency planning and management, e.g. offloading delays causing backlogging of ambulances

- Issues relating to organisational change
  - How to maintain emergency planning and management capability and effectiveness during periods of organisational change?
  - How does the emergency planning system provide sufficient consistency and leadership for emergencies covering a wide geographical area?

There is considerable uncertainty in the emergency planning and management community within and outwith health care systems. Not only is the NHS structure changing considerably, but required savings across the government sectors is meaning that emergency planning teams are changing, typically reducing in size and maybe being shared across organisations. For instance, in Greater Manchester, the Association of Greater Manchester Authorities (AGMA) is taking a larger role and responsibility in emergency planning while emergency planning teams within the constituent local councils are being reduced in numbers. Such reorganisation creates uncertainty and breaks personal contacts. An overall reduction in staff also suggests at a prima facie level that capacity is reducing. This is true within the NHS as much as outside it. Even if there is
no reduction in capacity, there will be a diversion of attention to understand the new systems and organisations away from emergency planning itself.

- Social, administrative and political contexts
  - What constitutes effective and fair systems for commissioning, contracting and performance management of emergency preparedness and response (e.g. taking account of the costs and knock-on impacts of response)?
  - What would constitute appropriate, devolved systems for decision-making during a pandemic, and how could they be put in place?
  - What is the impact of political imperatives on decision-making with regard to emergency preparedness, response and recovery?

 Emergencies can have substantial knock-on effects on both emergency and non-emergency health care services, particularly with regard to levels and timeliness of service provision. Such effects need to be allowed for in contracts and resource allocation and reimbursement systems if services are not to be disadvantaged, particularly in a competitive market environment, and to avoid disincentives to participation in emergency response and recovery efforts.

 The 2009/10 swine flu outbreak highlighted problems of overly centralised control by national agencies, which the most recently proposed strategy for flu pandemic planning and response does not appear to fully address. The large number of organisations involved produces a complex set of cultural, structural and organisational issues to be considered in making a more devolved system effective. And more generally it is clear that emergency preparedness, response and recovery constitutes a highly political domain, with both large and small p’s.

- Leadership and decision support systems during crises
  - What competencies and training are needed for NHS managers who may take on command and control roles?
  - How are decisions taken during emergencies, and what use is made of decision support data and of emergency plans?

 Organisations need senior managers who have the abilities to take effective command and control decisions during emergencies. Yet decision-making processes during crises are not fully understood, with plans and procedures sometimes being too rigid in practice, for example. This makes it difficult to provide suitable training or to incorporate assessment of the necessary abilities into recruitment processes. This may also make it difficult to provide information that decision-makers find useful, in terms of form, content and timing.

### 8.4.2 Research commissioning process

Any research commissioning process based on this scoping study should take account of its limitations (see Section 8.3). It is suggested that the findings, recommendations and limitations of this study are compared with
those produced by the NIHR HS&DR project 09/1005/03, which is a scoping study of emergency planning in health care. In addition, the research questions listed in Section 8.4.1 should not be regarded as a complete set, but some space should be allowed for researchers to propose research to answer other questions. When assessing research proposals, attention should be paid to research feasibility and implementation of results.

There is also scope for collaboration between research commissioners, including UK government departments and commissioners in the USA, to compare research priorities, coordinate commissioning and develop commissioning models. This study has not been able to take account of research conducted on behalf of government departments which has not been published (e.g. for reasons of national security), so this should be checked. Field research on emergency planning and preparedness can be commissioned in the same ways as other research, but field research on emergency response, recovery and outcomes is likely to require new commissioning arrangements. It would make sense to learn from the experiences of organisations who have commissioned such research.

In view of the limitations in the quality and quantity of UK based research; the likely pressures on future research funding; and the breadth of the topic, which may leave researchers isolated, consideration should also be given to building capacity and organisation to conduct research on health care emergency planning and management in the UK. Finding out more about experiences from the USA of establishing, commissioning and evaluating PERRCs (see Sections 4.7.2 and Section 5.2.1) may be useful both with regard to research capacity building and with regard to the potential usefulness of establishing partnerships between UK researchers/centres and PERRCs.
<table>
<thead>
<tr>
<th>Cluster and constituent topics</th>
<th>Overall assessment of candidature (section 8.2)</th>
<th>Relationship to existing academic research themes (section 4.4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cluster 1: Affected public</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovery (including long-term health impacts)</td>
<td>Robust</td>
<td>Theme 4.4.6</td>
</tr>
<tr>
<td>Community involvement and vulnerable groups</td>
<td>Robust</td>
<td>Theme 4.4.7</td>
</tr>
<tr>
<td>Communication and public information</td>
<td>Robust</td>
<td>Theme gap 4.4.11</td>
</tr>
<tr>
<td>Social networking</td>
<td>Plausible</td>
<td>-</td>
</tr>
</tbody>
</table>

**Cluster 2: Inter- and intra-organisational collaboration**

| Coordination/collaboration | Robust | Theme 4.4.4 |

**Cluster 3: Preparing responders and their organisations**

| Learning and quality improvement | Robust | Theme gap 4.4.11 |
| Training/exercises | Robust | Themes 4.4.3 and 4.4.1 |

**Cluster 4: Prioritisation and decision making**

| Priority and resourcing | - | Themes 4.4.2 and 4.4.1 |
| Reorganisation of the NHS | Plausible | - |
| Social, administrative and political contexts | Plausible | Theme gap 4.4.11 |
| Leadership and decision support systems during crises | - | Theme gap 4.4.11 |
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Appendix 1: Literature Review Keyword Searches

Applied Social Sciences Index and Abstracts (ASSIA)

1. DE="("disaster management" or "critical incident debriefing" or or "crisis management") OR KW="("emergency preparedness" or "emergency planning" or "emergency management")"
2. DE="("disasters" or "natural disasters" or "floods" or "terrorism" or "bombing" or "suicide bombing" or "counterterrorism" or "hijacking" or "epidemics" or "pandemics" or "hazardous waste products" or "nuclear waste products" or "radioactive waste products" or "toxic waste products" or "toxic industrial waste products" or "regional security" or "national security" or "civil defence") OR KW="("catastrophe or catastrophes or CBRN or CBRNe or decontaminat* or "cyber attack" or "cyber attacks")"
3. KW="((extraordinary* or serious* or catastrophic or large or large-scale or global* or international* or national* or severe* or extreme* or major or complex or critical* or mass or system or systems) within 1 (incident or incidents or disrupt* or outbreak or outbreaks or failure or failures or casualt* or destruct* or fatalities or mortuar* or attack*))"
4. (KW="((extraordinary* or serious* or catastrophic or large or large-scale or global* or international* or national* or severe* or extreme* or major or complex or critical* or mass or system or systems) OR DE="("infrastructure")") AND (KW="("incident or incidents or disrupt* or outbreak or outbreaks or failure or failures or casualt* or destruct* or fatalities or mortuar* or attack*)) OR DE="("weather" or "cold weather" or "hot weather" or "accidents" or "fatal accidents" or "fatal road accidents" or "industrial accidents" or "fatal industrial accidents" or "nuclear accidents" or "railway accidents" or "road accidents" or "motorway accidents" or "technological accidents")")"
5. KW="((serious* or catastrophic or severe* or extreme*) within 1 (event or events))"
6. KW="("business continuity" or "surge capacity") OR DE="("warnings" or "mitigation" or "preparedness" or "readiness" or "resilience")"
7. DE="("efficiency" or "effectiveness") AND (KW="("respon* shelter* or rescue*)") OR DE="("triage" or "care" or "emergency services" or "evacuation" or "protection" or "relief" or "rescue services")")"
8. 6 or 7
9. 2 or 3 or 4 or 5
10. 8 and 9
11. 1 or 10

13 "*" and "$" are wildcards for any number of characters; "?" is a wildcard for a single character; "DE" stands for descriptors (controlled vocabulary terms); "KW" stands for keywords; "exp" stands for exploding a term in a hierarchical controlled vocabulary to include all terms lower in the hierarchy; "adj3" stands for terms occurring within 3 words of each other, similarly "adj1", "adj2" etc.; phrases in quotation marks must be matched exactly; "/" indicates that the previous terms is part of the controlled vocabulary; ".mp." and "TITLE-ABS-KEY" indicate that the title, abstract and keywords will be searched
12. \( \text{DE} = ("hunger" \text{ or } "malnutrition" \text{ or } "aids" \text{ or } (("animals" \text{ or } "cattle" \text{ or } "pigs" \text{ or } "sheep") \text{ and } "diseases") \text{ or } "developing countries" \text{ or } "drought" \text{ or } "earthquakes" \text{ or } "foot and mouth disease" \text{ or } "hiv" \text{ or } "least developed countries" \text{ or } "volcanoes")} \\

13.11 not 12 \\
14. limit 13 to english language \\

Literature review identification: \( \text{DE} = ("literature reviews" \text{ or } "systematic reviews") \)
British Nursing Index

1. exp "Disasters and Disaster Planning"/ or "emergency preparedness".mp. or "crisis management".mp.
2. (disaster? or catastrophe? or terroris$ or epidemic? or pandemic? or CBRN? or decontaminat$ or flood$ or "cyber attack" or "cyber attacks" or "homeland security" or "national security" or "civil defense" or "civil defence").mp.
3. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj1 (incident? or weather or disrupt$ or outbreak? or failure? or casualit$ or destruct$ or fatalities or mortuar$ or attack$)).mp.
4. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj3 accident?).mp.
5. ((serious$ or catastrophic or severe$ or extreme$) adj1 event?).mp.
6. ("business continuity" or preparedness or readiness or "surge capacity" or resilien$ or mitigat$ or "warning system" or "warning systems").mp.
7. ((effective$ or efficien$) adj1 (respon$ or evacuat$ or shelter$ or care or rescu$ or protect$ or relief or reliev$ or triag$)).mp. or ((effective$ or efficien$).mp and ("Patients : Transportation"/ or "Accident and Emergency Services"/))
8. 6 or 7
9. 2 or 3 or 4 or 5
10. 8 and 9
11. 1 or 10
12. ("developing country" or "developing countries").mp. or exp "AIDS"/ or (animal? and disease?).mp. or exp "Nutrition Disorders"/ or famine?.mp. or earthquake?.mp. or volcan$.mp.
13. 11 not 12
14. limit 13 to english language
15. (United Kingdom or UK or "U.K." or Great Britain or England or Scotland or Northern Ireland or Wales or (English or Scottish or Welsh or NHS or "N.H.S." or National Health Service)).mp.
16. 14 and 15

Literature review identification: ((review? adj3 (literature or research)) or "systematic review").mp.
EMBASE

1. exp "DISASTER PLANNING"/ or "emergency preparedness".mp. or "crisis management".mp.
2. exp DISASTER/ or exp Terrorism/ or EPIDEMIC/ or exp PANDEMIC/ or exp "PANDEMIC INFLUENZA"/ or "DANGEROUS GOODS"/ or CBRN?.mp. or decontaminat$.mp. or FLOODING/ or "cyber attack".mp. or "cyber attacks".mp. or exp "Civil Defense"/
3. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj1 (incident? or weather or disrupt$ or failure? or destruct$ or attack$)).mp.
4. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj3 accident?).mp.
5. ((serious$ or catastrophic or severe$ or extreme$) adj1 event?).mp.
6. ("business continuity" or preparedness or readiness).mp. or exp "Surge Capacity"/ or resilien$.mp. or mitigat$.mp. or "warning system".mp. or "warning systems".mp.
7. (effective$ adj1 (respon$ or evacuat$ or shelter$ or care or rescu$ or protect$ or relief or reliev$)).mp. or (effective$.mp. and ("patient transport"/ or "emergency health service"/))
8. exp "PRODUCTIVITY"/ and ((respon$ or shelter$ or care or rescue$ or protect$ or relief or relieve$).mp. or "patient transport"/ or "emergency health service"/)
9. 6 or 7 or 8
10.2 or 3 or 4 or 5
11.9 and 10
12.1 or 11
13."developing country"/ or exp "Human immunodeficiency virus"/ or exp "Human immunodeficiency virus infection"/ or exp "ANIMAL DISEASE"/ or exp hunger/ or exp "MALNUTRITION"/ or earthquake/ or volcano/ or exp "Nutritional disorder"/
14.12 not 13
15.limit 14 to english language
16."United Kingdom"/ or (United Kingdom or UK or "U.K." or Great Britain or England or Scotland or Northern Ireland or Wales).mp. or (English or Scottish or Welsh or NHS or "N.H.S." or National Health Service).mp.
17.15 and 16

Literature review identification: ((review? adj3 (literature or research)) or "systematic review").mp.
Environmental Sciences and Pollution management (restricted to Health and Safety Science Abstracts, Pollution Abstracts and Risk abstracts)

1. KW=("crisis management" or "emergency planning" or "emergency management") OR DE=("emergency preparedness")
2. DE=("disasters" or "floods" or "hazardous wastes" or "hazardous materials" or "radioactive fallout" or "radioactive pollution" or "radioactive wastes" or "radioactive emissions" or "radioactive decontamination" or "chemical pollution" or "chemical industry wastes" or "chemical spills" or "chemical wastes" or "decontamination") OR KW=(terroris* or epidemic or epidemics or pandemic or pandemics or "national security" or catastrophe or catastrophes or CBRN or CBRNe or "civil defence" or "civil defense" or "cyber attack" or "cyber attacks")
3. KW=((extraordinary* or serious* or catastrophic or large or large-scale or global* or international* or national* or severe* or extreme* or major or complex or critical* or mass or system or systems or infrastructure) within 1 (incident or incidents or disrupt* or outbreak or outbreaks or failure or failures or casualty* or destruct* or fatalities or mortuar* or attack*))
4. KW=(extraordinary* or serious* or catastrophic or large or large-scale or global* or international* or national* or severe* or extreme* or major or complex or critical* or mass or system or systems or infrastructure) AND DE=("weather" or "accidents")
5. KW=((serious* or catastrophic or severe* or extreme*) within 1 (event or events))
6. KW=("business continuity" or "surge capacity" or mitigation or preparedness or readiness or resilience) OR DE=("warning systems")
7. KW=(efficien* or effective*) AND (KW=(respon* shelter* or rescue* or "triage" or "care" or "emergency services" or "evacuation" or "protection" or "relief") or DE="health care")
8. 6 or 7
9. 2 or 3 or 4 or 5
10.8 and 9
11.1 or 10
12.KW=(famine or hiv or hiv/aids) OR DE=("malnutrition" or "animal diseases" or "developing countries" or "earthquakes" or "volcanoes")
13.11 not 12
14.limit 13 to english language

Literature review identification: PT=(review)
GEOBASE

1. exp "DISASTER MANAGEMENT"/ or "emergency management".mp. or "emergency preparedness".mp. or "CRISIS MANAGEMENT"/
2. exp DISASTER/ or exp TERRORISM/ or EPIDEMIC/ or pandemic.mp. or CBRN?.mp. or exp decontamination/ or FLOOD/ or "cyber attack".mp. or "cyber attacks".mp. or "civil defense".mp. or "civil defence".mp. or "homeland security".mp. or "national security".mp. or exp SECURITY/
3. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj1 (incident? or disrupt$ or failure? or destruct$ or attack$)).mp. or "SEVERE WEATHER"/
4. (extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure).mp. and exp accident/
5. ((serious$ or catastrophic or severe$ or extreme$) adj1 event?).mp.
6. ("business continuity" or preparedness or readiness).mp. or exp "MITIGATION"/ or exp "HAZARD MITIGATION"/ or "surge capacity".mp. or resilien$.mp. or exp "warning system"/
7. ((effective$ or efficient$) adj1 (respon$ or evacuat$ or shelter$ or care or rescu$ or protect$ or triag$)).mp. or ((effective$ or efficient$).mp. and ("health services"/ or "emergency services".mp. or "DISASTER RELIEF"/))
8. 6 or 7
9. 2 or 3 or 4 or 5
10.8 and 9
11.1 or 10
12."developing world"/ or exp "Human immunodeficiency virus"/ or exp "HIV infection"/ or exp "FOOT AND MOUTH DISEASE"/ or exp famine/ or exp "MALNUTRITION"/ or exp earthquake/ or exp "volcanic eruption"/ or exp "Nutritional disorder"/
13.11 not 12
14.limit 13 to english language
15.health care/ or health services/ or hospital sector/ or primary health care/ or health policy/ or public health/ or elderly care/ or service provision/ or partnership approach/ or "emergency services".mp.
16.14 and 15

Literature review identification: "literature review"/ or "systematic review".mp.
IEEE Xplore

1. ("disaster planning" OR "crisis management" OR "emergency management" OR "emergency preparedness" OR "emergency planning") AND (health* OR hospital* OR ambulance* OR pandemic* OR epidemic*)
2. (disaster* AND (resilien* OR mitigat* OR respon* OR warning) AND (health* OR hospital* OR ambulance OR pandemic OR epidemic))
3. ("disaster planning" OR "crisis management" OR "emergency management" OR "emergency preparedness" OR "emergency planning") AND (casualt* OR fatalit* OR mortuar* OR triag* OR surge)
4. (casualties OR fatalities OR mortuar* OR triag* OR surge) AND disaster* AND (resilien* OR mitigat* OR respon* OR warning)
5. #1 OR #2 OR #3 OR #4

Proquest dissertations and abstracts A&I

(\"disaster planning\" OR \"crisis management\" OR \"emergency management\" OR \"emergency preparedness\" OR \"emergency planning\" OR (disaster* AND (resilien* OR mitigat* OR respon* OR warning))) AND (health* OR hospital* OR ambulance* OR pandemic* OR epidemic* OR casualt* OR fatalit* OR mortuar* OR triag* OR surge)

(As per IEEE Xplore). Restricted to doctoral theses completed in the last 5 years (masters theses were excluded).

Index to Theses

ti contains ((disaster planning OR crisis management OR emergency management OR emergency preparedness OR emergency planning OR (disaster* AND (resilien* OR mitigat* OR respon* OR warning)))) AND (xfilter(date \"01/01/2006~~31/12/2011\"))

[AND’ing with terms for healthcare found only 1 thesis]

46 theses found.

On inspection, found 5 relevant complete records of doctoral theses and awarded 2006 onwards
Web of Science

TS=(("disaster planning" OR "crisis management" OR "emergency management" OR "emergency preparedness" OR "emergency planning" OR (disaster* AND (resilien* OR mitigat* OR respon* OR warning))) AND (health* OR hospital* OR ambulance* OR pandemic* OR epidemic* OR casualt* OR fatalit* OR mortuar* OR triag* OR surge))

(As per IEEE Xplore).

Restricted to Conference Proceedings Citation Indexes for Science and Social Science & Humanities. Publication year 2009 onwards. English Language.

Found 188 records.
Health Management Information Consortium (HMIC)

1. exp "MAJOR INCIDENT PLANNING"/ or ("emergency planning" or "emergency management" or "emergency preparedness" or "crisis management").mp.
2. exp DISASTERS/ or catastrophe$.mp. or exp "MAJOR INCIDENTS"/ or exp "SOCIAL WELFARE EMERGENCIES"/ or TERRORISM/ or CBRN?.mp. or DECONTAMINATION/ or FLOODS/ or "cyber attack".mp. or "cyber attacks".mp. or "CIVIL DEFENCE"/ or exp EPIDEMICS/
3. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj1 (incident? or weather or disrupt$ or outbreak? or failure? or casualt$ or destruct$ or fatalities or mortuar$ or attack$)).mp.
4. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj3 accident?).mp.
5. ((serious$ or catastrophic or severe$ or extreme$) adj1 event?).mp.
6. ("business continuity" or preparedness or readiness or resilien$ or "warning system" or "warning systems" or "surge capacity" or mitigat$).mp.
7. (exp EFFECTIVENESS/ or exp EFFICIENCY/) and ((respon$ or evacuat$ or shelter$ or care or rescu$ or protect$ or relief or reliev$ or triag$).mp. or exp "DISASTER SERVICES"/ or exp "EMERGENCY SERVICES")
8. 6 or 7
9. 2 or 3 or 4 or 5
10.8 and 9
11.1 or 10
12.limit 11 to english language
13."DEVELOPING COUNTRIES"/ or HIV/ or exp "ANIMAL DISEASES"/ or FAMINE/ or MALNUTRITION/ or EARTHQUAKES/ or volcan$.mp.
14.12 not 13

Literature review identification: (review? adj3 (literature or research)).mp. or exp "LITERATURE REVIEWS"/ or exp BIBLIOGRAPHIES/ or exp "STATE OF THE ART REVIEWS"/ or "systematic review".mp.
Medline

1. exp "DISASTER PLANNING"/ or "emergency preparedness".mp. or exp "Civil Defense"/ or "crisis management".mp.
2. DISASTERS/ or catastrophe$.mp. or exp "Mass Casualty Incidents"/ or exp Terrorism/ or "DISEASE OUTBREAKS"/ or "HAZARDOUS SUBSTANCES"/ or CBRN?.mp. or DECONTAMINATION/ or FLOODS/ or "cyber attack".mp. or "cyber attacks".mp. or "SECURITY MEASURES"/
3. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj1 (incident? or weather or disrupt$ or failure? or destruct$ or attack$)).mp. or "Radioactive Hazard Release"/ or "Chemical Hazard Release"/ or "Biohazard release"/
4. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj3 accident?).mp.
5. ((serious$ or catastrophic or severe$ or extreme$) adj1 event?).mp.
6. ("business continuity" or preparedness or readiness).mp. or exp "Surge Capacity"/ or resilien$.mp. or mitigat$.mp. or "warning system".mp. or "warning systems".mp.
7. (effective$ adj1 (respon$ or evacuat$ or shelter$ or care or rescu$ or protect$ or relief or reliev$)).mp. or (effective$.mp. and ("Transportation of Patients"/ or triage/ or exp "Relief Work"/ or exp "Rescue Work"/ or exp "EMERGENCY MEDICAL SERVICES")
8. exp "EFFICIENCY, ORGANIZATIONAL"/ and ((respon$ or shelter$ or care or rescu$ or protect$ or relief or reliev$).mp. or "Transportation of Patients"/ or triage/ or exp "Relief Work"/ or exp "Rescue Work"/ or exp "EMERGENCY MEDICAL SERVICES")
9. 6 or 7 or 8
10.2 or 3 or 4 or 5
11.11 and 10
12.1 or 11
13."developing countries="/ or exp HIV/ or exp "HIV INFECTIONS"/ or exp "ANIMAL DISEASES"/ or exp "MALNUTRITION"/ or earthquakes/ or "volcanic eruptions"/ or exp "Nutritional and Metabolic Diseases"
14.12 not 13
15.limit 14 to english language
16."Great Britain"/ or (United Kingdom or UK or "U.K." or Great Britain or England or Scotland or Northern Ireland or Wales).mp. or (English or Scottish or Welsh or NHS or "N.H.S." or National Health Service).mp.
17.15 and 16

Literature review identification: (review? adj3 (literature or research)).mp. or REVIEW/ or exp BIBLIOGRAPHY/ or exp "REVIEW LITERATURE AS TOPIC"/
National Criminal Justice Reference Service Abstracts

1. DE=("crisis management") OR KW=("emergency preparedness" or "emergency planning" or "emergency management")
2. DE=("terrorism" or "hazardous substances or materials" or "nuclear terrorism" or "national security" or "civil defense" or "decontamination" "cyber terrorism") OR KW=(disaster or disasters or catastrophe or catastrophes or flood* or epidemic or epidemics or pandemic or pandemics or CBRN or CBRNe)
3. KW=((extraordinary* or serious* or catastrophic or large or large-scale or global* or international* or national* or severe* or extreme* or major or complex or critical* or mass or system or systems or infrastructure) within 1 (incident or incidents or weather disrupt* or outbreak or outbreaks or failure or failures or casualty* or destruct* or fatalities or mortuar* or attack*))
4. KW=((extraordinary* or serious* or catastrophic or large or large-scale or global* or international* or national* or severe* or extreme* or major or complex or critical* or mass or system or systems or infrastructure) within 3 (accident or accidents))
5. KW=(serious* or catastrophic or severe* or extreme*) within 1 (event or events))
6. KW="business continuity" or "surge capacity" or "warning system" or "warning systems"or "mitigation" or "preparation" or "readiness" or "resilience")
7. DE="efficiency" or "effectiveness") AND (KW=(respon* or shelter* or rescue* or triag* or care or protect* or relief or reliev*) OR DE="emergency services training" or "emergency services infrastructure protection"or "emergency operations centers" or "rescue services")
8. 6 or 7
9. 2 or 3 or 4 or 5
10.8 and 9
11.1 or 10
12.DE="aids/hiv" or ("animals" and "diseases") or "developing countries") OR KW=(famine or famines or malnutrition or earthquake or earthquakes or volcan*)
13.11 not 12

Literature review identification: DE="literature reviews")
Literature review identification: KW=((literature or research) within 3 (review or reviews))
Psycinfo

1. exp "EMERGENCY PREPAREDNESS"/ or exp "EMERGENCY MANAGEMENT"/ or "crisis management".mp.
2. exp DISASTERS/ or exp Terrorism/ or exp EPIDEMICS/ or exp "HAZARDOUS MATERIALS"/ or CBRN?.mp. or decontaminat$.mp. or flood$.mp. or "cyber attack".mp. or "cyber attacks".mp. or exp "NATIONAL SECURITY"/
3. ((extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure) adj1 (incident? or weather or disrupt$ or outbreak? or failure? or casualt$ or destruct$ or fatalities or mortuar$ or attack$)).mp.
4. (extraordinary$ or serious$ or catastrophic or large or large-scale or global$ or international$ or national$ or severe$ or extreme$ or major or complex or critical$ or mass or system? or infrastructure).mp. and ACCIDENTS/
5. ((serious$ or catastrophic or severe$ or extreme$) adj1 event?).mp.
6. ("business continuity" or preparedness or readiness or "surge capacity" or resilien$ or mitigat$ or "warning system" or "warning systems").mp.
7. (efficien$ adj1 (respon$ or evacuat$ or shelter$ or care or rescu$ or protect$ or relief or reliev$)).mp. or (efficien$.mp. and (exp "emergency services"/ or exp "health care services"/))
8. exp "ORGANIZATIONAL EFFECTIVENESS"/ and ((respon$ or shelter$ or care or rescue$ or protect$ or relief or relieve$).mp. or exp "emergency services"/ or "health care services"/)
9. 6 or 7 or 8
10.2 or 3 or 4 or 5
11.9 and 10
12.1 or 11
13."developing countries"/ or exp "HIV"/ or exp "AIDS PREVENTION"/ or (animal$ and disease$).mp. or famine.mp. or exp "NUTRITIONAL DEFICIENCIES"/ or earthquake?.mp. or volcan$.mp.
14.12 not 13
15.limit 14 to english language
16.exp Health Care Services/ or exp Health Care Delivery/ or public health services/ or exp emergency services/ or Public Health/ or hospitals/ or exp intensive care/ or residential care institutions/ or nursing homes/ or (exp organizations/ and exp Cooperation/)
17.15 and 16

Literature review identification: (review? adj3 (literature or research)).mp. or "LITERATURE REVIEW"/
((TITLE-ABS-KEY("emergency management" or "disaster planning" or "emergency preparedness" or "crisis management" or "emergency planning") AND TITLE-ABS-KEY(healthcare or hospital or hospitals or ambulance* or "public health" or NHS or "primary care trust")) AND DOCTYPE(ar OR re) AND SUBJAREA(MULT OR ARTS OR BUSI OR DECI OR ECON OR PSYC OR SOCI))AND NOT TITLE-ABS-KEY(famine* or malnutrition or hiv or animal* or earthquake* or volcano*)

Literature review identification: DOCTYPE(re)
Appendix 2: Research themes to promote preparedness to protect health. U.S. Centers for Disease Control and Prevention

1. Vulnerable Communities and Populations
   a. Determinants of Community Vulnerability to Public Health Emergencies: Identify, measure, and understand the factors and dynamic processes that influence the vulnerability of defined community populations
   b. Risk Appraisal and Adaptive Behavior During a Public Health Emergency: Explore how local influences, cultural factors, and past experiences affect the perception of risk among individuals and their communities and shape their behavioral responses
   d. Assessment Strategies for Populations Affected by Public Health Emergencies: Identify, develop, and evaluate strategies and policies to prevent, mitigate, and treat adverse health effects
   e. Public Health Emergency Response Strategies: Develop strategies to adapt the public health response system to accommodate heterogeneous social and physical contexts

2. Infrastructure and Prevention
   a. Critical Infrastructure Systems and Processes: Assess and prioritize methods and practices to better protect public health systems that are critical for maintaining healthy populations.
   c. Human Migration, Mobility, and Quarantine Issues Associated with Public Health Emergencies: Assess and evaluate the role of human migration in the public health response to public health emergencies occurring around the world

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Project 09/1005/01
d. Community Actions in Public Health Emergencies: Describe and explain how diverse communities detect, interpret, respond to, and communicate perceived and actual public health threats.

e. Local and Regional Operational Strategies for Managing Public Health Emergencies: Optimize local and regional operational strategies for information exchange, decision-making, and command and control, and define the optimal roles and functions for persons involved in managing public health emergencies

3. Public Health Workforce Preparation and Front-line Prevention and Response

   a. Community and Regional Response During Public Health Emergencies: Ensure scientific rigor in the design, implementation, and evaluation of drills and exercises

   b. Support for Front-line Personnel Involved in Health Protection Functions During Public Health Emergencies: Improve and evaluate the countermeasures, personal protective equipment, and health policy guidelines that support members of the public health workforce and maximize worker safety, personal resilience, self-confidence, and performance

   c. Proficiency of the Public Health Workforce in the Event of Disaster: Define and assess the knowledge, attitudes, and proficiencies needed by the public health workforce to successfully ensure the safety and well-being of the community

4. Detection and Diagnosis of the Hazards and Medical Consequences Associated with Emergency Events


   b. Rapid Clinical Diagnostic Capabilities During Public Health Emergencies: Develop or enhance rapid clinical diagnostic capabilities to identify significant exposures to potentially hazardous agents.

   c. Environmental Detection and Decontamination During Public Health Emergencies: Develop or enhance methods of rapidly detecting, identifying, and decontaminating persons and environments that may be adversely impacted by an emergency event and could potentially pose a threat to others.

   d. Rapid Assessment of Exposure and Impact Data from Public Health Emergencies: Identify and evaluate model strategies for rapidly assessing exposure impacts and resource needs during
adverse health events that impact a community, and evaluate the tools needed to support these strategies for resource allocation and health-status tracking

5. Communications
   a. Risk Communication and Information Dissemination: Identify and develop effective communication strategies, tools, and mechanisms to facilitate rapid and accurate communications regarding risk information and public health recommendations to affected populations.
   b. Emergency Response Communications Technology: Optimize strategic communications technology to allow for efficient event response across multiple jurisdictions

6. Community Preparedness and Response Improvement
   a. Outcome Measurement for Preparedness Improvement: Develop, evaluate, and apply outcome measures for public health practice, preparedness, response, and recovery improvement
### Appendix 3: Areas that are unresearched or under-researched, by hazard phase and analytic unit. Abramson et al. 89

<table>
<thead>
<tr>
<th>Analytic unit</th>
<th>Hazard phase</th>
<th>Prevention &amp; mitigation</th>
<th>Preparedness</th>
<th>Response</th>
<th>Short-term recovery</th>
<th>Long-term recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political /Legal /Ethical</td>
<td>Political /Legal /Ethical</td>
<td>Cost-benefit analyses; reviewing regulatory policy instruments; vaccine development strategies; mass vaccination ethics</td>
<td>Vulnerable population registries; governance issues of shared authorities; extent and efficacy of public health policy powers</td>
<td>Modified standards of care; triage and allocation standards; liability and professional credentialing; cross-border access and treatment issues</td>
<td>Disaster-relief; waiver of regulations (HIPAA, workforce rules)</td>
<td>Defining when “disaster relief” ends and social assistance begins</td>
</tr>
<tr>
<td>Social /Population</td>
<td>Social /Population</td>
<td>Analyzing effect of social, economic, linguistic vulnerabilities on disaster outcomes</td>
<td>Developing surveillance tools and trigger points for medical and public health response</td>
<td>Unanticipated consequences of public health interventions</td>
<td>Role of social services (housing, education, community re-engagement) in limiting physical and mental health sequelae</td>
<td>Long-term recovery as a form of local system and community development</td>
</tr>
<tr>
<td>Organizational</td>
<td>Organizational</td>
<td>Physical hardening of facilities; value of normalizing ongoing collaboration between sectors</td>
<td>Workforce training and practices to assure willingness and ability to work during a disaster</td>
<td>Systems for coordinating private medical and public health activity; emergent referral networks</td>
<td>Development of shared data systems (health records, pharmacy records)</td>
<td>Maintaining stable public health functions if workforce and system have been severely disrupted</td>
</tr>
<tr>
<td>Individual /Clinical</td>
<td>Individual /Clinical</td>
<td>Development of tailored preventive health messages for vulnerable patients by enhancing self-sufficiency</td>
<td>Outcomes research on value of individual preparedness in reducing system burden</td>
<td>Treatment efficacy and protocol studies; matching responder capacity to need</td>
<td>Disaster-based primary care; defining the evolution of emergency to primary care</td>
<td>Estimating the long-term physical and mental health impacts of disaster</td>
</tr>
</tbody>
</table>

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Appendix 4: Specific research questions suggested by the Institute of Medicine. Altevogt et al. 91

Enhancing the usefulness of training:

- What training modalities build lasting capacity and improved performance?
  - Why are these modalities successful?
- What education and training promote administrative and operational collaboration and cooperation between public health and the healthcare system?
- What are the characteristics of training simulations that produce the capabilities needed to enhance system performance in a cost-effective manner?
- What are the advantages and disadvantages of computer simulations compared to other training in enhancing system and specific personnel performance?
- What is the evidence that persons involved in different training modalities perform at a higher level, and for how long is this higher level of performance sustained? What is the frequency of training necessary to maintain desired skills?
- Which subsets of the public health workforce can best benefit from various training modalities and why?
- Which, and how valid are, training modalities that address the needs of special populations, including children and vulnerable populations, and that account for the effect of public health crises and disasters on behavioral health?
- Which, and how valid are, training modalities that prepare the workforce and the public to better respond to emergencies and to limit the effect of the additional stressors they engender?
- Which, and how valid are, training modalities that improve information management and visualization to improve decision analysis and outcomes?
- How valid are case studies and standardized assessment tools for after-action reporting when applied retrospectively to actual public health emergency events?

Improving Timely Emergency Communications - evaluation of effective risk communication in pre-emergency and emergency settings:

- What are the criteria and metrics for effective risk communication in emergency situations with (1) the public health workforce, (2) emergency response partners, (3) the media, (4) the public, and (5) vulnerable populations?
• Which risk communication messages motivate people, especially vulnerable populations, to take protective action and engage in appropriate behaviors related to emergencies at different scales?

• To what extent can market research techniques be used to test the effectiveness and cultural competence of risk communication messages developed for the emergency scenarios identified in relevant preparedness frameworks?

• To what extent can research techniques be used to improve the cultural competence of frontline responders and others involved in disaster policy and decision-makers to improve the success and outcome of the community response in emergencies?

• How can new technologies (e.g., Internet and web-based technologies, and cellular/text messaging) be better used to fill risk communication gaps in emergency settings, including those experienced by vulnerable populations?

• How does one optimize and leverage the use of existing channels of risk communication in emergency settings to reach diverse audiences, including nonprofit organizations, faith-based organizations, schools, business community, and relevant professional associations? What are the existing risk communication capacities of these community partners in pre-emergency and emergency settings?

• What are the barriers preventing effective translation of pre-emergency and emergency communication strategies to practitioners?

• What organizational changes are required to implement effective communication strategies?

Improving Timely Emergency Communications - system enhancements to improve effective information exchange across diverse populations in pre-emergency and emergency settings:

• What are the criteria and metrics for system enhancements to improve effective information exchange within and across diverse partners and populations under pre-emergency and emergency conditions?

• How can information technology innovations (e.g., wireless technologies, electronic health records, systems integration, emergency medical response) strengthen emergency response systems by improving situational awareness, data sharing, and decision support for the public health workforce?

• How can challenges to information technology adoption (e.g., robustness, reliability, bandwidth limitations) be overcome for routine as well as emergency response use?
• How do we measure the value of “relationships” or “connectivity” of public health with traditional and non-traditional partners in information exchange in emergency settings?

• What are effective mechanisms for enhancing systems of information exchange to reach into vulnerable and special needs communities in pre-emergency and emergency settings?

Creating and Maintaining Sustainable Preparedness and Response Systems:

• What are the critical elements of a public health system that make it scalable and thereby capable of responding to different levels of emergency?

• What are the lessons to be learned from other academic, professional, and international fields of research and practice (e.g., operations research, systems engineering, and the business sector) that can and should be integrated into the public health system?

• What strategies, if any, should be established improved coordination of the public health system with other critical infrastructures?

• To what extent does training (e.g., simulations, drills, and exercises) demonstrate the efficacy and capabilities of communities to become integrated into the response system?

• Can historical accounts, after-action reports, lessons learned, and similar data from real life events increase the understanding of how communities best respond, and if so how can this knowledge be better integrated into the public health preparedness system?

• To what extent do coordinated pre-event preparedness activities impact the efficacy and capability of the public health system to integrate into the broader response system, including public, community, and private sectors?

• How can these findings be better integrated into the public health preparedness system?

• How can research results and findings be best applied to ensure a more effective and rapid response across all scales of emergencies, from small community to national events?

• Are there ways to collect and maintain data during events for later analysis that are not time or resource intensive and do not disrupt response?

• How can the “tipping points” that require abrupt changes to alternative response systems be identified, and how are these alternative systems sustained?

Generating Effectiveness Criteria and Metrics:
• What are appropriate criteria for decision-making processes in planning, response, and recovery? These include criteria for implementation, testing, and improvement of the decision-making process. The criteria should take into account existing practice, experience, and theory.

• What are appropriate criteria for the application of continuous quality improvement of the structure and process of planning, response, and recovery?

• What are appropriate criteria for planning and implementation of clear and accessible communication with the public, recognizing the specific needs of vulnerable populations?

• What are appropriate criteria to quantify the effectiveness with which the public health system addresses the social and behavioural impacts of events in planning, response, and recovery?

• What are appropriate criteria to measure the public’s expectations, experience and satisfaction with respect to public health emergency planning response and recovery efforts?

• To what extent, if any, will accreditation standards for state and local health departments contribute to an agency’s preparedness as it relates to capacity and performance?
Appendix 5: Elements of Preparedness Addressed, by Stage of Preparedness

<table>
<thead>
<tr>
<th>Element of preparedness</th>
<th>Preparedness</th>
<th>Response</th>
<th>Recovery</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations-ready workers and volunteers</td>
<td>39</td>
<td>10</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Countermeasures and mitigation strategies</td>
<td>16</td>
<td>15</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td>Health risk assessment</td>
<td>16</td>
<td>7</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td>Psychosocial outcomes and community resilience</td>
<td>2</td>
<td>6</td>
<td>19</td>
<td>24</td>
</tr>
<tr>
<td>Mass health care</td>
<td>11</td>
<td>10</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Public information and communication</td>
<td>13</td>
<td>8</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Testing operational capabilities</td>
<td>5</td>
<td>15</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Inter-agency communication and coordination</td>
<td>13</td>
<td>6</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Epidemiology functions</td>
<td>9</td>
<td>9</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Roles and responsibilities</td>
<td>9</td>
<td>6</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Robust supply chain</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Incident Command System (ICS)</td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Public engagement</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Laboratory functions</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Legal climate</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Performance management</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Leadership</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Financial tracking</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>101</strong></td>
<td><strong>58</strong></td>
<td><strong>28</strong></td>
<td><strong>169</strong></td>
</tr>
</tbody>
</table>

NOTE: Rows and columns do not necessarily sum to the Total figure because one citation could address more than one element or stage of preparedness.
## Appendix 6: Public Health Systems Research Agenda Priorities, by Research Area. Acosta et al. ¹²¹⁴

### Research Area 1: Planning and Other Pre-Impact Activities

<table>
<thead>
<tr>
<th>Topic</th>
<th>Research Question</th>
<th>Short-term priorities</th>
<th>Long-term priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Improving public health emergency preparedness planning and organizational structure</td>
<td>What approaches could improve PHEP planning processes and procedures in a systems-based framework?</td>
<td>Characterize existing planning practice, including variations within and across response disciplines. Identify and evaluate emerging technologies (e.g., Wikis or other collaboration tools) and practices that could streamline inter-jurisdictional, cross-disciplinary planning.</td>
<td>Explore whether variations in the characteristics of planning relate to variations in the quality of actual responses and, ultimately, population health outcomes. Determine whether different planning processes and organizational structures are needed to support scalable (i.e., building upon routine practices) versus catastrophic responses (i.e., those involving singular capabilities).</td>
</tr>
<tr>
<td>*Engagement of diverse groups and populations in PHEP efforts</td>
<td>How can diverse communities (e.g., demographic, geographic, cultural) be best involved</td>
<td>Examine the best way to include community members in the creation and implementation of emergency preparedness plans.</td>
<td>Evaluate the benefits of community engagement over time, with attention to how these strategies have resulted in greater citizen involvement.</td>
</tr>
</tbody>
</table>

¹⁴ Short-term priorities can be addressed in 2 or fewer years. Long-term priorities require sustained focus for between 2 and 10 years. Topics marked * should be pursued aggressively.
<table>
<thead>
<tr>
<th>Anticipating population behaviour during disasters</th>
<th>How do individuals and populations behave during disasters, and what cultural, socio-demographic, and other characteristics affect those behaviours?</th>
<th>Determine the impact of public response on the spread of an epidemic</th>
<th>Identifying the most salient predictors of variations in the behaviour of both the general public and the public health workforce or volunteers. Can incentives or interventions be designed to increase the likelihood of socially beneficial behaviours?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disaster risk reduction</td>
<td>How can population and public health system vulnerabilities be reduced in an effort to prevent or mitigate adverse impacts ahead of time?</td>
<td>Develop tools and protocols for identifying those prior health and socioeconomic conditions that leave individuals particularly vulnerable to threats</td>
<td>Identification and mitigation of vulnerabilities in public health response systems (e.g., failure of staff to report to duty, lack of interoperability in communication systems) Evaluate the impact on community resiliency of community capacity-building efforts (e.g., developing leadership and increasing trust in public officials)</td>
</tr>
</tbody>
</table>

in PHEP-related activities, and how can their involvement be sustained? How to build sustainable neighbourhood response networks and how such networks can be successfully activated for immediate response and long-term recovery efforts participation and collective action and decision-making.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Research Question</th>
<th>Short-term priorities</th>
<th>Long-term priorities</th>
</tr>
</thead>
</table>
| Improving epidemiology and surveillance in support of PHEP efforts | What approaches can improve the capability to determine the source, cause, incidence, prevalence, and other characteristics of diseases and other health conditions? | Support the development of better data sources on environmental conditions, including:  
- improved tests for airborne contaminants (such as aerosolized anthrax);  
- increased surveillance coverage through more and different sources of data on the occurrence of unusual health events;  
- streamlined near-real-time data-reporting systems;  
- rapid administration of diagnostic tests | Define the requirements of a universally applicable outbreak management information system                                                                                                                                                                                                                                                                                                                                 |
| Public health laboratory systems          | What approaches can support the improvement of a seamless laboratory network that can detect, characterize, and confirm threat agents in a timely manner?                                                                 | Better understand current public health lab capacities as a basis for further research  
Address the system’s ability to provide information to decision-makers during a large-scale and rapidly spreading emergency – strategies for:  
- decreasing detection and reporting | Assess and improve the lab system’s ability to detect radionuclides                                                                                                                                                                                                                                                                                                                                                       |
<p>| Risk communication | What approaches can improve the public health system's ability to provide messages to the public that lead to appropriate preparedness and response actions? | Use routine health incidents to identify strategies that have resulted in effective risk communication and that can be scaled up. Synthesize research on health communication, marketing, and the broader communication literature to determine what strategies, interventions, and lessons learned are applicable to public health. | Examine the relative effectiveness of risk communication using alternative modalities (e.g., text messaging, social networking sites). Determine how recipients' understanding, concerns, and overall perspectives affect their decision to take action based on risk communication. |
| Countermeasure delivery | What approaches are effective in decreasing the amount of time needed to distribute and dispense medical countermeasures during a public health emergency? | Develop a strong data foundation by developing better ways to capture capacities and operational capabilities through exercises and/or simulation studies and routine health incidents (e.g., influenza vaccination). | Use such data to improve the efficiency of dispensing: speed and throughput, accuracy and standards of care. |
| *Systems for population-level care | What approaches can be used to provide medical and mental health care across the entire continuum of need (e.g., injured, sick, “worried well,”) | Adapt simulation models for predicting emergency healthcare needs to examine the effectiveness of decision-making systems and workforce surge requirements for mass-casualty events. | Determine the effectiveness of alternative systems for population-level care that best take advantage of nonhospital resources (e.g., tele-health or... |</p>
<table>
<thead>
<tr>
<th>Special needs populations</th>
<th>What approaches can improve the public health system's ability to address the varied needs of special needs population groups?</th>
<th>Build on existing work to identify variation in the way in which special needs populations are defined; and variations in experiences in planning, response, and recovery. This will help define the capabilities required to promote positive health outcomes and to identify and meet medical and mental health care needs.</th>
<th>Explore approaches to ensure access to quality preventive health care and address social and economic needs that exacerbate vulnerability to disasters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displaced populations</td>
<td>What approaches can effectively provide for the medical and public health needs of populations that have to vacate their homes or areas of residence in response to a disaster?</td>
<td>Identify requirements for infrastructure used to accommodate displaced populations (e.g., shelters and temporary housing) to ensure that it supports people with special health needs (e.g., need for refrigeration or storage of medication, availability of oxygen, transport to dialysis).</td>
<td>Systems research and modelling to identify strategies for reducing redundancy and increasing surge capacity when medical and public health staff are displaced. Evaluate strategies for the long-term management of displaced populations after a disaster, as well as the impacts of geographical shifts in the public health or health care workforce after an emergency event.</td>
</tr>
</tbody>
</table>
### Recovery

| What approaches can improve the public health system’s ability to help the public regain or restore its well-being (e.g., physical, psychological) during and after a public health emergency? |
| Synthesize existing research on the emotional impact of trauma and resiliency from social science fields, such as psychology, focusing on findings relevant to recovery. |
| How to sustain social support networks in the recovery phase. How to engage traditionally isolated populations to ensure that their needs are adequately accounted for in the economic and social infrastructure rebuilding plans. |

### Strengthening the natural science base for advice provided during public health emergencies

| What is the evidence base supporting advice given by public health authorities during public health emergencies? |
| Summarize the different scenarios, categories of potential events, and types of questions that need scientific support. |
| Address some of the most pressing unanswered questions and evaluate practical approaches for science-based communication to determine which are most effective. |

---

### Research Area 3: Resources, Infrastructure, and Legal Frameworks

<table>
<thead>
<tr>
<th>Topic</th>
<th>Research Question</th>
<th>Short-term priorities</th>
<th>Long-term priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information technology and infrastructure</td>
<td>How will technology innovation and adoption by the communication and health care fields influence</td>
<td>Identify the decision-making requirements that can be supported by technology (e.g., developing the cyber-infrastructure to support decision-making and evaluating how users relate to the...</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Workforce and training</th>
<th>What training is necessary for the public health workforce to adequately respond to public health emergencies?</th>
<th>Determine the connections between training, competency and capability, and outcomes</th>
<th>Inform the development and evaluation of interoperable training modules that can be disseminated widely at low cost to promote a core set of response capabilities among the public health workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal framework research</td>
<td>How can legal and liability barriers to public health emergency preparedness and response be addressed?</td>
<td>Identify current laws, regulations, provisions, and legal constraints at the local, state, national, and federal levels related to public health emergency preparedness and response</td>
<td>Evaluate how emerging legislation and changes to existing legislation affect behaviour (e.g., Do changes in legislation determine what types of plans and partnerships get developed?).</td>
</tr>
<tr>
<td>Economics of PHEP</td>
<td>How can principles of economics be applied to encourage</td>
<td>Determine the return on investment for various types of</td>
<td>Determine how incentives (announced, e.g., through the</td>
</tr>
</tbody>
</table>

15 Also indicated as a long-term priority
nongovernmental organizations and individuals to engage in and maintain involvement in preparedness-related activities?

individuals, organizations, and firms, perhaps taking into account investment practices in other areas of security and prevention (e.g., health promotion).

publication of an industry standard) could be delivered via government program funding structures, insurance, or other mechanisms

Examine investments in areas in which routine and emergency public health infrastructure and capabilities for emergency preparedness overlap in order to identify how dual use might improve the efficiency of public health investments across both areas

### Research Area 4: Accountability and Quality Improvement

<table>
<thead>
<tr>
<th>Topic</th>
<th>Research Questions</th>
<th>Short-term priorities</th>
<th>Long-term priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Standards, metrics, and quality improvement</em></td>
<td>What approaches can be used to ensure that the public health system has access to standards, metrics, and quality improvement tools?</td>
<td>Examine existing methods of measurement development and validation from other fields and explore their applicability to PHEP. Explore opportunities to embed the measurement of PHEP capabilities in smaller-scale, more routine emergencies, such as food- and waterborne disease outbreaks and seasonal influenza, and day-to-day activities in which components of PHEP are tested (e.g., risk communication messages)</td>
<td>Simulation modelling to determine the types of strategies and capacities that have the greatest impact on preparedness and response, so that standards and metrics focus on these. Factor cost into standards development in order to sharpen decision-making about how much preparedness is needed to be “prepared”</td>
</tr>
<tr>
<td><em>Data sources and data collection</em>*</td>
<td><strong>What approaches can be used to develop data sources to support PHEP research and evaluation, either by leveraging existing data or by creating new data sources or repositories?</strong></td>
<td><strong>Identify critical data points to be captured during a real-time event and inform the development and evaluation of real-time data collection systems.</strong> Better leverage and link existing data sources (e.g., develop data sets that encode critical variables from after-action reports on both exercises and real incidents).</td>
<td><strong>Examine the feasibility of developing critical-incident registries that capture lower-level or small-scale events, similar to aviation close-call reports.</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Tools and templates to promote the transfer of research findings</td>
<td><strong>What approaches can support health departments and other system actors in selecting, adapting, and implementing research?</strong></td>
<td><strong>Identify and examine the impact of tools and templates from other sectors and disciplines (e.g., organizational and implementation science) on PHEP practice.</strong></td>
<td><strong>Determine the methods (e.g., quality improvement approaches) that promote the implementation of “best practices” and cost-effective.</strong></td>
</tr>
</tbody>
</table>

16 Not identified as being either a short-term or a long-term priority
| practice | Determine the characteristics of practices that are more likely to be disseminated and the characteristics of organizations that more frequently adapt best practices. | ways to promote these approaches. Examine the efficacy of practices to improve outcomes (e.g., response time, communication, coordination). |
Appendix 7: Potential for future research on emergency management. McEntire

Potential for future research includes:

- Development of Geographical Information Systems (GIS)
- The extent to which hazardousness may be increasing or shifting across locations
- Understanding the qualities of ambiguity and surprise that may be associated with threats, such as terrorist attacks, that span wide spatial, temporal and organisational scales.
- The consequences of global warming
- Using new technologies to alert the public to weather-related hazards
- Defining “acceptable risk”: E.g., what is the proper balance between living in extremely hazardous areas and trying to limit loss?
- The effects of globalization and development on disasters
- The media’s role in disasters
- Improving media reporting through the development of effective disaster plans for media organisations
- The media’s relationship to terrorism
- The value or otherwise of critical incident stress debriefing (CISD), and more generally, which psychological interventions work best in which situations.
- The benefit of professional psychologists versus paraprofessionals
- How cultural beliefs affect responses to disasters, including not only post-disaster activities, but also what constitutes acceptable risk and how that influences mitigation and preparedness policies. Further ethnographic research may be useful.
- Effective methods of helping disaster victims in cross-cultural settings
- What prompts volunteerism in the field of social work
- The impact of acute and chronic environmental disasters on rural and small communities
- Assessing the adequacy of disaster policies
- The impact of public policy on emergency management
- How disaster related policies impact societal values, government processes, and economic conditions
- What is effectiveness?
- How much investment in emergency management is enough?
• Comparative studies of emergency management institutions around the world to identify transferable principles and best practices
• Emergency procedures for older people living independently, since they are more likely to have medical issues or physical handicaps
• The mindset of older people who depend on others during disasters
• The reaction of older people to extreme temperature conditions, fires and nursing home evacuations
• The use of older people as volunteers in disaster situations
• Improving collaboration (E.g. information sharing) between health staff and emergency management officials in other organisations in the face of barriers such as different terminologies
• Development and utilization of mechanisms for conducting rapid needs assessments in disease outbreaks
• Processes of quarantine
• Who is or should be in charge of what after a disaster, and how should the various organizations interact to achieve optimal results?
• How humans behave in disaster situations
• What the police can do to better deal with violence and looting activity
• Understanding rising disaster losses, acceptable risk, and policies that create tax burdens for those who live in less-hazardous areas
• The impact of hazards such as terrorism on long term macro economic performance
• Focusing on long-term disasters instead of acute hazards
• Communication in disaster situations
• How inter-organizational communications and rational decision making unfold in disasters
• The role of communication in creating or being a source of disaster
• Assessing the impact of government documents and other standards on business continuity management in the private sector, and more generally how best to improve emergency planning there
• How does information flow among emergent volunteer groups?
• How can information sharing be improved among various levels of government and across different organizations and jurisdictions?
• What are the possible implications of the restriction of information on disasters?
Appendix 8: Codes and fuller descriptions for the priorities and areas identified by previous scoping reviews, as used in Table 5

Abr 1: Social/population
Abr 2: Prevention/mitigation
Abr 3: Political/legal/ethical
Abr 4: Recovery
Aco L1: Community and special needs populations
Aco L2: Surveillance
Aco L3: Training
Aco L4: Interagency communication and coordination
Aco L5: Legal climate
Aco L6: Psychological impact
Aco L7: Measurement
Aco L8: Risk communication
Aco L9: Countermeasures/mitigation and mass healthcare
Aco R1: Planning and other pre-incident activities
Aco R1a: Improving public health emergency preparedness planning and organizational structure
Aco R1b: Engagement of diverse groups and populations in PHEP efforts
Aco R1c: Anticipating population behaviour during disasters
Aco R1d: Disaster risk reduction
Aco R2: Key response capabilities
Aco R2a: Improving epidemiology and surveillance
Aco R2b: Public health laboratory systems
Aco R2c: Risk communication
Aco R2d: Countermeasure delivery
Aco R2e: Systems for population-level care
Aco R2f: Special needs populations
Aco R2g: Displaced populations
Aco R2h: Recovery
Aco R2i: Strengthening the natural science base for advice provided
Aco R3: Resources, infrastructure and legal frameworks
Aco R3a: Information technology and infrastructure
Aco R3b: Workforce and training
Aco R3c: Legal framework
Aco R3d: Economics of PHEP
Aco R4: Accountability and quality improvement
Aco R4a: Standards, metrics, and quality improvement
Aco R4b: Data sources and data collection
Aco R4c: Tools for transferring research into practice

Alt 1: Enhance the usefulness of training
Alt 2: Improve communications in preparedness and response
Alt 3: Generate criteria and metrics to measure effectiveness and efficiency
Alt 4: Create and maintain sustainable preparedness and response systems

CDC 1a: Determinants of Community Vulnerability
CDC 1b: Risk Appraisal and Adaptive Behavior During an Emergency
CDC 1c: Predictive Strategies for Risk and Recovery in Vulnerable Populations After an Emergency
CDC 1d: Assessment Strategies for affected Populations
CDC 1e: Adapt the response system to accommodate heterogeneous social and physical contexts
CDC 1f: Comprehensive risk-management strategies for heterogeneous populations

CDC 2: Infrastructure and prevention
CDC 2a: Critical Infrastructure Systems and Processes
CDC 2b: Public Health and Clinical Response Systems
CDC 2c: Human Migration, Mobility, and Quarantine Issues

CDC 3: Workforce Preparation and Front-line Prevention and Response
CDC 3a: Scientific rigor wrt exercises
CDC 3b: Support for Front-line Personnel Involved in Health Protection Functions
CDC 3c: Proficiency of the Public Health Workforce
CDC 4: Detection and Diagnosis of the Hazards and Medical Consequences Associated with Emergency Events

CDC 4a: Health Surveillance Systems

CDC 4b: Rapid Clinical Diagnostic Capabilities During Public Health Emergencies

CDC 4c: Environmental Detection and Decontamination During Public Health Emergencies

CDC 4d: Rapid Assessment of Exposure and Impact Data from Public Health Emergencies

CDC 5: Communications

CDC 5a: Risk Communication and Information Dissemination

CDC 5b: Emergency Response Communications Technology

CDC 6: Outcome Measurement for Improvement

Sav: Generate criteria and metrics to measure effectiveness and efficiency

Yea 1: Emergency operations and vulnerability assessment

Yea 2: Mitigation

Yea 3: Response

Yea 4: Collaboration

Yea 5: Legal/civil liberties

Yea 6: Recovery

Yea 7: Risk/crisis communication

Yea 8: Public information/education for response and recovery

Yea 9: Communication/warning systems and evacuation
Appendix 9: Framework for coding citations judged to be very relevant

- Country/area of the disaster (tick as many as apply)
  - UK
  - USA
  - Europe
  - Other European countries excluding UK
  - Australia/NZ
  - Canada
  - SE Asia (Japan, Hong Kong, Singapore, S Korea, Taiwan)
  - China
  - Israel
  - Other country/area (specify)
  - Generic (no particular country/area focus)
  - Country/area not known (lack of information)

- Phase of the emergency (tick as many as apply)
  - Planning structures/processes
  - Prevention
  - Threat/signal detection/warning/surveillance
  - Mitigation
  - Preparedness
  - Response
  - Recovery
  - Learning
  - Other phases (specify)
  - Generic (no particular phases specified)
  - Phase unknown (lack of information)

- Hazard type (tick as many as apply)
  - Fire
  - Flood
  - Heat wave
  - Hurricane/Tornado
  - Other extreme weather
  - CBRN
  - Terrorism
  - Flu – swine
  - Flu – avian
  - Flu – other
  - Other pandemic/epidemic/disease outbreak
  - Other hazard (specify)
  - Generic (no particular hazard focus)
  - Hazard not known (lack of information)

- Research method (tick as many as apply)
  - Literature review (structured)
  - Commentary/non-systematic review/editorial
  - Policy/guidance document
  - Expert/key informant consensus (E.g. Delphi)
• Case study
• Survey
• Interviews
• Simulation or other modelling
• Programme or policy evaluation
• Quasi-experimental/observational
• Secondary data/administrative data analysis
• Clinical trial
• Epidemiological investigation
• Other research method (specify)
• Research method unknown (lack of information)

• Element of preparedness
  • Health risk assessment
  • Legal climate
  • Roles and responsibilities
  • Incident Command System (ICS)
  • Public engagement
  • Epidemiology functions
  • Laboratory functions
  • Countermeasures and mitigation strategies
  • Mass health care
  • Public information and communication
  • Robust supply chain
  • Operations-ready workers and volunteers
  • Leadership
  • Testing operational capabilities
  • Performance management
  • Financial tracking
  • Psychosocial outcomes and community resilience
  • Interagency communication and coordination
  • Other element of preparedness (specify)
  • Generic (no particular element specified)
  • Element unknown (lack of information)
Appendix 10: Statistics for journal article citations judged to be very relevant

Table 26: Comparison of research method between previous scoping reviews and the current review

<table>
<thead>
<tr>
<th>Method</th>
<th>87</th>
<th>88</th>
<th>89</th>
<th>Current Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Editorial/commentary and literature review</td>
<td>46%</td>
<td>62%</td>
<td>32%</td>
<td>33%</td>
</tr>
<tr>
<td>Case report/study</td>
<td>17%</td>
<td>10%</td>
<td>24%</td>
<td>3%</td>
</tr>
<tr>
<td>Survey</td>
<td>11%</td>
<td>15%</td>
<td>12%</td>
<td>11%</td>
</tr>
<tr>
<td>Secondary data analysis</td>
<td>6%</td>
<td>-</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Interviews</td>
<td>5%</td>
<td>-</td>
<td>4%</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>15%</td>
<td>13%</td>
<td>21%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Table 27: Comparison of hazard between 32 and the current review

<table>
<thead>
<tr>
<th>Hazard</th>
<th>32</th>
<th>Current Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>All hazards, unspecified or other</td>
<td>34%</td>
<td>44%</td>
</tr>
<tr>
<td>Infectious disease outbreak or pandemic</td>
<td>25%</td>
<td>22%</td>
</tr>
<tr>
<td>Terrorism</td>
<td>24%</td>
<td>11%</td>
</tr>
<tr>
<td>Natural disaster</td>
<td>11%</td>
<td>13%</td>
</tr>
<tr>
<td>CBRNe</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Table 28: Comparison of elements of preparedness between 32 and the current review

<table>
<thead>
<tr>
<th>Element of preparedness</th>
<th>32</th>
<th>Current Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations-ready workers and volunteers</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Countermeasures and mitigation strategies</td>
<td>31</td>
<td>20</td>
</tr>
<tr>
<td>Health risk assessment</td>
<td>27</td>
<td>24</td>
</tr>
<tr>
<td>Psychosocial outcomes and community resilience</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>Mass health care</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Public information and communication</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Testing operational capabilities</td>
<td>18</td>
<td>38</td>
</tr>
<tr>
<td>Interagency communication and coordination</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>Epidemiology functions</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Roles and responsibilities</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Robust supply chain</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Incident Command System (ICS)</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Public engagement</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Laboratory functions</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Legal climate</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Performance management</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Leadership</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Financial tracking</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 29: Breakdown of citations by the country where the studied incident occurred

<table>
<thead>
<tr>
<th>Country or area of incident</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>23</td>
<td>8.2%</td>
</tr>
<tr>
<td>USA</td>
<td>59</td>
<td>21.1%</td>
</tr>
<tr>
<td>Europe</td>
<td>17</td>
<td>6.1%</td>
</tr>
<tr>
<td>Australia, NZ</td>
<td>6</td>
<td>2.2%</td>
</tr>
<tr>
<td>Canada</td>
<td>6</td>
<td>2.2%</td>
</tr>
</tbody>
</table>

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### Table 30: Comparison of research method between UK-focused citations and other citations

<table>
<thead>
<tr>
<th>Method</th>
<th>UK-focused</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Editorial/commentary and literature review</td>
<td>13%</td>
<td>35%</td>
</tr>
<tr>
<td>Case report/study</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Survey</td>
<td>23%</td>
<td>12%</td>
</tr>
<tr>
<td>Secondary data analysis</td>
<td>12%</td>
<td>3%</td>
</tr>
<tr>
<td>Interviews</td>
<td>12%</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>37%</td>
<td>40%</td>
</tr>
</tbody>
</table>

SE Asia: Japan, HK, Singapore, S Korea, Taiwan | 1 | .4%
China | 1 | .4%
Israel | 2 | .7%
Generic - no particular country or area focus | 125 | 44.8%
Country or area not known - lack of information | 40 | 14.3%
Total | 280 | 100.0%
Appendix 11: Research projects being conducted by Preparedness and Emergency Response Research Centers (PERRCs) or otherwise on the NIHR database

PERRCs projects:

<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baker, E.</td>
<td>Engineering the North Carolina Health Alert Network.</td>
</tr>
<tr>
<td>Baseman, J.</td>
<td>Reaching Health Care Providers with Emergency Information.</td>
</tr>
<tr>
<td>Biddinger, P.</td>
<td>Linking Assessment and Measurement to Performance in PHEP Drills and Exercises.</td>
</tr>
<tr>
<td>Dunlop, A.</td>
<td>Academic-Community Partnerships in Preparedness.</td>
</tr>
<tr>
<td>Finkelstein, S.</td>
<td>Linking Assessment and Measurement to PHEP through Engineering Systems Analysis.</td>
</tr>
<tr>
<td>Hedberg, C.</td>
<td>Retrospective Cohort Study of Responders Training and System Performance.</td>
</tr>
<tr>
<td>Hodge, J.</td>
<td>Legal and Ethical Assessment Concerning Mental and Behavioral Health Preparedness.</td>
</tr>
<tr>
<td>Howard, D.</td>
<td>Improving Disaster Planning for Nursing Home, Home Health, and Dialysis Providers.</td>
</tr>
<tr>
<td>Isakov, A.</td>
<td>Academic-Community Partnerships in Preparedness.</td>
</tr>
<tr>
<td>Ivey, S.</td>
<td>All-Hazards Communication to Improve the Resilience of Vulnerable Populations.</td>
</tr>
<tr>
<td>Macdonald, P.</td>
<td>Regionalization of Public Health Preparedness Workforce Infrastructure.</td>
</tr>
<tr>
<td>Mays, G.</td>
<td>Effects of accreditation on local public health preparedness.</td>
</tr>
<tr>
<td>McCabe, L.</td>
<td>Fostering Coordinated Mental Health Preparedness Planning.</td>
</tr>
<tr>
<td>Meischke, H.</td>
<td>Bystander CPR.</td>
</tr>
<tr>
<td>Meischke, H.</td>
<td>Limited English Proficiency 911.</td>
</tr>
<tr>
<td>Miller, J.</td>
<td>Effectiveness of Simulated Disaster Response Scenarios.</td>
</tr>
<tr>
<td>Miner, K.</td>
<td>Assessing the Utility of Incident Command Systems (ICSS) and Emergency Operations Centers (EOCs) in Public Health Crises.</td>
</tr>
<tr>
<td>Monahan, C.</td>
<td>Using Collaborative Virtual Environments in Preparedness and Emergency Response Planning.</td>
</tr>
<tr>
<td>Neuhauser, L.</td>
<td>All-Hazards Communication to Improve the Resilience of Vulnerable Populations.</td>
</tr>
<tr>
<td>Omer, S.</td>
<td>Immunization Systems and Public Health Preparedness.</td>
</tr>
<tr>
<td>Potter, M.</td>
<td>Public Health Adaptive Systems Studies (PHASYS).</td>
</tr>
<tr>
<td>Reingold, A.</td>
<td>Early Warning, Investigation, &amp; Surveillance: Epidemiologic Networks in Action.</td>
</tr>
<tr>
<td>Shoaf, K.</td>
<td>PERRC research projects.</td>
</tr>
<tr>
<td>Storey, D.</td>
<td>Role of the Media in Resistance.</td>
</tr>
<tr>
<td>Stoto, M.</td>
<td>Linking Assessment and Measurement to PHEP Systems Improvement.</td>
</tr>
<tr>
<td>Principal Investigator</td>
<td>Project Title</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Viswanath, V.</td>
<td>Linking Assessment and Measurement to Performance in PHEP Communications.</td>
</tr>
<tr>
<td>Waller, A.</td>
<td>Public Health Surveillance Systems.</td>
</tr>
<tr>
<td>Zilinskas, R.</td>
<td>Closing the Chemical, Radiological, and Nuclear Gaps in Public Health All-Hazards Preparedness.</td>
</tr>
</tbody>
</table>

### Non-PERRCs projects:

<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandera, C.</td>
<td>Mobile Just-In-Time Training Of Emergency Response Personnel - Phase II</td>
</tr>
<tr>
<td>Broderick, J.</td>
<td>Psychogenic Illness in Response to Pandemic or Mass Biological Exposure: Development of Experimental Model</td>
</tr>
<tr>
<td>Dunlap, E.</td>
<td>Stages Of Drug Market Disruption &amp; Reformulation In Disaster Cities</td>
</tr>
<tr>
<td>Ganz, A.</td>
<td>DIORAMA: Dynamic Information Collection And Resource Tracking Architecture</td>
</tr>
<tr>
<td>James, J.</td>
<td>A Health Security Card For Disasters And Public Health Emergencies</td>
</tr>
<tr>
<td>Norris, F.</td>
<td>National Center for Disaster Mental Health Research</td>
</tr>
</tbody>
</table>
Appendix 12: Information sheet for interviewees

You are invited to take part in a research project which has been commissioned by the National Institute for Health Research (NIHR) Service Delivery and Organisation programme (SDO) and is sponsored by the University of Manchester. Please take time to read the following information. If you have any questions about this research you can contact one of the research team listed at the end of the sheet.

1. What is the purpose of the study?

The National Institute of Health Research has commissioned a series of studies about the emergency planning in Health Care R&D Needs. The overall aims of this project are to conduct a state of the art review of emergency preparedness in health care, drawing on learning and experiences from the local, regional, national and international contexts, particularly in health care but also extending into other forms of crisis where there might be learning applicable to health care. The review will identify good practice, gaps in current knowledge and concerns about current practices, and produce a prioritised R&D agenda for addressing these. The review will focus on the academic and professional literature on emergency planning and response in health care and the dilemmas which face emergency managers and responders in handling care crisis. Conducting such research is important in contributing towards developing a research development and training agenda for local, regional and national bodies.

2. Why have I been chosen?

You have been approached because of your experience in the area and thus you are an excellent position to provide a very informative perspective and comment on emergency planning, from both your organisational and personal point of view.

3. Do I have to take part?

No. It is up to you to decide whether or not to take part. If you decide to take part you will be asked to sign a consent form. This information sheet is for you to keep. You are free to withdraw from the study at any time and without giving a reason. If you decide to withdraw or not to take part, your job will not be affected. Any information held about you by the research team will be destroyed.

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Project 09/1005/01
4. What will happen to me if I take part?

A researcher will contact you to arrange a convenient time and place to talk to you and discuss the extent of your involvement. The study involves one or two one-hour interviews. The interview(s) will take place in a confidential setting with no other person present. You will be asked about your previous experiences and the nature of your work, about how organisational factors influence your work and about your wider involvement and engagement with relevant professional communities of practice. If you give permission, the interview will be tape recorded. If you do not give your permission for this, notes will be made about what you say. If there are any questions you prefer not to answer, you can decline to answer them. Some participants may be invited to take part in further meetings and events along with other participants. These will be conducted under Chatham House rules, i.e., all participants are free to use the information received, but neither the identity nor the affiliation of any participants may be revealed.

5. What are the possible disadvantages and risks of taking part?

Agreeing to take part in the study will take a few hours of your time, but we are happy to arrange interviews/meetings at your convenience. It is also possible that talking about your work might be unsettling, but we are obviously happy not to pursue any line of questioning you feel uncomfortable with.

6. What are the possible benefits of taking part?

There are no direct benefits to you of taking part, other than the opportunity it gives you to reflect on your own practices, and if you take part in further events, on others’ practices too, which may be a useful learning experience. The findings from the review should contribute to improving emergency planning practice in the NHS.

7. Will my taking part be kept confidential?

The information you give will be kept confidential. Only the research team will hear or see records from your participation. Any report or presentation of the findings will include examples and quotes taken from the interviews, but no-one who has taken part will be recognisable.

8. Who is funding the study

The study has been funded by the National Institute for Health Research Service and Delivery Organisation programme as part of their call for
research headed “Scoping Study of Emergency Planning in Health Care R&D Needs”

9. Who has reviewed the study?
This study has been reviewed by four independent academic reviewers. This study has been reviewed by the Derbyshire Local Research Ethics Proportionate Review Sub-Committee (Reference 10/H0401/72).

10. Contacts for further information

We are very happy to answer any questions or queries you may have regarding the research.

Please contact any member of the research team from Manchester Business School named below:

Prof. Simon French (simon.french@mbs.ac.uk, Tel: 0161 275 6401)
Prof Naomi Chambers (naomi.chambers@mbs.ac.uk, Tel: 0161 275 7964)
Alan Boyd (alan.boyd@mbs.ac.uk, Tel: 0161 275 2923)
Appendix 13: Interview Protocol

Check that a consent form has been signed before beginning.

1. What do you think should be the direction of healthcare emergency planning over the next few years?
   [Prompts: this should bring out their perspective on where it is at the moment and what the main activities are]

2. What issues give you the most concern, perhaps sleepless nights?

3. What do you understand to be good practice with regard to healthcare emergency planning?
   [Prompt: push them to either point to a source of good practice or be clear on how they would recognise it,]

4. How do the resources allocated to healthcare emergency planning get used currently?

5. Obviously you plan for emergencies that have happened previously, but how do you prepare for events that have not happened before?
   [Prompt: how do you anticipate the unanticipatable?]

6. How do you co-ordinate your emergency planning with that of other organisations?
   [Prompt: consider whether all participating organisations understand each other’s structures and constraints.]

7. In an emergency how best can the health needs of vulnerable groups be met?
   [Prompt: Consider both vulnerable people caught up in the emergency and vulnerable people who are having elective procedures that are further delayed.]

8. What are the important issues and unanswered questions that research should focus on?
9. Is there anything you would wish to add that might shape our project?

Thank you. We are happy to send you the final report in due course if you would like a copy.
Appendix 14: Protocol for case study telephone conversations

1. Introduction (1-2 mins)
   a. Recap the project purpose and the case studies to be considered during the phone conversation as per the email
   b. Explain that “What you say may be shared within our research team, but any wider reporting will not identify you. Are you happy to go ahead on that basis?”
   c. How long do you have to talk to me?
2. What good practices demonstrated in this incident might usefully be taken up by others?
   a. [If time: Can you give a brief, concrete example to illustrate the good practice and its benefits?]
3. What important practice/service issues did this incident highlight?
   a. [If time: Can you give a brief, concrete example to illustrate the issue and its consequences?]
4. Are there any important gaps in knowledge highlighted by this incident?
   a. [If time: Can you give a brief, concrete example to illustrate the gap and its consequences?]
5. Do you know of any documents, published or unpublished, that might provide us with information about good practices, service issues or knowledge gaps highlighted by this incident?
   a. How might we obtain them?
6. Can you suggest anyone else who it would be interesting for me to talk with?
   a. Do you have a contact email address and/or phone number?
7. Thanks
   a. We will send you a copy of our final report in due course

NB If really short of time – ie person has 10 mins or less - omit questions 2 and 3 and come back to them after question 6 if there is time
If the person has 15 mins or more then try to cover all questions (approx 3 minutes each including sub-questions).
Appendix 15: Suggested good practices and actual practices during the 2009/10 swine flu (H1N1) outbreak

Clear plans, implemented appropriately

The UK started from a relatively strong position, as it was the first European country to have a contingency plan in place. The uneven spread of the outbreak during the early stages of the pandemic proved problematic however. Rather than flexibly triggering actions from the national framework based on local circumstances there was a “one size fits all” approach, which was specified at a national level, based on WHO phases and UK alert levels. This tied some localities in to sub-optimal strategies. The response in some early “hotspots” was too little too late – for example the roll out of swab testing to regional laboratories to increase capacity and reduce turn around times. As one of our informants put it, “West Midlands really copped for it”. Decisions such as when to turn on the national pandemic flu service, and when to increase capacity for critical care were also affected, although the NPFS did usefully reduce pressure on primary care and A&E. In addition, some PCTs would have preferred to have been able to choose who would vaccinate people, rather than the national agreement that GPs would vaccinate the first priority groups in the population. In future a better balance needs to be struck between central strategic co-ordination, subsidiarity and local flexibility.

While measures such as school closures and vaccination were to some extent responsive to learning about the virus and the status of the outbreak in different populations (E.g., age groups, people with pre-existing chronic conditions), the national approach was maintained. Some new initiatives were added and new pieces of guidance were developed and issued (see below), reinforcing the perception among some practitioners that while there were plans at local and regional level there was no real plan at national level, just a framework.

There was some confusion and lack of clarity, particularly during the early stages of the outbreak, but also at some later points. Thus although the Command and Control Framework and the traffic light reporting system proved to be an invaluable tool not only in monitoring performance but in initiating proactive management of incidents, they were not used systematically early on. Some school Heads were unclear that the authority to close their school lay with them and communities were concerned about the appropriateness of closure decisions that had been made on a school-by-school basis rather than local authority-wide. Furthermore, the efficacy of school closures was doubted because of mixing of young people in other community venues (E.g. mosques, youth clubs etc.). The NHS-led vaccinations programme, which included social care workers from a range of organisations, was managed effectively in the North West, but vaccination of social care staff sometimes proved challenging and contentious elsewhere, with a lack of clarity locally about whether the PCT or the local authority was responsible. However
national guidance on staff to be vaccinated did not match the priorities of some organisations (E.g., those who wanted to maintain business continuity) and rationales for vaccinating some staff groups were not sufficiently clear or thought through – particularly the focus on “frontline” staff and the definition of “frontline” 247. The definition of frontline healthcare worker was seen as divisive 249. There was not a consensus on whether guidance should have been more flexible.

One of the positive aspects identified by informants was local and regional organisations being proactive and flexible rather than waiting for guidance from the Department of Health. An SHA asked for national level data to be disaggregated for local use in planning, for example, and local inter-organisational issues such as stock shortages and lack of clarity regarding some responsibilities were resolved locally through negotiation and cooperation 222. As the outbreak progressed, organisations generally appeared to have adopted a more pragmatic response, rather than being restricted by formal mechanisms. In the North West region, for example, in spite of national guidance, different models for dispensing anti-virals were adopted to suit local circumstances, such as using mobile pharmacists in rural Cumbria. Making use of suitable existing buildings, and of pharmacists and on-call doctors used to handling drugs appeared to be effective, more patient friendly and substantially cheaper 247.

The Swine Flu Critical Care Clinical Group was impressed by local and regional planning to enable surge to happen 250. It was essential that the principles around command and control, stopping elective activity, and providing mutual aid were agreed and shared between managers and clinicians in all organisations. There was a clear, clinically-informed protocol in London for moving to rationing procedures for existing ITU patients if required, and local and regional plans and planning processes within the North West were felt to have worked well 247. Actions and strategies had been developed by “mining” a range of relevant plans, including winter, flu, business continuity management, and major incident plans. The ambulance service’s Resource Escalation Action Plan (REAP) also provided a structured approach to increase capacity, although its actual value in practice required evaluation. There was a clear focus on vulnerable groups in many plans, although definitions of vulnerability were not always consistent, with particular problems regarding differences between those people who were vulnerable to the direct effects of flu and those who were vulnerable to the loss of support networks. Even with the plans it proved very challenging to identify vulnerable people in practice.

Multiple models of the development of the pandemic, from multiple sources, were used to provide as robust information as possible to inform decision-making, but early modelling was necessarily uncertain due to lack of data and key ministers and officials had unrealistic expectations 215. Ministers may have tended towards resourcing the response on the basis of the worst case scenario rather than basing decisions on the most likely
outcome and flexing resources as likelihoods changed; and some actions also appeared to be driven by political imperatives rather than evidence of effectiveness. As a result, valuable staff resources were not always used to best effect during the containment phase, and some efforts were wasted on things which weren’t ultimately required. While the advance purchase agreements with pharmaceutical companies were potentially a valuable tool, they need to have more flexibility, in order to avoid unnecessary expenditure on unwanted drugs. Such advance agreements with GPs about vaccine administration would prevent the need for time-consuming negotiations during a future pandemic. Nationally agreed Patient Group Directions to enable antivirals and vaccines to be supplied to groups of patients rather than individually identified patients were also useful. Initial stocks of vaccine were however insufficient.

Communicating clear, consistent messages to the public and staff

The government’s communication strategy was deemed to have built a high level of general public awareness and understanding of key aspects of pandemic influenza, but a greater amount of factual, scientific information could have been made available. The advertising materials provided to local and regional organisations were appreciated, and the intranet and public facing internet sites of most NHS organisations displayed consistent messages throughout the containment and treatment phases. Channels such as community radio were used effectively, and Mental Health Trusts from the North West developed training and information materials for staff and clients which were picked up in other Regions. Very little information was however available to help companies build business continuity plans, with potential adverse impacts on the economy and on the health of employees. Some modest behaviour change resulted, yet few people changed their hand hygiene practices. A significant proportion of the public regarded the outbreak as over-hyped, although they tended to attribute this to media over-reporting rather than to the government. This appears to be at variance with conclusions that the government’s media briefings helped media reporting remain largely accurate. There was pressure on GPs and on NHS Direct from the “worried well”, leading to less than 10% of calls being answered in less than a minute, and half of all callers hanging up before their call was answered, and A&E departments were vulnerable to pressures from large numbers of the “worried well". There may be a tension between using the mass media to raise awareness and reducing public interest in the pandemic through oversaturation or worrying some people unnecessarily.

There was some criticism about lack of information in the early stages of the outbreak, and of the consistency of the information provided. For example, advice from the Department of Health to pregnant women, changed rapidly from ‘stay in’ to ‘go out’ to ‘stay in if you feel concerned’
 confusing GPs as well as expectant mothers. Some terminology also caused confusion, particularly the use of ‘containment’ for a strategy intended only to slow the spread of the disease, and ‘reasonable worst case scenario’ for a very unlikely scenario of reasonable worst cases with regard to every parameter. There was also some confusion because the H1N1 and seasonal flu campaigns ran in parallel. Specific additional information explaining the likely impact of swine flu on people with pre-existing chronic respiratory problems might have been useful, and more needed to be done to ensure appropriate communication of risk regarding vaccination.

Social networking had mixed effects. Monitoring of social network sites identified the concerns that some pregnant women had about vaccination, leading to action to try to address these concerns. However information spread between children used social networking sites and text messages sometimes hindered school closure messages and also the provision of mass prophylaxis to school children during the containment phase.

Communication from the centre to regional and local organisations and their staff could have been better. Insufficient notice was given about key changes, such as the activation of anti-viral centres, and what changes there were going to be to prescription regulations, and when these would come into force. Prior to the top level “noon” briefing, which were useful but repetitive, there was information overload for local staff in the early part of the outbreak, with central agencies sometimes differing in the advice they provided and communicating directly with different parts of the system rather than channelling communications through SHAs. Informants indicated that the goodwill of GPs was in danger of being lost on account of frequent changes in guidance and slow, sometimes contradictory responses to their queries, although their expectations about the speed of response may have been the cause rather than bottlenecks in the system. Furthermore, central agencies’ requirements for data collection and reporting placed a significant burden on local organisations, which could conflict with other demands, indicating the need for a more streamlined process.

The staff vaccination campaign contributed to vaccine uptake rates that were considerably higher for frontline NHS staff than they had been during the previous year’s flu season (40% compared with 13%). The perceived success of the campaign was attributed to flexible and accessible delivery approaches, visible leadership, an effective communications strategy, and having a robust plan with clear governance arrangements and supported by sound project management.

**Coordination and collaboration between agencies – horizontally and vertically**
Although how relationships would work between the HPA and NHS was unclear towards the start of the outbreak, there was good cooperation between agencies at all levels in the North West, including between the HPA and the NHS, with social care, and with LRFs and RRFs, to communicate with each other and deliver action. This both built on existing good partnerships and has helped to further develop joint working, with increased understanding of the roles of other organisations and knowledge of individual contacts. There was regular contact between key personnel, with teleconference calls between the 5 district Gold commanders providing an excellent forum for monitoring the situation in each district, and facilitating a strategic approach to action. Three Critical Care Networks and the Intensive Care Bed Information (ICBIS) reporting system worked together seamlessly to produce an excellent escalation plan, which although not actually tested by the pandemic, has proved useful subsequently. Specialist paediatric unit clinicians also provided education and guidance to critical care staff in adult units.

The lead PCT Command and Control role worked well on the whole. PCTs performed valuable roles because of their good communication links with other organisations, and experience in logistics management. Voluntary sector organisations such as the Red Cross provided ‘flu friends’ and other very valuable support to vulnerable people. Enabling NHS Trust information to be shared with Local Authorities was however sometimes complex, and limits on ambulance capacity were not always well understood and accepted by other organisations. This may have been exacerbated by ambulance organisations not being able to attend a multiplicity of PCT-based flu command groups.

Some regional level structures proved useful, with the Regional Operations Centre (ROC) providing an essential out of hours communication facility and a central collation point for data and reporting to health partners and national ambulance colleagues. Establishing an RSTAC vaccination subgroup was an effective way of dealing with the vaccination queries in a timely manner, whilst ensuring that the issues could be debated by professionals representing a range of agencies. The inclusion of communications staff at a national, regional and sub-regional level also facilitated consistent communications.

The separate reporting lines for health and for social care up to national government risked inconsistent information being fed into national strategy-making. It was also hard to provide accurate up to date information about social care pressures and capacity due to the variety and number of organisations providing services, and to engage with residential and nursing home owners and staff, particularly in the independent sector.

There was good coordination of decision-making at national level between the four home nations, although video-conferencing or face-to-face meetings rather than teleconferences may have helped to build
relationships and eased decision making\textsuperscript{215}. Teleconferencing was also found useful in the North West, especially as skills in this developed; but less experienced participants were not always fully effective.

Although the nursing network provided much useful information, there appeared to be little coordination between national networks such as the medical network, director group network and the nursing network. The Nursing and Midwifery Council was also perceived to have been relatively inflexible in sanctioning changes to nursing roles to aid implementation of contingency plans\textsuperscript{247}. In professional journals generally there was little discussion prior to the pandemic declaration of the risk and professional dilemmas that members would have to face in the event of a severe pandemic.

**Adequate resourcing – quantity and quality**

Setting up dedicated and substantial resources was perceived as being generally effective. Having the NHS as the lead partner, appointing a Chief Executive as Flu Director and having a dedicated Flu Team at all levels from the Department of Health to Strategic Health Authority to Gold Primary Care Trusts instilled confidence and increased understanding of NHS Resilience with partner organisations\textsuperscript{247}. Identifying key individuals to lead the response and teams of people to support them was critical to a successful response\textsuperscript{222}, and setting up a dedicated Incident Room with one email contact address facilitated communication\textsuperscript{247}. Some local teams were however disbanded too early in the recovery phase, often due to financial or other pressures because there was a lack of clarity about the availability of funding and recovery planning not being considered sufficiently early in the pandemic\textsuperscript{222}. Substantial resources were also needed for reports and producing debriefs.

Regular skills audits helped organisations to identify staff with previous skills, and these can also be useful in the response to many other emergencies\textsuperscript{222}. There was however a poor return of information in the North West\textsuperscript{247}, and using a standard format may have been beneficial. And attempts to use recently retired staff to aid service continuity did not prove fruitful\textsuperscript{222}.

Significant pressure was put on some individuals in key roles\textsuperscript{215}, and consideration needs to be given to potential “burn out”\textsuperscript{247}. Some Lead Gold PCTs in the North West struggled to respond in a timely fashion when activity was high, and occasionally had to “chase” individual Trusts for responses, finding nominated individuals difficult to track down. ICBIS (see above) was also shown to be vulnerable to staff sickness and IT outage.

**Build on existing resources**

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Project 09/1005/01
Building on existing processes and structures and the skills and expertise which have been built up by people working within them would appear to be more prudent than setting up new systems, particularly if they have not been tested, with associated risks such as duplication and failure. Regional Flu Response Centres (FRCs) were such an unanticipated and unplanned means of working, and although they were set up quickly, problems soon occurred, with early spikes in demand in some areas jamming phone lines. One informant thought they were almost “set up to fail”, as they were being run by a specialist scientific organisation (the HPA) rather than a response organisation, which could not command and control NHS organisations. One upside was that there was good access to information that could be provided by HPA (E.g., on test results), but less positively, large numbers of HPA staff were diverted away from other areas of the HPA’s work. Good training was made available to staff, but they did not always have a suitable existing skill-base to build on, and some were not seconded for sufficient amounts of time. Continued staffing of FRCs to support the later stages of the containment phase was problematic, with not all NHS organisations providing staff equally.

There were conflicting views about how easy the Stock Management System was to use, but not all antiviral collection points were trained to use it, with PCTs having to step in to enter data on their behalf. Creation of a national stockpile of Personal Protective Equipment (PPE) by the Department of Health meant that such consumables which were also needed for everyday NHS use were harder to source, and Trusts could not develop local stockpiles. The system also lacked flexibility regarding delivery times and choice of stock. Stock management could have been improved if business as usual processes had been used.

The ImmForm website used to record incidence of flu-like illness generally worked well, with any problems being resolved fairly promptly, but it was not well suited for processing data on staff uptake of H1N1 vaccine, and consequently not always used by Trusts. Similarly, the web-based Collection Point Administration System (CPAS) worked well as a way of sharing information with the NPFS about antiviral collection points and their opening hours.
Appendix 16: Suggested good practices and actual practices during the Cumbria floods of 2005 and 2009

Multi-agency collaboration, facilitated by prior multi-agency planning and training

Relationships between responding organisations were good in both 2005 and 2009, with all operating as directed by the command and control structures that were put in place. Many representatives already knew each other from previous multi-agency planning, training and exercising, and this facilitated the rapid establishment of working arrangements. NHS Cumbria played a key role in helping co-ordinate the emergency response in 2009, and on the ground, for example, GPs worked alongside mountain rescue teams to assist the public in Cockermouth and Keswick. Good inter-agency and cross-boundary working was demonstrated in various locations, sometimes providing a foundation for permanent integration of services: the Workington Community Services team won an award for bringing together GPs, nurses, therapists and social care workers into one team, which was a direct result of the response to the floods 237.

Planning appeared to be less successful, however, with this being emphasised particularly in reports of the 2009 floods. Cumbria’s emergency plan, recovery plan and business continuity plan had been re-written following the 2005 floods, and emergency plans had also been tested, but the scale of the flooding was beyond what was predicted. This resulted in adverse consequences such as the flooding of access routes to some identified evacuation centres.

There were shortcomings in recovery planning, with a lack of exit strategies being highlighted generally in 2009, and with regard to the mobile centre in 2005. Planning for recovery began quickly in 2009, but momentum was lost due to a hurried official handover from response to recovery. It was suggested that in future there should be more of a gradual handover which takes into account that recovery may start at different times in different communities, and maintains continuity as new staff come in and get up to speed. In addition, longer term and exit strategies were not fully developed, and strategies were not always communicated down to all involved. In 2005, the mobile service would have been improved by more inter-agency collaboration, and by having a clear exit strategy that dovetailed with the development of alternative provision.

Coordinating the rapid use of external resources, which included offers of assistance from members of the public, private and voluntary organisations as well as from other responder organisations outside of the region, was recognised as a key issue in both 2005 and 2009 236. It was suggested that there should be a more pre-planned and proactive approach, as there was no process in place to collect and coordinate the nearly 1700 offers of help quickly enough both in the immediate aftermath of the floods and over the first few weeks. Organisations were also hampered in their planning and provision of support during the recovery phase by a lack of coordination.
and consistency in the collection of relevant data on those people affected by the flooding. The data collection spanned many responding organisations, and an eclectic mix of formats and methods were used. Some people were approached on multiple occasions, and there was some reticence to share data between responding organisations into the recovery phase.

While prior involvement in training and exercising by the people mounting the response was recognised as a foundation for good collaboration, poor attendance at multi-agency training by staff and organisations was also noted in both 2005 and 2009, with a need for more staff to be trained. In 2009 many staff had received no training in the recovery process and some did not receive sufficient support from their colleagues and organisations: “the Recovery phase is a difficult beast – initial frenetic activity, still lot of work but some people think it’s finished and day job is still to do” 255.

Specific suggestions made following the 2005 floods were to ensure that:

- the frequency of severe weather exercises reflects past experience of the frequency of actual incidents (this should be assessed through the Community Risk Register).
- full multi-agency attendance is obtained (including from voluntary organisations), with all staff who could become involved in an incident receiving sufficient training to enable them to handle an incident confidently and effectively
- all aspects of an incident are tested from the initial response, through to the recovery process

**Involvement of community and voluntary organisations**

It was recognised in both 2005 and 2009 that the people and expertise within affected communities were key resources 236, in addition to the many volunteers who were formally deployed on the ground during the rescue operation 256. Greater recognition that protecting vulnerable people during floods is a community issue as well as an issue for emergency responders might have prevented the deaths of the two elderly ladies in 2005, for example. There was generally however a strong community spirit and wish to contribute support, which should be built on in future. Many additional reception centres were opened on an ad hoc basis by members of the public and community groups during the 2005 floods, and it was suggested that plans needed to be reviewed to provide co-ordination across all facilities. It was suggested that training provision for larger voluntary organisations on command and control structures used during an incident should be reviewed in order to broaden their understanding and facilitate smoother working arrangements. One of the GPs from the Cockermouth surgeries flooded in 2009 had previous experience of working in emergency situations and played a crucial role, supported by the dedication of other staff and community spirit. This suggested the idea of exploring the
formation of a network of locally-known people to coordinate responses to future emergency incidents 236.

In 2009 it was found that where communities were organised before the flooding, they were able to respond quickly and efficiently. For example, Keswick Flood Action Group, staffed by volunteers, was able to check on the welfare of local people, move furniture upstairs and deal with all kinds of trauma. Emergency plans needed to support and dovetail with this community resilience. There appeared to have been variable levels of support offered to different communities by the statutory agencies and Third Sector Groups. Some communities had Community Emergency Plans which worked very well, while others were less developed or not in existence. Before the flooding there were 18 flood action groups; subsequently the National Flood Forum identified 68 community groups it would like to work with. Having high visibility Recovery Action Teams on the ground to provide information, advice and equipment was suggested in order to ensure that all communities receive comparable support. These teams might be based at the Flood Support Centres, which were well received, and should be in place for at least 12 months. There was uncertainty however as to whether healthcare staff should be members of such teams.

There needed to be greater stakeholder involvement in planning through the 2009 recovery phase, and in 2005 it was noted that the mobile service would have been improved with greater involvement of young people at all stages. Such involvement could help to manage expectations, identify needs, improve the integration of services and manage the reduction or withdrawal of organisations from the recovery process. Some voluntary groups which provided useful services had not been involved.

Support for vulnerable people

Lack of support for older people was highlighted in 2005, when two elderly ladies died. It was suggested that both organisations and the community itself needed to improve methods for quickly identifying vulnerable people so that they can receive the support they need during an incident. Comments on the recovery phase included that support for elderly people in coping and clearing up had been poor 257. Cumbria Resilience Forum also identified that it needed to consider alternative methods of disseminating information, particularly to vulnerable groups (young, old, disabled, etc).

There were a number of care homes in Carlisle that suffered from a loss of power. Generators were provided by responder organisations where possible, but questions were raised as to whether care homes and other locations housing vulnerable people should have back-up power as a matter of course. More clarity was required on the procedures for ensuring that vulnerable people in care homes are not put at risk as a result of power supply disruptions. It was suggested that plans should identify potential...
Business Continuity Planning

Business continuity planning was particularly highlighted in 2005, but also to some extent in 2009. In 2005 the nearest Emergency Control Centre, which plans mandated the use of, could not be activated because it was flooded. Communications between Gold and Silver command were made difficult by problems with mobile and landline telephones and by power outages. Loss of power also affected the ability of some media organisations to provide information to the public, and it was suggested that they should review their business continuity plans to ensure service provision during a loss of essential services. Similarly it was suggested that care homes should have their own business continuity plans (see above). In 2009, emergency response plans for primary care were not accessible by staff in the two practices that were flooded because the plans had not been printed off, and local IT servers were down. A programme of making IT servers more resilient by centralising them at remote locations was in progress, but had not yet reached these two practices. It was suggested that further work was required to include GP practices in emergency response planning, particularly with regard to business continuity.

Appropriate support for the emotional problems of individuals

The only academic research on the floods which was found focused on mental health issues arising from the 2005 floods. Such issues were not prominent in the debriefs and reports produced by the organisations directly involved, however.

People generally sought help for physical ailments, but many people suffering mental health problems did not seek help from the NHS, with the PCT’s psychological support services under-utilized, perhaps due to stigma and fear of labelling. Preferred sources of support were families, friends, neighbours. When people did approach their GP, they were often given medication. It seems that many people did not receive prompt psychological and practical support to lessen their anxiety, prolonging their stress. When voluntary organisations were approached for help, it may not have been directly about mental health issues; they provided psychological first aid, but were not always well equipped to do so. Some help and advice services were not set up early enough after the flood and were under-resourced 229.

Distress may be a ‘normal’ response to a difficult situation rather than being regarded as a ‘disorder’, in which case; and pathologising it can be detrimental to populations who are generally psychologically intact.
Rather, while not minimising distress, public communications and education should highlight that distress following events is understandable – this encourages better coping and reduces perceived stigmatisation.  

Mental health services might not have a role to play in populations who appear unwilling to approach them for assistance, but it is difficult to know whether services are just not needed or are feared. Statutory agencies should consider different methods of providing assistance for example, by providing teaching or advice to local groups rather than seeing individuals one-to-one. Government agencies would also be advised to consider how to access these affected. More ‘therapeutic spaces’ outside of a medical base may be needed, with early interventions focusing on practical help (E.g., advice, food, shelter, financial, benefits, etc.) together with emotional support. A coordinated ‘local’ response that provides individualised support has been suggested. A community support ‘one stop shop’ providing practical was seen as an invaluable ongoing support structure to complement peer support. This would require multi-agency working, training of highly skilled staff and sustainable funding.

**Communication to the public**

Public communications in 2005 were hampered by the lack of electricity. This meant that some people were unable to hear radio broadcast output, as they did not have access to battery powered radios. It was suggested that the use other media to provide public health messages, such as on-street notice boards or billboards. Government and other partners might also need to consider reviewing their promotion of the “Go in, Stay in, Tune in” message, to encourage the public to think about how they would tune in during the loss of essential services such as power. The manner in which BBC Radio Cumbria gathered information about the current situation on the ground from reporters and members of public was also recognised as an important information source that could potentially be tapped into more effectively by emergency responders.

In 2009, public communications were generally been effective and timely, aided by centralisation of key messages through the county council, and the PCT communications function having been expanded since 2005. Reports were not always clear, however, and it was suggested that there should be greater continuity of content between reports in future. Sufficient skilled communications staff were not always available through the recovery phase and it was suggested that mutual aid might be considered. Use of social networking technologies such as text messaging, twitter and facebook might also be considered in the light of a privately funded text messaging service established in Cockermouth which got information out quickly.
Adequate resources

The floods stretched the resources of organisations. In 2005 some organisations had difficulty in providing full 24/7 cover in Gold command, and this sometimes hindered the development of a clear picture of what work was being progressed on the ground at any point in time. In 2009 the management of offers of help required months of dedicated staff time, as did project management of the recovery phase. Having dedicated project management support for this was critical, with “light touch” project management being found most appropriate.

The floods also created significant budget pressures. Not all of the costs to local organisations (estimated at £7.1m to health and social care from the 2009 floods) were covered by insurance and central government grants, and organisations did not receive their Bellwin claims in full for either flood. Following the 2009 floods it was suggested that central government should provide more detail about what Bellwin will cover, and consider use of Bellwin for the recovery phase.

Learning

Much was learned from the 2005 flood. The potential for people to get injured when trying to repair buildings was identified, for example, and this informed the provision of appropriate public information in 2009. It was also possible to re-use some of the information materials from 2005.

The experiences also stimulated some positive developments both with regard to emergency planning and with regard to service provision more generally. £38m was invested in flood protection infrastructure in Carlisle, reducing damage from the 2009 floods by an estimated £48m, and the replacement of damaged infrastructure presented an opportunity to update that infrastructure. Many individuals affected by the 2005 floods spoke about having taken practical measures to prepare for a future flood, and the 2009 floods also brought communities and partner agencies closer together, sometimes accelerating beneficial cross-agency integration of services.

Not all of the issues that were identified were addressed however. It was noted for example that some learning points for the 2009 recovery phase were the same as ones from the 2005 floods and from other flooding incidents around the country. In 2005 some responders (particularly the non-blue light services) felt that the processes surrounding the declaration of a “major incident” and subsequent information cascade could have been improved. Organisations would have preferred to be put on standby at an earlier stage, even if they were subsequently stood down. Whilst it was recognised that the threshold for declaring a “major incident” may be different for each organisation, the important point was that this decision was cascaded to all agencies so they could assess what response their
organisation needed to make. Yet in 2009 NWAS was criticised for not notifying PCTs about the event as it was supposed to do, and this was noted as having been a failing at several recent events and exercises.
### Appendix 17: Research topics and questions considered at the prioritisation workshop

<table>
<thead>
<tr>
<th>Topic</th>
<th>Collaboration across Multiple Organisations</th>
<th>Short Name: COLLABORATION</th>
</tr>
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</table>
| **Research Questions** | - How can coordination across a “mixed economy” of relatively autonomous healthcare organisations be maintained and improved, especially during the response and recovery phases?  
- How do responders in one organisation locate information, support, etc. within another responding organisation in the face of different jargons etc.? | |

**Background and Description of Issues**
The literature on collaboration, team work and sharing knowledge suggests strongly that there is a need for teams to meet and know each other personally in order to collaborate effectively. Building trust is much easier if you know someone. The issue here is that, even before the current reorganisation, it was becoming difficult for cross organisational teams to have enough personal contact and familiarity to be sure that they could work together as effectively as they might in an event. Moreover, contacts are through Local Resilience Forums (LRFs); and generally ‘planners; build the relationship not the ‘responders’. What happens about events that require a response beyond the LRF or have a non-geographical linkage?

**Notes:**  
(i) Many of these issues have been discussed under the heading of interoperability though that often has a more technical interpretation relating to ‘kit’ working together.  
(ii) There are some common issues with REORGANISATION below

<table>
<thead>
<tr>
<th>Topic</th>
<th>Issues relating to reorganisation</th>
<th>Short Name: REORGANISATION</th>
</tr>
</thead>
</table>
| **Research Questions** | - How to minimise the effect of NHS reorganisations on capability and effectiveness?  
- Does the emergency planning system provide sufficient consistency and leadership for emergencies covering a wide geographical area?  
- Does the system have the capacity to deal with long running events requiring 24 hour management over several days? | |

**Background and Description of Issues**
There is considerable uncertainty in the emergency planning and management community within and outwith healthcare systems. Not only is the NHS structure changing considerably, but required savings across the government sectors is meaning that emergency planning teams are changing, typically reducing in size and maybe being shared across organisations. For instance, in Greater Manchester, the Association of Greater Manchester Authorities (AGMA) is taking a larger role and responsibility in emergency planning while emergency planning teams within the constituent local councils are being reduced in numbers. Such reorganisation creates uncertainty and breaks personal contacts. An overall reduction in staff also suggests at a prime facie level that capacity is reducing. This is true within the NHS as much as outside it. Even if there is no reduction in capacity, there will be a diversion of attention to understand the new systems and organisations away from emergency planning itself.

**Note:**  
(i) There are some common issues with COLLABORATION above.
**Learning and quality improvement**

<table>
<thead>
<tr>
<th>Research Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• What approaches and systems are effective in facilitating learning from good practice, exercises, and incidents of all sizes - at local, regional and national levels?</td>
</tr>
<tr>
<td>• What constitutes quality in emergency preparedness and how can this be measured?</td>
</tr>
<tr>
<td>• What approaches (internal processes or external regulation) are effective in producing continuous, sustainable quality improvement in emergency preparedness?</td>
</tr>
</tbody>
</table>

**Background and Description of Issues**

All NHS Trusts and responding organisations debrief after any significant incident. These debriefs are written up in house or within the group of organisations which responded to the event. Typically, they contain a very short summary of the event/issue and its chronology, a list of 'what went well', a list of 'what did not go well', and perhaps some recommendations. They may be circulated at Local Resilience Forums and particular recommendations and learning points may be followed up locally. This discussion may be delayed waiting for Coroner's verdicts and by other 'legal' issues. Generally, however, debriefs end up filed and no structured attempt is made to compare them at a larger scale to learn from them. They represent an underused resource to improve practice, to recognise business continuity issues and also to identify emerging threats and patterns.

There is a need to recognise that for larger, thankfully rarer incidents the evidence base will be more anecdotal and case study oriented.

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**Priority and Resourcing given to Emergency Planning and Management**

<table>
<thead>
<tr>
<th>Research Questions</th>
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<tbody>
<tr>
<td>• What characteristics (capabilities, capacities etc.) make for an effective emergency planner/planning function in NHS organisations?</td>
</tr>
<tr>
<td>• Which factors (E.g. professional background of senior managers, political, social and administrative contexts, funding sources, targets etc.) have the greatest impact on the resources (staff, financial, equipment etc.) that organisations devote to preparedness?</td>
</tr>
</tbody>
</table>

**Background and Description of Issues**

Many smaller organisations assign the emergency planning portfolio as part of the job description of a manager or management team. The other parts can relate to activities with constant demands which inevitably divert attention away from emergency planning. Moreover, in the reorganisation and the ensuing 'back-office savings' there is a possibility that attention will be further diverted away from emergency planning. Chief Executives may be required to ensure that it is given priority but practice may not follow intention. Self-regulation which is largely the de facto practice in this area despite the de jure role of the regulator is not conducive to prioritising resources to deal with 'rare' events.

In exercises, there is a folklore that the real decision makers always send their deputies, meaning that in a real incident they themselves are not sensitised to many of the issues ("top people do not engage").

Targets and other ‘day-to-day’ management practices can get in the way of emergency planning and management E.g. Offloading delays causing backlogging of ambulances

Note: (i) There may be some common issues with LEARNING above.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Distinctions between major incident/national emergency, smaller business continuity issues and the ‘day job’ of Accident and Emergency (A&amp;E) and acute healthcare</th>
<th>Short Name: INCIDENT LEVEL</th>
</tr>
</thead>
</table>
| Research Questions                                                    | • How should the level of an incident be defined and declared so as to elicit appropriate and proportionate actions from all relevant organisations, recognising that a single level may not be appropriate for all?  
• Which factors are important in determining whether an incident is escalated/declared to be a major incident by a healthcare organisation?  
• What makes for successful management of business continuity (as opposed to major incidents) in NHS organisations? |
| **Background and Description of Issues**                              | There is almost a need for an agreed typology/glossary of terminology across the many emergency management communities. Incidents which blue light and acute hospital services cope with without major stretching may raise non-healthcare issues which elevate the incident to a major one and require more sensitive handing within hospitals. At one extreme the media and inevitably politics focus on significant major emergencies and structures and organisations are planned to deal with those. At the other, hospital A&E departments hardly blink at, say, 5 or 6 patients arriving from a major pile up on the motorway. Even during the response to the Grayrigg rail crash there were few problems encountered in the 3 hospitals concerned in dealing with some 23 patients. However, there are a range of incidents in the middle: business continuity incidents that affect the delivery of healthcare for several days or weeks: a fire at a health centre, significant IT or power outages. Up to a certain magnitude of incident, “heroic leadership” within a service or organisation may work; similarly, mass casualty incidents invoke emergency planning systems, which generally help to address the incident. In the grey area in between, decisions have to be made about whether to escalate the incident, and such decisions may vary between individual decision makers. There may be a reluctance to escalate some incidents appropriately because calling for help is perceived as indicating failure. |

<table>
<thead>
<tr>
<th>Topic</th>
<th>Public risk communication and information dissemination</th>
<th>Short Name: RISK COMMUNICATION</th>
</tr>
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</table>
| Research Questions                                                    | • How do the public perceive risks and how can we prepare develop more effective and targeted communication strategies to advise them?  
• Is good practice in risk and public communication embedded in all healthcare responders and agencies?  
• How should reasonable expectations about the length and efficacy of the response be communicated to the public? |
| **Background and Description of Issues**                              | In the 1990s there were a lot of issues relating to public information and health scares. These seem to have been addressed well. Indeed, there is little evidence in the UK of information provision to the public being an issue for discussion with practitioners. There is a recognition that it is an element of good practice. However, the literature still points to it a major issue requiring further research. Moreover, the rise of social networking (Facebook, Twitter, etc) means that the communication channels that the public use are changing.  

*Note:* (i) There may be some common issues with SOCIAL NETWORKING below.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Use of Social Networking</th>
<th>Short Name: SOCIAL NETWORKING</th>
</tr>
</thead>
</table>
| Research Questions | • How should social networking be used to communicate with the public during and after an event?  
• During an incident how can social networks be monitored most effectively for intelligence on what is happening?  
• Can social networking be used to build trust between the authorities and the public? | |

**Background and Description of Issues**

There is a growing use by the public and affected groups to use social networking (Twitter is the current tool) to share information and learn what is happening. As mobile technologies evolve this is likely to grow significantly. Such social networking offers many opportunities: the ability to communicate with the public quickly; more data to monitor the course of an event; geographical awareness allows one to target and analyse information according to location. Moreover, the responders can use social networking tools to build trust and awareness between themselves before, during and after any incident.

*Note:* (i) There may be some common issues with Risk Communication and ICT Developments.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Making best use of new information and communication technologies (ICT)</th>
<th>Short Name: ICT Developments</th>
</tr>
</thead>
</table>
| Research Questions | • How will technology innovation and adoption by the communication and health care fields influence emergency planning and response, and how can the system best anticipate and plan for these changes?  
• How can ICT be used most effectively in training and education of healthcare responders?  
• Can location aware ‘smart phones’ be used in a valuable way by responders? | |

**Background and Description of Issues**

ICT is constantly evolving and bring new opportunities – and challenges. These need to be anticipated. ICT, social networking and Web 2.0 are bringing huge technological changes and possibilities. There is the possibility of responders using these in incidents to respond more effectively and the public is also using them. The NHS IT provision has traditionally lagged behind best industry practice – whatever the success or failure of the current NHS IS Strategy, it is several years behind how say TESCO uses ICT. Since emergency response is an activity that faces the public and needs to communicate with them, understanding what they can see, understand and are thinking, there is an argument for horizon scanning on the possibilities of these technologies. Video and immersive technologies are used by, e.g., the military as a partial replacement for exercises in training. Technically much more is now becoming possible with mobile technologies – smart phones. They can be location aware and attach voice messages relating to say triage to specific locations, video of patients can be transmitted for assessment by experts easily. Communication may be 1-1 or 1-many. Etc. There are many conceivable uses of such technologies and some are being explored in research conferences. But will they be useful in practice? Do they address a real need of healthcare responders?

*Note:* (i) There may be some common issues with Social Networking and Training.
### Topic: Resilience to ICT outages

<table>
<thead>
<tr>
<th>Research Questions</th>
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<tbody>
<tr>
<td>• Which parts of healthcare systems are most at risk from an ICT outage?</td>
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<tr>
<td>• What is the systems resilience of NHS-Net (as opposed to the technical resilience)?</td>
</tr>
<tr>
<td>• What is the systems resilience of the National Resilience Extranet?*</td>
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</tbody>
</table>

#### Background and Description of Issues

More and more medical treatment relies on the availability of IT. In general practice the process is most advanced. Medical records are electronic and GPs seeing patients need to know their whole health history to treat a patient's current acute or chronic problems. In hospitals, the diagnosis has been made generally and the treatment focuses mainly on one issue. Without access to medical records treatment can continue more easily than in GP practices. On the other hand, hospitals are using more and more equipment in critical care that need stability of power supply and access to networks. NHS-Net is becoming more and more central to healthcare practice: e.g. laboratory results are distributed through it. Undoubtedly the NHS IT support teams have considered its resilience, but a wider check of its ability to withstand shocks may be important.

### Topic: Exercises and Training

<table>
<thead>
<tr>
<th>Research Questions</th>
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<tbody>
<tr>
<td>• What makes for an effective exercise design?</td>
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<tr>
<td>• What are the connections between training, competency and capability, and outcomes?</td>
</tr>
<tr>
<td>• How do we train and share best practice among emergency planners?</td>
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</tbody>
</table>

#### Background and Description of Issues

Training and exercises are key for at least two aspects of emergency planning and response. Firstly, they train the participants to deal with specific features of events. Secondly, they build teams and create trust and understanding. But conventionally, exercises tend to rehearse well anticipated events that ‘run to plan’. Conjunctions of events that can destroy emergency plans are seldom addressed. Moreover, if an exercise involves senior managers, there is a presumption that the ‘worst will happen’ to make it worth the managers attending, and but that the exercise will finish in the allotted time with most of the issues addressed. Finally there is a tendency to exercise every functionality ‘while all the responders are together’ even if this means that the exercise is superficial in all its details in order to achieve this coverage.

Generally there is an issue of professional training for emergency managers and ways of sharing best practice. In interviews, no clear mechanisms were identified for this other than membership of certain professional bodies (e.g. Emergency Planning Society, International Association of Emergency Managers), taking part in exercises and attending Local Resilience Forums. In many cases senior emergency planners have worked their way up from being ‘blue light responders’. This provides them with a valuable wealth of experience, but how should they be provided with the behavioural and management competencies that they will also need.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Willingness of staff to work</th>
<th>Short Name: WILLINGNESS TO WORK</th>
</tr>
</thead>
</table>
| Research Questions | • What factors (E.g. individual, organisational and incident characteristics) influence the willingness of staff to work during incidents?  
• How can willingness to work be increased? |

**Background and Description of Issues**
Staff are perhaps the most important resource during emergencies. It is generally assumed that all responders will report for work in any emergency whatever the circumstances. But will they in say a Chemical, Biological, Radiological or Nuclear (CBRN) incident or a virulent pandemic? There have been reports of decreased willingness to work during biological incidents. Various factors are assumed to affect their willingness to work in such circumstance: e.g., gender, other socio-demographic characteristics, immunisation status, organisational culture, ethical and legal implications, knowledge of potential adverse physical and mental consequences.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Recovery of the Public</th>
<th>Short Name: PUBLIC RECOVERY</th>
</tr>
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</table>
| Research Questions | • How are recovery issues best factored into the *early* stages of response?  
• How can social support networks be supported in the recovery phase?  
• How can the needs of vulnerable groups be identified and addressed? |

**Background and Description of Issues**
Recovery often seems to be seen as the poor cousin of emergency planning and response. Yet unless good support for recovery swings into action as the emergency is being dealt with there is a lot of evidence that long term problems can be created. Thus recovery teams need representation at 'top table' to observe throughout response. The recovery itself needs to recognise that some groups are more vulnerable than others. Moreover, since social, psychological and political issues can impact stress related health care needs, recovery needs to address the broad range of issues that concern victims, their families and the broader public in an integrated way with healthcare issues. Issues of indirect or vicarious trauma and are among the most widely identified gaps in research noted in non-UK studies.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Recovery of healthcare systems</th>
<th>Short Name: SYSTEM RECOVERY</th>
</tr>
</thead>
</table>
| Research Questions | • What is the most effective way for healthcare systems to recover and return to normal operations?  
• What are the best ways of preventing adverse impacts on responders and helping them to recover from their involvement in an incident? |

**Background and Description of Issues**
Any incident has the potential to divert resources from other parts of the healthcare system. Major incidents almost inevitably do. Intensive Care Units (ICUs) become unavailable to other patients; A&E units cannot treat their usual throughput; etc. With continuing pressure on resources, there is little spare capacity in the system. Is the correct relationship between a big-bang incident and recovery the use of a major incident plan for the opening phase followed by a business continuity model for recovery? Another aspect relates to the trauma suffered by the responders in severe incidents. Even if they suffer no significant physical or mental trauma, they may have to recover from long periods of working with little break.

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<table>
<thead>
<tr>
<th>Topic</th>
<th>Community and vulnerable/special needs populations, including engagement in preparedness plus effective service response.</th>
<th>Short Name: COMMUNITY GROUPS</th>
</tr>
</thead>
</table>
| Research Questions | • How do we identify vulnerable populations pre, during and post event?  
• How can access to community healthcare services be maintained when key infrastructures are significantly disrupted by a major incident (E.g. healthcare provision in emergency shelters)?  
• What are the potential roles of the public in emergency planning, prevention, preparedness, response and recovery? | |

**Background and Description of Issues**

There are many issues relating to vulnerable populations, i.e. populations whose health, economic circumstances or similar make them more susceptible to the effects of an event/pandemic and populations who are made vulnerable by the event itself. Identifying these can be difficult. Even if, for example, social services have a database, there are issues about gaining access to it during an emergency ranging from finding the gatekeeper to persuading them that the information can be released. Many thought knocking on doors and asking neighbours the most effective way of identifying vulnerable groups.

Within the healthcare system the treatment of acute victims can reduce availability of resources for other patients, e.g., awaiting elective surgery or simply suffering a chronic illness and needing attention.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Prevention and mitigation/countermeasures, particularly health surveillance systems and also laboratory/diagnostic capabilities.</th>
<th>Short Name: SURVEILLANCE</th>
</tr>
</thead>
</table>
| Research Questions | • How can we increase laboratory systems’ ability to provide timely information to decision-makers during a large-scale and rapidly spreading emergency?  
• How do we develop better data sources on environmental conditions (E.g. heatwaves)?  
• Is such information useful to decision makers? | |

**Background and Description of Issues**

There are many things that could be done in the ‘background’ to improve preparedness and response relating to health surveillance and laboratory systems, including:

- improved tests for airborne contaminants (such as aerosolized anthrax);
- increased surveillance coverage through more and different sources of data on the occurrence of unusual health events;
- streamlined near-real-time data-reporting systems;
- rapid administration of diagnostic tests;
- decreasing detection and reporting time;
- increasing lab throughput.

What is the efficacy of such improvements? Will the data actually change the decisions made during response and recovery? What information would they find most helpful?
### Pandemics and release of biological agents

**Short Name:** INFECTIOUS DISEASES

<table>
<thead>
<tr>
<th>Research Questions</th>
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<tbody>
<tr>
<td>How do we predict the impact and epidemiology of large-scale pandemics, particularly those arising from new strains?</td>
<td></td>
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<tr>
<td>How do we assess the risks of cross-species transmission, resulting in pandemics?</td>
<td></td>
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<tr>
<td>Where does Bioterrorism and the deliberate release of infective agents fit into healthcare emergency planning?</td>
<td></td>
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</table>

**Background and Description of Issues**

A significant number of research gaps have been identified by authors of UK-focused research concerned a flu pandemics. Key issues relate to predicting the epidemiology of relatively poorly understood diseases, poorly understood simply because they are new at the time of the pandemic. In addition there are calls for research on:

- Controlled studies to assess the impact of Personal Protective Equipment use;
- Larger studies on preparedness of care homes for pandemic flu;

A significant proportion of research gaps identified by authors of UK-focused research concerned the deliberate or accidental release of biological agents. Among them:

- Informing response to infectious agents through model development that better considers patterns of movement and social interaction.
- Effectiveness + efficiency of decontamination methods, of the injured and fatalities from CBR incidents
- How and where patients with potential infectious diseases are assessed in the emergency setting and if infection control guidelines are adhered to.
- Compare the current level of preparedness in the UK for biological incidents with that suggested by expert-generated guidelines.
- Analysis of European cooperation in public health with regard to different communicable diseases.

Such issues have high media coverage and political importance, but where do they fit into the priorities of healthcare emergency planning? Healthcare emergency planners have said that whether infective agents are released deliberately or accidently or whether they arise naturally is not a driving issue: the response is the same.

### Strategic modelling to inform preparedness and response

**Short Name:** STRATEGIC MODELLING

<table>
<thead>
<tr>
<th>Research Questions</th>
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<tbody>
<tr>
<td>What are criteria for good modelling and the constructive use of modelling?</td>
<td></td>
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<tr>
<td>How can good modelling and constructive use of models be achieved?</td>
<td></td>
</tr>
<tr>
<td>What local NHS good practice is there with regard to strategic modelling (for surge capacity and otherwise)?</td>
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</table>

**Background and Description of Issues**

Many current policies and plans are not based on a comprehensive analysis of costs and benefits. There is a need for an exploration of:

- analytical models to quantitatively analyse the response to an emergency and resource needs/allocation.
- population level modelling/planning, including economic models, to develop cost-effective strategies.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Ability to generalise from US (and other countries’) findings to the UK context</th>
<th>Short Name: INTERNATIONAL RESEARCH</th>
</tr>
</thead>
</table>
| Research Questions | • What aspects of research findings and good practice are transferable to the UK, bearing in mind differences of culture, legal systems and governance systems?  
• What scope is there for multi-nation research to generate more robust findings? | |

**Background and Description of Issues**

Many other countries have looked at emergency planning and response and made research recommendations or identified good practice, but are these applicable to the UK context? US studies, which are the majority, are conducted in different legal and cultural environments; issues identifies in responding to major events in developing countries are set against entirely different expectations of ‘normal’ living. Although the economic context in Japan and the UK are comparable, the cultures are substantially different and it may not be safe to assume that what is learnt there after the Tsunami can be transferred to the UK.