

Who Benefits from Disaster Mitigation?

Evaluating Equity and Risk Reduction Outcomes

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Why This Study?

Mitigation programs must decide:

- Who receives funding?
- How are limited resources allocated?

Most systems maximize expected loss reduction, but this may leave the most vulnerable households behind.

Study Area



Figure 4.1: STARR Study Region in Eastern North Carolina

Eastern NC · 44 counties · 708 tracts

Allocation Framework

STAGE 1

PRIORITIZATION
Who is eligible?

P1: All · P2: Low Income (MHI) · P3: High Density (PD)

STAGE 2

OPTIMIZATION
How to allocate?

O1: Efficiency · O2: Risk Burden · O3: Hybrid

9 ALLOCATION FORMULATIONS

(O1–O3) × (P1–P3)

	P1	P2	P3
O1	O1P1	O1P2	O1P3
O2	O2P1★	O2P2	O2P3
O3	O3P1★	O3P2	O3P3

★ Best performing

Research Question

How do:

- optimization objectives
- prioritization rules

Influence:

- Mitigation allocation outcomes?
- Distribution of risk reduction?

97%

Efficiency Retained

~18%

Burden Reduction (CTM95)

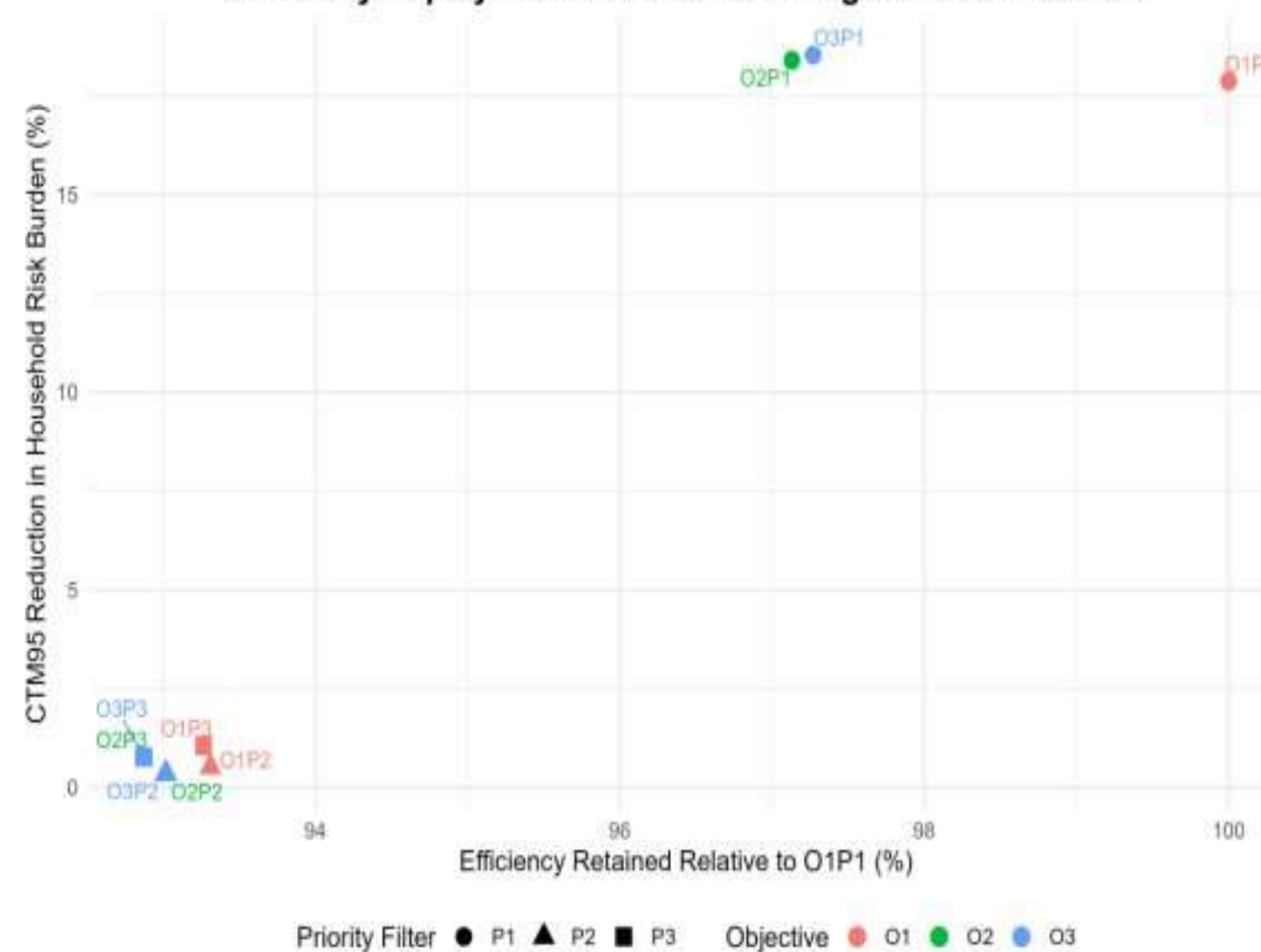
7–8%

Efficiency Lost from Filters

Main Result: Efficiency–Equity Trade-off

O2P1 and O3P1 achieved ~18% reduction in concentrated household burden while retaining approximately 97% of baseline efficiency, the strongest combined performance across all nine formulations.

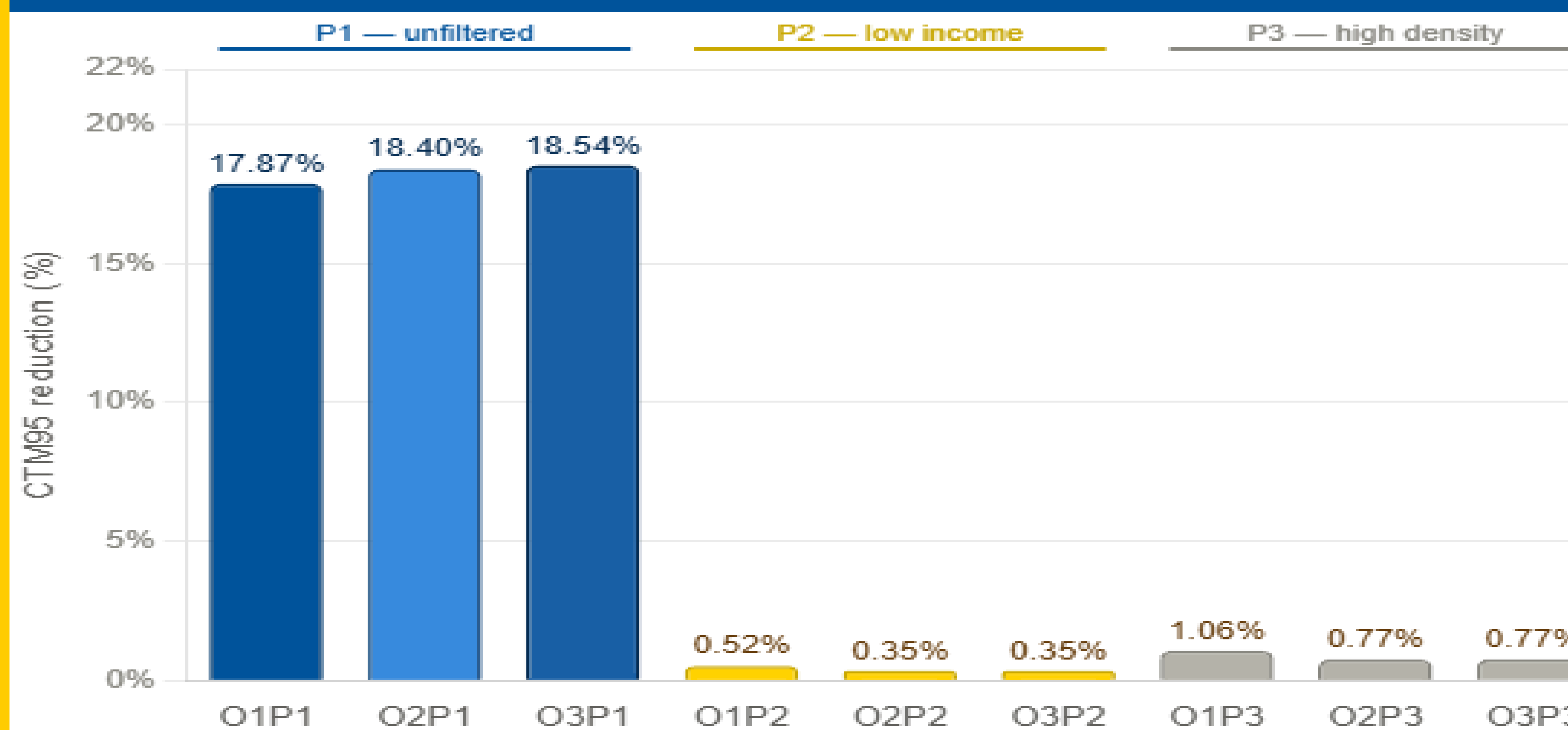
Efficiency–Equity Trade-Offs Across Mitigation Formulations



Key Finding: Geographic Filters Underperform

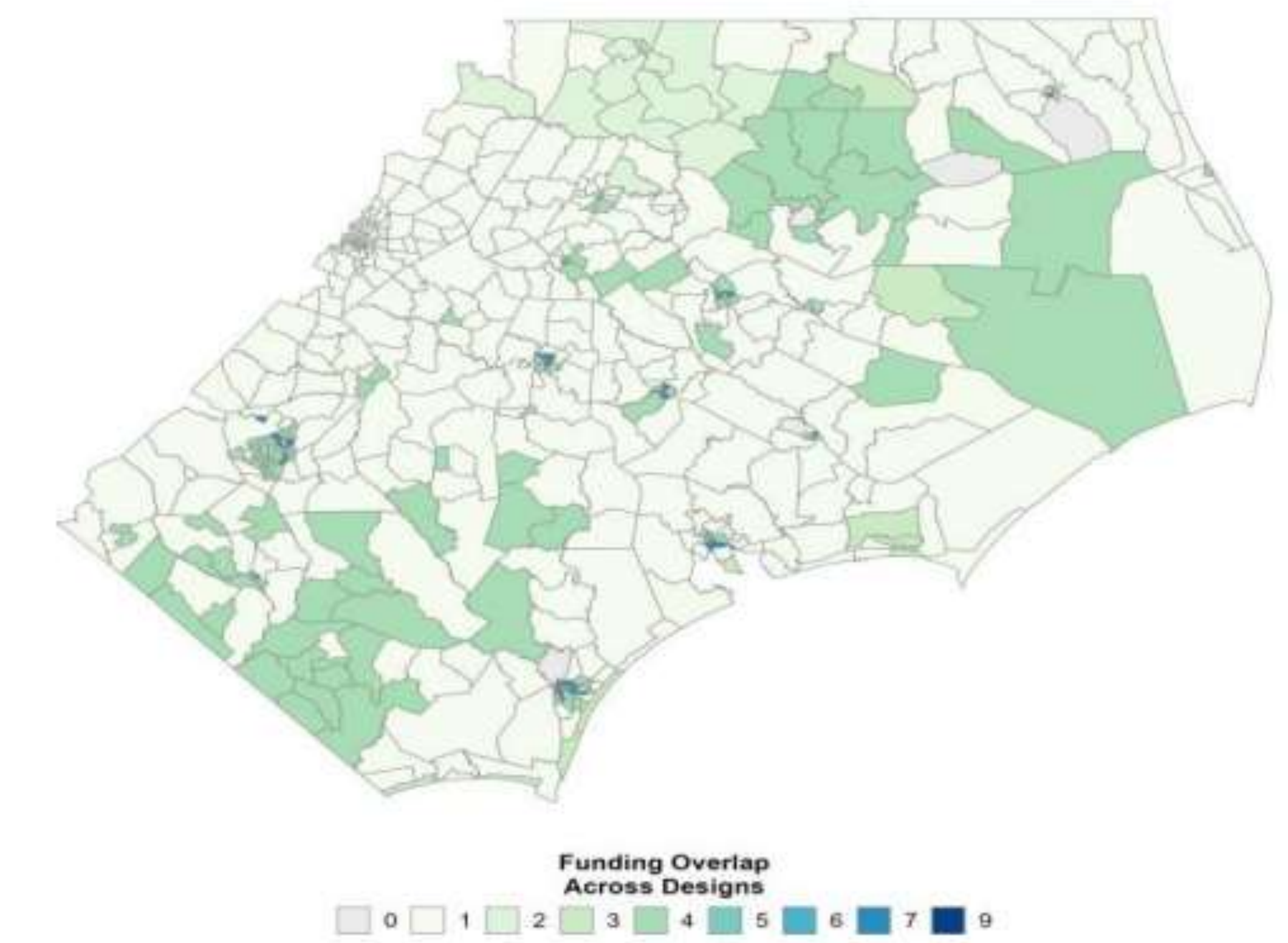
- P2 and P3 reduced efficiency by 7–8%.
- Produced minimal improvement for highest-burden households.
- Allocation objectives had greater influence than eligibility filters.

Reduction in Risk Among Highest-Burden Households



Spatial Results

Funding Overlap Across Designs



Only 1 of 708 tracts

Funded under all 9 allocation designs
Allocation rules shape who benefits from mitigation investments.

APPLICATIONS FOR POLICY & PRACTICE

Improving Mitigation Prioritization

- Consider both expected loss reduction and household risk burden when allocating mitigation resources.
- Different allocation objectives can produce substantially different beneficiary outcomes.

Identifying High-Burden Communities

- Broad geographic targeting may not consistently identify households facing the highest relative disaster burden.
- Burden-sensitive approaches may improve the identification of priority areas for mitigation investment.

Balancing Risk Reduction and Distributional Outcomes

- Significant reductions in concentrated household burden can be achieved while retaining most aggregate mitigation benefits.
- Distributional goals and risk reduction objectives need not be treated as competing priorities.