Household Flood Preparedness During Hurricane Dorian

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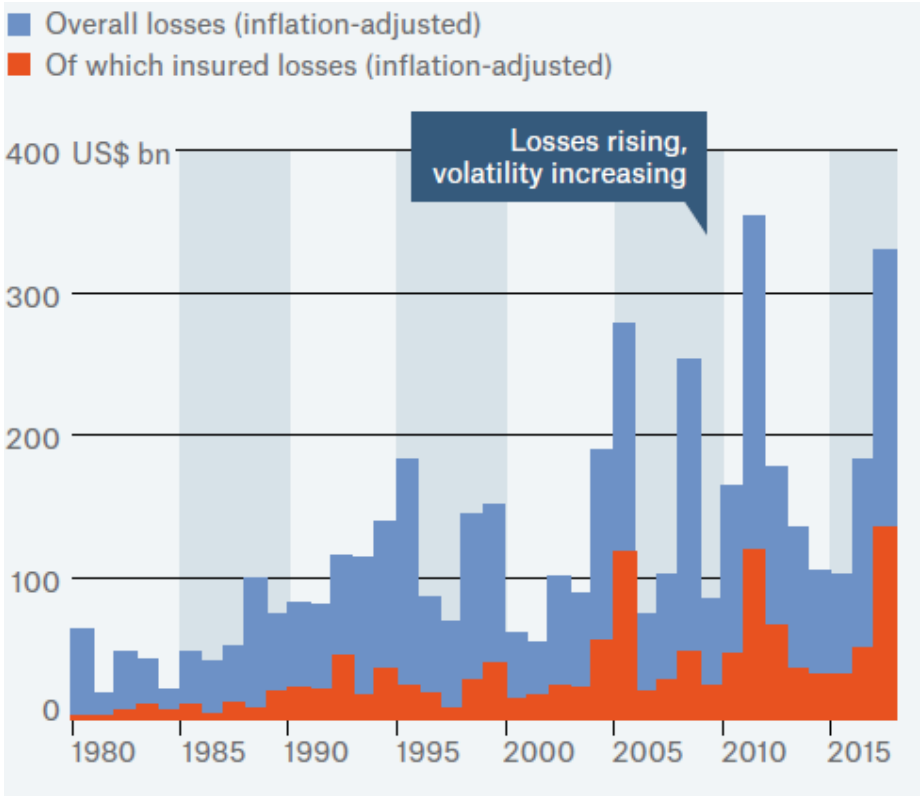
1. Adaptation measures in flood risk management



Source: Munich Re (2018)

- Trends in global flood risk due to:
  - Population and economic growth
  - Possibly climate change

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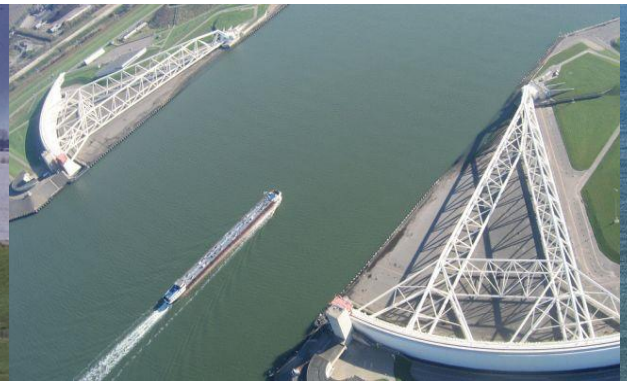
Flood risk management approaches

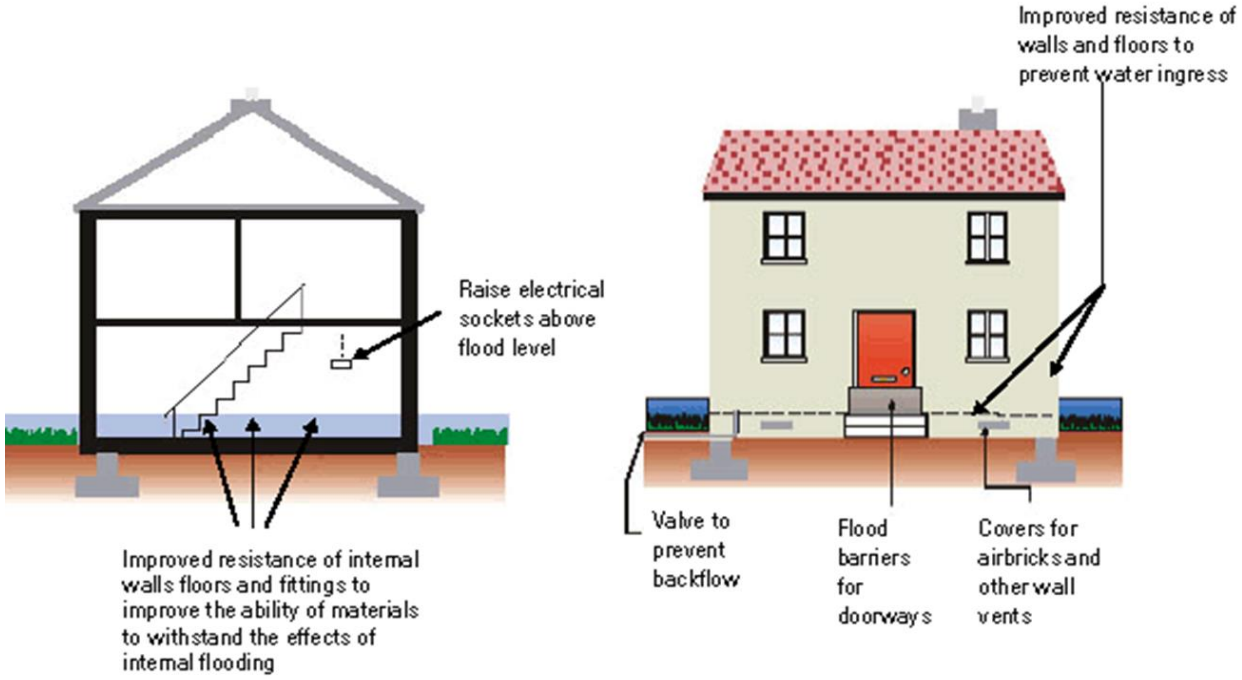
- Traditional focus on flood-prevention infrastructure
  - Engineering options: levees, dams, storm surge barriers
  - Cost-effective in many flood-prone regions
  - But, infeasible to limit flood risk to zero


Flood risk management approaches (2)

- Flood insurance for financial resilience
- Increased interest in damage mitigation by households
  - Household level measures can significantly limit flood damage

  - Up to 50% of damage savings in Netherlands, Germany and France
  (e.g., Poussin et al., 2015)



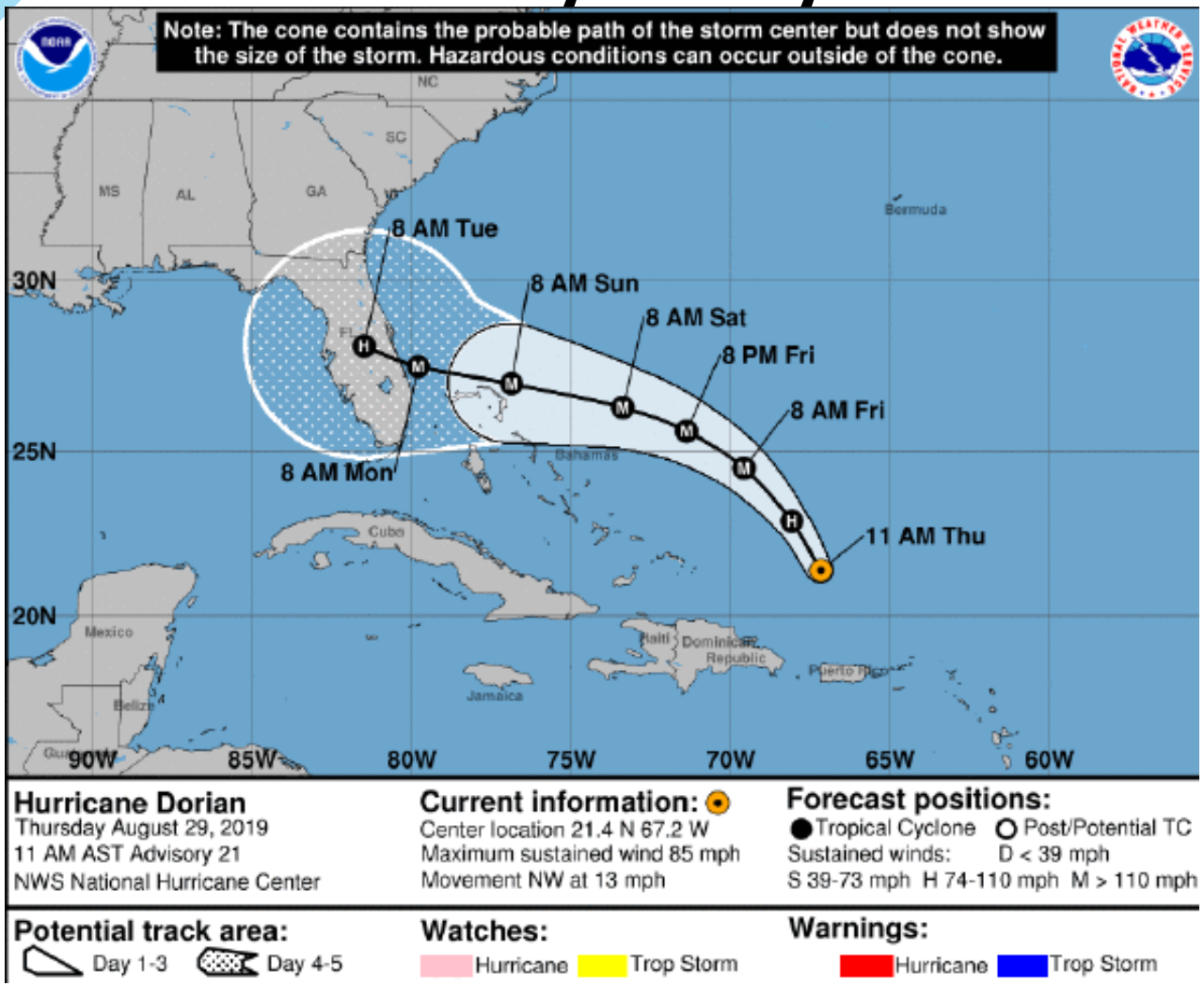
Boundedly rational behavior w.r.t. flood risk

- Biases imply insufficient preparedness for floods:
  - Underestimation of low-probability risk
  - Costs of information seeking about risk and coping measures
  - Myopia and discounting of the future
  - Charity or moral hazard of compensation

2. Real time survey of flood preparedness for Dorian

- Conducted by phone between 29 August and 2 September
- Random sample in Florida flood zones, completion rate 71% (*N*=871)
- Location can be linked to objective flood risk
- 54 questions about:
  - Risk perceptions
  - Flood experience and expected compensation
  - Behavioral motivations for preparedness
  - Insurance purchases
  - Risk mitigation measures
  - Socio-economic characteristics

Forecast first day survey



From Cat 1 to Cat 2

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Forecast midway survey

31 August: Cat 4

1 September: Cat 5

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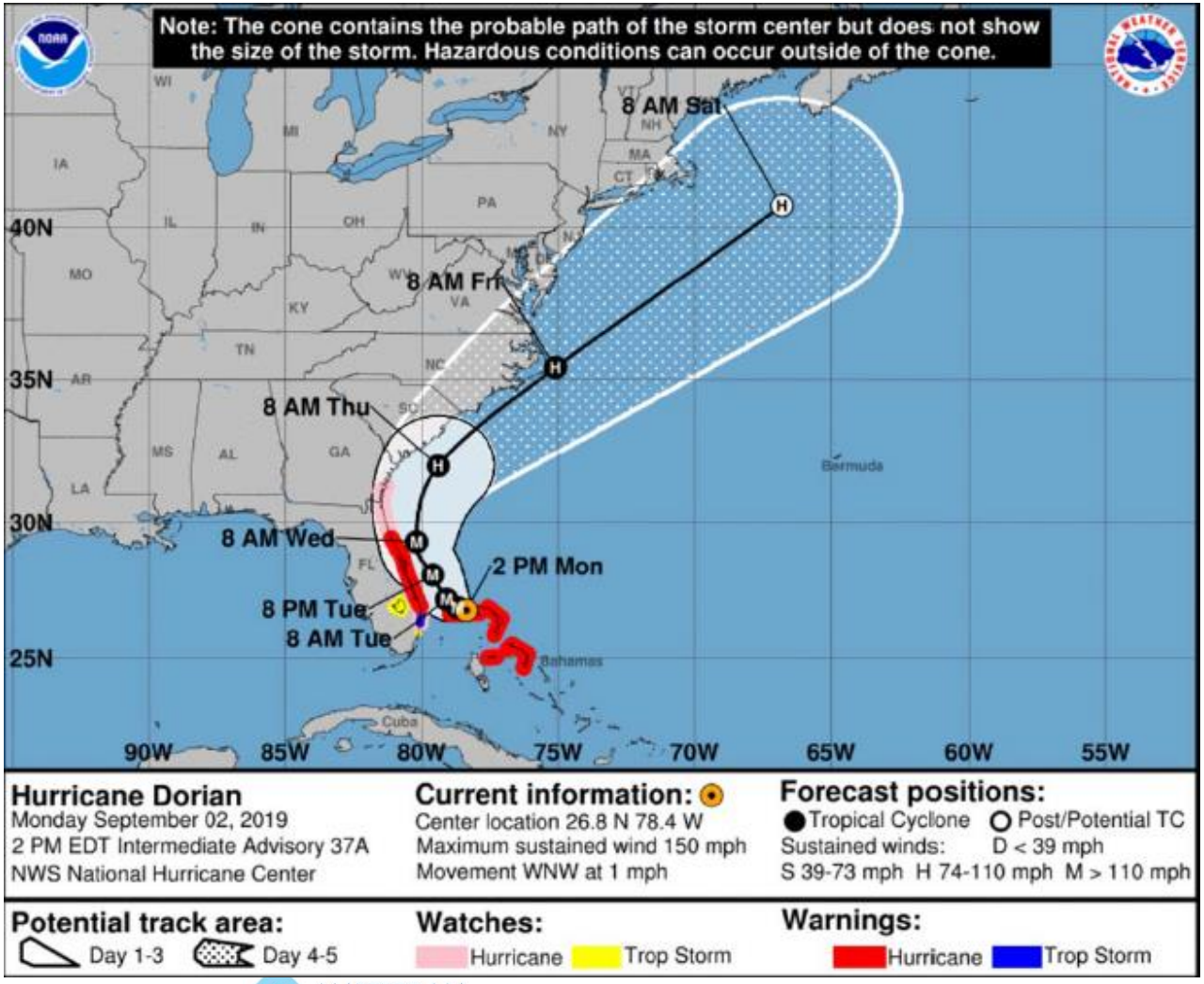
Forecast final day survey



2 September: Cat 4

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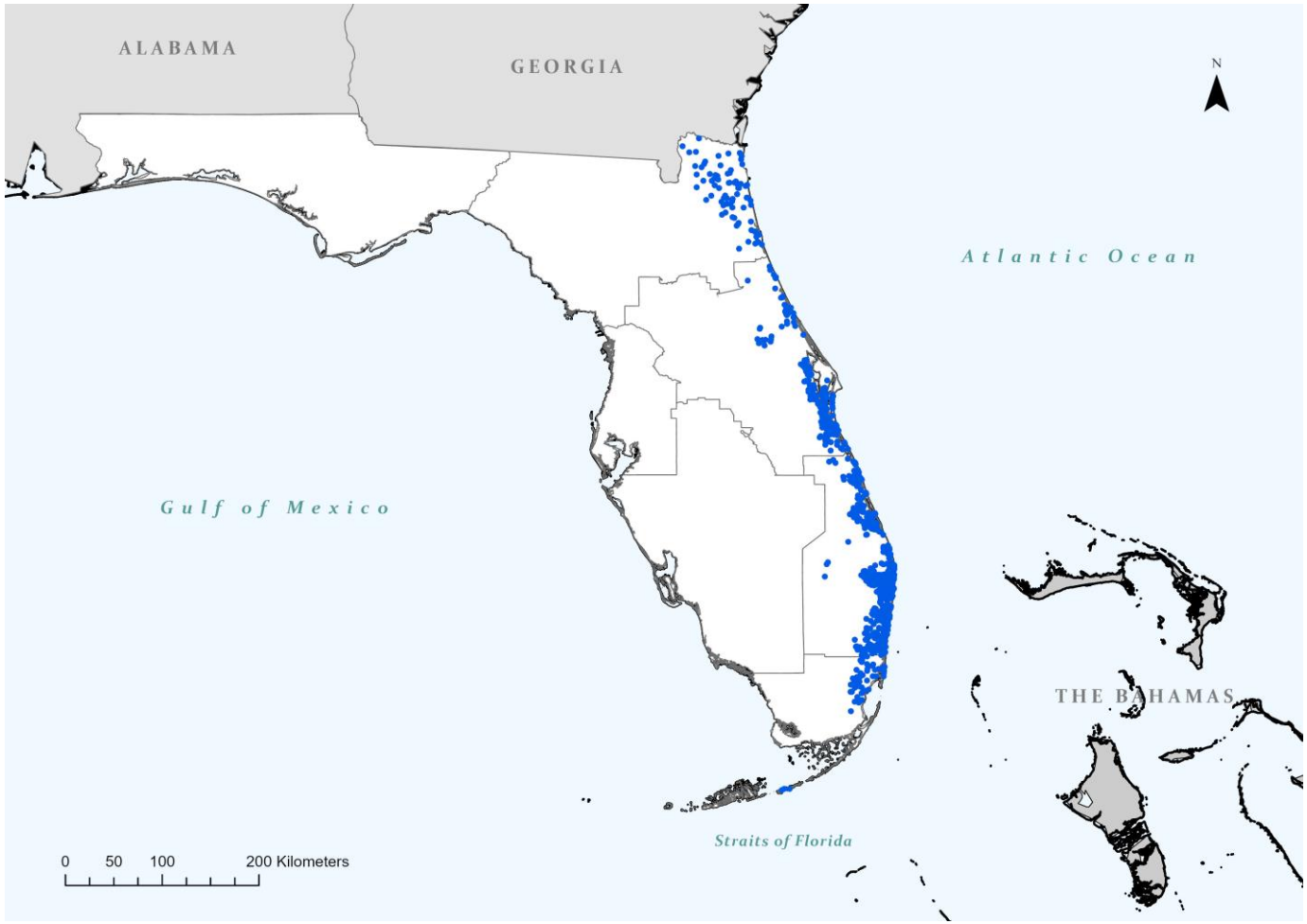
Location respondents



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3. Results: general flood risk perceptions

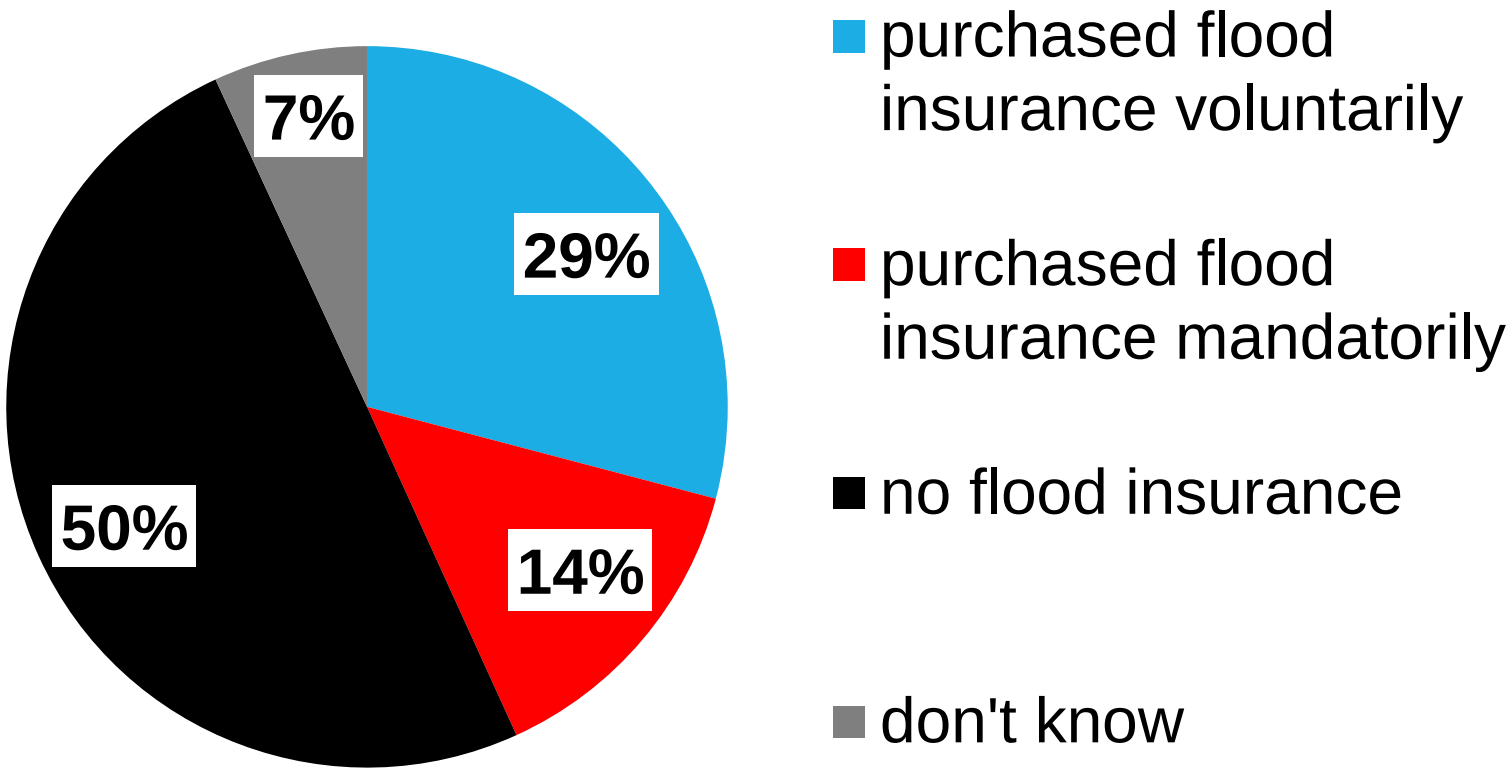
- High awareness flood risk, but not necessarily concern
  - About 80% in 1/100 year flood zone believe their flood probability ≥1/100
  - Still, a majority (54%) believes the flood probability is too low to be concerned about it
  - In case they are flooded, people realize damage will be high (median expected damage =$80,000)
  - Still, a majority (59%) is not worried about flooding

Perceptions particular to Dorian

- Overall high awareness
  - 92% know about the storm threat
  - Of those people, 83% realize they live in the impact area
  - 66% are worried about damage from Dorian

- Misperceptions
  - Still, about 1 in 4 people do not know about Dorian or that they can be impacted
  - Most misperceived hurricane strength when it was low (Cat 1, 2, 3), while most were accurate when it was high (Cat 4, 5)

4. Results: insurance purchases



Factors related with flood insurance purchases

Risk perceptions:

- Flood probability (+)
- Concern about flood probability (+)
- Expecting higher risk from climate change (+)
- Worry about floods and Dorian (+)

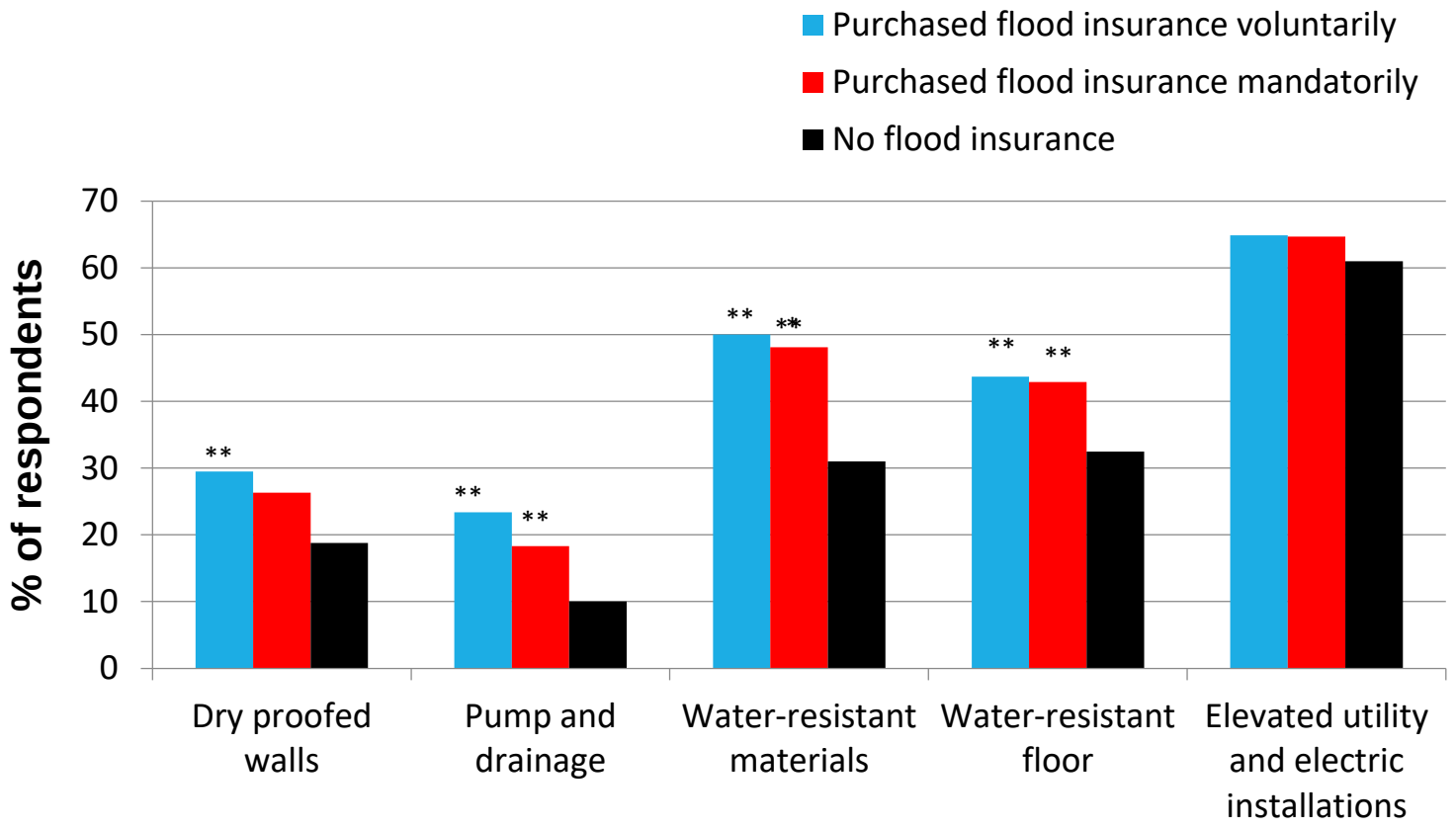
Insurance attitudes:

- Confidence flood insurance will pay out (+)
- Regret not insuring when flood happens (+)
- Regret insuring without a flood (-)
- Social norm insuring (+)

Demographics:

- Education (+)
- Value home (+)
- Value home contents (+)
- Income (+)

Relation between flood insurance and ex ante flood-proofing



Note: ** indicates a significant difference at the 5% level with the no flood insurance group

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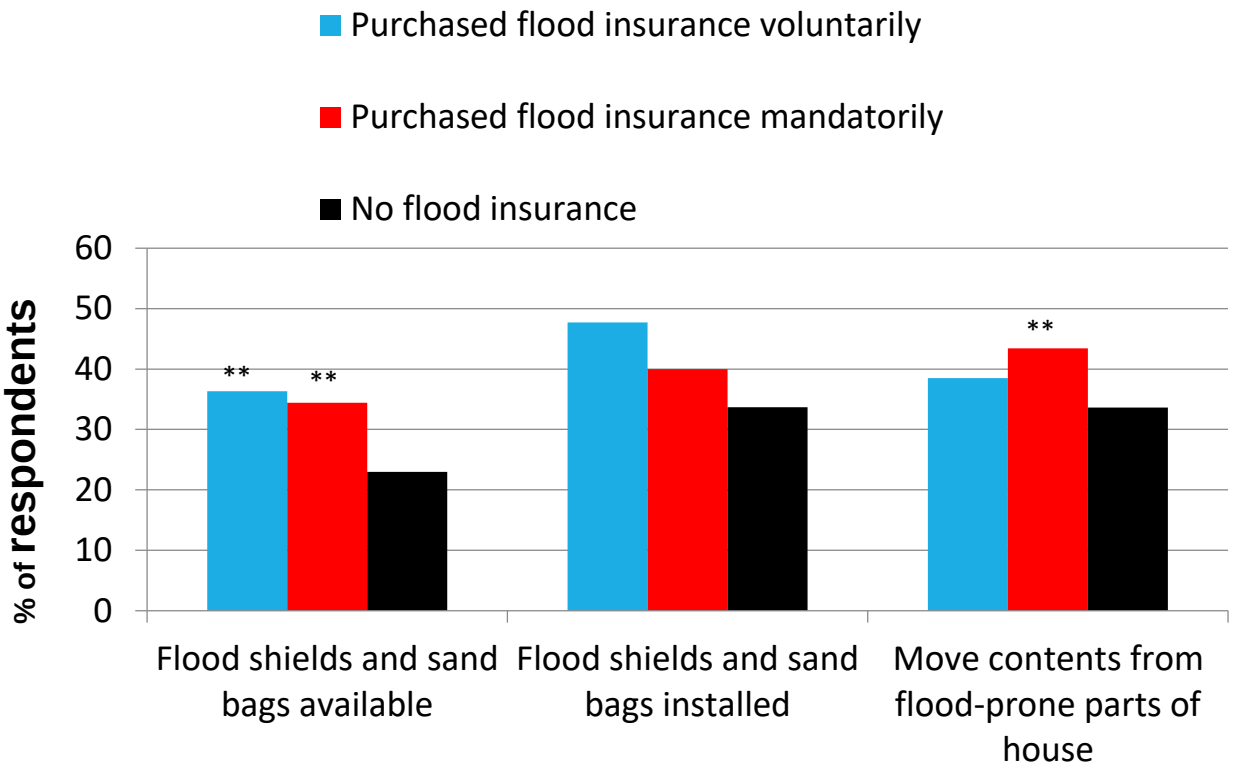
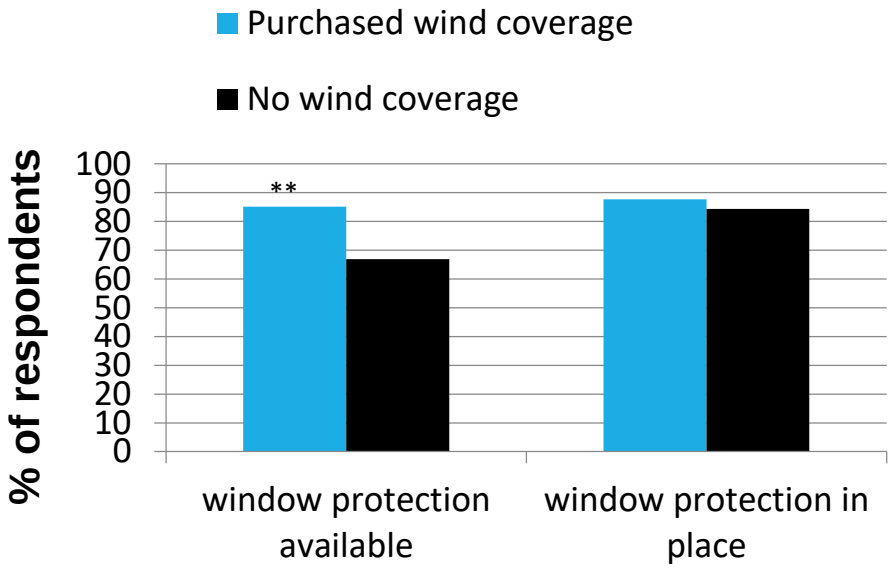
Relation between flood insurance and emergency preparedness



Note: ** indicates a significant difference at the 5% level with the no flood insurance group

Wind insurance coverage (purchased by 80%)



Note: ** indicates a significant difference at the 5% level with the no wind coverage group

- The overall absence of moral hazard confirms the few other studies on this topic

(Hudson et al., 2017, Botzen et al., 2019a)

5. Results: factors of influence on risk reduction

- A few significant correlations exist between risk perceptions and ex ante flood-proofing
  - Concern about flood probability (-)
  - Worry about floods (-)
  - Aware of Dorian (+)
  - Worry about Dorian (-)

- Risk perceptions mainly drive emergency preparedness:
  - Flood probability (+)
  - Concern about flood probability (+)
  - Worry about floods (+)
  - Aware of Dorian (+)
  - Aware living in impact area Dorian (+)
  - Perceived strength Dorian (+)
  - Worry about Dorian (+)

Factors of influence on risk reduction (2)

- Consistent correlations between attitudes to coping measures and both emergency preparedness and ex ante flood-proofing
- Coping appraisals are important drivers across measures
  - Perceived coping-efficacy (+)
  - Perceived self-efficacy (+)
- Important influence of social norm flood risk reduction

Factors of influence on risk reduction (3)

- Expected federal disaster relief lowers emergency preparedness
  - (-) significant correlations for all emergency preparations
  - 35% expects relief, people overestimate relief amounts
- Confirms concerns for charity hazard found by other studies
  - Purchases NFIP coverage (Kousky et al., 2013)
  - Flood risk reduction measures NYC (Botzen et al., 2019b)

Factors of influence on risk reduction (4)

- Socio-demographic variables are mainly related with ex ante flood-proofing measures
  - Internal locus of control (+)
  - Low discounting (+)
  - Education (+)
  - Age (-)
  - Homeowner, value home and contents (+)
  - Income (+)
- A few socio-demographic variables are related with emergency preparedness measures
  - Age (-), home value (+)
  - Mainly driven by risk perception and flood experience

6. Conclusions: lessons for communication policy

- High awareness about flood probability and damage, does not necessarily translate into concern needed for reducing risk and purchasing flood insurance
  - Raise concern, highlight potential regret of being uninsured
- Awareness about storm (Dorian) and its characteristics is an important driver of emergency preparedness measures
  - 1 in 4 is insufficiently aware of the storm
- Communicate about effectiveness of risk reduction measures and how to take them
- Trigger social norms in risk reduction and flood insurance coverage

Conclusions: other lessons and future research

- Moral hazard of insurance coverage appears to be absent
  - Opportunities for stimulating risk reduction via insurance
- Charity hazard crowds out emergency preparedness actions
  - Communicate about uncertainty and low amounts of federal disaster relief
- Vulnerable groups insufficiently prepare for flooding
  - Address affordability concerns
- Future research (second survey)
  - Change in risk perception and other attitudes towards risk reduction
  - Additional risk reduction undertaken and evacuation behavior
  - Effectiveness of risk communication
  - Detailed risk assessment per respondent

References

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Thanks for your attention!

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