A Geographic Tool To Predict Community Deprivation In Health Care Access: Based On A Model Of Combined Personal And Ecologic Characteristics

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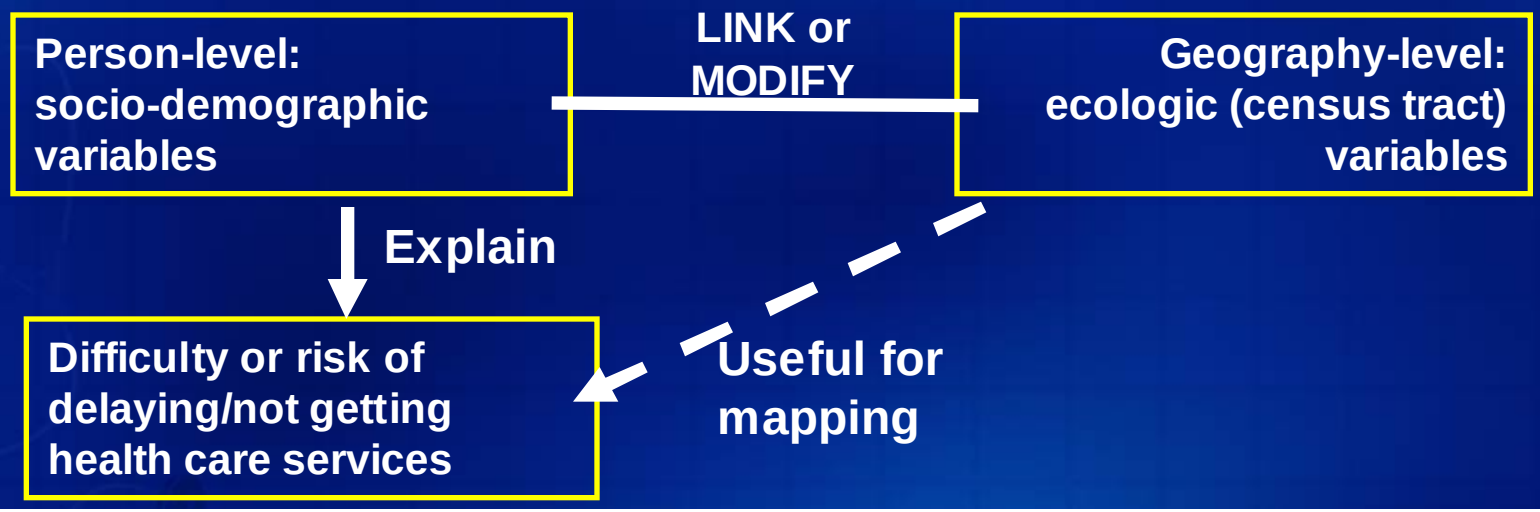
Outline

- Background and context
  - Previous work
  - Rationale for modeling
- Data
- Method: five-phased analysis plan
- Findings to date
  - Individual person-level; census-level; multi-level models
- Limitations and Next steps:
  - Modeling and mapping
  - Incorporation in mapping tool

Background

- Growth in persons at risk of poor access to health care services
- To explain barriers or delays in accessing health care, many used either:
  1. Personal characteristics
  2. Ecological measures as near-proxy for access problems
- We combined 2 methods ➔ multi-level model (2-levels) to derive health access deprivation index (HADI)



Five-phased Analytical Method:

(Earlier:) (1) Selected key NHIS variables based on review of literature & exploratory analysis including checks for multicollinearity (prior work). Identified 2 dependent variables from NHIS

(Earlier:) (2) Logistic modeling to explain individual-level health care services deprivation – create individual Deprivation Index

(3) Merged NHIS data with Census 2000 data at census-tract level (n=65,443), and 2006 ARF at RDC-NCHS.
- Two-part modeling to explain census tract-level deprivation

(4) Multi-level - Hierarchical Linear Modeling (HLM) – best predictors

(5) OLS regression analysis to identify best predictors – assess by comparing to HLM model - create census tract level Deprivation Index.

Mapped resulting health deprivation index –

(Future): Map provider availability overlay etc.

Analytical Design and Method:

(1) **Estimated** model using 2001-2003 NHIS data.
(2) **Evaluated** model using 2004-2006 NHIS data.

Exploratory analysis included:

a) check for multicollinearity (variance inflation factor),
b) identification of two dependent/outcome variables;
c) Identification of explanatory variables after extensive lit. review

(3) Logistic regression – used goodness-of-fit tests for complex survey samples, by Archer and Lemeshow, (2006) using Stata

(4) To maximize cell sizes - Combined merged **2001-2005** NHIS data with 2000 Census data

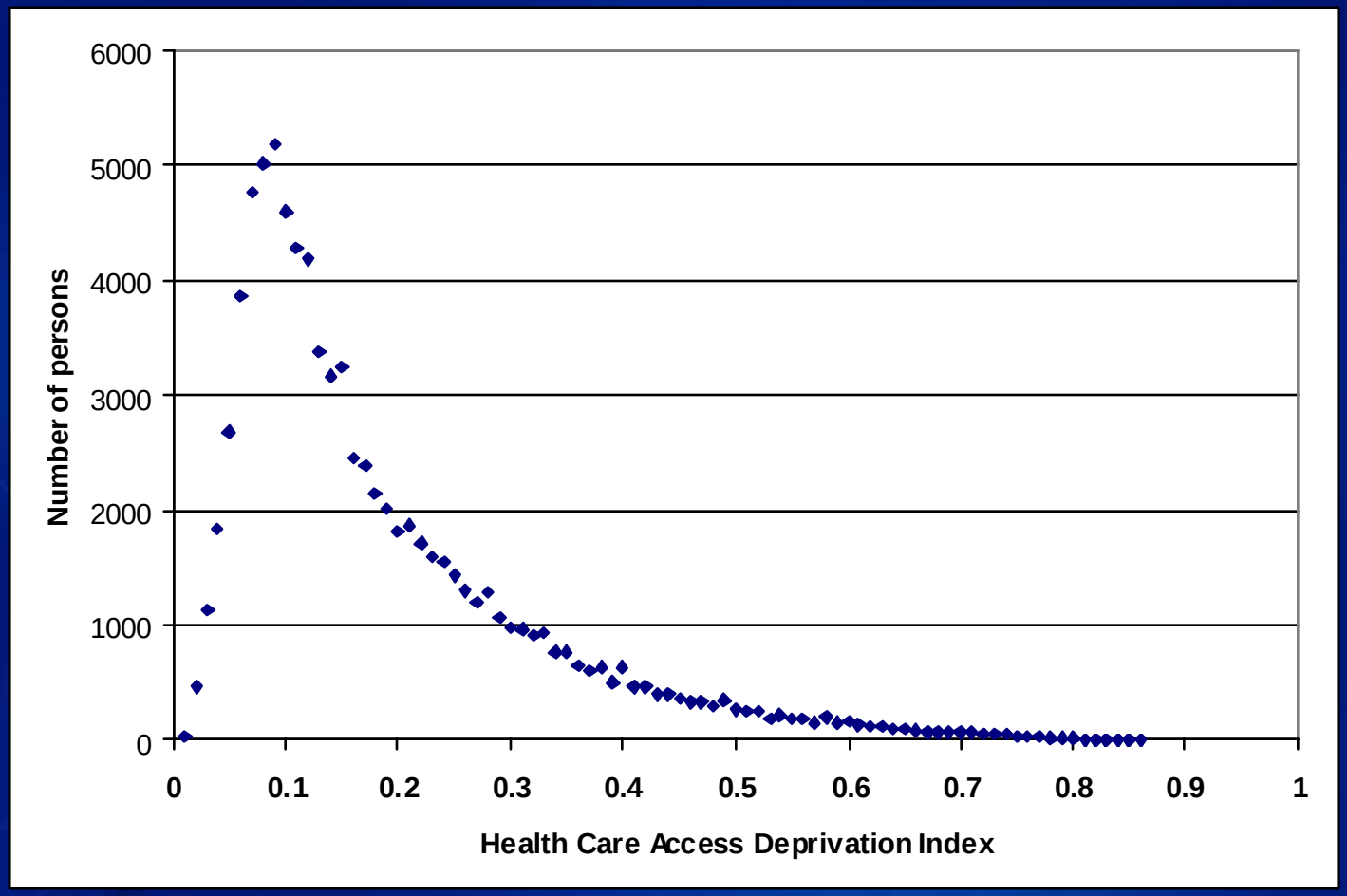
(5) Tried various methods for **index creation**

Findings: Person-level

From 2001-2003 and 2004-2006 NHIS data files, most significant predictors of health access deprivation at individual level are adults:

- With no insurance
- With a functional limitation
- With fair or poor health (self-assessed)
- Not own home
- Living with no children in household
- Less than 65 years old

Health Access Deprivation Index
– from individual-level modeling



Findings: Census tract level

From 2000 Census data, most significant predictors of health access deprivation at ecologic level are census tracts with:

- **Few retired persons (more 18 to 64 year olds)**
- **Are less densely populated**
- **Are in suburban areas**

- **Few variables stat. significant but wrong sign**

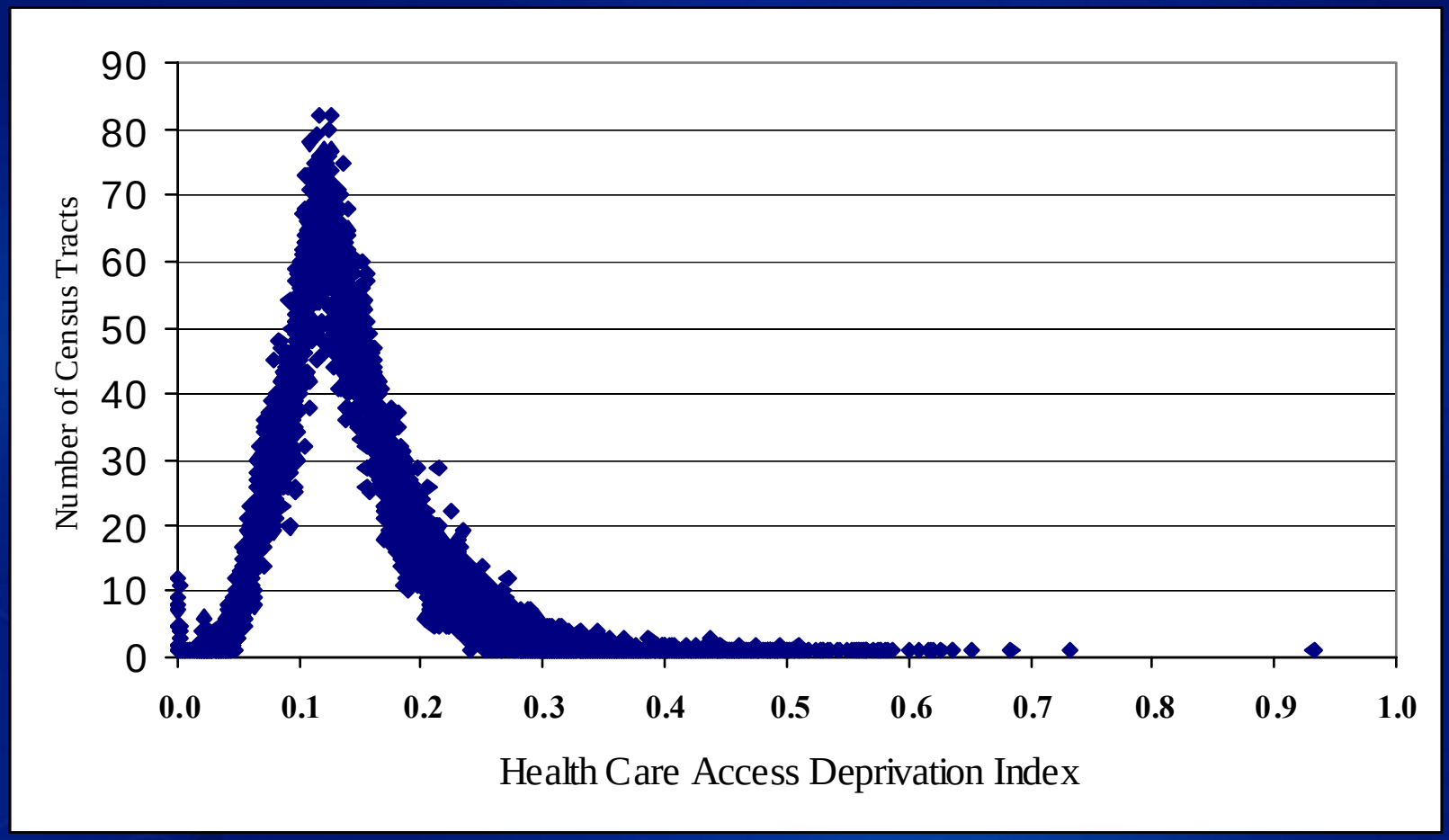
Multi-level analysis estimation:

- **Level-1 of Model**
- Probability (Y=1|B) = P (where Y = health access deprived)
- $\log[P/(1-P)] = B_0 + B_1*(HLT\_3) + B_2*(LIM\_1) + B_3*(RAC\_4) +$
- $B_4*(AGE\_1) + B_5*(HIS\_1) + B_6*(INS\_4) +$
- $B_7*(OWN\_2) + B_8*(SMO\_2) + B_9*(PHO\_2) + U_t$
- **Level-2 of Model**
- $B_0 = G_{00} + U_0$
- $B_1 = G_{10} + U_1$
- $B_2 = G_{20} + G_{21}*(\%\,65plus) + U_2$
- $B_3 = G_{30} + U_3$
- $B_4 = G_{40} + G_{41}*(\%\,65plus) + U_4$
- $B_5 = G_{50} + G_{51}*(\%\,Hispanic) + U_5$
- $B_6 = G_{60} + G_{63}*(MUA) + U_6$
- $B_7 = G_{70} + G_{71}*(Miles\ CHC) + G_{72}*(\%\,Own\ Home) + U_7$
- $B_8 = G_{80} + G_{81}*(\%\,Disabled) + U_8$
- $B_9 = G_{90} + G_{91}*(\%\,No\ Phone) + U_9$

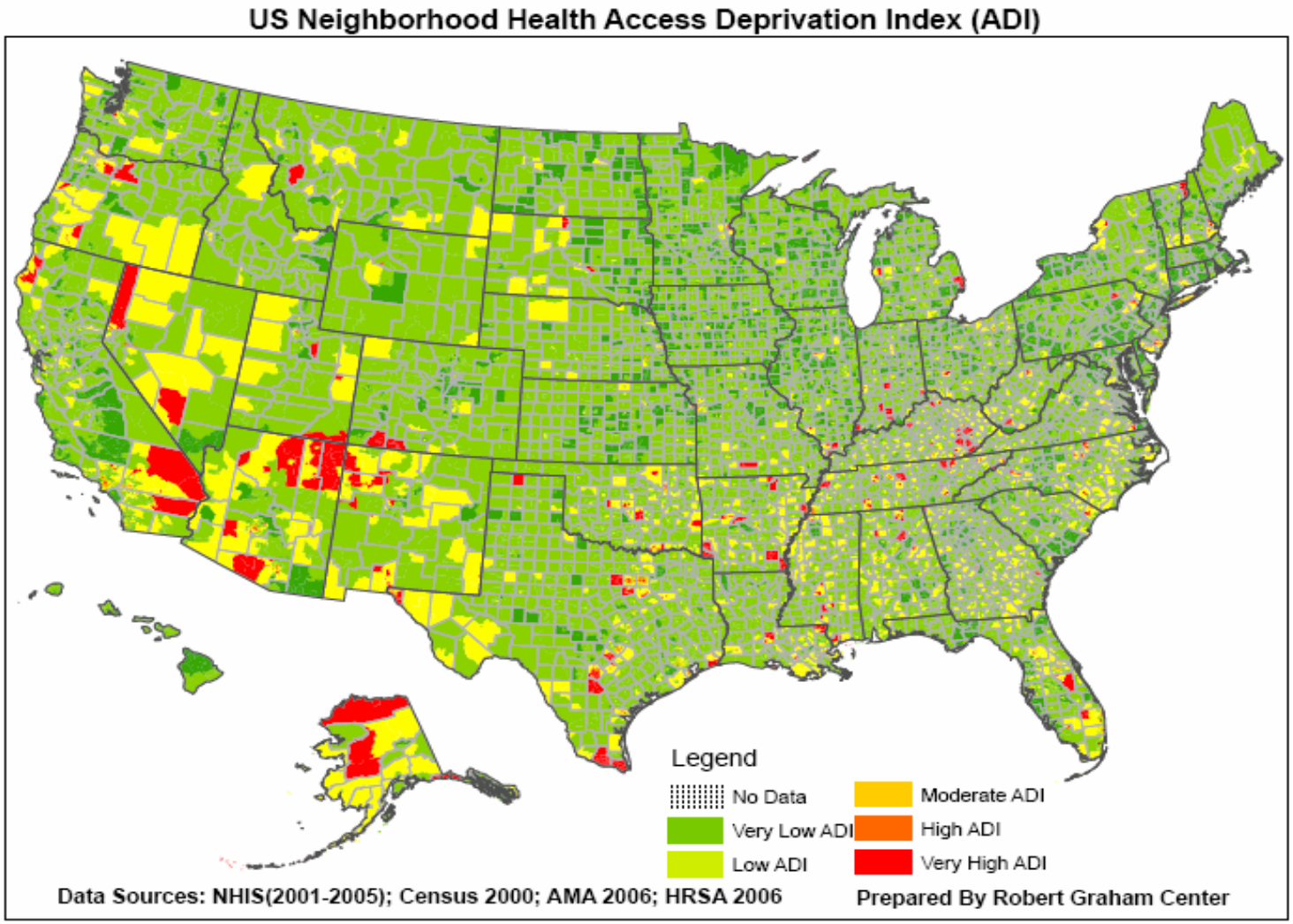
Multi-level Regression Results: 2001 – 2005 NHIS & 2000 Census data

	β Coeff	SE of β	P-value	OR	Variance
INTRCPT1, B0, INTRCPT2, G00	-2.057	0.015	0.000	0.130	
Rent home, slope B1 INTRCPT2, G10	0.312	0.032	0.000	1.370	0.107
% own home, G11	0.145	0.050	0.004	1.160	
Miles to CHC, G12	0.002	0.001	0.030	1.000	
MUA or not, G13	0.018	0.024	0.467	1.020	
Fair/Poor Health slope B2, INTRCPT2, G20	0.433	0.312	0.165	1.540	0.078
% 65 plus, G21	-0.063	0.296	0.832	0.940	
% Male, G22	0.216	0.609	0.723	1.240	
Functional limit slope, B3 INTRCPT2, G30	0.606	0.199	0.003	1.830	0.269
% 65 plus, G31	-0.580	0.175	0.001	0.560	
% Male, G32	0.297	0.386	0.442	1.350	
Never smoked slope, B4, INTRCPT2, G40	-0.345	0.027	0.000	0.710	0.272
% Disabled, G41	0.868	0.129	0.000	2.380	
No phone slope, B5 INTRCPT2, G50	1.570	0.491	0.002	4.810	0.295
% in Household w/ phone, G51	-1.195	0.509	0.019	0.300	
Multiple race slope, B6 INTRCPT2, G60	0.388	0.061	0.000	1.470	0.684
% Hispanic, G61	0.236	0.274	0.390	1.270	
Hispanic slope, B7 INTRCPT2, G70	0.070	0.030	0.020	1.070	0.304
% Hispanic, G71	0.127	0.066	0.054	1.140	
Less than 65 slope, B8 INTRCPT2, G80	0.511	0.021	0.000	1.670	0.469
% 65 plus, G81	0.226	0.122	0.063	1.250	
Medicaid/SCHIPP, B9 INTRCPT2, G90	-0.069	0.049	0.162	0.930	0.458
Miles from CHC, G91	0.002	0.002	0.333	1.000	
HPSA or not, G92	0.007	0.059	0.909	1.010	
MUA or not, G93	-0.167	0.061	0.006	0.850	

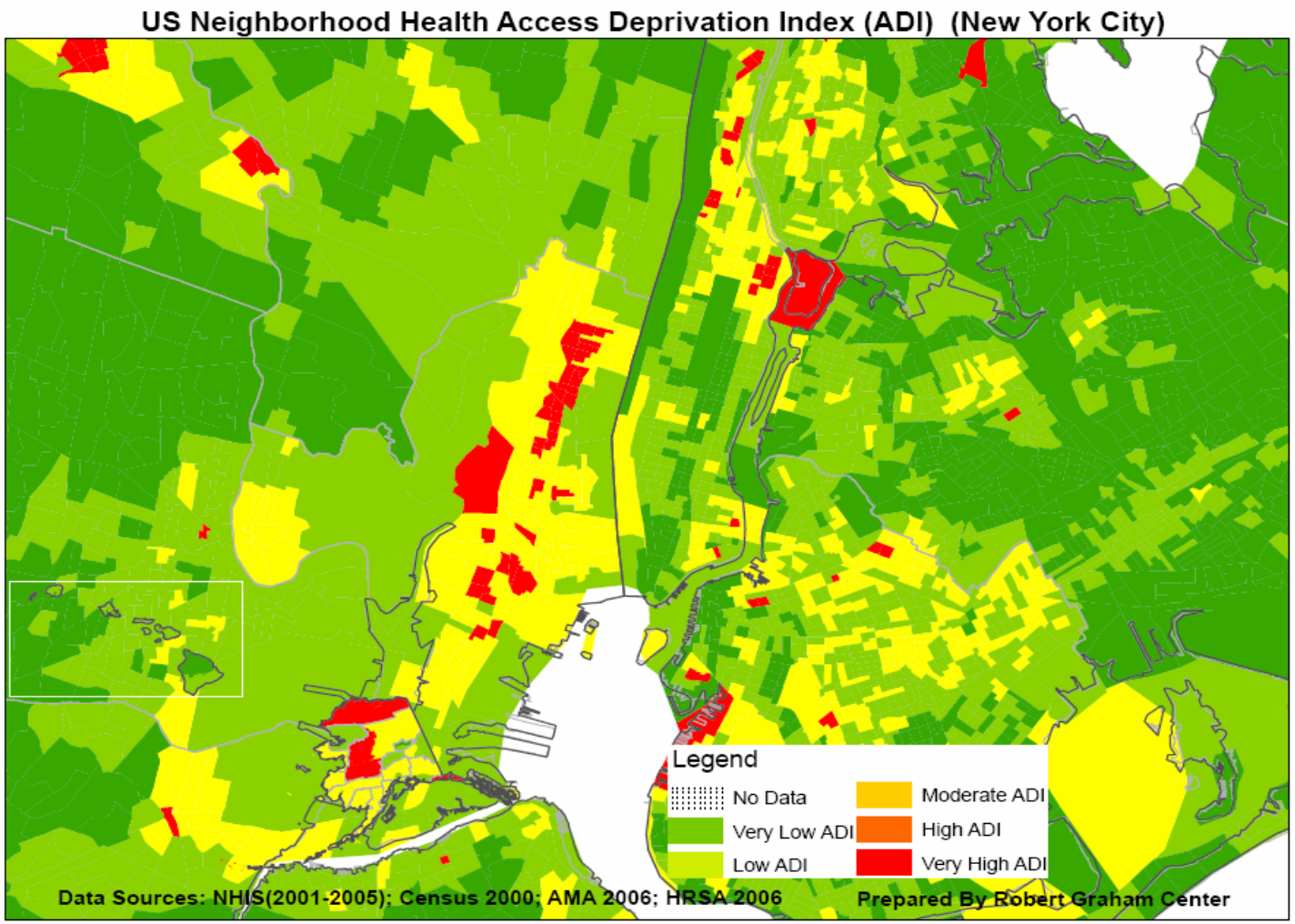
Health Access Deprivation Index - census tracts – scatter plot from final estimations



Health Access Deprivation Index - all US census tracts



Health Access Deprivation Index - local census tracts (NJ-NY)



Thanks

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