Private needs, public responses: Vulnerable people's flood-disrupted mobility

Abstract

Purpose

-To explore the experiences of vulnerable people during flood events, impacts of changes in mobility on wellbeing and the extent to which frontline services, emergency planning officers and other service providers allocate resources for vulnerable members of the community to meet the challenges posed by floods.

Design/methodology/approach

- In-depth qualitative interviews carried out with 15 vulnerable residents, seven community representatives, and eight service providers.

Findings

-Vulnerable people's wellbeing was negatively affected by the disruption to travel caused by floods, though support from the community to some extent redressed these negative feelings. Whilst there seems to be a strong response from both the community and the local authorities to the mobility needs of vulnerable people during floods, what seems to be missing is an equal response from the private sector in terms of provision of transport services to access goods such as food and money.

Practical implications

-More needs to be done to make sure that communication and support networks are formalised to address the potential unevenness of informal networks. Private companies need to engage more with customers. Improved information and more resilient services such as 4X4 vehicles and doorstep provision of goods and money would directly support vulnerable people who are highly dependent on their services.

Originality

- This study is the first in the UK to explore and compare the private experiences of vulnerable people with the views of stakeholders who could support them during floods.

Introduction

Floods, mobility and vulnerability

The UK summer floods in 2007 affected over 55,000 homes and 6,000 businesses and saw the greatest number of search-and-rescue missions in the country since the Second World War (Marsh and Hannaford, 2007). Flood events are likely to become more frequent as a result of floodplain development, climate change and sea level rise (Environment Agency, 2007; Pitt, 2008). It is estimated that 1.7m homes and 130,000 commercial properties are at risk from river or coastal flooding in England, with many more at risk from flash floods. Floods cause widespread disruption to transport and people's mobility, with a disproportionate effect on vulnerable members of communities. The Pitt Report (2008) reflected on the need to create resilient communities by helping them prepare, respond and adapt in the aftermath of floods. The Government now seeks to promote community resilience, defined as "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." (Cabinet Office, 2011 p4).

Floods dramatically reduce the effectiveness and reliability of the physical transport infrastructure, severely hindering access and communication within local communities (Jinwoo et al, 2013). This situation has consequences for people's wellbeing, for instance by exacerbating pre-existing health conditions (Walker and Burningham, 2011). Research has illustrated how limited accessibility, mobility and access to transport, restrict people's ability to access outside support and medical attention, with elderly people being particularly vulnerable. Many people experience high levels of isolation and loneliness as a result (Tapsell

and Tunstall, 2008). Limited knowledge of available transport links and support in the aftermath of floods has been shown by Walker and Burningham (2011) to be exacerbated by language barriers related to ethnicity. The most deprived people within the UK are more likely to live in an area of high flood risk (Walker and Bulkeley, 2006). Walker and Burningham (2011) in their discussion of flood vulnerability research from an environmental justice perspective, identified that low-income families may not necessarily have the ability to drive and so were not even able to try and rent a car in order to evacuate. People were also not able to evacuate by bus and did not know where to board them if they were available, whilst others reported no buses in their neighbourhood, or had elderly relatives who were not able to walk and so had to remain in their homes.

In any community there are likely to be such vulnerable people less able to cope with extreme events who may need targeted support from services to help them access food, healthcare and social support. Human vulnerability, in the context of hazards and emergencies, has been defined in many different ways, but is generally taken to refer to the range of conditions resulting from physical, socio-economic and environmental factors that increase individual or community susceptibility to hazards' impacts (Thywissen, 2006).

Ageing is one important element in social vulnerability to hazards. It makes people more vulnerable physically, reducing their capacity to take action during emergencies, when chronic health conditions may also worsen due to poor temporary living conditions and disruption of regular health care. Socio-economic factors also contribute to vulnerability among older people: many live alone or are isolated from family and community support structures (Peek, 2013). Older people may have low incomes, be less likely to drive, less likely to have access to computers/internet and thus access to information about flooding and changes in service provision. Nevertheless, research has also explored and demonstrated the value of older people's psychological resilience, environmental knowledge and coping or adaptation strategies in emergencies in many parts of the world (Adams, et al., 2011; Henderson, et al., 2010; Hutton, 2008; Tuohy and Stephens, 2012; Peek, 2013). Integrated and flexible networks of formal and informal care have been identified as a key factor in older people's resilience to extreme weather events (Wistow et al., 2015).

Litman (2006), reporting on the lessons learned from the floods caused by hurricanes Katrina and Rita in the USA, argued that communication of information is very important to manage the mobility of vulnerable people during disasters. He proposed that a system of communication and support networks is needed to identify and contact vulnerable people and an individual plan on what to do and who to contact so that a 'a chain of responsibility for caregivers' can be established. To achieve this he argues that each neighbourhood would need a list of the people who may need assistance, and ways to contact them, including details of friends and relatives who could provide support. He argued that this could be achieved through the agencies responsible for emergency planning working with a community groups, professionals and social services.

Only a limited number of studies within the UK have focused on the distribution and fairness of flood management and vulnerability to flooding (Fielding and Burningham, 2005). Lack of mobility is officially acknowledged to be a factor in flood vulnerability in the UK (e.g. Stanke et al., 2012; Kazmierczak et al., 2015) but there has been very little research into how changes in mobility impact on the wellbeing of the most vulnerable and the role of both the public and private sector in mitigating the negative impacts. Studies in other high-income countries tend to emphasise vulnerability of public transport infrastructure and services to flooding rather than local and individual mobility challenges (e.g. EEA, 2014); elsewhere, the focus of interest in human mobility and floods is mostly on emergency evacuation and long-term migration. To address this gap in the literature we aimed to explore the experiences of vulnerable people who have encountered flood events to understand how impacts on mobility influence wellbeing and the strategies people

and communities use to prepare, respond and adapt their mobility and support their wellbeing. In addition we aimed to explore to what extent frontline services, emergency planning officers and other service providers allocate resources for the vulnerable members of the community to meet the challenges of floods.

Regaining mobility after floods is a key aspect part of a community's ability to engage in usual activities (Chang, et al., 2010). However, research has tended to focus on quantitative analysis of trip patterns from a transport modelling perspective and not the lived experience of people. There is a dearth of research exploring people's experiences of flood-related mobility problems and the impact of this on wellbeing. In this study we try to characterise the impacts of travel disruption caused by floods for vulnerable people and how this affects their wellbeing. These vulnerable people have diminished physical capacity to cope because of impaired mobility or are alone coping with dependent children or relatives. In addition, they may struggle to access resources to cope with the challenges they face because of low income or lack of social support or where these intersect to compound vulnerability (Walker et al., 2006; Thrush et al., 2005a and 2005b; Buckle et al. 2000).

In our study wellbeing is defined as the 'balance' between an individual's resources and the challenges they face (Dodge et al, 2012). In this sense a stable wellbeing is when individuals have the psychological, social and physical resources they need to meet a particular psychological, social and/or physical challenge: 'When individuals have more challenges than resources, the see-saw dips, along with their wellbeing, and vice-versa.' (ibid., p230). This definition seems particularly useful in understanding the impact of extreme and challenging events such as floods on people's ability to maintain equilibrium.

This research took place in the City of Oxford which has a population of around 150,000 people. Whilst the urban areas are very densely developed, more than half of the city is open space. Approximately 3500 properties within the city are located on the floodplain of the River Thames and its tributaries. The participants were recruited in the West Oxford / New Botley and South Oxford areas of the city; both are on the floodplainand prone to flooding due to rivers overbanking and the water table rising to the surface (Macdonald et al, 2012)..

Oxford has low levels of socio-economic deprivation but the study area comprised an area in the most deprived quintile of area deprivation measured by the 2010 Indices of Deprivation.[1] The study area also contains roads of strategic importance including the Botley Road which is the main arterial road into Oxford from the West of England and the Abingdon Road which is the main arterial road into the South of the city.

Following decades during which there was limited occurrence of flooding, five major floods have occurred in Oxford in the past 15 years: December 2000, January 2003, July 2007, November 2012 and January 2014. In 2007, almost a thousand homes were flooded in Oxfordshire, and hundreds of homes were affected in the City (Figures 1, 2). Numerous people were stranded, displaced or evacuated (Figure 3). Flood levels were the highest that had been experienced in Oxford since 1947. Both the Botley and Abingdon Roads were closed for several days with no bus services. Flood waters on the Abingdon Road were above knee height in places. In

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[1] The Indices of Deprivation is a government dataset which characterizes small areas in England in terms of seven key domains of deprivation based on Income, Employment , Health and Disability, Education Skills and Training, Barriers to Housing and Services, Living Environment, and Crime
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6871/1871208.pdf

South Oxford flood waters inundated an electricity substation causing some houses to be without a supply for up to a day. The flood of 2012 was not as severe, however the Abingdon Road was again closed for several days without a bus service and although the Botley Road remained open, vehicular access was limited.

[Figure 1,   2, 3 here]

Research participants (vulnerable people and stakeholders) were identified through community flood action groups that have been set up throughout Oxford and belong to the Oxford Flood Alliance: a voluntary community group formed in 2007, which campaigns to reduce flooding in the Oxford area and works with the local authority to help protect the community from the impacts of floods. A system of flood wardens also operates in Oxford. Flood wardens are unpaid members of the community who work with the local authority to cascade information about flood preparedness to the rest of the community.

Methodology

In-depth interviews among vulnerable people were conducted to explore the impacts of flooding on their mobility, how they responded and adapted to changed mobility, and what the facilitators and barriers to mobility were and their impact on wellbeing. A topic guide was developed from a detailed literature review. In-depth interviews with stakeholders focused on how they identified vulnerable people and helped them access goods and services during and after floods and what transport contingency plans they had.

After initial identification of vulnerable people through flood wardens, further vulnerable people were recruited to the study using opportunistic snowball sampling. This strategy enables the identification of concealed populations who have the desired characteristics and uses individuals' social networks to recruit participants with similar characteristics (Atkinson and Flint, 2004).

Informed consent was used for all interviews. Interviews lasted from 30 minutes to an hour and for most vulnerable participants this was conducted at their home or in the case of service providers by telephone. The interviews were audio recorded, transcribed and analysed using thematic content analysis. Ethical approval for the study was granted by UCL's ethics committee.

Results

Participants' characteristics

Fifteen vulnerable residents were recruited comprising three males and 12 females (Table 1). They have been given pseudonyms to protect their identity. These participants were interviewed in their own homes which

were single houses. Seven community volunteers and representatives (Table 2) and eight service providers were interviewed (Table 3).

[tables, 1,2,3 here]

Key themes

The data for vulnerable residents, community representatives and service providers are presented under key themes which emerged from the interviews. The views which emerged from vulnerable people and community representatives are compared and contrasted against those of service providers where relevant.

Psychological challenges

Impact of changed mobility on wellbeing

Vulnerable people described the disruption to travel in terms of direct impacts on their psychological wellbeing. They described feeling isolated, stranded, trapped, and frustrated at losing their independence. In this respect wellbeing was affected because the floods 'immobilised' people and prevented them from functioning in their usual ways. They expressed anxiety and fear of a changed environment and distress at not being able to access services or receive social support. Participants also expressed feeling a sense of social support from friends, relatives and neighbours and a 'coming together' of the community in a time of chaos. In this sense the floods were viewed as facilitating social cohesion. Many observed others trying to carry on with normal life despite their vulnerabilities:

Participant: "There is a woman with disability that lives two doors away from me and her path has a dip in it so it does flood almost all around her house, but she still gets out.
Interviewer:She does? How does she manage it?
Participant: Just with wellingtons [waterproof rubber boots]. *Fortitude. But the other thing is I think people do help each other more..." (Paul, community representative (flood warden- service provider)*

Information

Participants felt that information and warnings from different agencies had improved, enabling them to be more prepared to deal with the disruption caused by floods. This was facilitated by receiving timely information. A number of sources of information were mentioned, including the Environment Agency[2] (EA), local radio, and Flood Alliance members. On the other hand, participants felt that the information from the EA made the flood sound a lot worse than it was and it would have been better to have locality-specific information. They thought that this could be achieved by the EA communicating with local community volunteers at different locations in the flooded area.

"..the local authorities, they don't have enough knowledge about the local conditions, about what water's doing in an actual set of streets, and that's where you might come in, that you understand the water conditions better " (Robert, community volunteer)

Participants felt that a point of contact was important and underlined the role of word of mouth. For some, informal channels of communications seemed to fill the gap where there was perceived to be a lack of adequate formal communication. The flood action plan is a document that was drawn up in partnership with the Environment Agency, the local and county authorities and water utilities providers and rail operators. It aims to provide residents with information about the roles and responsibilities of the partners for maintaining

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[2] In the UK the EA is responsible for improving and protecting the environment which include managing the risk of flooding from main rivers, reservoirs, estuaries and the sea.

waterways, waste and drainage and what can be expected of them during a flood emergency. Some participants seemed uncertain about the flood action plan, who the official actors were and what their roles were. The internet was identified as one source of information and also a way of getting food delivered. However, one participant with impaired eyesight said that it would difficult to use a computer to seek information or shop.

A disparity seemed to exist between the viewpoint of service providers and the opinions of local people. Service providers believed that appropriate information was available both online and in paper format. The emergency planning team distributed flood preparation leaflets in a variety of languages and formats, including braille for people with limited vision, giving people information on emergency numbers and places of support in addition to ways in which they can prepare and protect their property from flood damage. Consequently, making people aware that this information is available may help overall wellbeing during periods of flooding. Delivering this information through face-to-face contact may also positively impact wellbeing.

Physical challenges

The importance of buses

A key theme that emerged from the data is the importance of bus services for vulnerable people and how their absence created a real physical challenge which impaired their wellbeing. Residents did not feel that a good service was offered by bus companies. Bus services were viewed as being disrupted and this had direct negative consequences for vulnerable people's wellbeing, especially for those who needed to give care for relatives and or receive care from them:

"..it's been absolutely shocking. Dad rung me up and said..., because he's epileptic as well as other health issues ..and said, "Can you come over, I can't stop fitting." So I got to the top of the road, it was on a Thursday , I rang Stagecoach and they said all buses were running normally ... I checked the traffic then on Teletext, no problems. No buses from the Monday so I couldn't get to him." (*Cathy, carer for father who has long term illness*)

Elderly participants said they were very dependent on bus services (which were cancelled) to access shops for groceries and felt that the bus companies could have deployed minibuses (which unlike standard buses are more manoeuvrable and able to turn within a road width) to circumnavigate partially flooded roads:

"The whole thing is being cut-off with no bus service, I mean we are – and a few of us have just said "Why can't the council arrange a minibus service or something down as far as Norreys Avenue or something like that?" *(Carol, elderly, limited mobility)*

Local bus operators voiced the importance of maintaining routes and services such as the Oxford Park and Ride service to make sure people were able to carry on with their everyday lives during floods. They reported that they had flood contingency plans that aimed to maintain a bus service as close as possible to the normal timetabled routes. They said that if a route had to be closed a different route would be used. Overall, they claimed that bus operations were as good as they could be during times of floods, with direct communication occurring between different bus operators and with the local council. The need to

improve temporary transport operations which would help keep people mobile during the floods in times of floods was raised by a local councillor:

"That's one of the things to put on the agenda for next time around because it is now pretty clear that if we do get a closure on the Abingdon Road or the Botley Road again it would be sensible to have some kind of bus shuttle service, taxi service or whatever, for those areas. So that's on the list of actions for the next time around" (Local Councillor, Oxford City Council)

Service providers also recognise how minor changes to bus services operating during floods may inhibit elderly or mobility impaired people from using buses. For example, the inability of buses to be lowered[3] during floods may make it difficult for people to board the bus, exemplifying how very small changes to bus operations prevent people from using them.

Dependence on walking

For elderly people and those with mobility impairment, or people with push chairs and young children, walking was viewed as more difficult in a number of ways. Participants with mobility or health problems said that it was exhausting to wade through water. This situation was exacerbated by having to make several repeat journeys to shops because it was not possible to carry heavy loads whilst walking. Consequently the floods slowed things down and much more time was needed for routine journeys.

"Now, that generates real problems for people like myself because, although I'm, thank God, able to walk into town without too much difficulty, although, you know, it's a bit of an effort but I can do it, and do my shopping, there is no way I can carry my groceries and myself back on my own two feet, I just can't do it." (John, elderly, heart condition)

For many, the water was too deep to walk out in. Those that did walk out were fearful of falling or tripping over kerbs that can't be seen under the water and were concerned that poor road surfaces were a trip hazard. Many participants spoke of the importance of having suitable footwear such as Wellingtons in order to venture outside.

"I have to wear big wellingtons so it takes a lot longer to get anywhere, you can't drive – your car's in there but we get cut-off. ..[..] So I think time, allowing time, getting yourself organised, completely changing your routine to the point where everything takes probably four times longer." (Eve, elderly, community volunteer)

Accessing goods and services

The disruption of transport meant that many participants could not access shops or food. Participants spoke of the importance of being prepared and having a deep freeze to keep a supply of food. Whilst some people were offered deliveries of food, some could not get to a bank to get money to purchase it.

"There are two shops at the bottom, you couldn't get to them the water was too deep. It even came above your wellingtons, so that was that. To go up to the Tesco's at Speedwell Street was too far to walk. I've got artificial knees as well as being blind. I've got a handicapped son, he's next door" (Mary, elderly, mobility and visually impaired)

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[3] Some city buses are equipped with height adjustable air suspensions known as "low-floor" or "kneeling buses", allowing the floor to be lowered when the bus is stopped.

The emergency operations team at Oxford recognise accessing goods and services as an issue during floods and reported that they work continuously around the year to help people prepare for floods. However, there were clearly gaps in vulnerable people's access to public services. Many of the residents could not get medicine prescriptions, had to cancel healthcare appointments or could not attend day care centres, creating extra pressure for one parent who had visual impairment and poor mobility and looked after an adult child who had learning difficulties.

"My son's got learning difficulties and he goes to a day centre two days a week and then he's got a little therapy job the other three. Now he couldn't get to either because of the buses, you see." (Mary, elderly, mobility and visually impaired).

Participants reliant on home care visits said that carers had struggled to get to them. This suggests a very real and direct impact on people's health and wellbeing caused by the floods. The importance of maintaining home visits by nurses and social workers was recognised by all service providers.

"Maintaining home visits by health and care workers during floods prevent situations from going from routine to high emergency priority situations where the emergency services need to get involved. That's where I come in" (Emergency Operations, Social Services)

"It is one thing, not being able to access services or go to the supermarket, but it is a completely different circumstance if emergency help or health or social workers can't make house calls" (Local Councillor, Oxford City Council)

Consequently, the Emergency Operations Centre at Oxford Council reported deploying 4x4 vehicles so that home visits and vulnerable people could be accessed without the need to contact the emergency services for help.

"*So when travel becomes really difficult and we can't guarantee that normal vehicles can get in and out we then send in transportation (4x4 vehicles) to shuttle people back and forth and appropriately trained people were taken in so that they could assist. We also deploy teams to knock on doors and in extreme situations, open a centre so that people could be taken to it" (Emergency Operation Team, Oxford Council)*

Social challenges

Identifying vulnerable people

Participants who had acted as voluntary flood wardens said that it was the role of the flood warden to identify and log who was vulnerable in the community. Participants suggested that vulnerable people needed to be identified in a more formal way so that this not reliant on informal networks. It was also recognised that it was a challenge to find volunteers. Some participants commented that changes in community profile - people moving out, multi-occupancy and short-term occupancy – meant that it was harder to identify vulnerable people.

"I only know about 50% of them now because we've got a lot of multi-occupancy houses and houses that are rented privately for up to a maximum of two years, so we've got people coming in and going all the time." (Eve, elderly, community volunteer)

This opinion was not shared by all: one flood warden believed that community links within areas in Oxford are very strong, with some communities still being small enough to be self-sufficient in identifying those who may need help.

"Being quite a small community I think we would know who the vulnerable people were without necessarily having to compile a list or do any sort of formal identification of those people, do you see what I mean?....local knowledge is key" (Flood warden, Oxford Flood Alliance)

The importance and strength of sense of community was also shared by the police as well as other service providers. During times of crisis, communities were seen to pull together and help each other long before the emergency services arrived to help. In this sense, community resilience helped shape and coordinate plans in flood preparedness, mitigation and recovery. However, the strength of community action was shown to vary from area to area as some participants said that there was no flood warden in their locality as it doesn't flood but this did not take into account the need to be able to travel in the flooded areas.

"Our involvement was, that we started to coordinate what we were doing with their efforts, with the military and the other agencies, along with what the local community had done themselves. The local community had done it through their parish council, through their own knowledge of each other, getting together and saying, well, we need to do this, because at the moment there's nobody else here helping us, we need to help ourselves. So they did." (Assistant Constable, Oxford Police)

Social support

Many vulnerable people depended on social support from family and friends. If the family member lived some distance away, the floods disrupted this social support, leading to feelings of isolation, anxiety and fear which negatively impacted wellbeing.

"Mainly my dad lives in [area in Oxford] so where there was no buses running for a week at a time I couldn't get over there to him which is why, three months ago, once the rain sort of broke, he got the first available bus and he's stayed here ever since. He's too scared to go home." (Cathy, carer for father who has long term illness)

Support from families and friends was viewed as more important than that of social service support. Participants acknowledged the importance of neighbourliness and knocking on the door to check on vulnerable people.

"All of them kept coming over. "Are you sure there's nothing you need from the shop? Are you alright? Let us know if you need anything." They are very, very good neighbours." (Sally, elderly, impaired mobility)

It was clear that there was an active network of people who identified vulnerable people and ensured that they were looked after when their own relatives, friends or carers could not travel to them because of the floods:

"We've got tenants here who rely on their families and their families had to go really around the houses to come and deliver the groceries or whatever they'd done for their mother or father. But luckily I was able to – I put my walking shoes on, borrowed a shopping trolley from somebody, and I said to a few of the tenants – those that I know are really stuck – "Right, I'll go and get your bread and milk", and that's what I did. I came back in the taxi." (Carol, elderly, limited mobility)

Discussion

The 'balance' between an individual's resources and the challenges they face is changed during floods, leading to both negative and positive impacts on wellbeing. Vulnerable participants lacked the physical

resources to access food, money, health care and social support and in this respect this had a negative impact on wellbeing, whilst the neighbourliness shown by people helped restore some of the balance in terms of providing social support. To restore wellbeing as quickly as possible the community and service providers need to address the physical, social and psychological challenges presented by floods.

Psychological and social challenges

Travel disruption caused by floods disrupts everyday life by immobilising some of the affected community and preventing face-to-face contact with existing social support networks and access to goods and services. This made some vulnerable people feel anxious and stranded, with clear impacts on wellbeing. The physical link between some carers and cared for people can be broken by floods and there needs to be a system to ensure that this is managed.

The impact on wellbeing caused by not being able to get to vulnerable relatives was also reported by Guiver (2011) in her research among flooded communities in Workington, a coastal town in the north west of England. She found that as the time to travel to participate in normal activities (such as going to work) increased because of the floods there was little time for social visits especially to vulnerable family members which people found very distressing.

Service providers felt they did all they could to keep this link alive, acknowledging the importance of maintaining everyday care visits by health professionals to prevent people's health deteriorating into an emergency situation. However, the informal care provided by relatives also needs to be considered. On the other hand, flooding enhanced some face to face contact and brought people together– so there is an uneven and contradictory picture of isolation and support.

Physical challenges

The physical challenges posed by floods affected people's wellbeing negatively. There was fear about walking and falling in flooded areas because of not being able to see the road surface or kerb. The policy implication of this is that highways authorities need to identify safe routes for people so that they can walk safely in flooded areas to access or provide social support or services. The importance of appropriate footwear such as wellingtons was repeatedly mentioned. It would be interesting to know how many vulnerable people did not attempt to walk because they did not have appropriate footwear.

Accessing groceries was a key issue for participants. Many were prepared for the impact of floods by stocking up food in their freezer. However, many participants needed to visit shops and, particularly for the elderly, this meant an exhausting long trip and often repeated trips to bring groceries home in stages because they could only carry a limited amount.

Implications for resources

Social support

Different areas in Oxford were shown to have varying levels of community cohesion, meaning that the same local support networks were not available in all areas of Oxford. The reliance on informal networks was perceived to be a concern especially in areas where the community was perceived to be frequently changing. This was also raised by some service providers who believed that communities can also be seen to pull in different directions. Consequently, more formal management of communities may help make community action more efficient.

Service provision

Food, banking and health services could be provided peripatetically to vulnerable residences in times of floods. This also underlines the importance of the local store or corner shop during flood events, although such services are increasingly under threat. Flexible and adaptive service provision has been observed in other parts of the UK that have been flooded. Guiver (op.cit) reported that agencies had acted quickly and the local superstore obtained emergency planning permission to erect a temporary store accessible to flooded communities and put on bus services between villages and the local store; similarly, temporary surgeries were set up and mobile banks were put into operation.

Information

The provision of information is important for people during stressful events because it can manage people's expectations and help allay their anxiety (Van Kessel et al, 2014). Information[4] was available for residents about preparing for a flood and stocking up food in the deep freeze, but none of the residents we spoke to mentioned this. Some residents believed that more should be done to make sure that this information is appropriately disseminated to the community. This would be of particular interest to the Emergency Planning Team at Oxford Council as they believe that these leaflets are well distributed and found in many homes. They are currently going directly to local parishes and flood affected areas and speaking to people to make sure that they have information available to them in a format which they can understand. It will be interesting to see if more people have this information to help alleviate the effects of floods on their lives in the future. The Emergency Planning Team also stated that emergency 4x4 vehicles could be deployed to help residents in times of need. However, residents may not know that this service is available and how in particular the local council could help.

Researchers who investigated the impact of the floods in Victoria 2011, Australia reported that participants relied on face-to-face contact for information and did not use newsletters, leaflets and posters as reported in other studies (Van Kessel et al, 2014). Information from local radio and agencies was perceived to be timely and appropriate, with the exception of information about bus services. This may be due to the improved organisation of the Emergency Operations Centre in Oxford Council which allows all service providers and emergency operators to remain in constant communication throughout times of flood. However, participants also felt that information should be locality specific and agencies should seek this information from local people to improve the accuracy of information especially with regard to water levels.

Public transport

Bus companies need to work in closer partnership with the local authority and should be more proactive and provide improved information that is accurate and timely. In addition, they could consider deploying smaller vehicles with shorter turning circles so that they can negotiate flooded roads more easily. The need for improved transport services and shuttle buses was recognised by a local Councillor in Oxford, who stated that this may be implemented in the future. As local bus companies such as Oxford Bus Company believe that their operations in times of floods are as efficient as possible, it would be interesting to see if more improvements could be reached by speaking directly to their customers.

The roles of stakeholders in supporting vulnerable people's needs are summarized in Figure 2 below.

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[4] https://www.oxfordshire.gov.uk/cms/sites/default/files/folders/documents/fireandpublicsafety/emergency/AreYouReadyBooklet.pdf.

[Figure 4 here]

Conclusions

The impacts of floods on mobility and wellbeing can be understood in terms of the social, psychological and physical challenges that people experience and the resources they have, or are provided with, to meet these challenges. Floods disrupt mobility and disrupt the ability of people to function in a way that supports their own wellbeing or that of others. These functions include care giving and social support; maintaining health through engaging with health services and being able to participate in normal subsistence activities such as grocery shopping.

Moreover, there seem to be strong responses both from individuals and the local authorities to the mobility needs of vulnerable people during floods. What seems to be missing is an equal response from the private sector in terms of the provision of transport services and goods. Better engagement with customers, improved information and more resilient services such as having a fleet of 4X4 vehicles would directly support vulnerable people who are highly dependent on their services. More needs to be done to make sure that communication and support networks are formalised to address the potential unevenness of informal networks.

Other research into floods in different geographic locations in the UK suggests that the public and private sector have provided peripatetic services during floods. More could be done to share this knowledge and help create more resilient services which support people's wellbeing.

Arguably, measuring the impact of potentially traumatic, extreme events on the wellbeing of vulnerable people should only be done qualitatively to acknowledge an individual's temperament and personality and how they interact with life circumstances. Whilst a quantitative approach may not be appropriate for exploring the impact of such events, our study and those of others suggest that there are key areas of questioning which could characterise the relationship between flood disrupted travel and wellbeing for individuals and characterise the actions of the public and private sector that influence this. For individuals, these include questions around information about transport, access to banking, groceries, healthcare and medicines; giving or receiving social support; and community networks. For service providers, similarly there are questions around information about transport services, provision of services to access banking, groceries, healthcare, medicines and social support; and engagement with the community; crowdsourcing and social media may help to address these information challenges (Haklay et al., 2014; Alexander, 2014). Exploring the actions and responses of individuals, private and public organisations will help elucidate gaps in service provision for vulnerable people and help explore how best to reduce the negative impacts of flood disrupted travel on their wellbeing.

We took a bottom up, qualitative approach to exploring the impact of floods on people's wellbeing and also sought information from key stakeholders to 'triangulate' our findings. Whilst the sample of vulnerable residents was small it was relatively homogenous and under these circumstances it has been argued that 12 interviews are sufficient to reach thematic saturation (Guest et al, 2006). The majority of the sample was old (and very old), and most were female. In the UK females live longer than males and account for nearly three out of every four people aged 90 and over (ONS, 2014).

Whilst Oxford has low levels of disadvantage and is situated in a country which is well resourced in terms of public services, it does flood repeatedly , and there are vulnerable people that are affected by this. Therefore, our approach is likely to be transferable to other communities that experience flooding and may help identify gaps in service provision. A potential weakness of our study was the lack of participants from the private

sector who, despite our attempts, proved difficult to engage with. In addition, in terms of transferability we believe that the key themes which emerged will be common to other communities as they address how floods affect everyday activities. However, Oxford is a city that has been repeatedly flooded in recent years and has developed and implemented plans to increase resilience. In this respect experiences of people in Oxford in future floods may be different to those of people in cities that experience floods of similar severity but less frequent, who, arguably, may experience more profound impacts on wellbeing.

Finally, our study has focused on the impacts of flood disrupted travel on wellbeing and has sought answers to how communities can adapt to such events to become more resilient. It has been argued, notably by Ribot (1995), that a focus on adaptation to the consequences of climate change masks questions about the causes of vulnerability. Further research is needed to understand why people become vulnerable to the consequences of floods and to describe the interplay of political, economic, social and environmental factors with a view to preventing these hazards and their impacts occurring.

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