

# The Power of Connection: Why Social Capital is Critical during Climate Change

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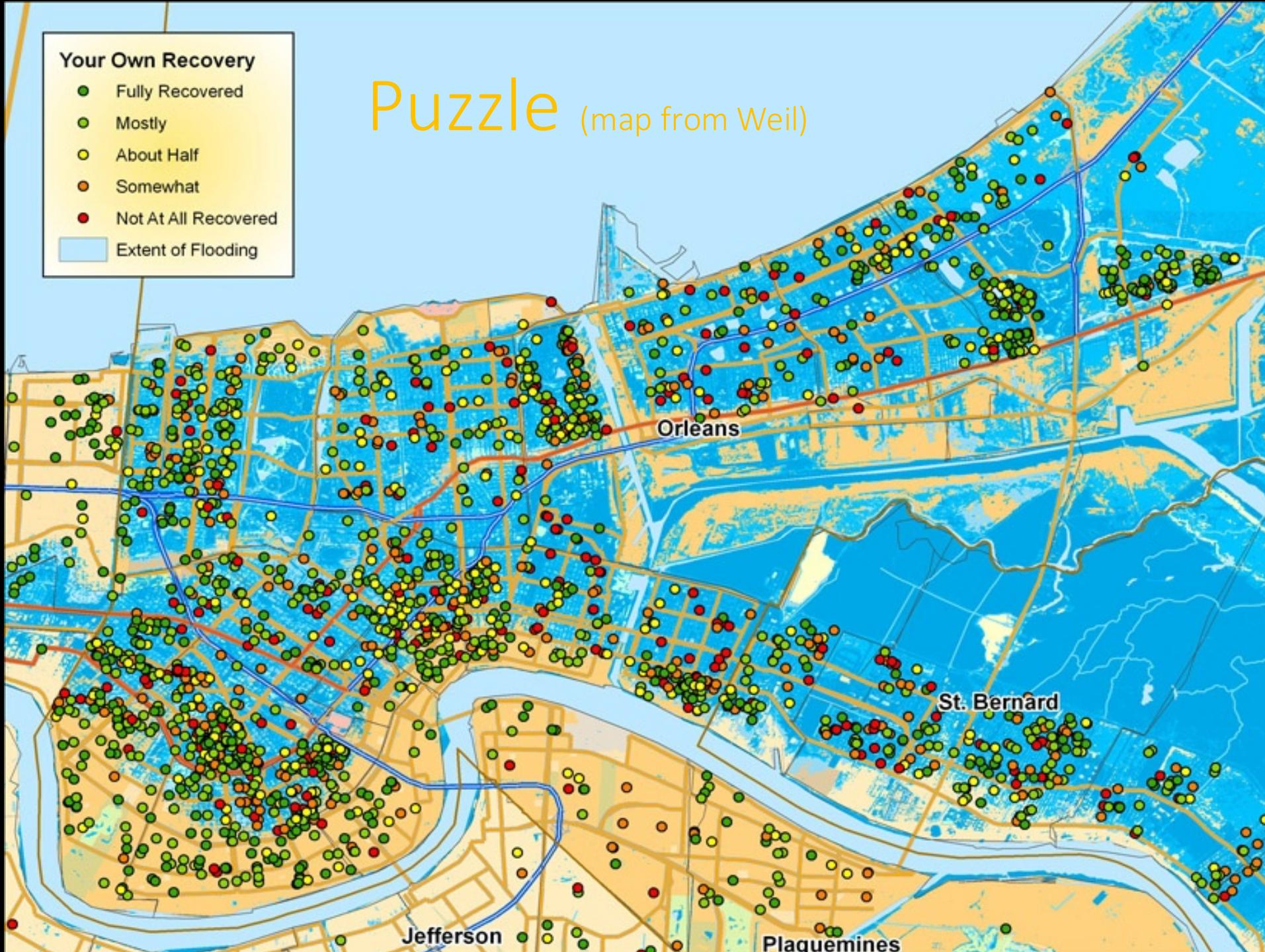
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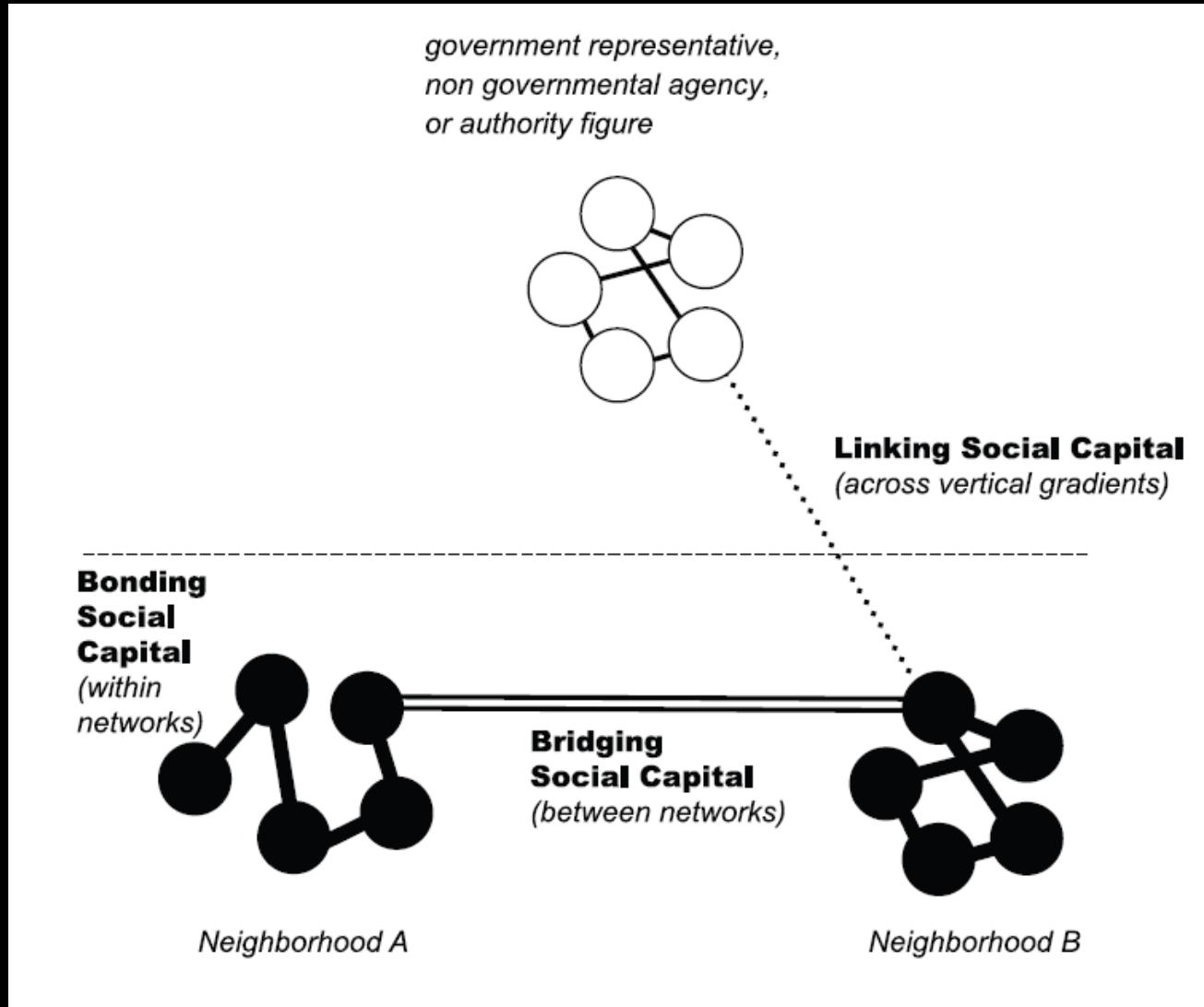
### Your Own Recovery

- Fully Recovered
  - Mostly
  - About Half
  - Somewhat
  - Not At All Recovered
- Extent of Flooding

# Puzzle (map from Weil)



# Trust, Neighbors, Networks



# Exit vs. Voice



# Collective Action



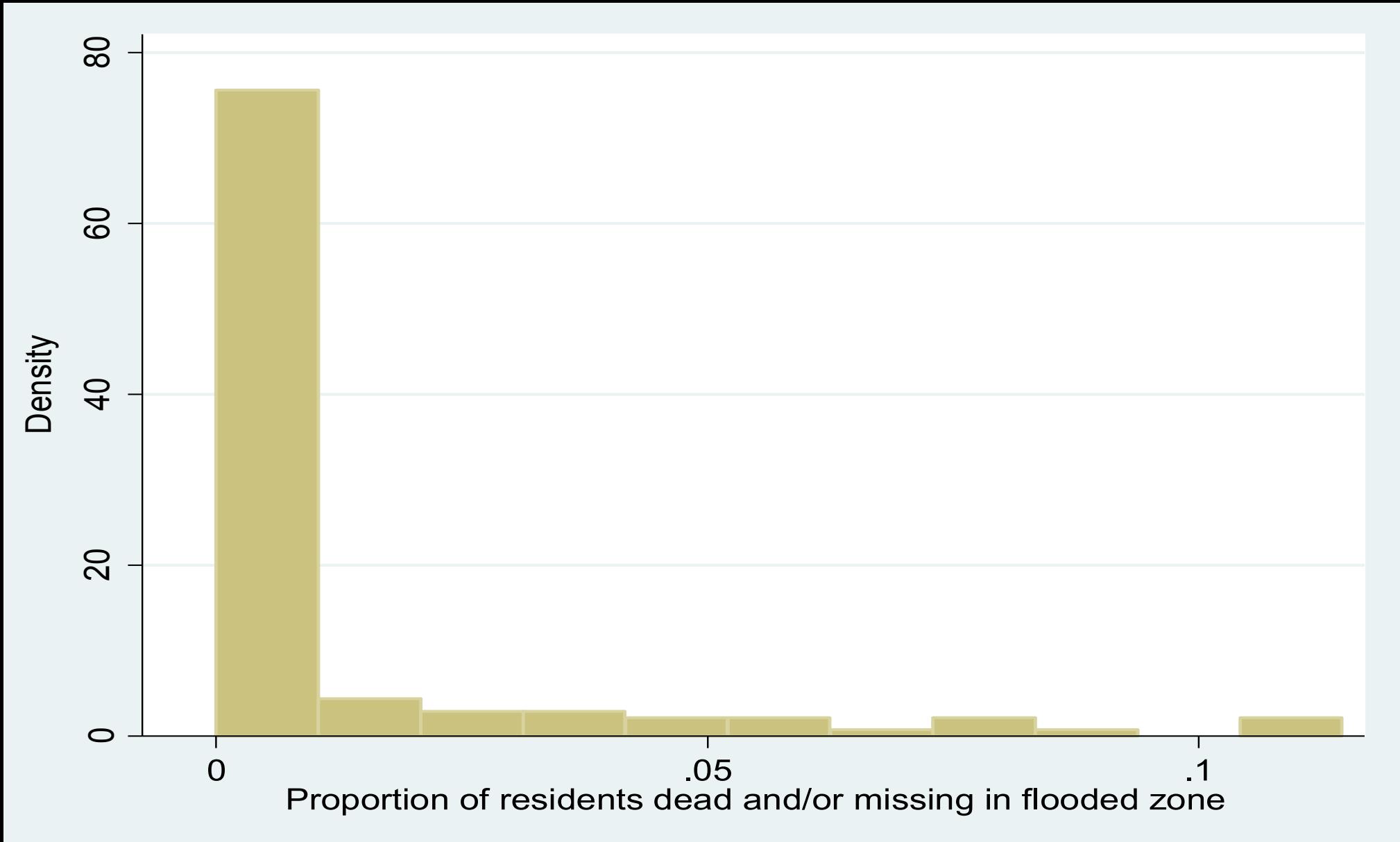
# Informal Insurance



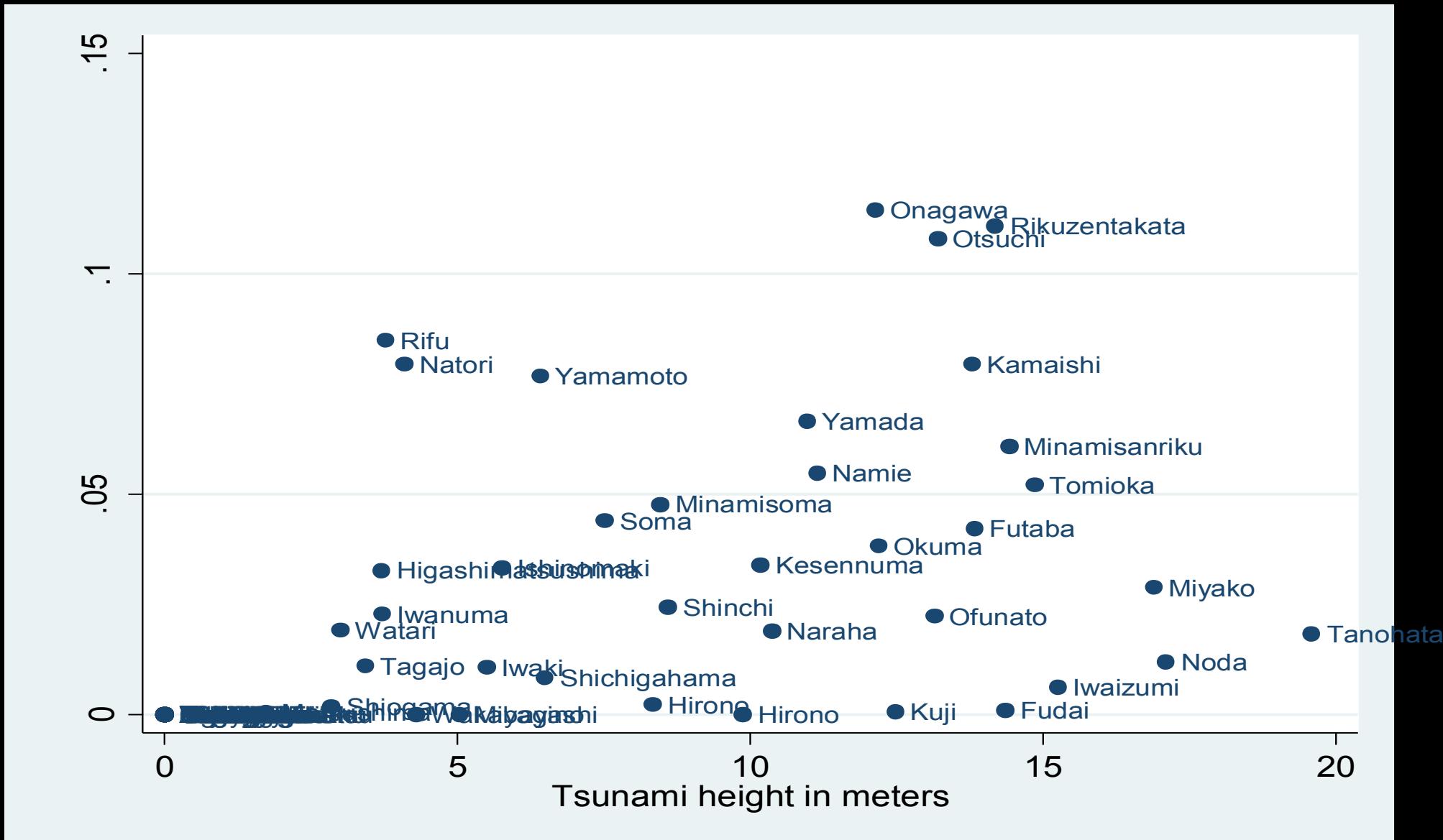
# 11 March 2011 Tsunami in Tohoku Japan



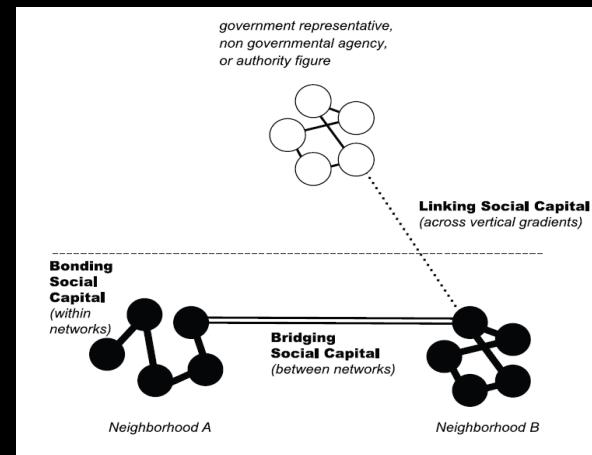
# Uneven distribution of deaths



# Not perfectly correlated with height



# Theories of Mortality



# Social capital helped vulnerable evacuate

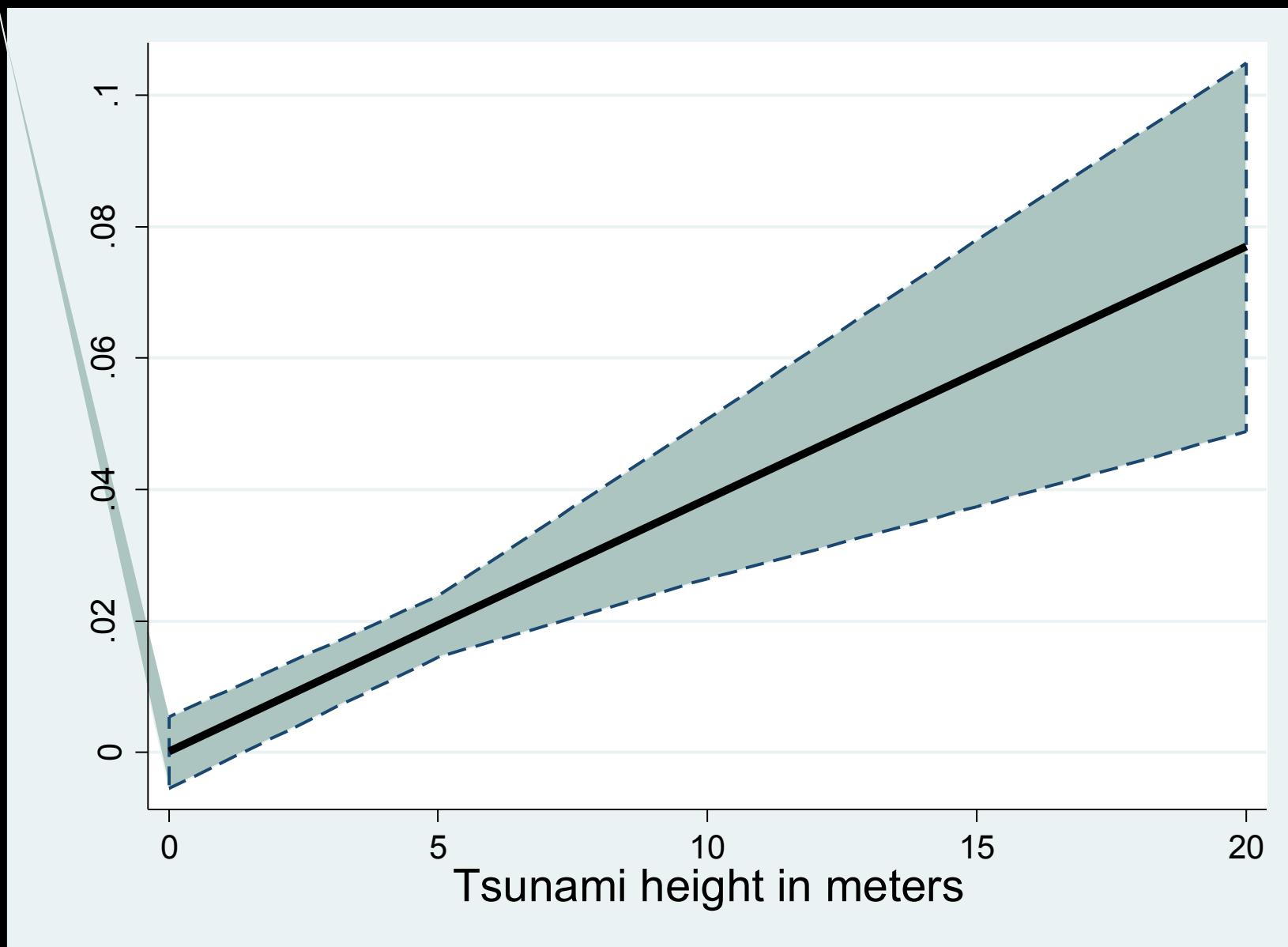


# Variables we can measure

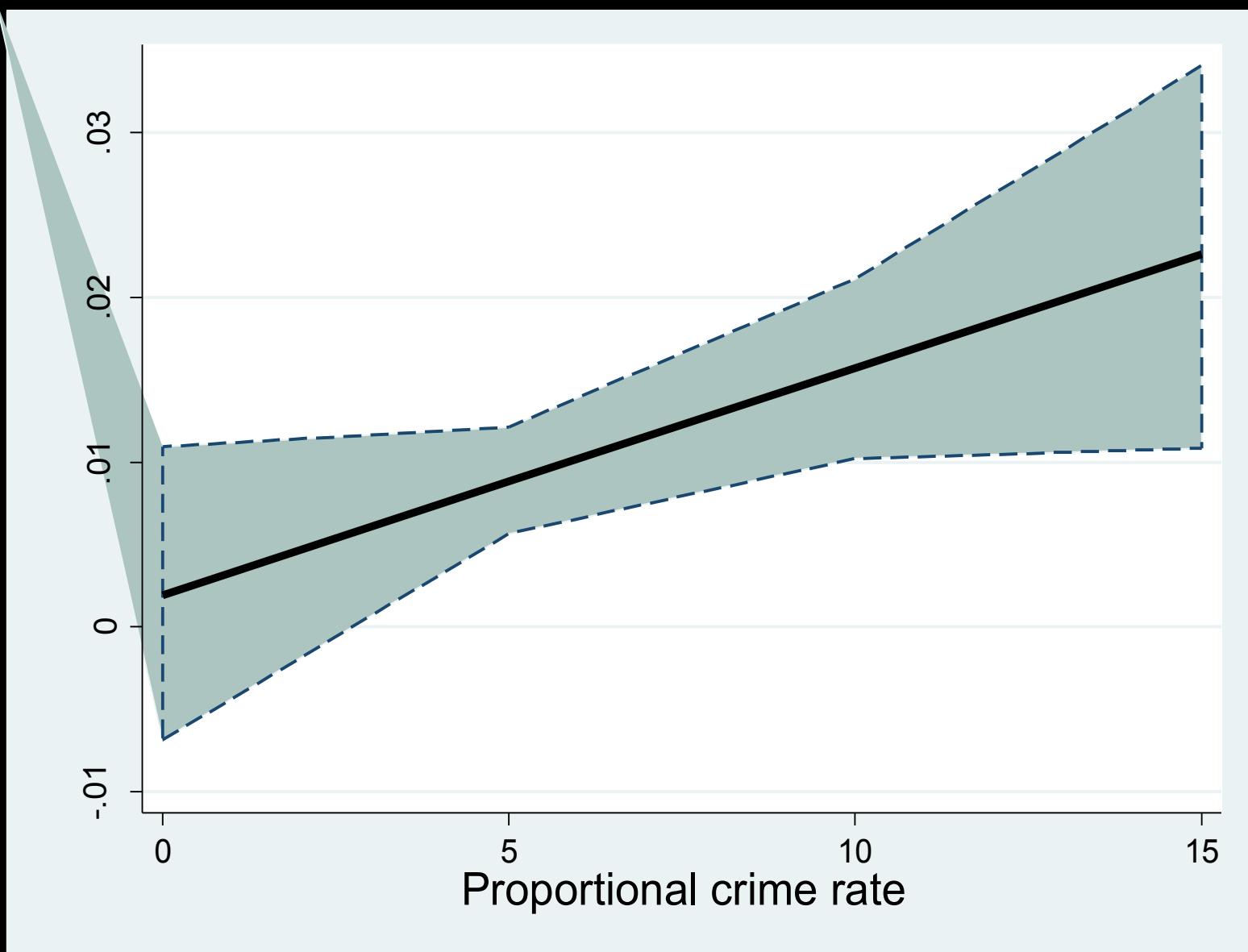
Firefighting expenditure	Paved roads
Tsunami height	Area of the municipality
Sea wall height	Coast line length
Length of paved roads	Population density
Pre-tsunami mortality rate	Percentage of pop in fishing industry
Percentage of single-family households	Crimes per 1000 people
LDP support	Disaster spending

Model	OLS regression (robust standard errors)	Negative binomial regression (robust SEs)	GLM logit family (robust standard errors)	Zero inflated beta distribution	Tobit (lower limit at zero, robust SEs)
Tsunami height (meters)	0.00403*** (3.22)	0.269*** (4.49)	0.280*** (4.39)	0.121** (2.46)	0.00783*** (4.49)
Area of the municipality (square km)	-0.00000924 (-0.92)	0.000622 (0.37)	0.000664 (0.39)	0.000712 (0.54)	0.0000158 (0.58)
Sea wall height (meters)	-0.00107 (-0.63)	0.0856 (1.13)	0.0831 (1.07)	-0.0710 (-1.22)	0.00267 (1.56)
Coast line length (km)	0.000598** (2.09)	0.0509*** (3.34)	0.0522*** (3.35)	0.0233* (1.95)	0.00150*** (3.87)
Length of paved roads	-0.00000286 (-0.10)	-0.00578 (-1.40)	-0.00599 (-1.43)	-0.00499 (-1.58)	-0.000149** (-2.17)
Population density (people/sq km)	-0.00000323 (-1.35)	-0.000111 (-0.49)	-0.000122 (-0.52)	-0.000457** (-2.02)	0.000000686 (0.19)
Pre-tsunami mortality rate	0.918* (1.73)	-13.33 (-0.15)	-11.92 (-0.13)	107.0 (1.52)	0.574 (0.27)
Percentage of population in fishing industry	-0.591 (-0.91)	-35.26 (-1.01)	-36.74 (-1.02)	-0.682 (-0.02)	-0.405 (-0.43)
Percentage single-person households	-0.00340 (-0.08)	-5.626* (-1.70)	-5.838* (-1.67)	-1.551 (-0.57)	-0.120 (-1.11)
Crimes per 1000 residents	1.395** (2.14)	264.6*** (4.06)	270.7*** (4.03)	204.1*** (2.70)	6.883*** (3.62)
25 to 30% LDP support in 2009 LH election	-0.0128** (-2.45)	-0.278 (-0.69)	-0.326 (-0.79)	-0.905** (-2.31)	-0.0275** (-2.56)
30 to 35% LDP support in 2009 LH election	-0.00980 (-1.62)	0.194 (0.34)	0.160 (0.27)	-0.882** (-2.04)	-0.0162 (-1.13)
Above 35% LDP support in 2009 LH election	-0.0245** (-2.53)	-0.609 (-0.46)	-0.689 (-0.51)	-1.155** (-2.37)	-0.0617*** (-3.19)
Merged locality (0/1)	-0.00883 (-1.48)	-0.350 (-0.74)	-0.373 (-0.76)	0.135 (0.24)	-0.0292* (-1.91)
New locality created through merger (0/1)	-0.00390 (-0.87)	-0.861** (-1.97)	-0.883* (-1.96)	-0.441 (-0.95)	-0.0354*** (-2.65)
Firefighting expenditure per capita	-0.000165 (-1.52)	-0.0613 (-1.15)	-0.0631 (-1.14)	-0.0258 (-1.59)	-0.000855** (-2.22)
Constant	-0.00114 (-0.11)	-5.755*** (-3.13)	-5.718*** (-3.02)	-4.852*** (-3.84)	-0.0427 (-1.14)
Auxillary coefficients					
	20.42				

# Tsunami Height Matters to a Degree



# Social Networks Critical



# Recovery: Rebuilding Ishinomaki



# Clean up in Sendai



# Recovery Components for NIRA

**Convenience store presence**

**Number of people in evacuation shelters**

**Number of evacuees from outside the prefecture**

**Rate of temporary housing occupation**

**Recovery rate of middle and junior high schools**

**Electricity restoration level**

**Gas line restoration level**

**Railroad restoration**

**Road restoration**

**Emergency medical service restoration**

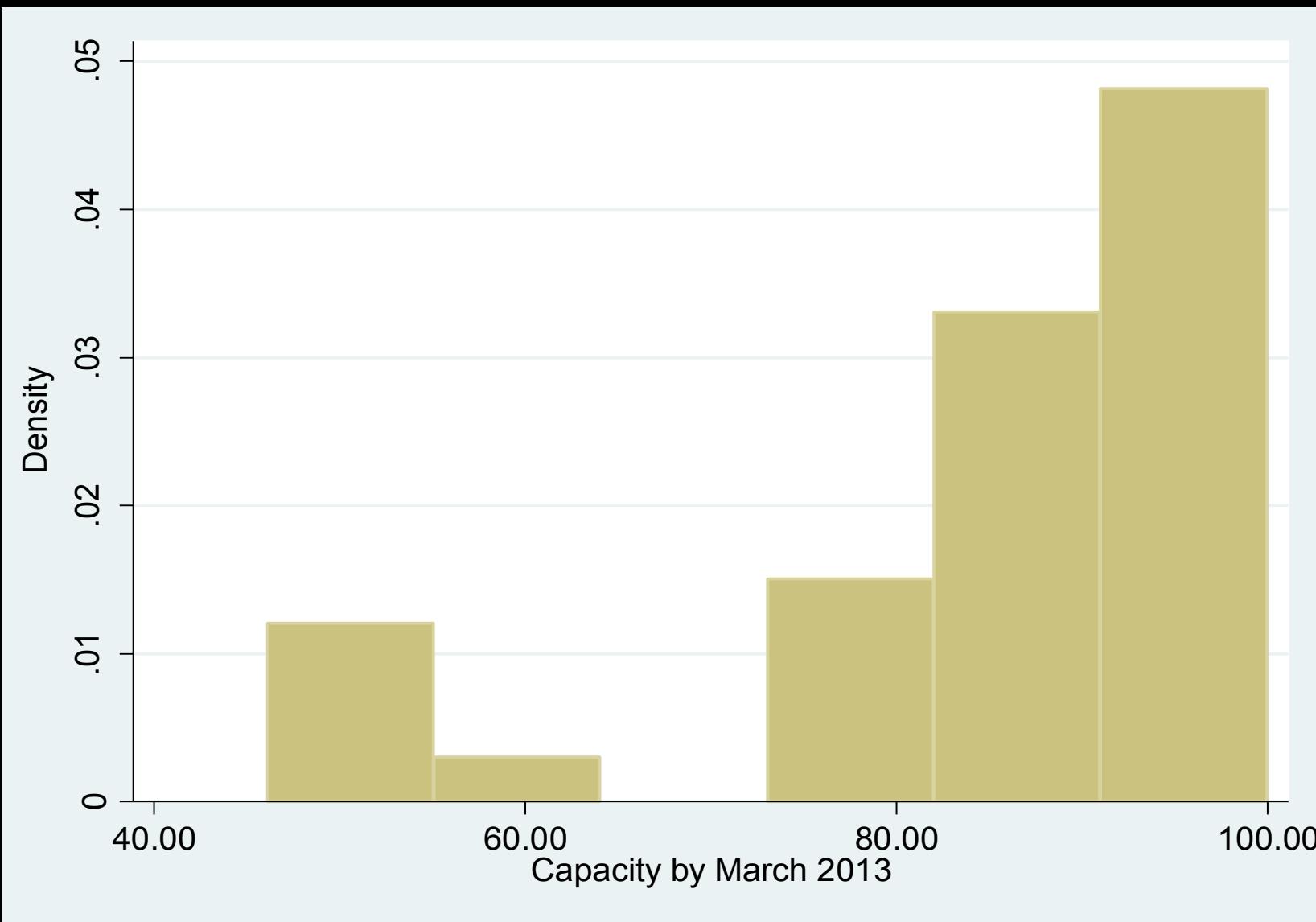
**Restoration of medical testing**

**Debris pick up levels**

**Support from other municipal governments**

**Private and public insurance rates**

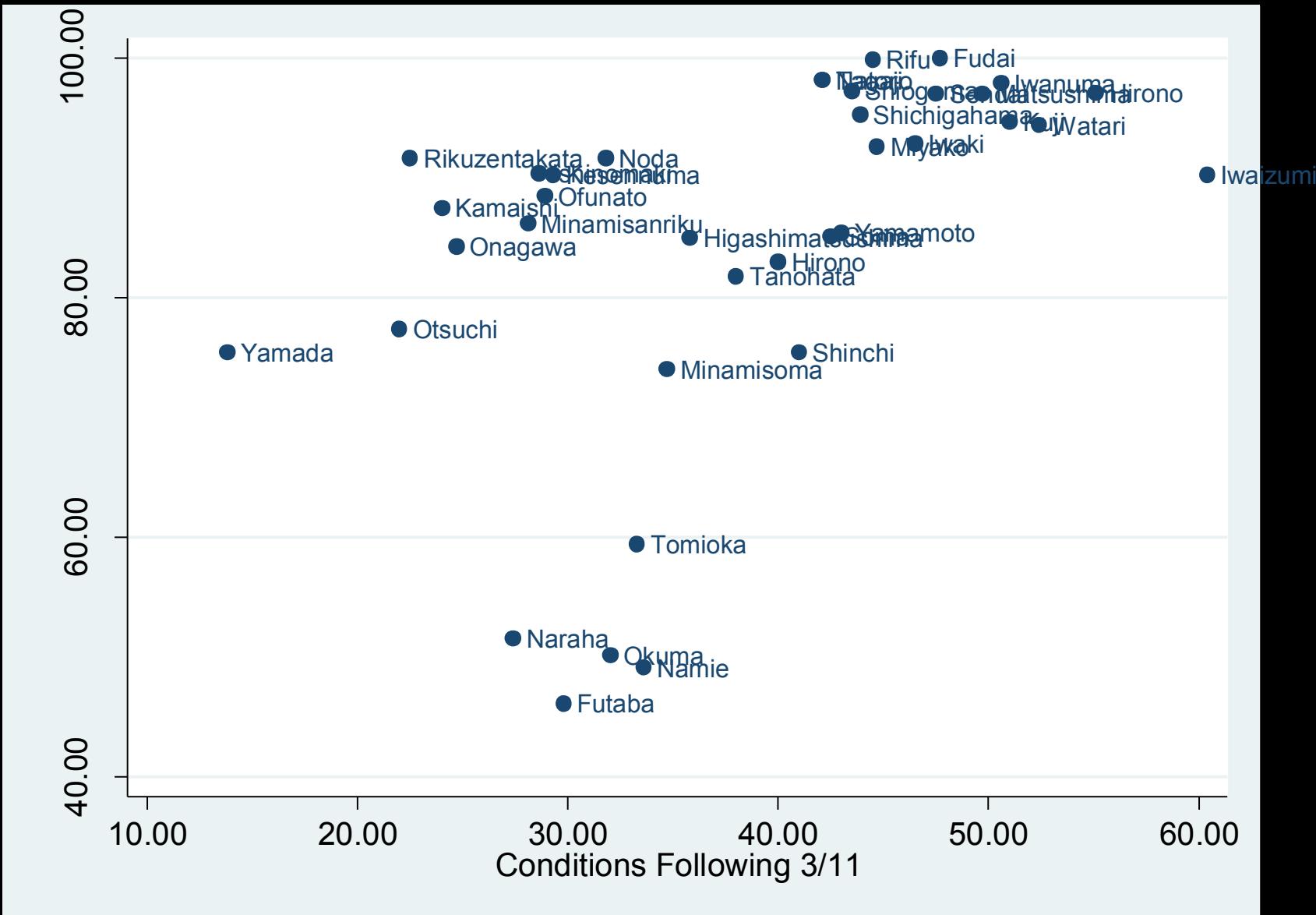
# Distribution of Post Tsunami Recovery



# Descriptive Statistics

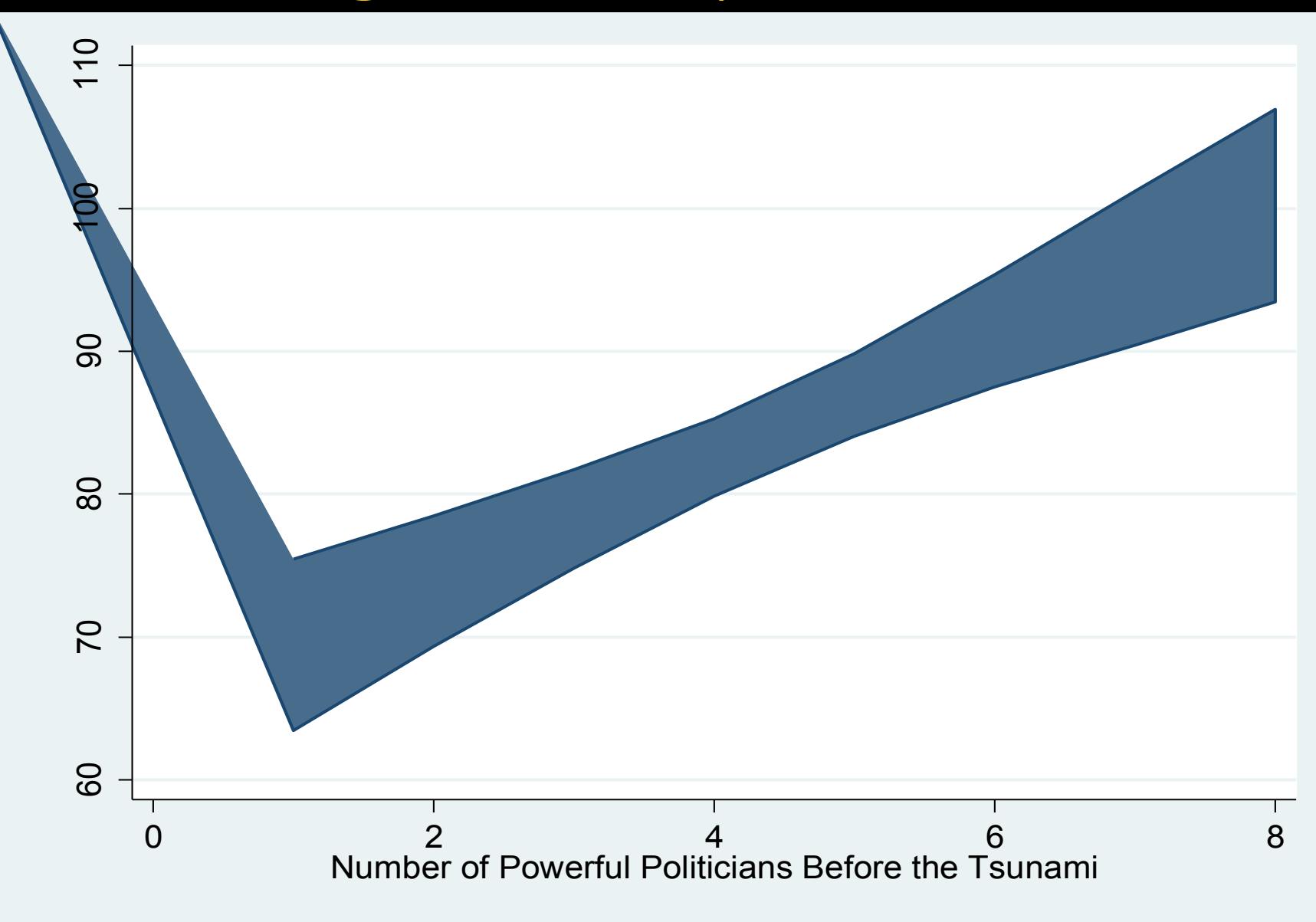
Variable	N	Mean	Standard Deviation	Minimum	Maximum
Outcomes					
<b>Immediate post-tsunami capacity</b>	37	38.01	10.64	13.80	60.40
<b>Capacity by March '12</b>	37	75.14	12.96	45.00	91.20
<b>Capacity by March '13</b>	37	84.65	15.20	46.10	100.00
<b>Proportion of dead and missing</b>	37	0.02	0.02	0.00	0.09
Geographic Factors					
<b>Town area (km)</b>	37	266.39	325.95	13.27	1259.89
Economic Factors					
<b>Financial capability Index</b>	37	0.59	0.34	0.14	1.50
<b>Normed budget for disaster activities</b>	37	1.15	2.023	0	10.67
Political Factors					
<b>Perc supporting LDP</b>	36	0.31	0.05	0.22	0.45
<b>Perc supporting DPJ</b>	36	0.47	0.05	0.33	0.57
<b>Number of powerful politicians</b>	35	4.29	2.46	1.00	8.00
Demographic Factors					
<b>Pop. density (people/km2)</b>	37	433.35	749.35	10.88	3209.16
<b>Proportion greater than 65</b>	37	0.27	0.05	0.16	0.38
Social Cohesion					
<b>Proportional crime rate</b>	37	0.01	0.00	0.00	0.01

# Post 3.11 Capacity and Recovery

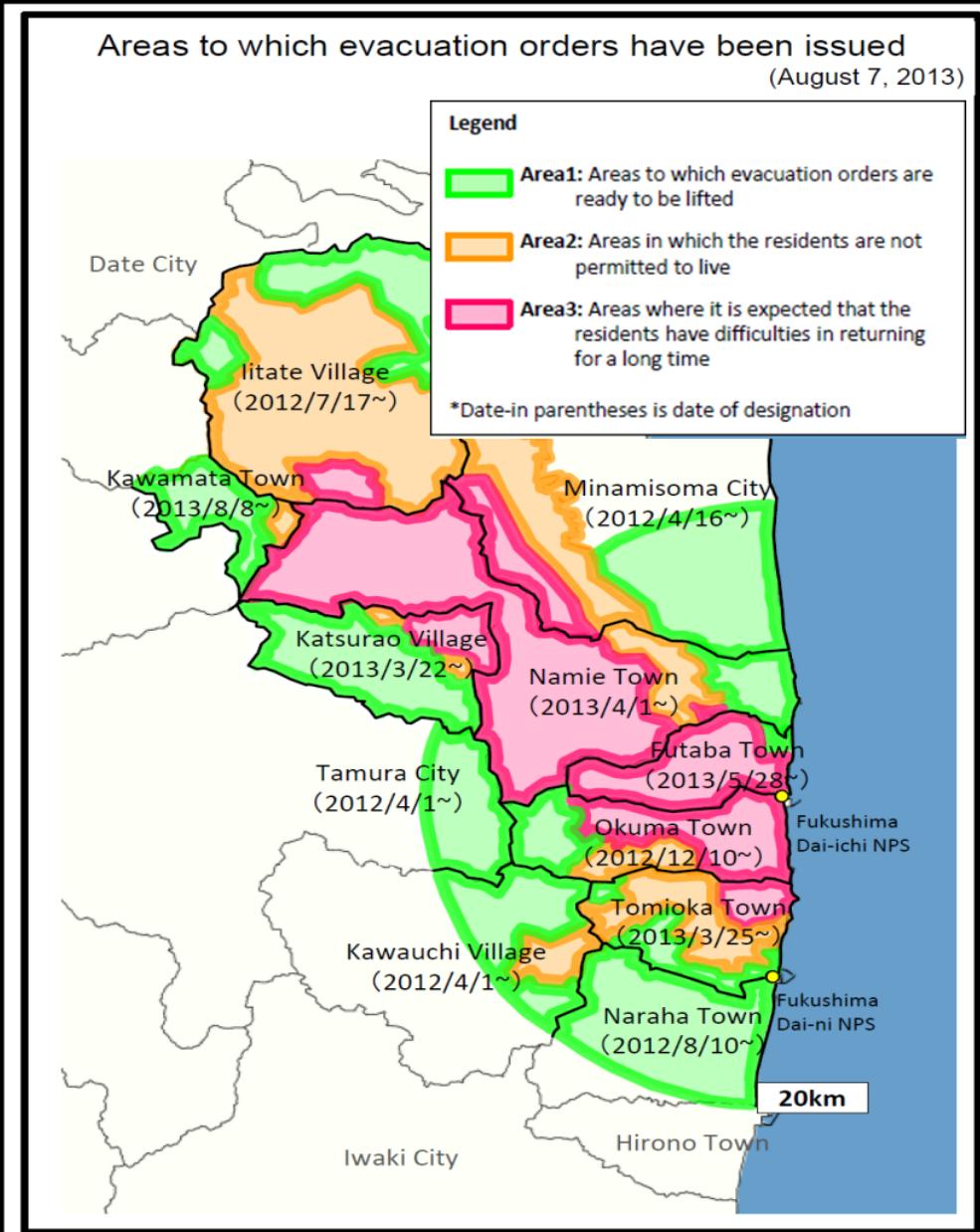


	Ordinary least squares (robust SE)	Tobit (upper bound at 100)
<b>Immediate Conditions</b>	0.512***	0.512***
	0.18	0.14
<b>Proportion of dead and missing</b>	98.18	98.18
	55.78	66.88
<b>Town area (km)</b>	0.008*	0.009*
	0.00	0.00
<b>Financial capability Index</b>	-3.44	-3.44
	6.27	5.01
<b>Normed budget for disaster activities</b>	0.77	0.77
	0.76	0.72
<b>Percentage supporting LDP</b>	-69.89	-69.89
	50.08	45.19
<b>Percentage supporting DPJ</b>	-12.41	-12.41
	34.12	36.96
<b>Number of powerful politicians</b>	3.41***	3.41***
	0.92	0.76
<b>Population density (people/km2)</b>	0.00	0.00
	0.00	0.00
<b>Proportion greater than 65</b>	2.88	2.88
	56.73	46.28
<b>Proportional crime rate</b>	1220.45	1220.45
	762.22	651.25
<b>Constant</b>	55.24	55.24
	45.59	40.13
<b>/sigma</b>		6.27
		0.76

# Linking social capital critical



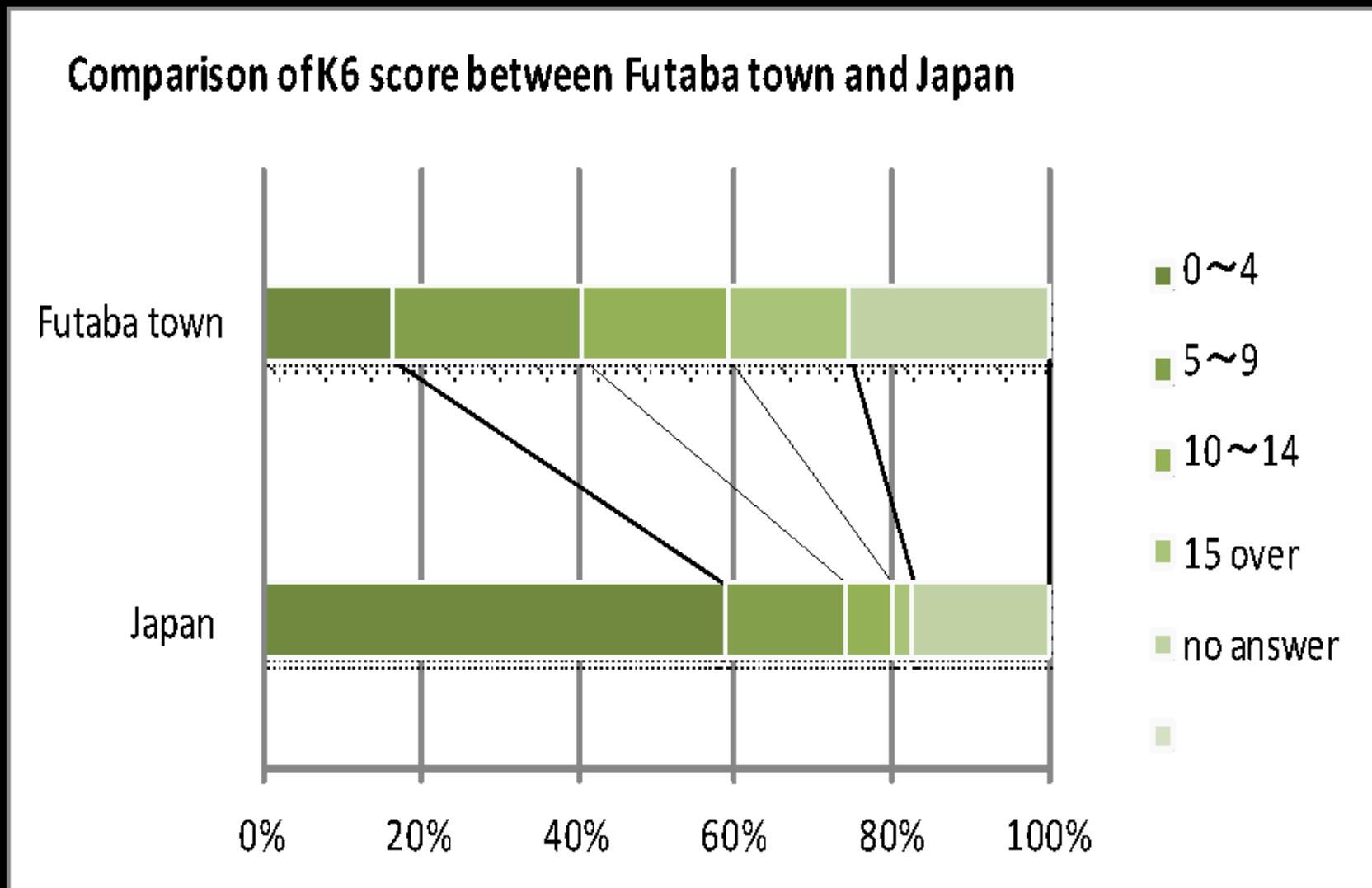
# Futaba town and Evacuation Orders



# Mental Health Checklist

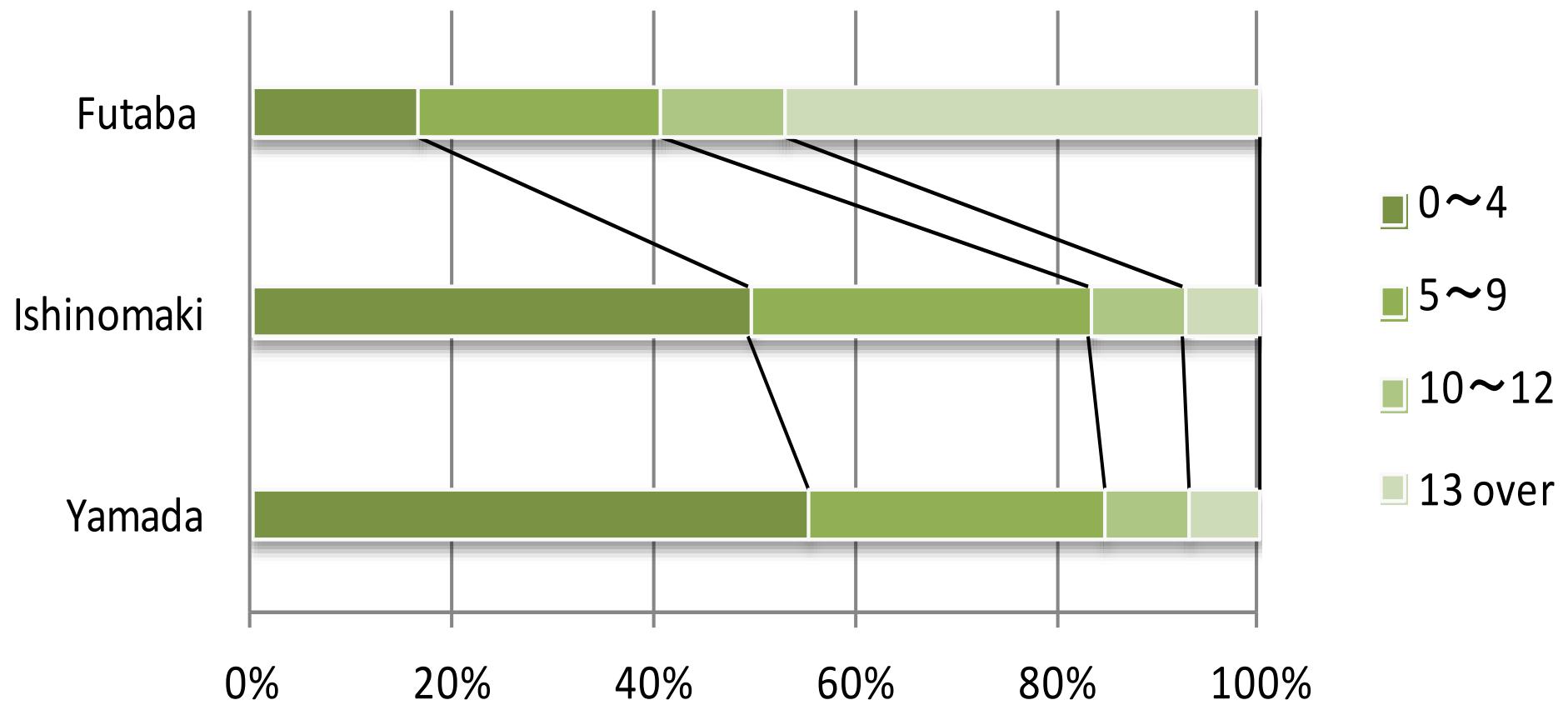
	During past 30 days how often did you feel....	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a.	... nervous?	4	3	2	1	0
b.	... hopeless?	4	3	2	1	0
c.	...restless or fidgety?	4	3	2	1	0
d.	...so depressed that nothing could cheer you up?	4	3	2	1	0
e.	...that everything was an effort?	4	3	2	1	0
f.	...worthless?	4	3	2	1	0

# Major differences in mental health

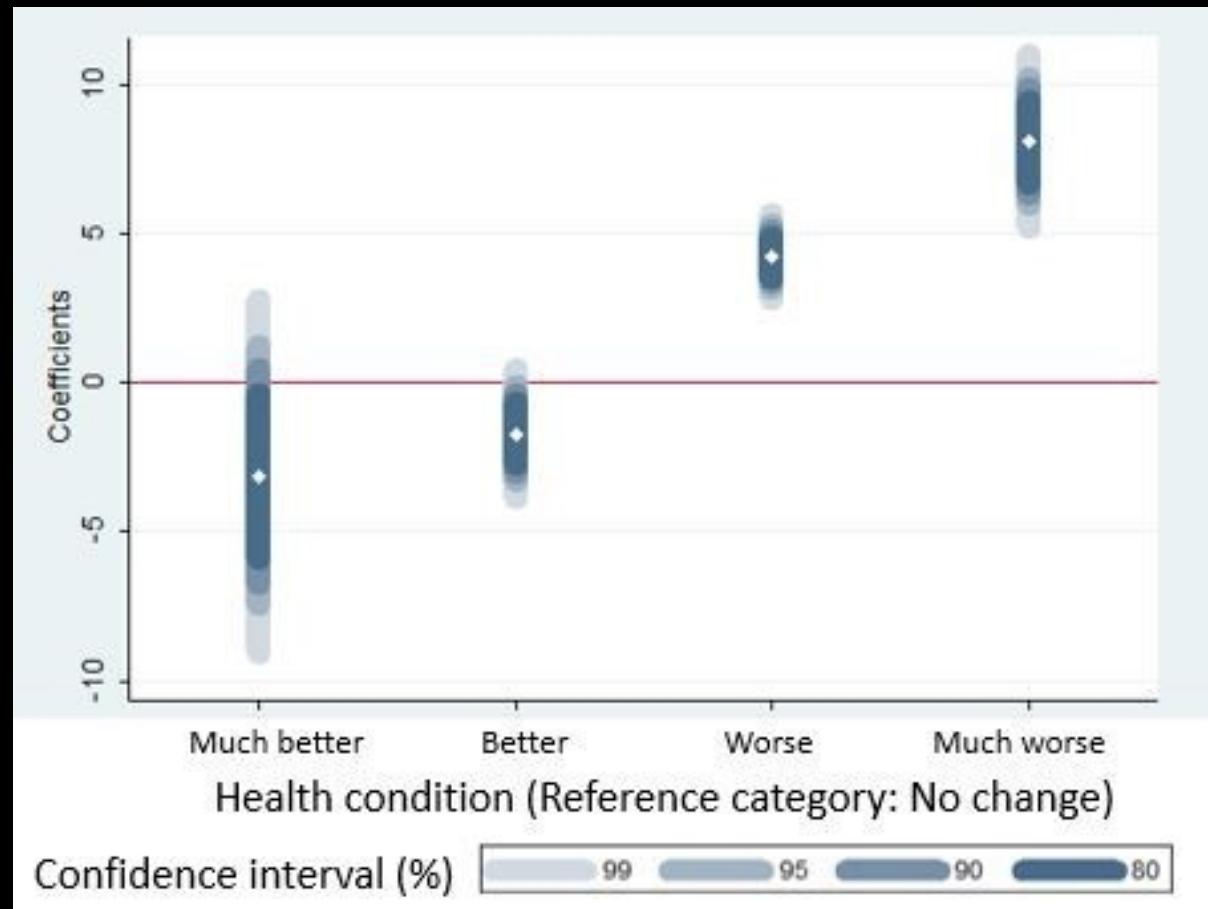
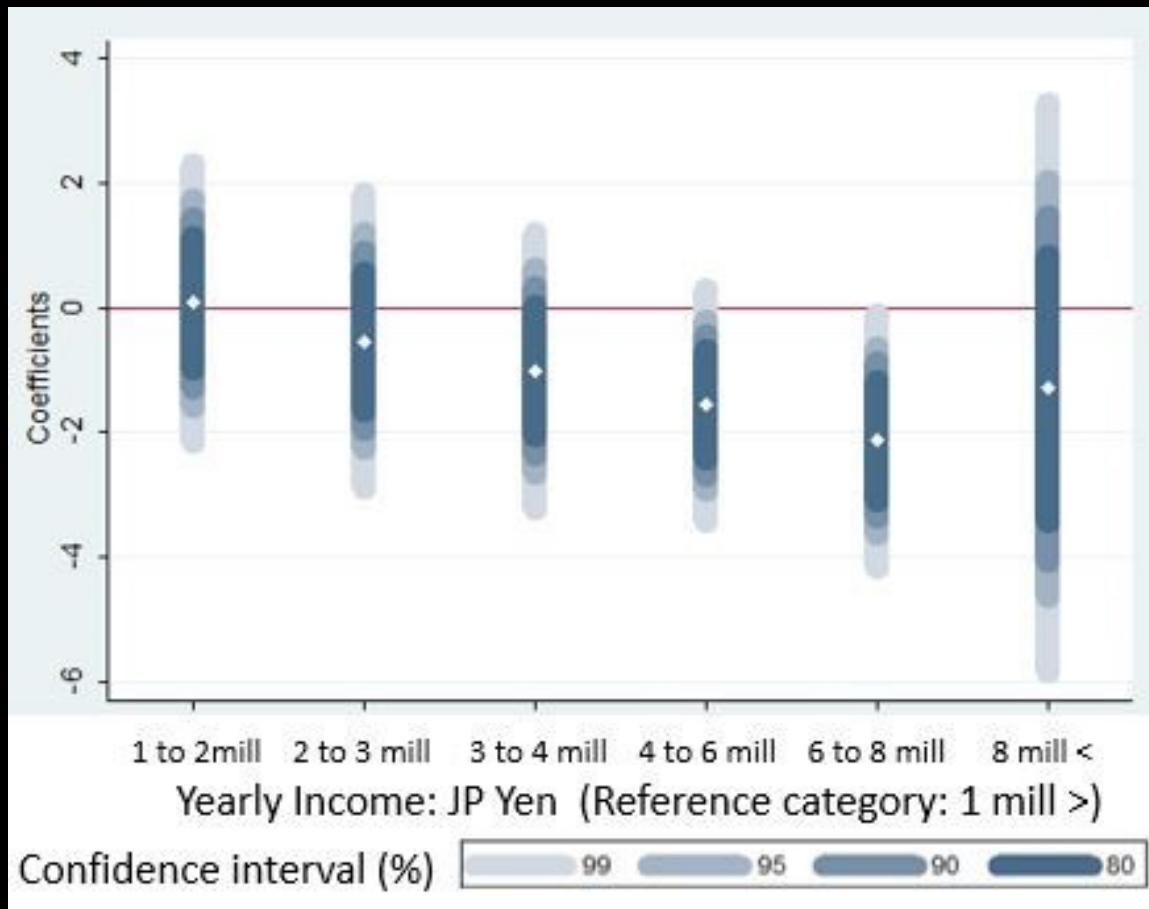


# Different from other disaster survivors

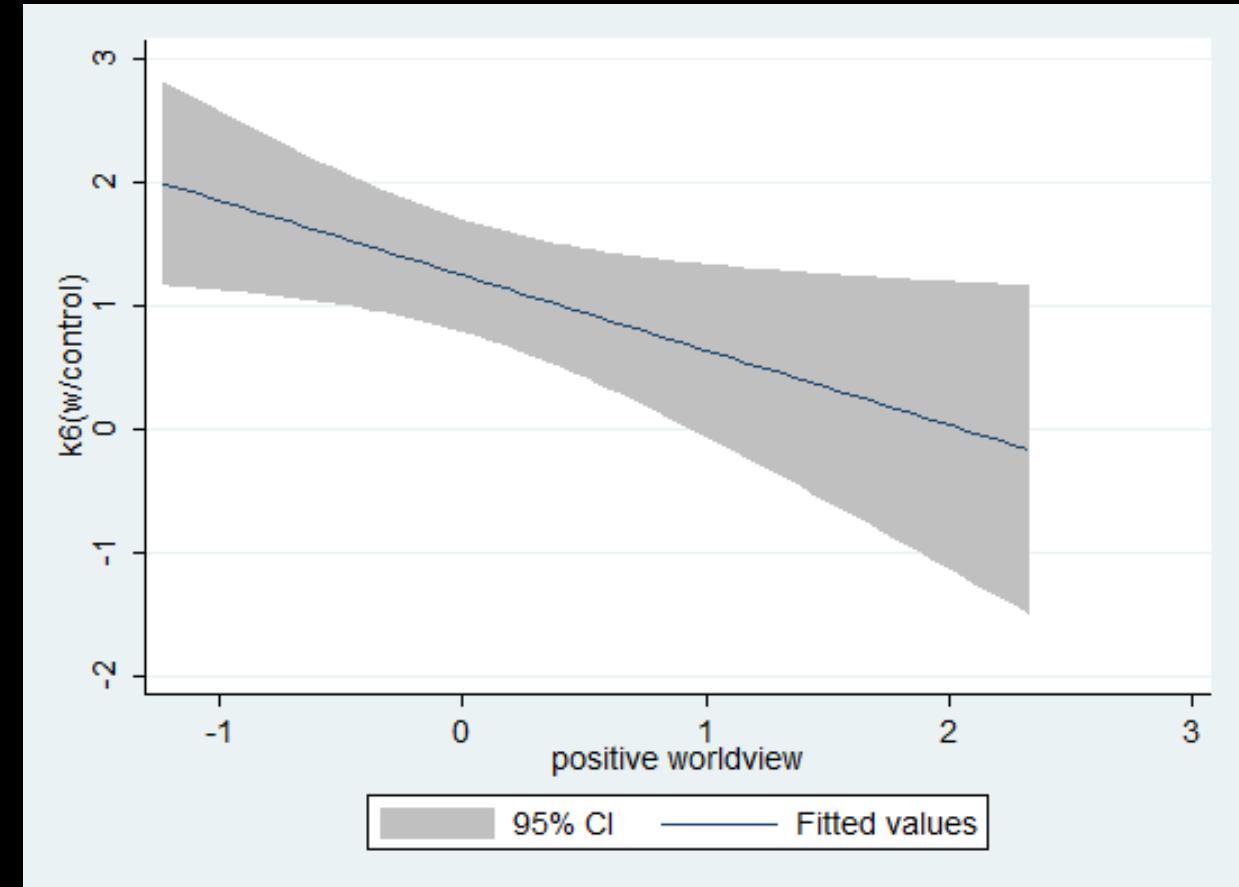
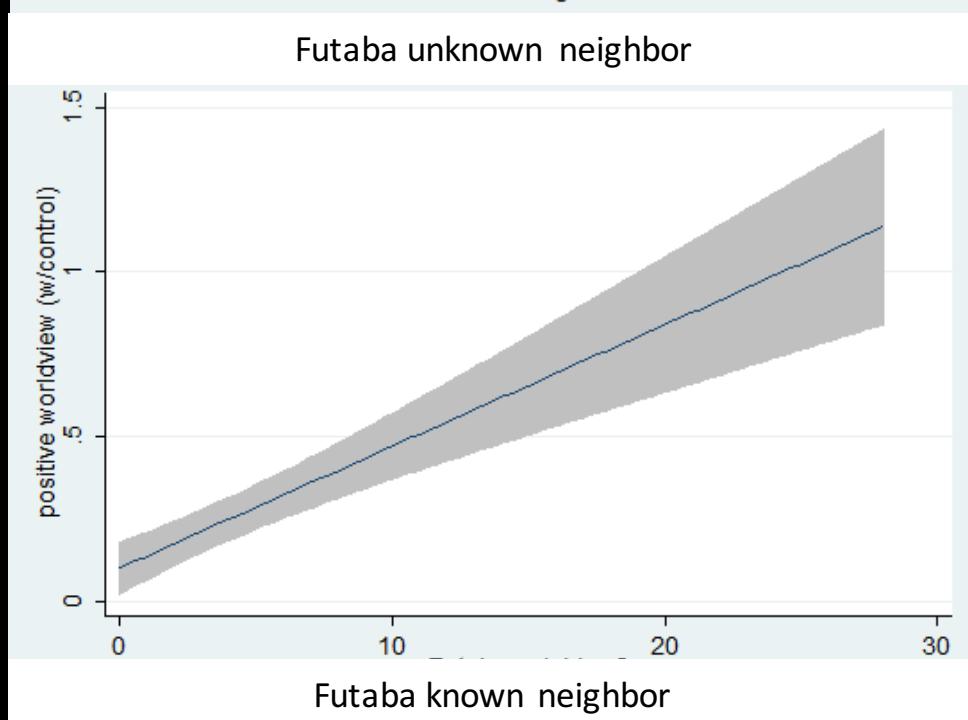
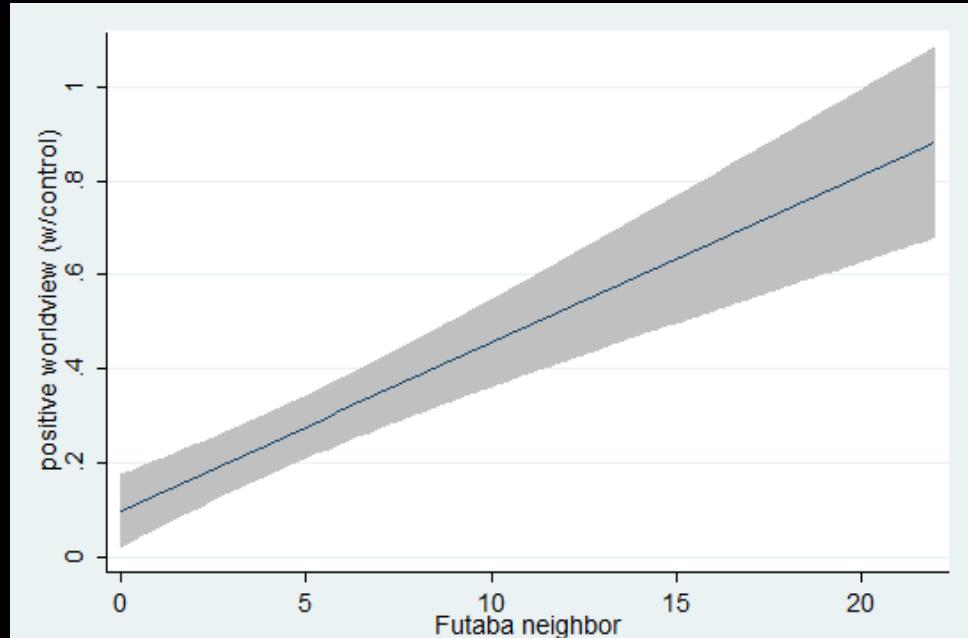
**Comparison of distribution of the K6 scores**



# Income and health do not affect K6 scores



# Social capital serves as a shield against mental illness



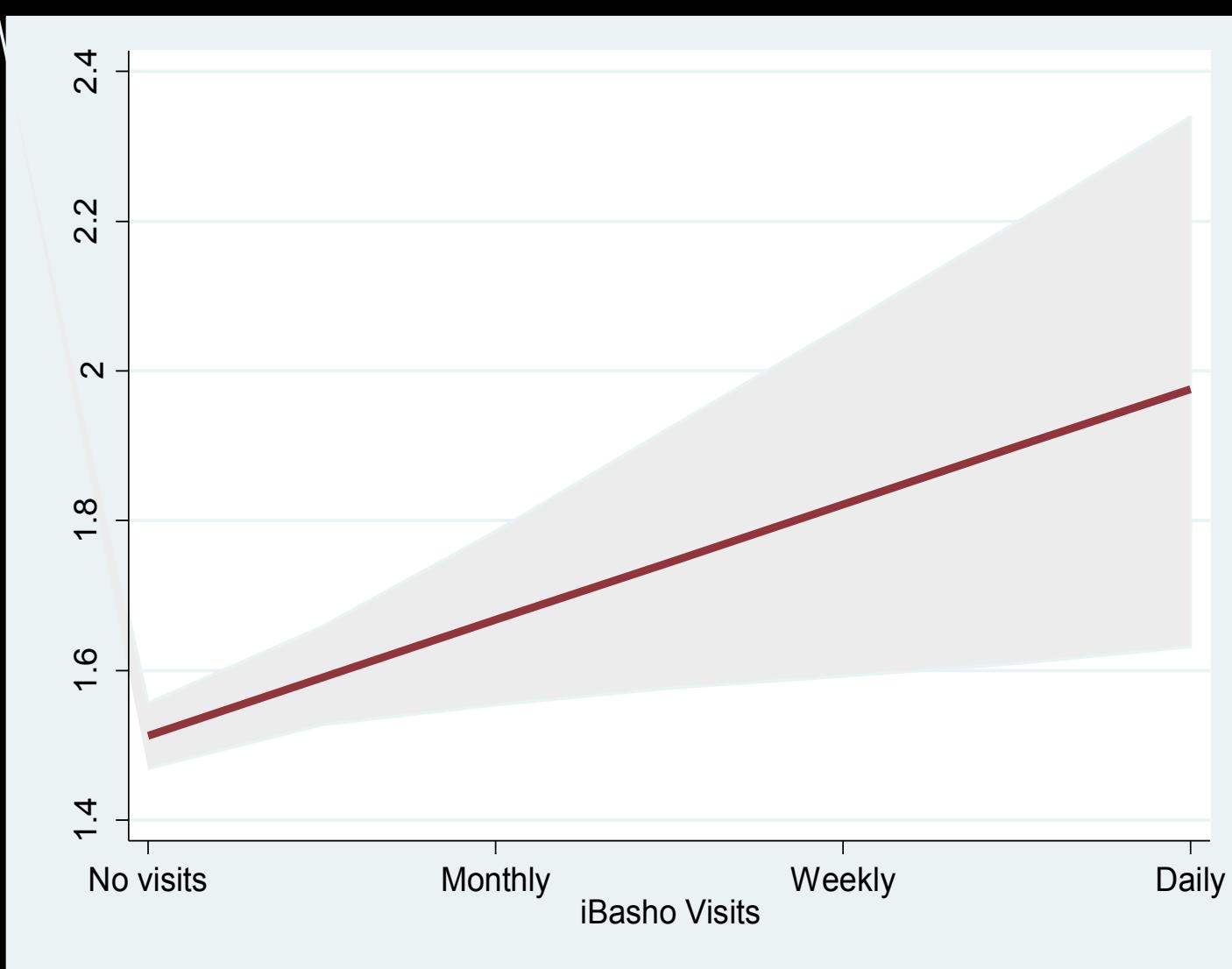
# Policy Recommendations to enhance adaptation



# Our experiment in Japan, Philippines, and Nepal: Ibasho



# Measurable impact of Ibasho

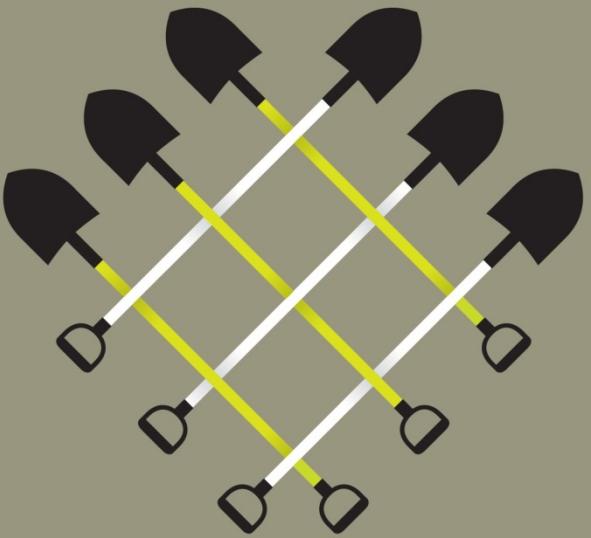


# Conclusions

Typical models for handling climate change induced disasters and stresses focus on physical infrastructure

Yet horizontal and vertical ties proved critical during and after the 3/11 compounded disasters

Should invest in social, not physical, infrastructure for mitigation / adaptation to climate change



# Building Resilience

SOCIAL CAPITAL IN POST-DISASTER RECOVERY

Daniel P.  
Aldrich



Healthy, Resilient, and Sustainable  
COMMUNITIES  
AFTER DISASTERS



Strategies, Opportunities, and  
Planning for Recovery

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