



Public Health
England

Protecting and improving the nation's health

The English National Study for Flooding and Health: First year report

Briefing for policy makers and
practitioners

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health, and are a distinct delivery organisation with operational autonomy to advise and support government, local authorities and the NHS in a professionally independent manner.

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Background

The storms of winter 2013-14 brought the wettest winter to England in 250 years. From December 2013 through to February 2014, a series of twelve major storms caused record levels of rainfall, river flows, sea levels and wave heights and communities faced widespread flooding. Approximately 11,000 properties were flooded from December 2013 to May 2014 and 155 severe flood warnings (severe flooding, danger to life) were issued.

Floods are one of the most common environmental emergencies and have significant health impacts. Short term health impacts are usually due to injuries, infections, exposure to chemical hazards and disruption to health services; the longer term effects are less well understood and may arise from the impact of damage to homes, loss of domestic utilities, having to move out until the home is habitable, and delayed recovery. The population at risk of exposure to flooding is expected to increase over time as a result of changes in population size, land-use and climate.

Why this study was carried out

Although a number of studies have described the health impacts of flooding using qualitative methods or cross-sectional surveys in the first months after a flooding event, there is very limited evidence available to help us understand the scale, intensity or duration of these impacts. Better information is needed to support those affected and to inform decisions about services and interventions before, during and after a flood.

Following careful consideration and discussion with stakeholders, Public Health England established the National Study of Flooding and Health, supported by the National Institute for Health Research Health Protection Research Units in **Environmental Change and Health, Emergency Preparedness and Response** and **Evaluation of Interventions**.

The aims of the study were to investigate the medium and longer term impact of flooding on health and wellbeing among affected communities, to help inform preventive and follow up actions and to reduce harm from future floods. The survey will be repeated with the same participants on an annual basis for some years, in order to better understand the duration of impacts of flooding on health and wellbeing. We also intend to manage this as an open cohort, so that more participants may be recruited from future flood events, as was the case following the floods in Cumbria in December 2015. If we are able to do this, this may enable us to explore the impacts of flooding in

different contexts, increase statistical power to examine the risk of rarer health outcomes, and mitigate against loss to follow-up.

The full report describes the findings from the first year's data collection; this document is a shortened version for the benefit of policy makers and practitioners.

What methods the study used

We established a study to follow over time, the impact of the winter 2013/14 floods on mental health outcomes of a sample of adults in the south of England. We conducted an analysis of the data collected approximately one year after the floods. Data collected in subsequent years will be analysed and reported in future.

Invitations to participate in the study were sent to a total of 8761 addresses in postcodes in six local authority areas (Gloucestershire, Wiltshire and Surrey, Sedgemoor, South Somerset and Tonbridge and Malling) where at least one house was known to have been flooded between Dec 1st 2013 and Mar 31st 2014. These areas were chosen as they were known to have been affected by the floods and had information available on which postcodes had been affected. The invitations were posted in January 2015.

The invitation included a cover letter, information sheet for participants with information about the study, a consent form, a paper questionnaire and a postage paid return envelope. The possibility of completing the questionnaire online was offered. The questionnaire included questions on whether flood water entered the respondents home, various types of disruption as a result of flooding, validated sets of questions to assess mental health outcomes (probable depression, anxiety and post-traumatic stress disorder (PTSD) symptoms), and some questions on sociodemographic information.

A total of 2126 adults living in 2014 unique households responded (23% response rate). Based on their responses, participants were allocated to one of three categories:

- flooded (reported floodwater in at least one of the liveable rooms of their home)
- disrupted (reported no floodwater in liveable rooms of their home but reported at least one disruption including loss of utilities, loss of access to services, evacuation, or flooding of non-liveable parts of their home)
- unaffected (reported no flooding or disruption to their lives from flooding in their area)

We calculated the percentage of the total number of respondents in each category with each mental health outcome. The associations between all the different types of

flooding and disruption measured and the mental health outcomes were estimated using standard statistical methods. These methods accounted for other possible explanations unrelated to the flood (such as differences in age, sex, income between the different groups) that could otherwise explain the impacts we observed.

What the main findings were

1. **The percentage of people with probable depression, anxiety or PTSD was highest amongst people whose homes were flooded, and the risk of having these mental health issues was approximately six times higher in this group than in those who were unaffected by flooding** (see Annex 1).
2. **The percentage of people with probable depression, anxiety or PTSD was also elevated amongst those who did not have floodwater in the liveable part of their homes, but whose lives were otherwise disrupted by the flood**, although not to the same extent (Annex 1).
3. **Amongst those whose homes were flooded, the risk of poor mental health outcomes was greater the deeper the floodwater**. For instance, those in the flooded group who reported floodwater depth of >100cm, the risk of probable depression was approximately 15 times greater than the unaffected group.
4. **The risk of poor mental health outcomes was greater amongst those whose homes were flooded for more than 24 hours compared to those who were flooded for less than 24 hours**. The risk did not increase further for those whose homes were flooded for periods beyond 7 days, but remained around the same.
5. **Amongst those who were flooded, evacuation** (ie leaving home in advance of, or at the onset of flooding) **further increased the risk of probable anxiety and PTSD**, above that observed in those flooded but not evacuated. Amongst those whose homes were not flooded, evacuation did not increase the risk.
6. **Amongst those whose homes were flooded, experiencing disruption to certain services further increased the risk** of some mental health outcomes in those who usually accessed those services. Losing a **utility** resulted in increased risk of probable anxiety and PTSD. Losing access to **health and social care services**, or access to **other activities** (eg shopping, social activities) resulted in an increased risk of probable PTSD.
7. **Amongst those whose homes were not flooded, but whose lives were still disrupted by the flood, losing access to health and social care services (if**

such services were required) further increased the risk of probable depression and anxiety. A similar, but slightly smaller effect was seen for loss of access to work/education and other activities.

- 8. Seeking help from any source during the first year post-flooding was increased amongst those whose homes were flooded or whose lives were disrupted** by the flood compared to those unaffected by flooding. This was particularly for help-seeking from **general practice, friends and family and the voluntary sector**. Some (though not all) of the help-seeking was likely to have been prompted by probable depression, anxiety or PTSD.

What these findings mean for policy and practice

- 1. Commissioners and providers of primary care, community services and mental health services and emergency planners should plan for an increased need for services in areas affected, or likely to be affected, by flooding.** Poor mental health is already recognised to be an important health problem in many communities; flooding is likely to exacerbate this challenge. The levels of poor mental health among people whose homes were flooded were strikingly high at one year following the event, with a smaller but still increased risk in those whose homes were not flooded but whose lives were nevertheless disrupted.
- 2. Health care practitioners should be alert to the potential for poor mental health amongst people whose homes have been flooded, as well as those whose lives have been disrupted by flooding.** Levels of depression and PTSD amongst people whose homes were flooded were high and comparable to those among members of the public involved in major incidents. National Institute for Health and Care Excellence (NICE) guidelines for the management of PTSD which are currently under revision, recommend that practitioners take opportunities for identification and management of PTSD in routine health care contacts.
- 3. Pilot studies of proactive approaches to identify and support those with poor mental health outcomes could be considered in future major flood events.** The NICE PTSD guidance recommends that consideration be given to proactive screening of victims for mental health disorder at around four weeks after major disasters, followed by referral for appropriate evidence-based treatment where required. While flooding is not explicitly referred to in this guidance, the high rates of disorder in this study may suggest that proactive approaches to identify people whose health may be suffering as a result of flooding could be valuable. These might

include an evidence-based psychoeducation leaflet to all those affected by flooding and/or a link for on-line self-screening and automated encouragement to seek help when screening results are positive, but there is little evidence to indicate which approach would be most suitable following flooding.

4. **Limiting ingress of water when a home is flooded may help reduce mental health impacts on the occupants, as well as the more obvious damage limitation to the home.** Increased depth of flood water, loss of a utility, more than 24 hours of flood water in the home and evacuation were associated with a higher risk of poor mental health outcomes, and may serve as useful markers to help identify and support people at risk post flooding.
5. **Individuals who regularly use health and social care services should be rapidly identified and reinstatement of these services prioritised.** Disruption to health and social care services increased the risk further of poor mental health outcomes in those who usually use these services and were flooded and/or disrupted by the event.
6. **Reinstating access to work and education as quickly as possible may reduce mental health impacts, as well as supporting community recovery in general.** Amongst those disrupted by the flood, but who did not have floodwater in their homes, disruption to work and education was a more important predictor of poor mental health outcomes than amongst those whose homes were flooded, possibly because they were not already dealing with the stress of damage to the home.
7. **Commissioners and service providers should plan for how an increased demand for support for those flooded and disrupted can be met and sustained. As at least some of this is likely to be prompted by mental health need, emphasis should be placed on minimising mental health impacts in flood management and recovery strategies.** The increase in help-seeking, particularly from general practice, friends/family and the voluntary sector, amongst those with floodwater in their homes and those otherwise disrupted indicates that there is increased demand on these sources of support following flooding.
8. **This study demonstrates that flooding and the mental health impacts it brings are not confined to less affluent groups; anyone can be affected.** Further work is needed to understand whether the impacts are different depending on the population and type of flooding, and to understand which interventions may be most beneficial to protect and improve health.

How confident we are of these findings

We are confident that these results are robust and representative of the impacts on mental health and wellbeing of the 2013-14 floods in these areas at the time of data collection. Our findings are consistent with other UK studies that have examined the mental health impact 3-6 months after flooding, and indicate that the impact is present at least one year later.

This was the most appropriate study design to answer our research question. However, as in all observational studies, there are a number of unavoidable limitations that we have minimised where possible.

We achieved a good response rate for this kind of study and the number of participants was sufficient to make obtaining these results by chance unlikely. We used statistical methods to account for the effect of chance and to provide estimates within a range of possible values. Our analyses enabled us to account for alternative explanations for the observed impacts, although we may not have identified all possible explanations.

Bias has been minimised by the selection of our unaffected comparison group from the same postcodes as our affected groups and by using standardised and validated outcome measurement tools. We used three widely-used, brief questionnaires to assess whether someone probably had anxiety, depression or post-traumatic stress disorder. Although only a physician can formally diagnose someone as suffering from one of these disorders, previous studies have demonstrated that the questionnaires perform well in differentiating between people who do and do not have a diagnosis of anxiety, depression or PTSD. We are therefore confident that we accurately detected most cases of these three disorders within our sample.

Some effect of bias could remain that could lead to over or underestimates of effect. For example, we may not have had responses from all those who were flooded or disrupted because people may have still been living away from their home address. Our unaffected group may still have been affected in a way we have not identified through proximity. Both would lead to underestimates of the impact.

The estimates are valid for the specific floods and population studied. However, the areas affected were generally more affluent than other parts of the country, and participants were more likely to be home owners, white, female and of an older age group, and less likely to have a long-term life-limiting illness than the England average. The impacts on mental health and wellbeing may have been different in a population with different characteristics.

The flooding in these areas was largely related to river flooding over a period of several weeks; whether similar impacts would be observed after rapid catchment or coastal flooding is also not known. Caution is therefore needed in extrapolating these results to other contexts.

What are the next steps

These initial findings extend our knowledge about the health impacts of flooding to inform policy and practice, but the full value of this study will only be realised as further work is undertaken. This includes further analysis of the data already collected and repeat data collection from participants in subsequent years.

We hope to take opportunities to examine impacts in different contexts, strengthen the study further, and pursue opportunities to answer other important questions. The study may also provide a valuable opportunity to measure the health or societal costs of flooding and the wider disruption it causes, and to inform decisions regarding flood defences and other protective measures. Standardised approaches to identifying households affected by floods would further enable future studies.

Conclusions

The aims of the English National Flooding and Health study are to investigate the medium and longer term impact of flooding and flooding-related disruption on mental health and wellbeing, and provide a cohort to support future studies in this area. We anticipate this will help direct preventive and follow up actions and to reduce harm from future floods. The full report describes the findings from analysis of this first year's data collection; this document is a shortened version for the benefit of policy makers and practitioners.

Findings include high levels of probable depression, anxiety and PTSD amongst those who had floodwater in their homes, but elevated levels in those whose homes were not flooded, but whose lives were otherwise disrupted. Amongst those whose homes were flooded a number of factors, which may reflect severity of flooding, were associated with a higher risk of poor mental health outcomes. Disruption to health and social care services increased the risk further of poor mental health outcomes for those who usually use these services and either had floodwater in their homes, or were not flooded directly, but were still disrupted by the event.

This study has implications for local authorities, the NHS and other health service commissioners and providers in responding to need, and will be of interest to those making decisions regarding investment in flood defences and other protective measures.

Further research is needed to fully understand the health impacts of flooding to best support those affected and to take better decisions about interventions before, during and after a flood which will help protect and improve health and wellbeing.

Sources of further information

1. Flooding: health and mental health guidance and advice:
<https://www.gov.uk/government/collections/flooding-health-guidance-and-advice>
2. NICE guidance. Post-traumatic stress disorder: management
<https://www.nice.org.uk/guidance/cg26>
3. WHO Guidance on Psychological First Aid:
http://www.who.int/mental_health/publications/guide_field_workers/en/

Annex 1 Mental health outcomes by exposure group

Outcome	Participants ¹	Prevalence ²	aOR ³	(95% CI) ⁴
Probable depression				
Unaffected	278	5.8%	n/a	-
Disrupted	1058	9.6%	1.56	(0.88-2.76)
Flooded	593	20.1%	5.91	(3.17-10.99)
Probable Anxiety				
Unaffected	278	6.5%	n/a	-
Disrupted	1052	10.7%	1.61	(0.94-2.77)
Flooded	597	28.3%	6.50	(3.77-11.24)
Probable PTSD				
Unaffected	278	7.9%	n/a	-
Disrupted	1056	15.2%	2.06	(1.27-3.35)
Flooded	591	36.2%	7.19	(4.33-11.93)

¹ **Participants:** numbers in this column vary, as some participants did not answer every question.

² **Prevalence:** the percentage of people with the outcome in each exposure group (unaffected, disrupted and flooded) at the time the data was collected. For example, 36.2% of 591 people who were flooded had probable PTSD.

³ **Adjusted odds ratio:** an estimate of the risk of an outcome in the flooded or disrupted group compared to the risk in the unaffected group, after accounting for alternative explanations for the differences, such as age, sex, pre-existing illness, deprivation, local authority, ethnicity, marital, education and employment status. For example, the risk (odds) of having probable PTSD was estimated to be 7.19 times higher amongst those who were flooded compared with those who were unaffected.

⁴ **95% Confidence Interval:** a measure to describe the uncertainty around an estimate, in this case the adjusted odds ratio. For example, the true risk (odds) of PTSD was 95% likely to be between 4.33 and 11.93 times higher in the flooded population compared to the unaffected population.