



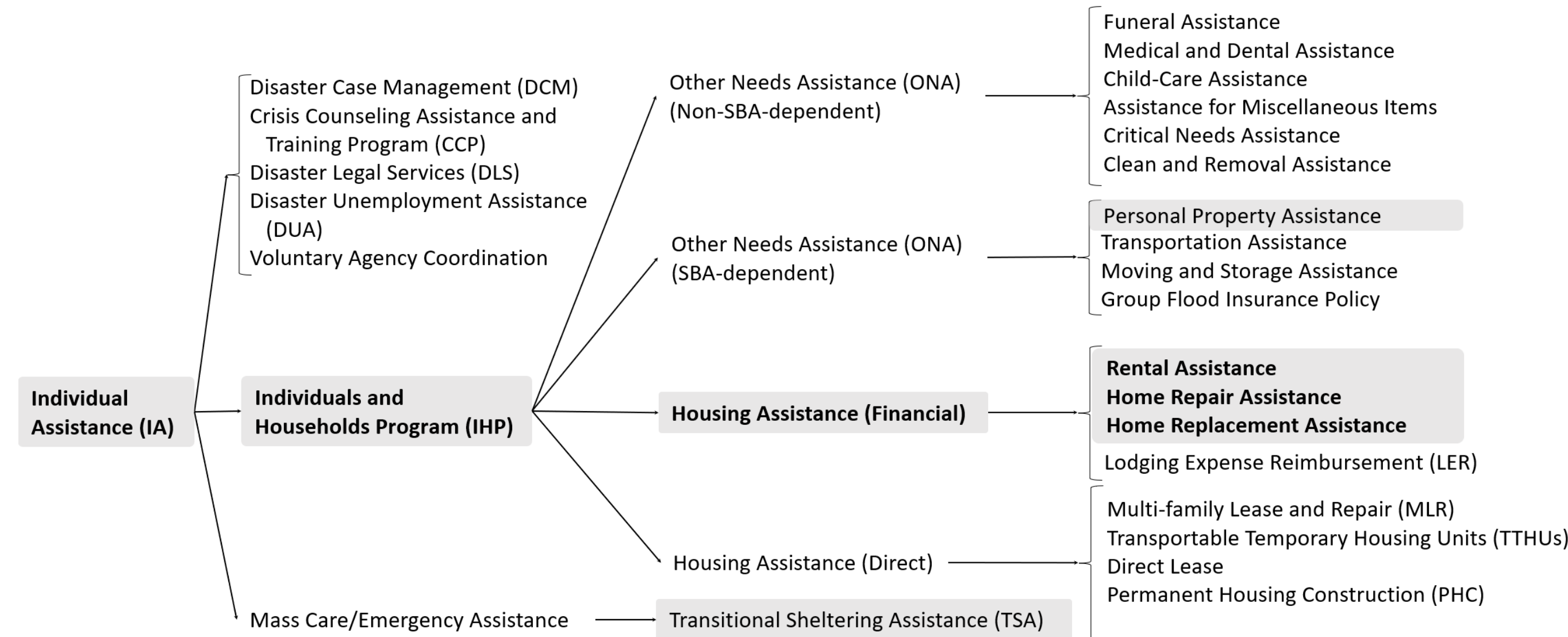
FEMA's Financial Housing Assistance to Owners and Renters After Hurricane Harvey

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(1) Research overview

Background: Sources of financial disaster assistance are critical for facilitating housing recovery. FEMA's Individual Assistance (IA) is one such critical program. IA includes seven programs and services available following a Disaster Declaration. The IA sub-program, Individual and Households Program (IHP), provides a federal safety net for housing-related and other needs for eligible renter- and owner-occupied households.



Case study: Hurricane Harvey (2017) in Texas under the disaster designation DR-4332-TX

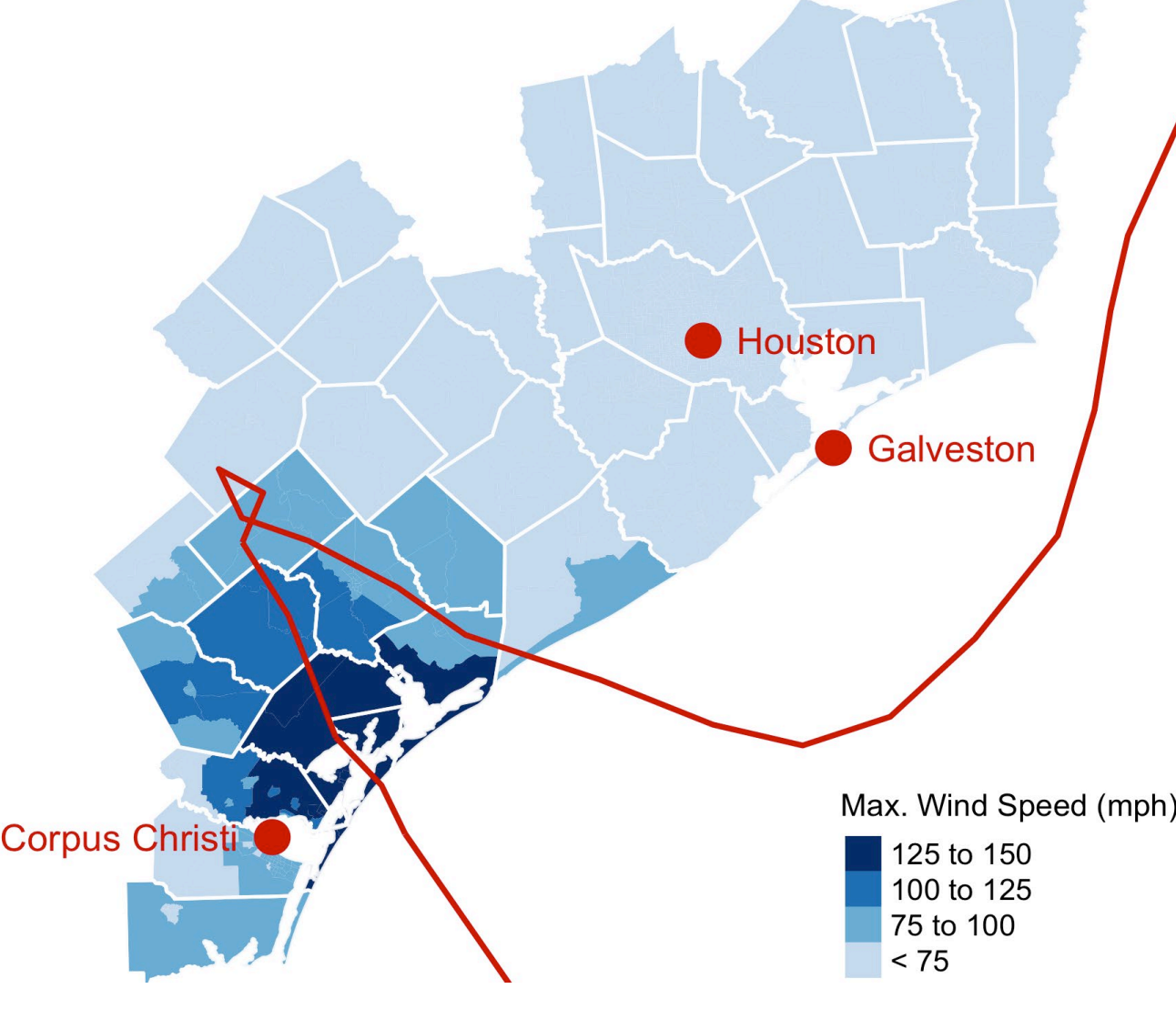
Our approach: We model discrete stages in the IHP application process using detailed, micro-data for IHP applicants and application outcomes integrated with other data to characterize hazard exposure, physical and social vulnerabilities – e.g., disaster-declared areas, flood inundation depths, wind swaths, storm track, housing and tenure characteristics, and socio-economic and -demographic characteristics.

Research goals: (1) Assess the utility of OpenFEMA data, (2) Describe IHP funding with respect to Harvey and identify correlates of funding, (3) Test for inequities in allocation of funding, and (4) Develop predictive models of assistance needs for future disaster scenarios at the household and aerial unit levels.

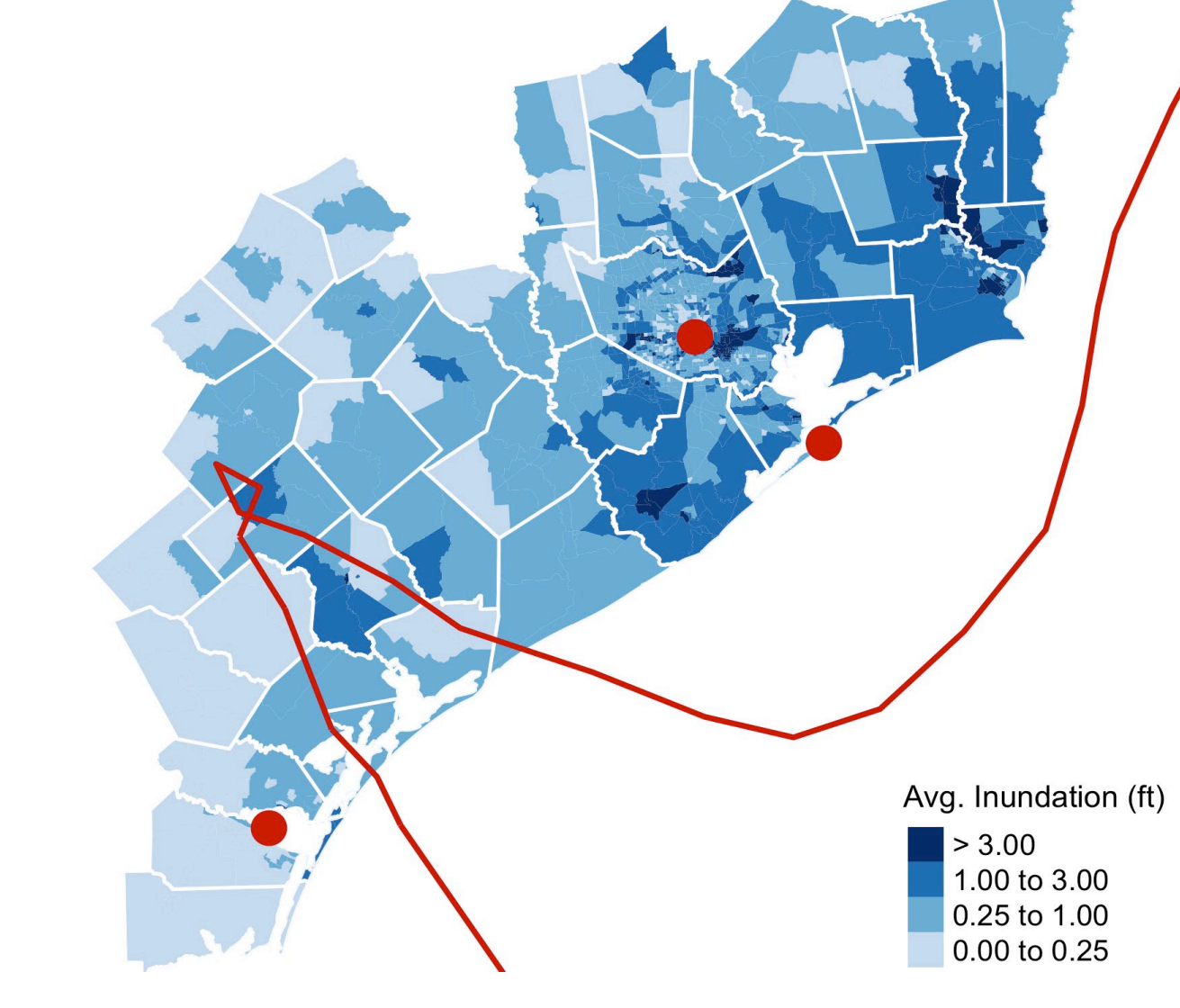
(2) Harvey's impacts were prolonged and devastating

- Initial landfall on August 25, 2017, near Port Aransas with maximum sustained winds of 130 mph
- Harvey tracked back out to the coast, remained fixed and released 60 inches of rain over the Houston region
- Second landfall on August 30, 2017, in Southeast Texas and Western Louisiana
- 200,000+ homes and businesses were damaged, 30,000+ people displaced, and 89 people died
- Estimated damage of \$155 billion (inflation adjusted), 2nd most costly tropical storm behind Katrina (NOAA)

Wind speeds were highest with the initial landfall



Flooding was greatest in Southeast Texas and Western Louisiana



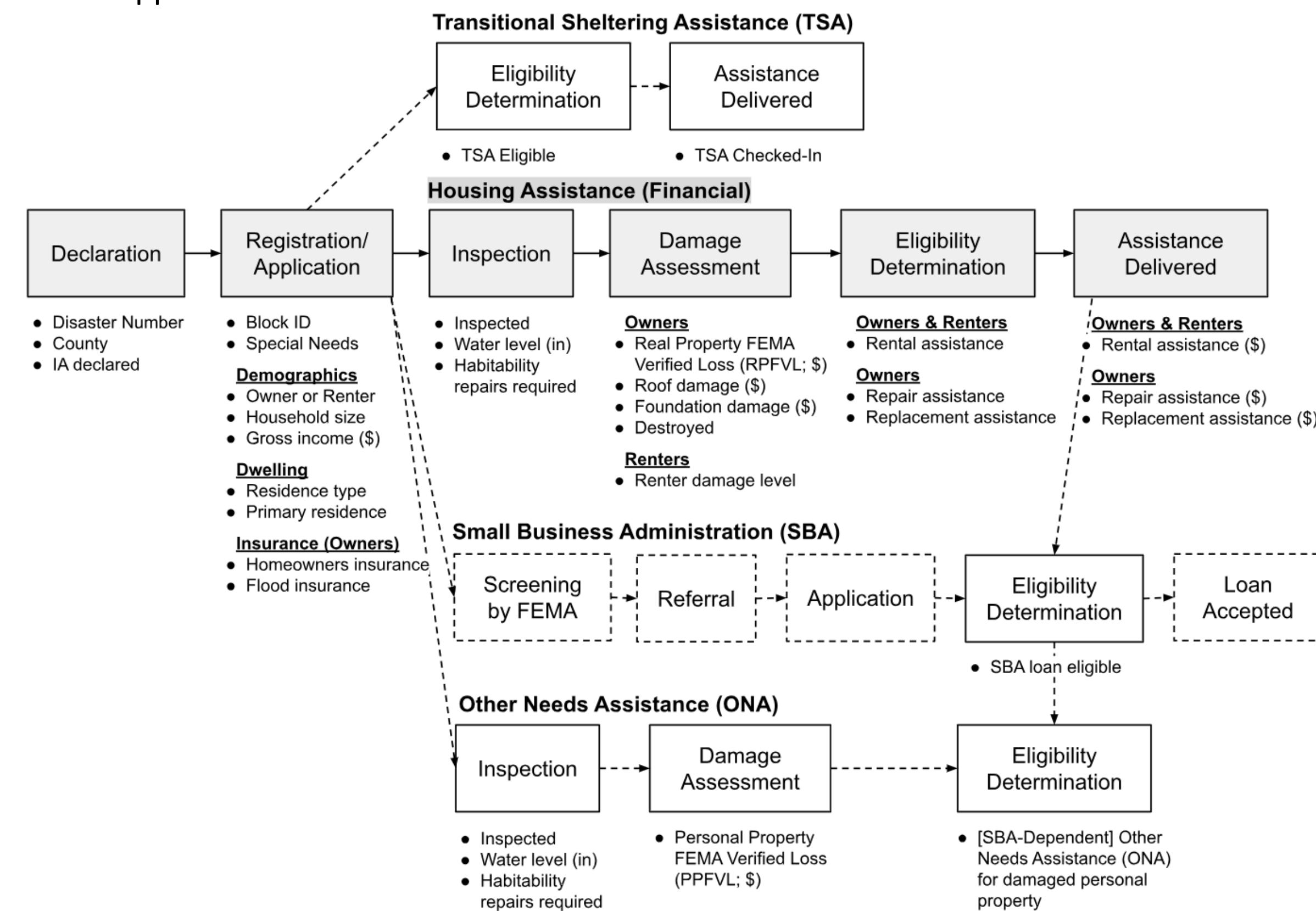
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(3) OpenFEMA reveals assistance outcomes at applicant level

The OpenFEMA data sharing program makes various datasets publicly available. We use:

- The Disaster Declarations Summaries file to identify the disaster declaration number for Hurricane Harvey in Texas (DR-4332-TX) and counties eligible for IA;
- The IHP - Large Disasters (IHP-LD) dataset which provides micro-level, deidentified data at the household-applicant level.



895,636 IHP-LD records are associated with DR-4332-TX. Approximately 91% of the records (814,139 total applicants, 415,796 owners, 398,343 renters) are retained for analysis; the other 9% are omitted due to coding errors, non-sensical values, and Census blocks located outside of a declared county.

(4) Individual Assistance applications, eligibility, and funding

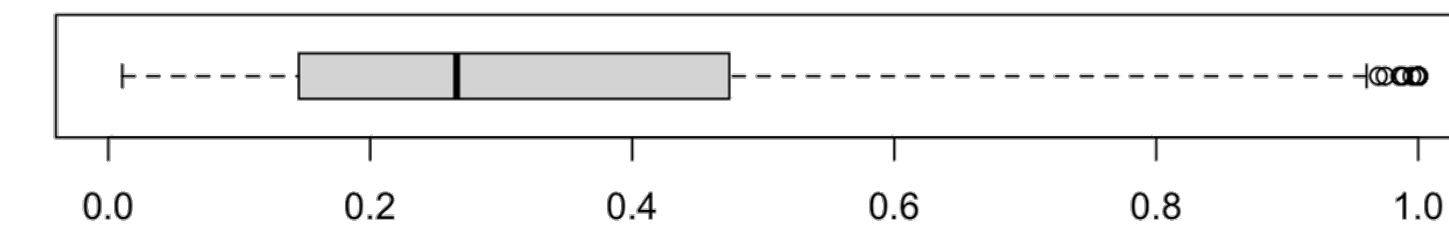
- Approximately 30 percent of individuals and households were in counties eligible to receive IA.
- For of the ~2.85m households in IA eligible counties, over 895k applied for IA.
- On average, funded homeowners received \$2,367 in rental assistance and \$10,320 in repair/replacement assistance; renters received \$2,202 in rental assistance.

Count of individuals and occupied housing units

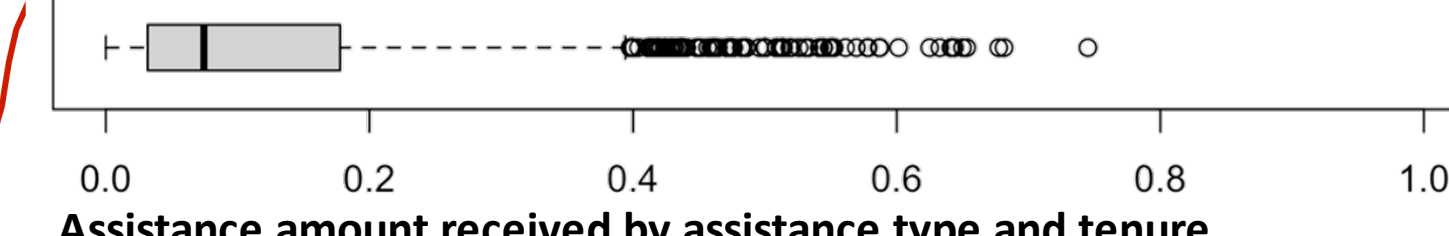
	Individuals in housing units		Occupied housing units	
	Total	Owner	Renter	Total
In IA designated areas	8,117,295	2,853,287	1,763,364	1,089,923
In Texas	26,815,013	9,430,419	5,851,046	3,579,373

Source: 2013-2017 ACS 5-year

Proportion of households within Census Tract that applied



Proportion of applications within Census Tract eligible for IHP



Assistance amount received by assistance type and tenure

	Homeowner		Renter		Total	
	Mean	SD	Mean	SD	Mean	SD
Rental assistance	\$2,367	\$1,593	\$2,202	\$1,741	\$2,313	\$1,644
Repair/replacement assistance	\$10,320	\$8,590			\$10,320	\$8,590
Any assistance	\$9,145	\$8,874	\$2,202	\$1,741	\$7,260	\$8,230

References

- FEMA (2021). Individual Assistance Program and Policy Guide (IAPPG) Version 1.1, FP 104-009-03.
- National Oceanic and Atmospheric Administration (NOAA). Billion-Dollar Weather and Climate Disasters.
- Wehner, M., & Sampson, C. (2021). Attributable human-induced changes in the magnitude of flooding in the Houston, Texas region during Hurricane Harvey. Climatic Change, 166(1-2), 20.
- FEMA (2024). Individual Assistance Program Equity, Federal Register 2024-00677.

(5) IA application outcomes for owners & renters

We analyze distinct stages in the IA process – specifically, inspection, rental assistance eligibility and amount, and repair/replacement assistance eligibility and amount – using multilevel regression modeling.

	OWNERS				RENTERS			
	INSPECTION	ELIGIBILITY Rental	AMOUNT Repair/Replace	AMOUNT Rental	INSPECTION	ELIGIBILITY Rental	AMOUNT Repair/Replace	AMOUNT Rental
constant	0.7789***	0.2314***	0.1600***	4,337.60***	1,082.14***	0.5363***	0.0006	1,018.10***
SOCIO-ECONOMIC								
household size	0.0276***	0.0121***	0.0069***	71.56***	309.11***	0.0283***	0.0060***	210.70***
HUD INCOME THRESHOLDS (high=ref)								
medium	0.0413***	0.0014	-0.0001	-360.61***	97.55***	0.0024	-0.0053**	93.89***
low	0.0798***	0.0036	0.0036	-443.72***	123.25***	0.0171***	-0.0148***	176.59***
very low	0.0962***	0.0136***	0.0058*	-583.94***	113.89***	0.0954***	-0.0202***	220.01***
extremely low	0.0962***	0.0114***	0.0112***	-672.78***	141.47***	0.1545***	-0.0225***	143.10***
not reported	0.0394***	-0.0323***	-0.0357***	-329.22***	48.32	0.0874***	-0.0252***	83.04***
RACE-ETHNICITY								
Hispanic, percent of owner (or renter) households in Tract	-0.0003*	-0.0001	-0.0005**	-20.03***	-2.17***	-0.0000	-0.0002***	-0.53
Black, percent of owner (or renter) households in Tract	-0.0001	-0.0005**	-0.0003*	-12.01***	-0.77	0.0007***	-0.0001**	0.84
RESIDENTIAL TYPES (house/duplex=ref)								
apartment	0.2047***	-0.0058	0.0118	-1,507.15***	25.92	-0.0688***	0.0318***	-193.68***
townhouse	-0.0851***	0.0110	0.0298*	-947.15***	-84.03	-0.0533***	0.0172	-65.69
condo	0.0916*	0.0329	0.0799***	-1,375.17***	42.87	0.0166	0.0271***	83.84
mobile home	0.0966***	-0.0424***	-0.0325***	-680.33***	-103.66***	0.0194***	0.0054*	-140.48***
travel_trailer	0.1520***	-0.1120***	0.0694***	-1,516.26***	-98.93***	0.0915***	0.0208*	-200.40***
boat	0.1081*	-0.1694***	-0.0762	-9,790.39***	-207.37	0.1415*	-0.0373	-61.28
other	-0.4358***	-0.1792***	-0.1101***	-2,343.11***	110.51	-0.3541***	0.0026	-237.54***
INSURANCE COVERAGE (0.none=ref)								
homeowners only	-0.1770***	-0.0019	-0.0729***	987.08***	20.22			
flood only	-0.0301***	-0.0054	-0.0054	-8,278.44***	52.50			
homeowners and flood	-0.0849***	-0.4587***	-0.0278***	-10,279.44***	134.16***			
HAZARD EXPOSURE								
inundation (ft; mean of Tract)	0.0224***	-0.0007***	-0.0007***	-17.54***	-0.12	0.0208***	0.0004**	-0.44
wind field (mph; max of Tract)	-0.0034***	0.0531***	0.0627***	92.30	-404.94***	-0.0014***	0.0303**	-379.68***
in storm tract buffer (31 mi)	0.0294***	0.0075	0.0166*	670.57**	281.28**	0.0343***	0.0007	167.79***
in coastal county								
INSPECTION								
water level (ft)	0.0332***	0.0466***	0.0466***	711.30***	25.95***		0.0189***	30.46***
OWNER DAMAGE								
real property FEMA verified loss (RPVVL; in 000s of \$)	0.0158***	0.0199***	0.0199***	573.40***	6.39***			
RENTER DAMAGE (LT Mod=ref)								
moderate								
major								
destroyed								
sd(Tract)	0.1177	0.0993	0.0932	0.00	219.29	0.0959	0.0277	369.25
sd(Residual)	0.4034	0.3748	0.3572	4,340.55	1,454.99	0.4401	0.2152	1,632.76
N	415,796	296,553	296,553	87,042	94,098	398,343	268,937	47,285
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
r2 (within)				0.623	0.106			0.055
r2 (between)				0.892	0.180			0.103
r2 (overall)				0.726	0.130			0.073
rmsc				4,492.51	1,456.38			1,629.35

(6) Allocation of funding is according to program design, but...

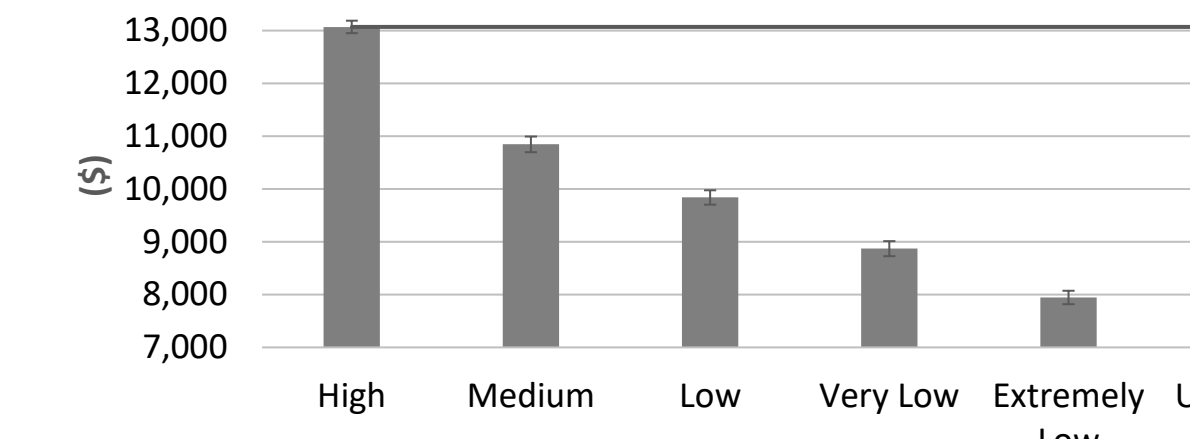
FEMA's policy positions, program eligibility requirements, and administrative procedures can have unintended consequences for households that face greater recovery challenges – i.e., procedural inequities.

- Assistance is a function of FEMA assessed damage, household size, and insurance
- RPVVL is conditional on household size → can restrict assistance amount
- Insurance matters: type (i.e., flood), coverages (e.g., loss of use), and claim proceeds
- Though effect sizes are small, high minority Tracts can have lower assistance rates and amounts
- Assistance favors owners, the underinsured, larger households, and correlates of higher property values

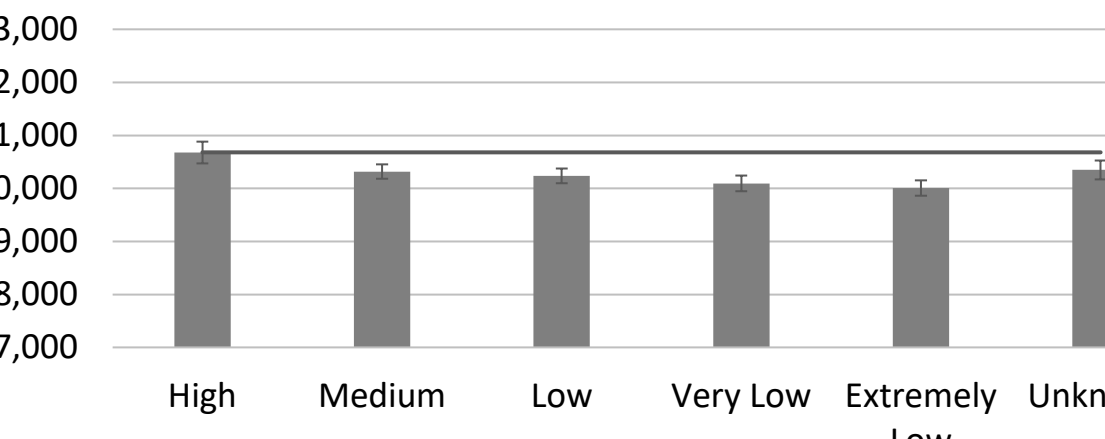
Comparisons of rates and amounts between groups using simple averages yields an incomplete picture of assistance and inequities (e.g., high- vs low-income).

- FEMA analysis found that low-income households received 48% less Repair/Replacement assistance than high-income households for disasters declared during 2014 to 2018 (FEMA, 2024); whereas in our models, controlling for other pertinent factors reveals a more complete analysis of assistance.

Repair/Replacement amount by HUD income level (simple averages)



Repair/Replacement amount by HUD income level (adjusted averages; other factors held at their mean)



Recent policy changes alleviate some concerns in program design

- Separate assistance maximums for repair/replacement and rental
- Missing-middle of insured owners: when insurance < RPVVL but insurance > assistance maximum

Acknowledgements

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- The views expressed are those of the presenter and may not represent the position of the institutions.