

Building Public Health Resilience to Fluvial Flooding in Scotland

Dr Rhian Thomas¹ & Dr Claire Niedzwiedz²

¹School of Geographical & Earth Sciences (Rhian.Thomas@glasgow.ac.uk); ²School of Health & Wellbeing (Claire.Niedzwiedz@glasgow.ac.uk); University of Glasgow

1 Background

Climate change is increasing our exposure to fluvial flooding in Scotland. Scotland's climate has seen a warming trend, shifting rainfall patterns, more extreme weather events and rising sea levels (Figure 1). Projected changes for Scotland's climate include:

- warmer, drier summers;
 - milder, wetter winters;
 - increases in intense, heavy rainfall events in summer and winter
- These changes are happening faster than expected. Projected increases in intense heavy rainfall events will increase the risk of extensive and significant fluvial flooding in Scotland.

There is now clear evidence linking climate change to detrimental health impacts (WHO, 2021).

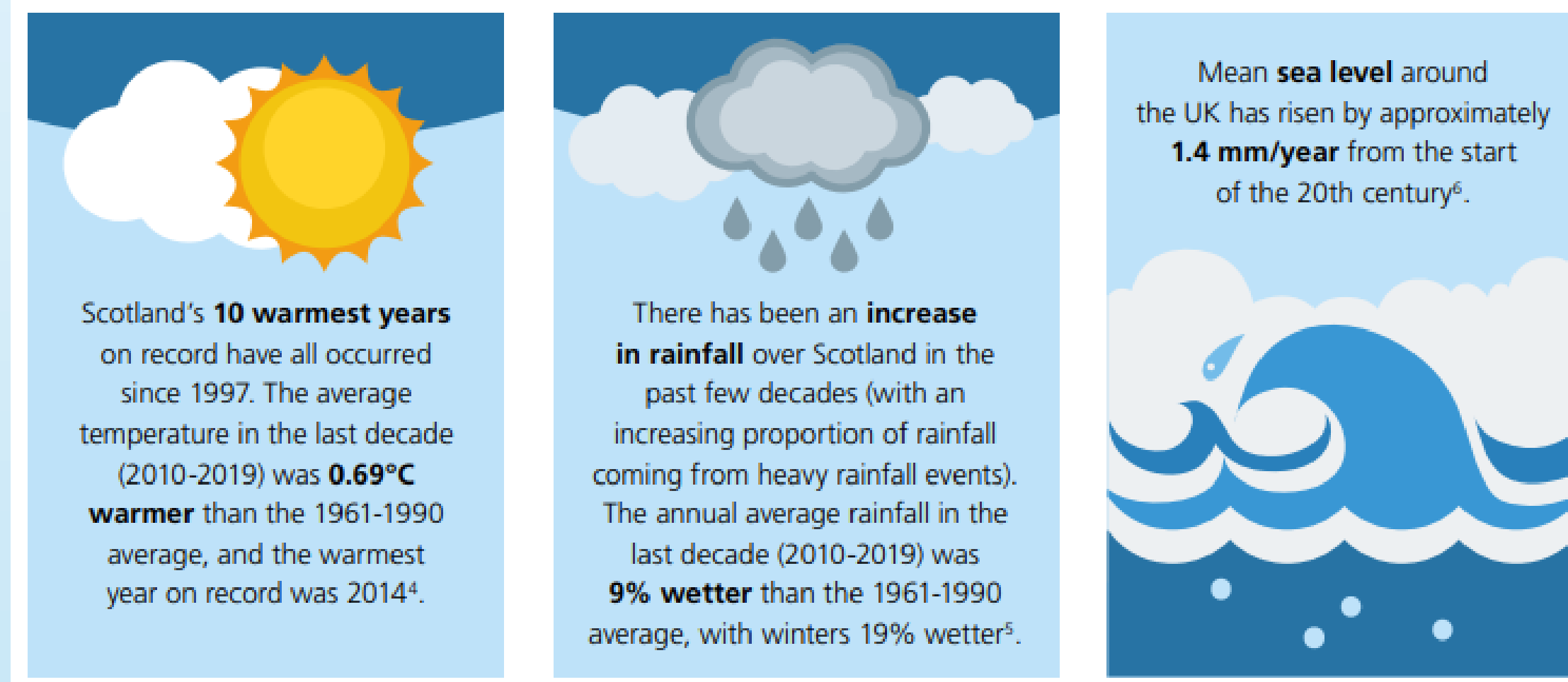


Figure 1. Adaptation Scotland: Climate Projections for Scotland Summary

2 Aims of CREW Science Policy fellowship:

To support evidence-based decisions by providing the opportunity for Scotland's research community to advocate for critical science that addresses upcoming water-related policy, regulatory and/or industry needs. This research supports the development of Scotland's first Flood Resilience Strategy.

3 Methods:

The research did this by synthesising existing literature and policies, via a rapid evidence assessment (REA) and a stakeholder workshop, identifying knowledge gaps, and providing future perspectives and recommendations to enhance individual and community health resilience to fluvial flooding.

4 What are the links between climate change and public health?

Physical (Box 1) and mental health (Box 2) are negatively impacted by flooding, with the greatest health impacts in the UK and Scotland seen for mental health. People who experience flooding are at higher risk of depression, anxiety and posttraumatic stress disorder. However, the longer term impacts of flooding on mental health have been less well described with limited evidence available to fully understand the impacts. **Secondary stressors** are factors indirectly associated with flooding that often have negative mental health consequences, but where potential action can be taken to reduce their impact (Box 3).

Box1 Physical Health Impacts of Flooding
<ul style="list-style-type: none"> Drowning Electrocution Water-borne pathogens or chemical and/or biological contaminants arising from floods Skin and gut infections from exposure to contaminated flood water Vector-borne and zoonotic disease including rodent-borne disease Respiratory disease from mould and damp Cardiovascular events Non-fatal injuries Risk of carbon monoxide poisoning in clean-up phase from inappropriate use of generators

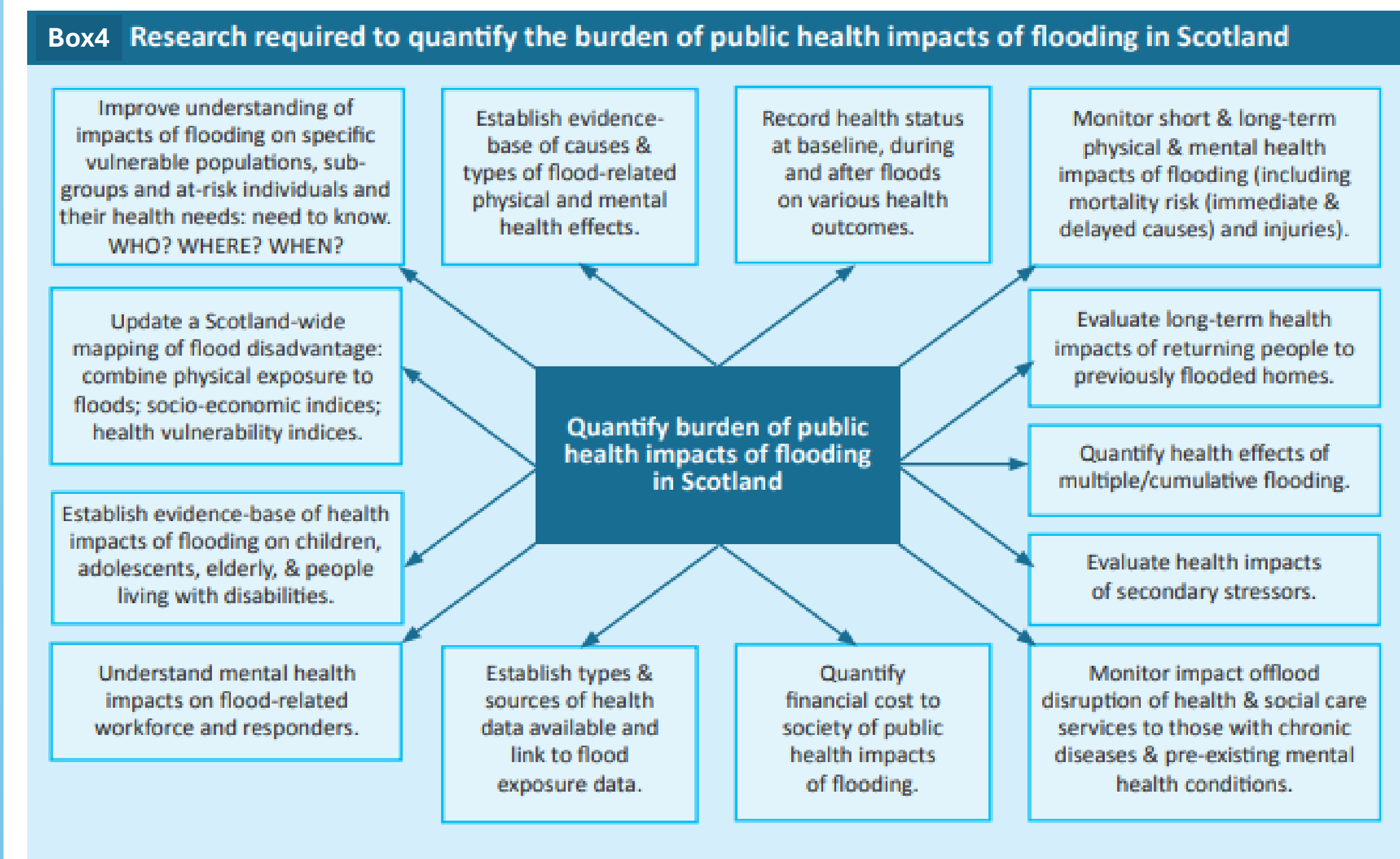
Box2 Mental Health Impacts of Flooding
<ul style="list-style-type: none"> Anxiety and stress-related disorders Mood disorders including depression Post-traumatic stress disorder (PTSD) Strained social relationships, domestic violence Sleep disturbances Helplessness Fear and grief Suicidal thoughts and behaviours Alcohol and substance use Increase in psychotropic medication use Decrease in sense of self and identity via loss of place and grief reactions Emerging concepts such as ecological grief, eco-anxiety, solastalgia Exacerbation of pre-existing mental disorders

6 Why should we care about this in Scotland?

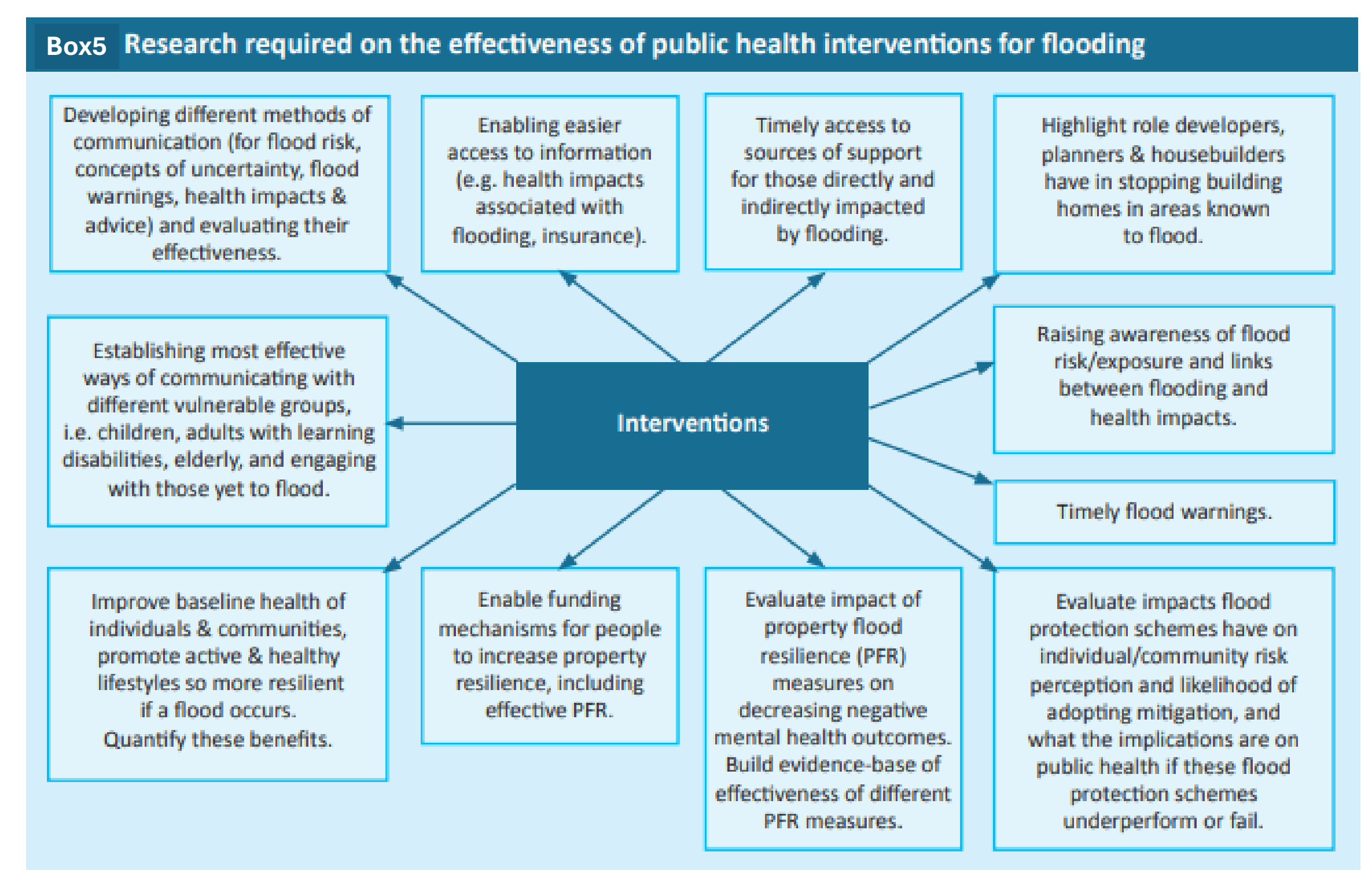
In Scotland certain groups – children, older people, those living alone, with pre-existing chronic illness or disability and stressful life circumstances, place-based occupations, low incomes, rural and remote areas – are all more vulnerable to flooding and to extremes of heat and cold.

Particular public health-related challenges exist for Scotland and certain factors make Scotland's population more vulnerable to the health impacts of climate change and flooding than other parts of the UK and Europe:

- Scotland's population is ageing; the proportion of the population of pensionable age is expected to increase from about 20% to 25% by 2033.
- Scotland also has areas of greater deprivation and the lowest life expectancy than the rest of the UK.
- Health is poorest in the most deprived areas, with a difference in life expectancy of 13.7 years between men living in the most and least deprived areas of Scotland.
- 98% of Scotland's landmass is classed as rural with a dispersed and ageing population.



Box3 Secondary Stressors
<ul style="list-style-type: none"> Lack of warning, not enough time to respond Greater flood water depth and duration Extent of flood damage Structural damage, costs of rebuilding or repair Uphaval, financial implications of clean-up Distress and financial implications of displacement or evacuation from home (temporary or permanent) Loss of domestic utilities Loss of/damage to possessions, sentimental items and burden on household costs Insurance-related issues e.g. dealing with insurance claims Disrupted access: employment, education, and wider facilities, health & social care services Separation from friends and family Feelings of loss of control and fear of recurrence of another extreme event Stress arising from exposure to media Damage to agriculture or livestock, leading to loss of food supplies



8 What Next?

ESRC-SGSSS-funded Interdisciplinary Steers PhD with Prof Hester Parr, School of Geographical & Earth Sciences, University of Glasgow 'Rain rain go away ... come back another day': Understanding Scotland's changing relationships between climate change and mental health. PhD candidate: Rhiannon Hawkins start date: Oct 2024.

5 Who is most vulnerable?

Climate change affects everyone, but not equally. Climate change heightens existing social and economic inequalities. Exposure to floods interacts with demographic, socio-economic and environmental factors, as well as access to and quality of health care, to affect the magnitude and pattern of risks. Some groups are at greater risk of health effects due to flooding than others (Figure 2).

Health	Socioeconomic	Demographic	Geographic	Sociopolitical	Occupational
Chronic diseases	Poverty, financial insecurity	Age (elderly, children, adolescents)	Remote and dispersed communities	Gender	Healthcare and frontline workers
Physical, sensory or cognitive disabilities	Precarious housing; transient communities	Sex	Water-stressed zones; areas prone to extreme weather events	Political instability	Place-based occupations
Pre-existing mental health conditions	Individuals exposed to abuse/violence	Ethnicity	Conflict zones	Displaced populations; migrants	Migrant workers; informal insecure work
Complex healthcare needs at home	Lack of education, poor literacy; language & cultural vulnerabilities	Indigenous status	Declining urban cities	Discriminated or socially-isolated groups	Self-employed

Figure 2: Factors influencing vulnerability and resilience to flooding.

7 What can Scotland do? - Key Findings of Policy Reviews:

- Useful Flood Risk Management strategies exist however most do not incorporate a public health perspective and have not been co-produced with public health experts
- Need to focus on health resilience measures alongside existing resilience measures
- Need to raise awareness of public health impacts of flooding
- Incorporate pre-existing vulnerabilities of individuals/communities in risk/resilience assessments
- Public health policies recognise flooding has a significant impact on health, particularly mental health, and on disadvantaged groups
- Need for further evidence and guidance for vulnerable groups (e.g. children, disabilities)
- Need for research on effective interventions

Findings from the REA of existing literature and policies, along with outputs from a stakeholder workshop (Figures 3 & 4) held with representatives from Scottish Government, Public Health Scotland, regulatory & industry delivery partners, wider stakeholder & knowledge brokers and academia, were synthesised to identify further research required to a) quantify the burden of public health impacts of flooding in Scotland (Box 4) and b) on the effectiveness of public health interventions for flooding (Box 5). Finally, a set of recommendations was produced (Figure 5).



Figure 3: Stakeholder Workshop February 2024

Figure 5: Recommendations

Recommendations

To enhance the overall resilience of communities:

- Establish a cross-sectoral flood and public health resilience working group.
- Incorporate a public health perspective within flood risk management plans, focus on health resilience alongside existing environmental, economic & property resilience.
- Increase awareness of public health impacts of fluvial flooding and factors that influence people's resilience through communications and engagement, tailored to different vulnerable groups.
- Promote measures to protect and ensure continuity of public health services and health & social care facilities during floods.
- Greater emphasis on preparedness measures and establishing long-term community-based support networks to assist with secondary stressors and increase capacity to respond.



Figure 4: Visual minutes from stakeholder workshop Feb 2024. Graphic artist: Jenny Capon