Photo: Jonathan Camper

Quantifying Health and Well-being Impacts of Flooding

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Budapest, 17 September 2025

GFP global flood partnership

GFZ Helmholtz Centre for Geosciences

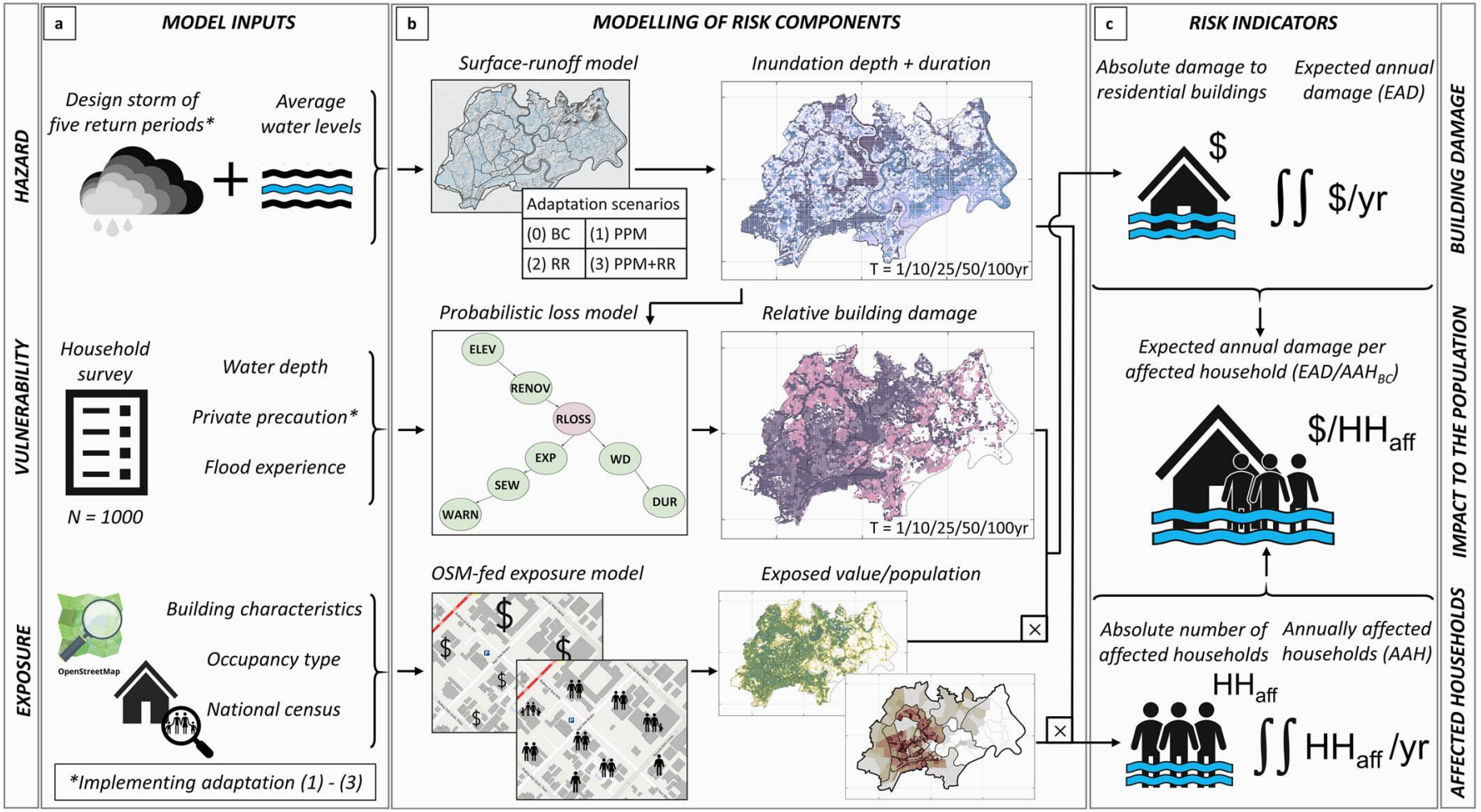
H-CLIF

Federal Ministry of Research, Technology and Space

HELMHOLTZ

Flood Risk Assessment

Case Study: Ho Chi Minh City, Vietnam



Scheiber et al. 2024 [3]

Towards more inclusive risk assessments

Causal understand drivers and processes influencing multiple dimensions of risk

Economic losses (e.g. Expected Annual Damage)

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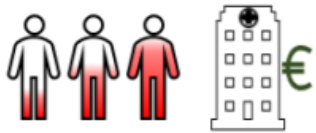


Health impact metrics
(e.g. DALY, healthcare expenses)

People-centric risk metrics

Adapted from Sairam et al. 2025

Case Study: Health burden of 2021 Floods in Germany

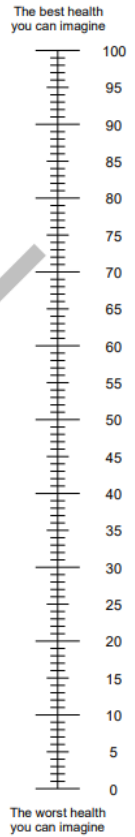
Hea oding

Data: Household survey pos cioeconomic and residential
building characteristics, flo event characteristics and
response, impact, recovery a

EQ-5D VAS	Please assess how go *Please use the slider f* 0----------1 Please rank your heal can imagine.
WHODAS 2.0	How many difficulties of your health proble The options are: Non Did you have any diff ... to stand for a longe ... To meet your budg ... learn new tasks (e.g ... participate in socia How much emotional ... to concentrate on s ... walk a longer dista ... wash your entire b

- We would like to know how good or bad your health is TODAY.
- This line is numbered from 0 to 100.
- 100 means the best health you can imagine.
  0 means the worst health you can imagine.
- Please mark an X on the line to show how your health is TODAY.
- Now, write the number you marked on the line in the box below.

YOUR HEALTH TODAY = ☐



ı can imagine and 0 = The worst health you

he last month, i.e. the last 4 weeks, because

specified

ies) in the same way as everyone else?

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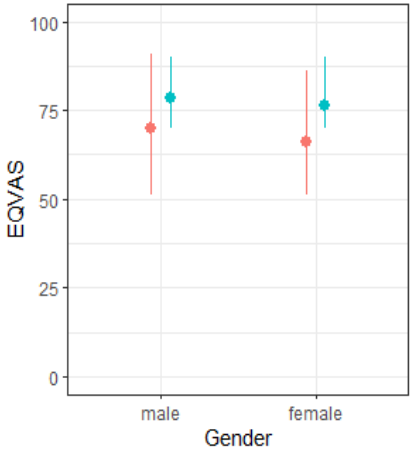
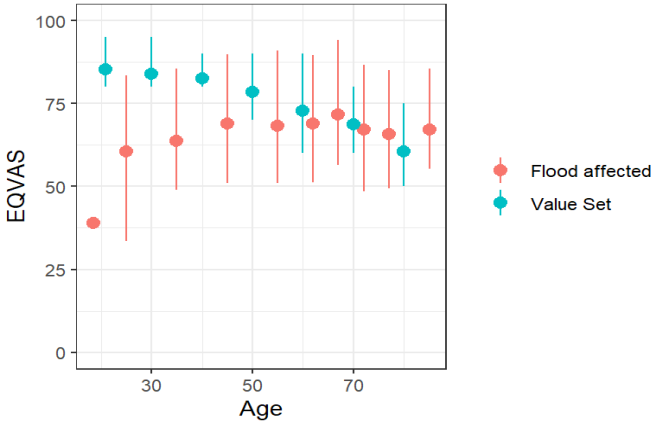
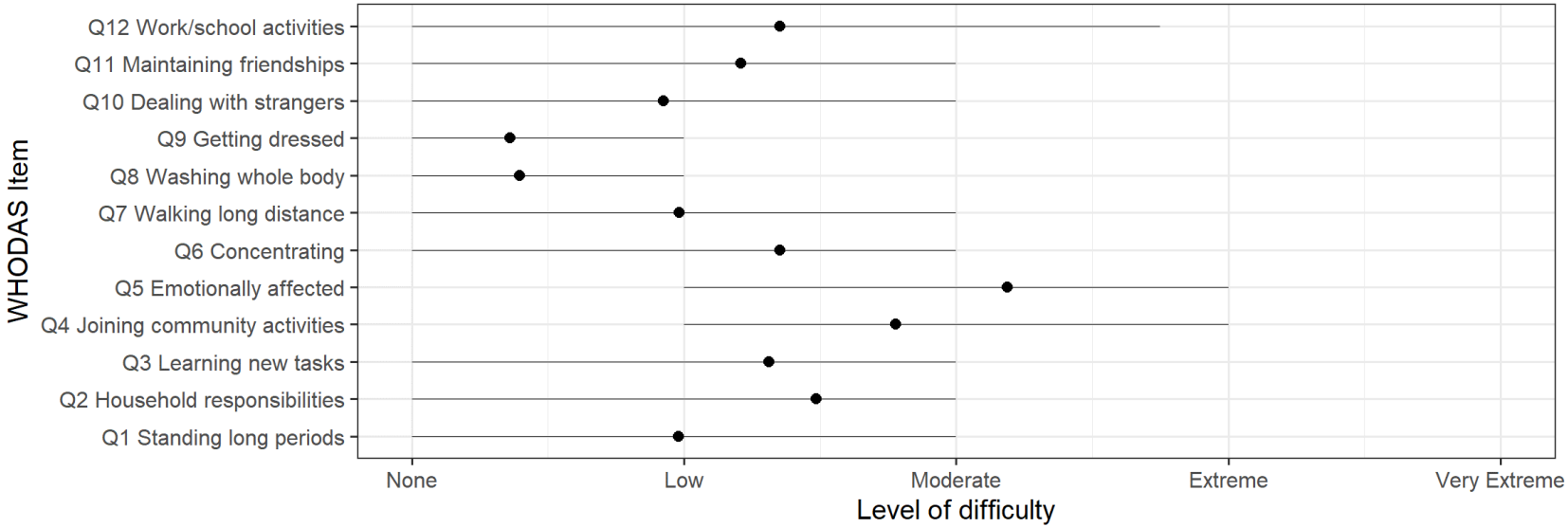
AVO

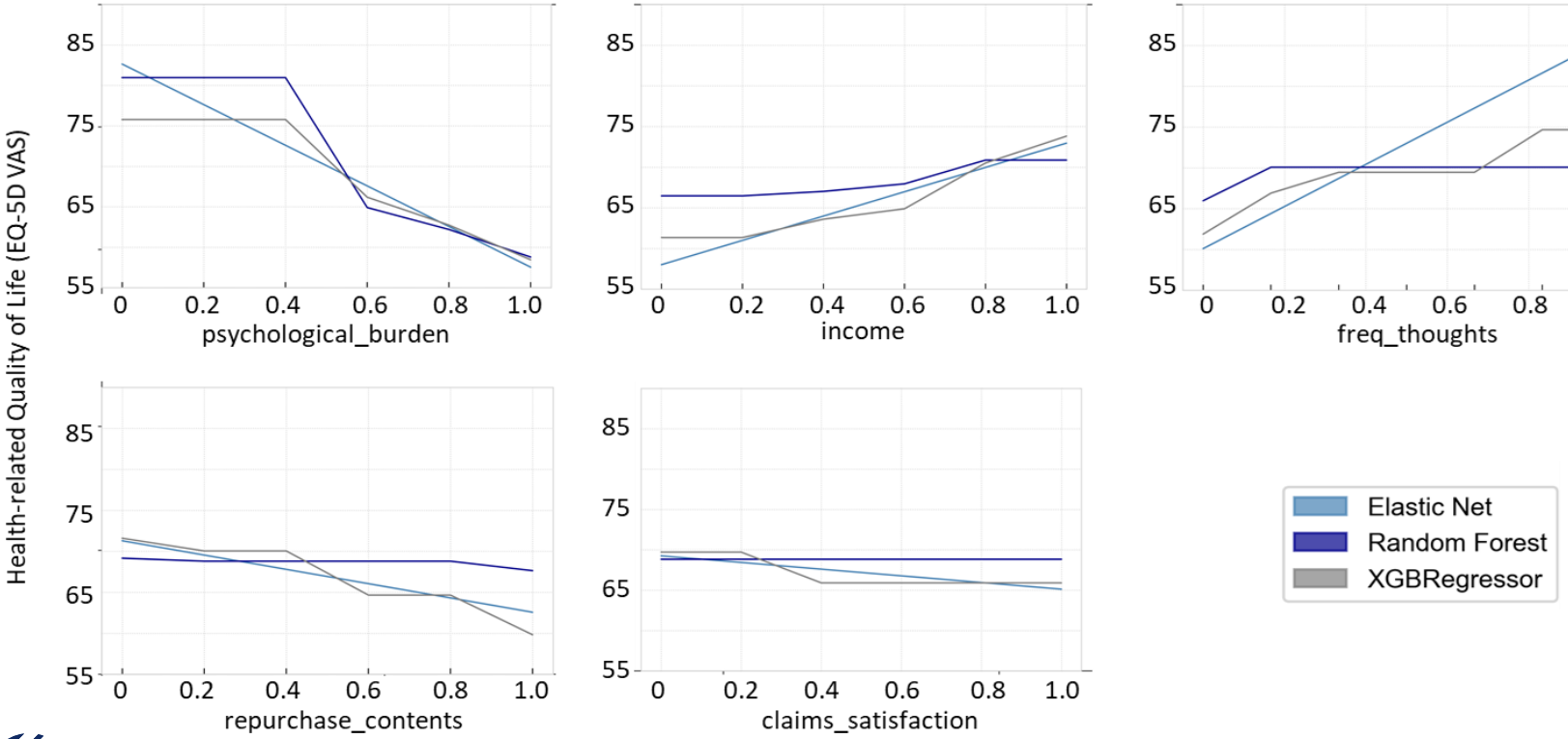
KLIMA ANPASSUNG HOCHWASSER RESILIENZ


100
75
50
25
0
EQVAS
male
female
Gender


100
75
50
25
0
EQVAS
30
50
70
Age
Flood affected
Value Set


WHODAS Item
Q12 Work/school activities
Q11 Maintaining friendships
Q10 Dealing with strangers
Q9 Getting dressed
Q8 Washing whole body
Q7 Walking long distance
Q6 Concentrating
Q5 Emotionally affected
Q4 Joining community activities
Q3 Learning new tasks
Q2 Household responsibilities
Q1 Standing long periods
None
Low
Moderate
Extreme
Very Extreme
Level of difficulty

Factors associated with health-related wellbeing in flood-affected populations



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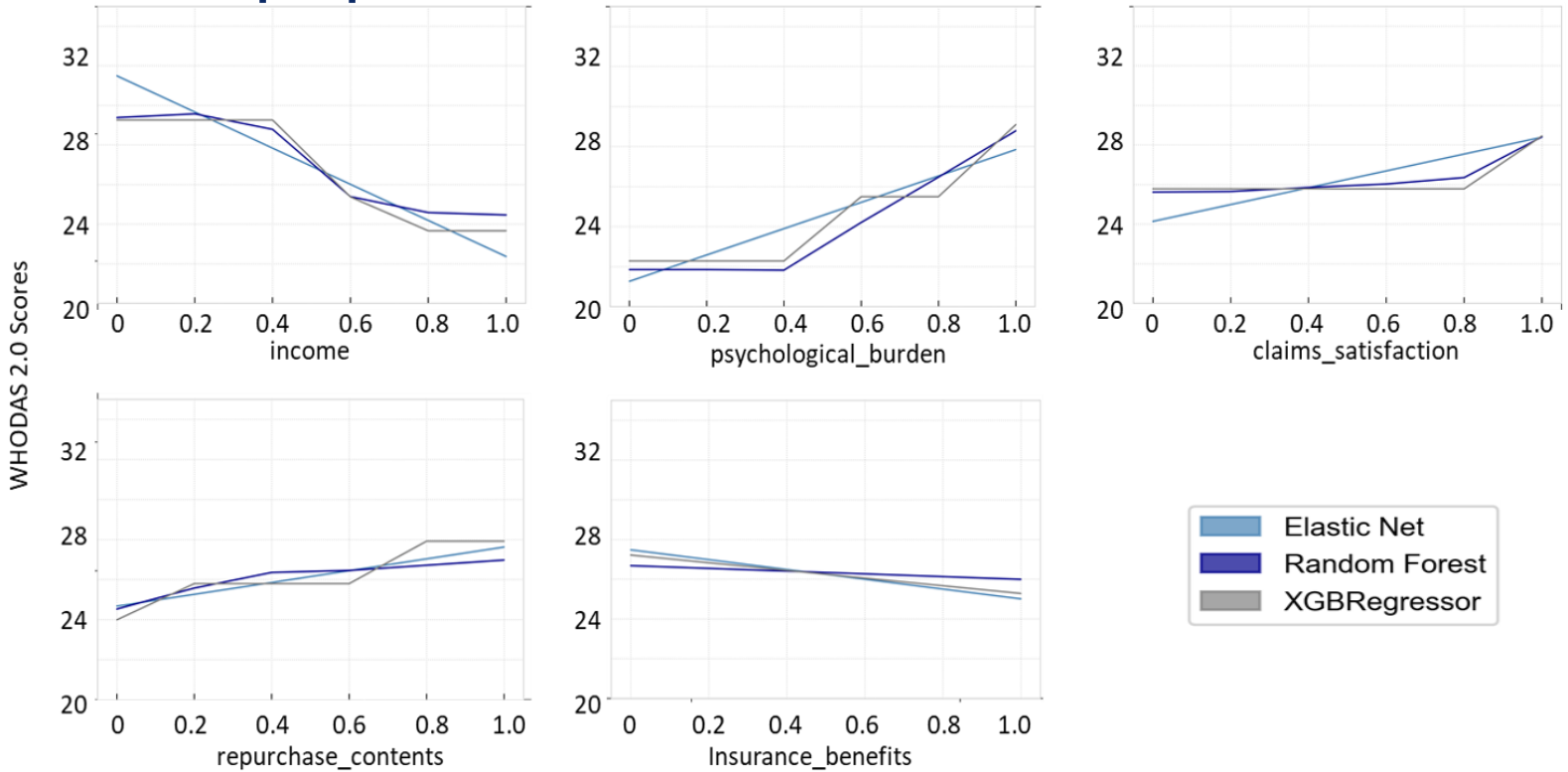
Factors associated with functionality in flood-affected populations



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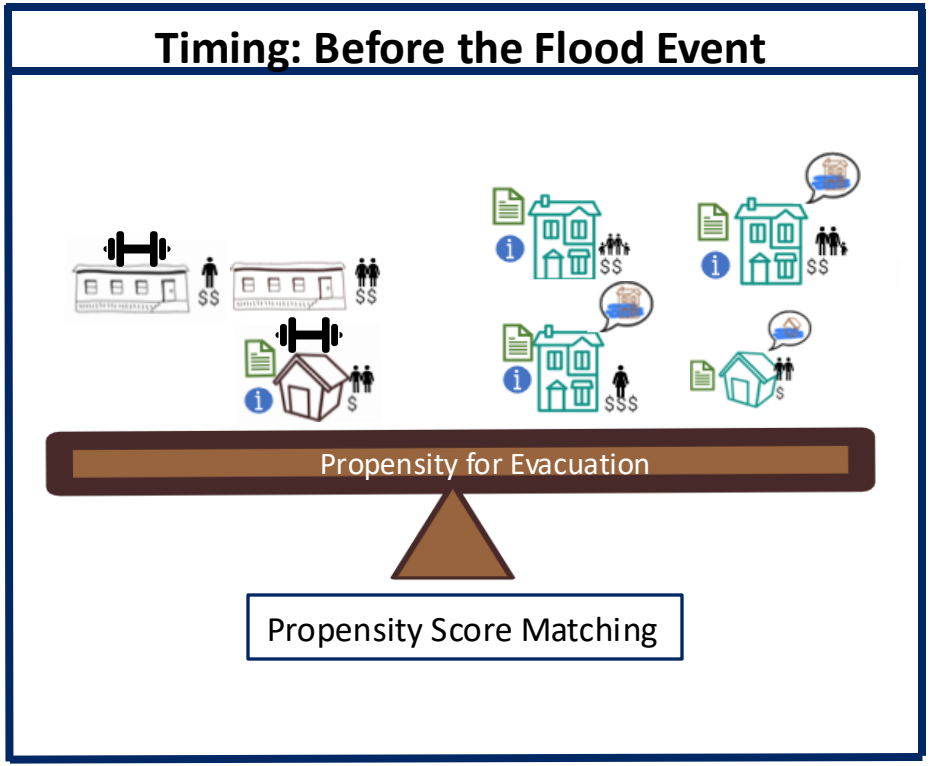
Evacuation and long-term psychological burden

Flood Response: Psychological Burden

Does timing of evacuation – before/during or after the onset of flooding have an effect on the **psychological burden of the flood-affected population**?

When were you evacuated?	Before/During the flood After the flood Not evacuated
How long until you could go back to your house after the flooding?	Days
Are you still burdened by the flood from 2021?	1 – no bother; 6 – weighs heavily

Confounders of Evacuation



Matching Distance:

Propensity Score: $$P(T_i = 1|X) = \frac{1}{(1 + e^{X_i\beta})}$$

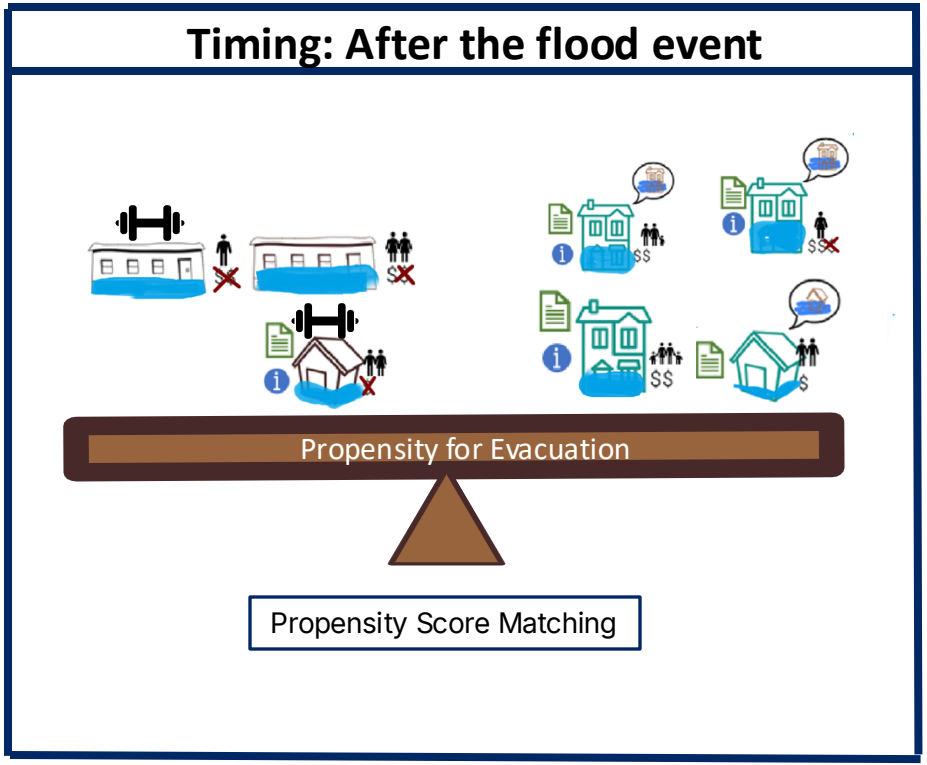
X indicates confounding variables of household i

β is the set of regression coefficients

Algorithms to eliminate bias:

(1) Nearest neighborhood
(2) Inverse probability treatment weighting
(3) Genetic matching algorithm

Confounders of Evacuation



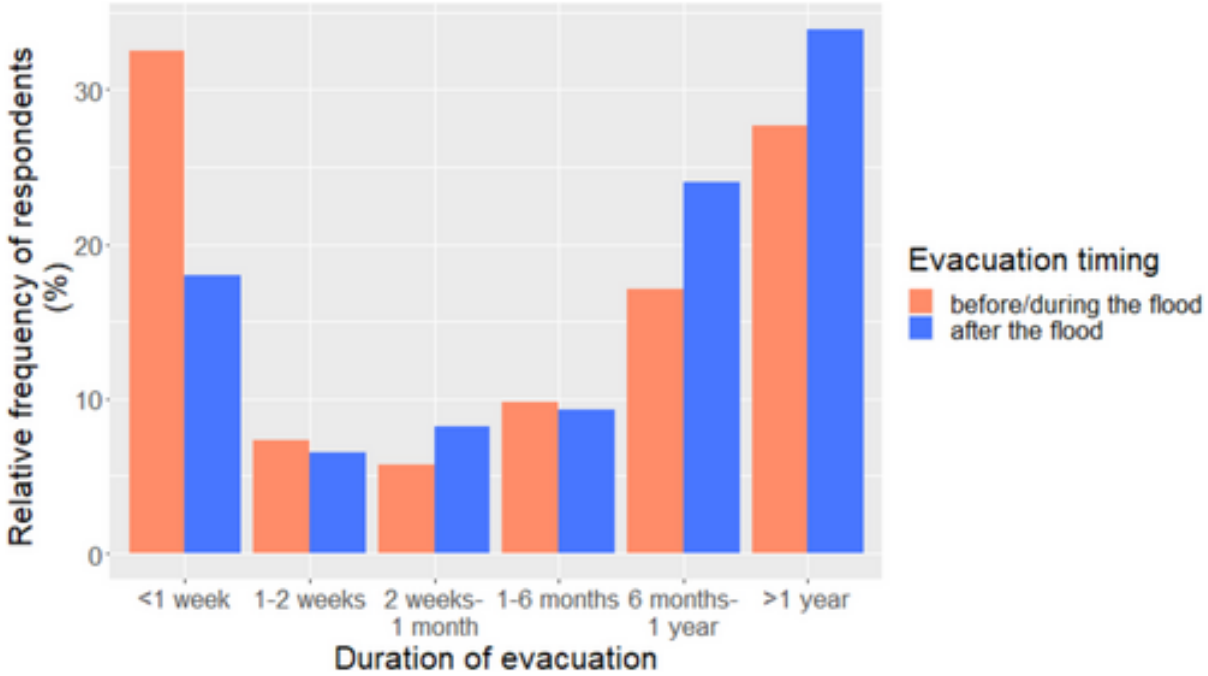
Post-matching Logistic Regression model

Control variables – probably after the evacuation:

- *Impacts – cost of damage, physical impacts, death of family or friends*
- *Recovery – reconstruction, repurchase of damaged contents, insurance claims*

E | Evacuated before/during the event – E | Not Evacuated = 0.41 on a 6-point scale or 10.3%

Duration of Evacuation



People who have not returned to their houses 1.5 years after the flooding suffer from an average of **15.4% higher psychological burden** than people who were not evacuated.

Take Away

Key Outcomes:
Health-related wellbeing and functioning of the flood-affected population are associated with

Income

Insurance

Psychological Burden

Policy Implications:
Flood Preparedness and Recovery should focus on strengthening mental health

The **resilience dividend** of effective **insurance** is highlighted

Adaptation decisions should consider the **burden on health** – in addition to economic costs.

Flood Response should be effective and fair - specifically, to **reduce long term psychological burden**

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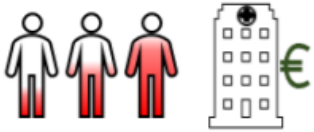

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