

Inequities in Infant Mortality and Low Birth Weight in Hampton Roads:

Rethinking Birth Outcomes Using GIS and Geospatial Analysis

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Objectives

- Provide overview of GIS and spatial analysis capabilities
- Demonstrate added value for targeting infant mortality and promoting health equity

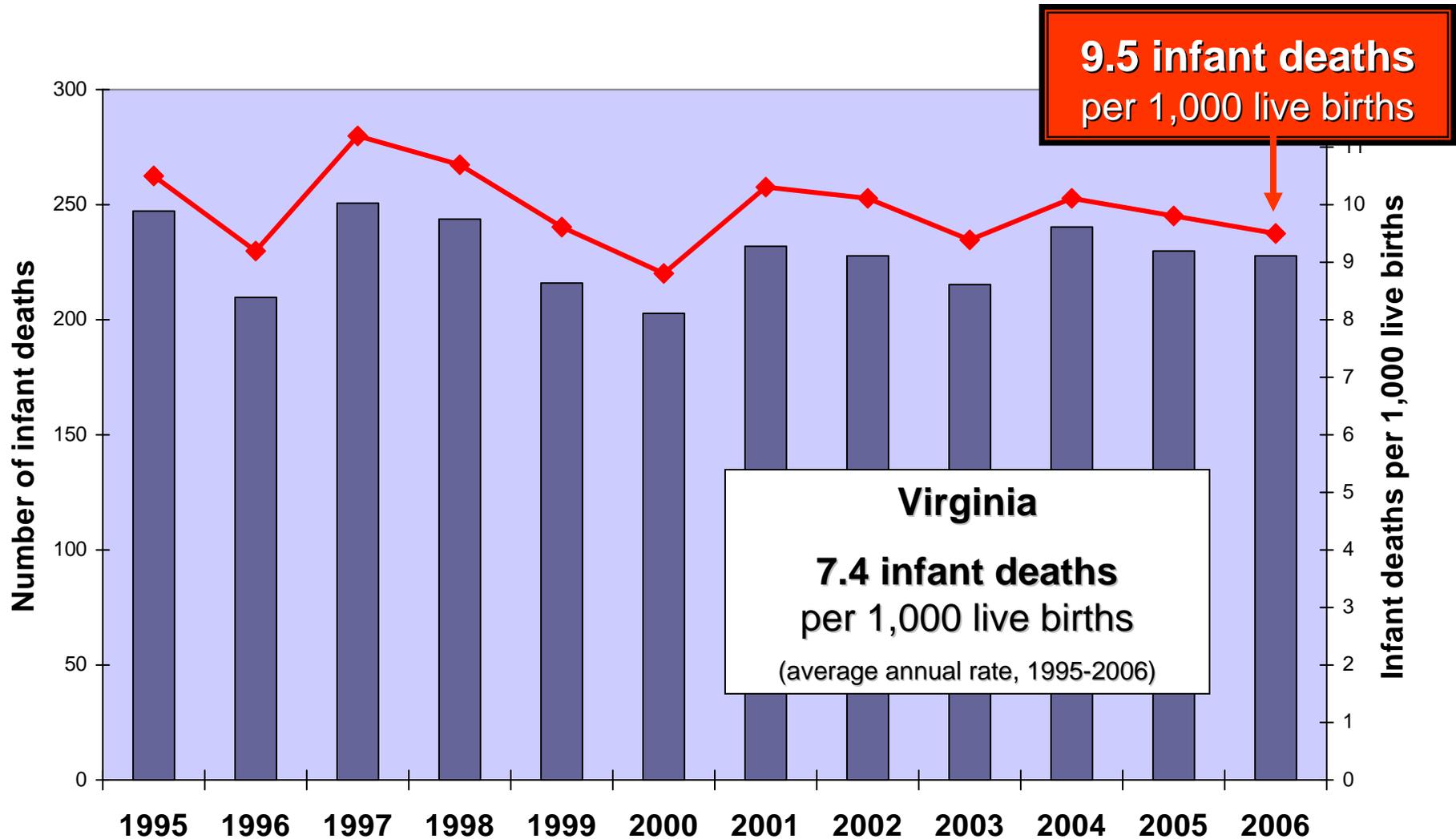
Infant Deaths in Hampton Roads

Locality	Number of Infant Deaths
Virginia Beach City	68
Norfolk City	45
Hampton City	25
Newport News City	23
Chesapeake City	22
Portsmouth City	21
Suffolk City	8
Accomack County	6
Gloucester County	4
Williamsburg City	3
York County	2
James City County	1
Poquoson City	1
Northampton County	0
Hampton Roads (Total)	229
Virginia	760

- In 2006, 30 percent of infant deaths in Virginia occurred to Hampton Roads residents

Source: Virginia Department of Health, Division of Health Statistics, 2006 Death Certificate data, compiled by the Office of Family Health Services, Division of Women's and Infants' Health

Infant Deaths and Infant Death Rate Hampton Roads, 1995-2006



Infant mortality

Hampton Roads, 2006

	Hampton Roads	Virginia 2006	Nation 2005
Number	228	760	28,440
Rates (per 1,000 live births)			
Infant deaths	9.5	7.1	6.9
Neonatal deaths	7.2	4.9	4.5
Postneonatal deaths	2.3	2.2	2.3
Race-specific rates			
White	6.6	5.5	5.7
Black	14.4	13.8	13.7
Other	6.2	3.7	--

Underlying Causes of Infant Mortality, 2004-2006

Top 3 Underlying Causes of Infant Mortality	Infant Mortality Rate per 100,000 live births	
	Hampton Roads	Virginia
Disorders of Short Gestation and Low Birthweight	216.1	145.2
Sudden Unexplained Infant Death (SUID)	157.9	112.1
Congenital malformations, deformations & chromosomal abnormalities	141.3	123.3

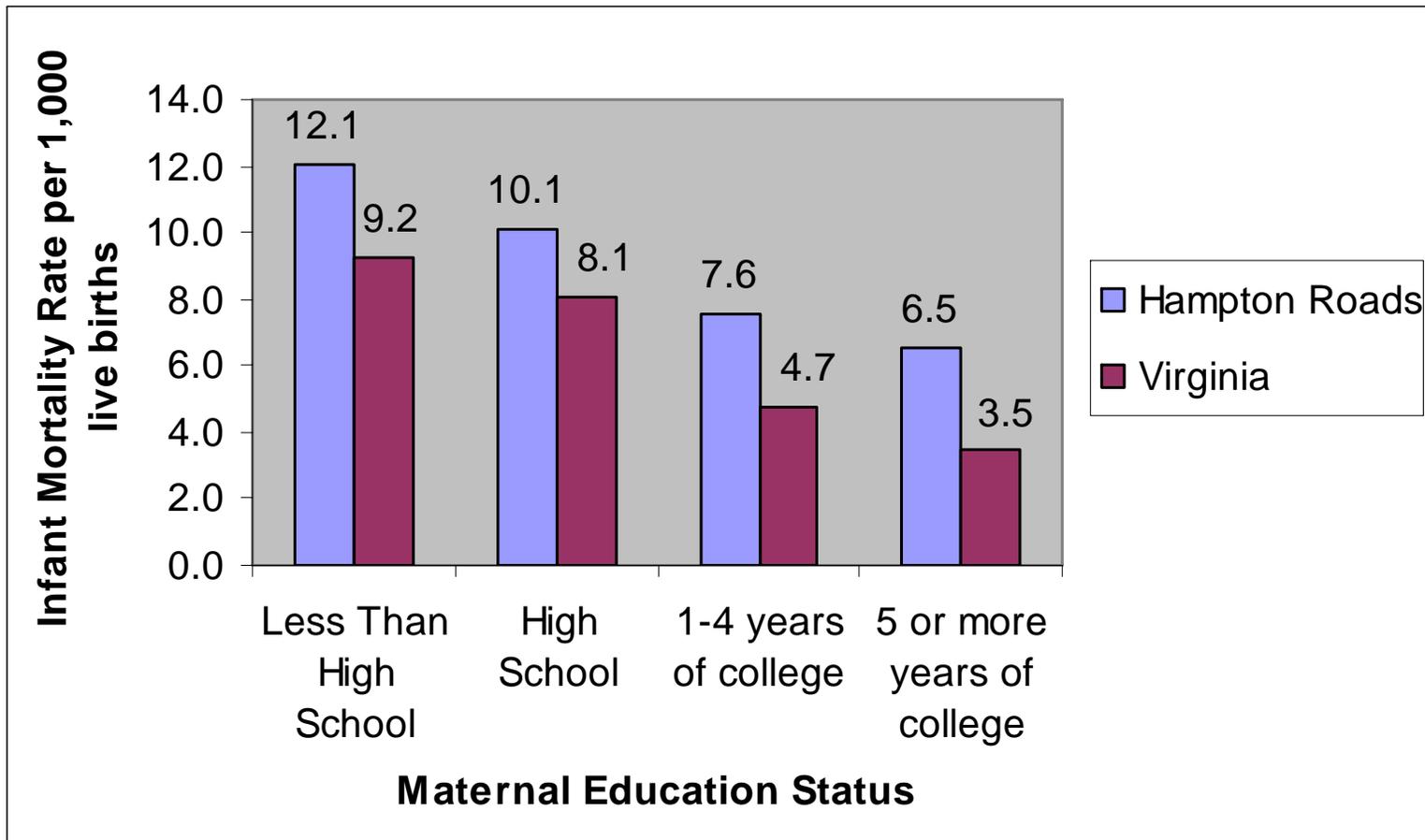
Source: Virginia Department of Health, Division of Health Statistics, 2004-06 Death Certificate data, compiled by the Office of Family Health Services, Division of Women's and Infants' Health

Period of Infant Death, 2004-2006

Period of Infant Death	Infant Mortality Rate per 1,000 live births	
	Hampton Roads	Virginia
Early Infant Death (less than one day)	4.7	3.2
Neonatal Infant Death (27 days or less)	6.7	5.0
Postneonatal Infant Deaths (28 to 364 days)	3.0	2.3

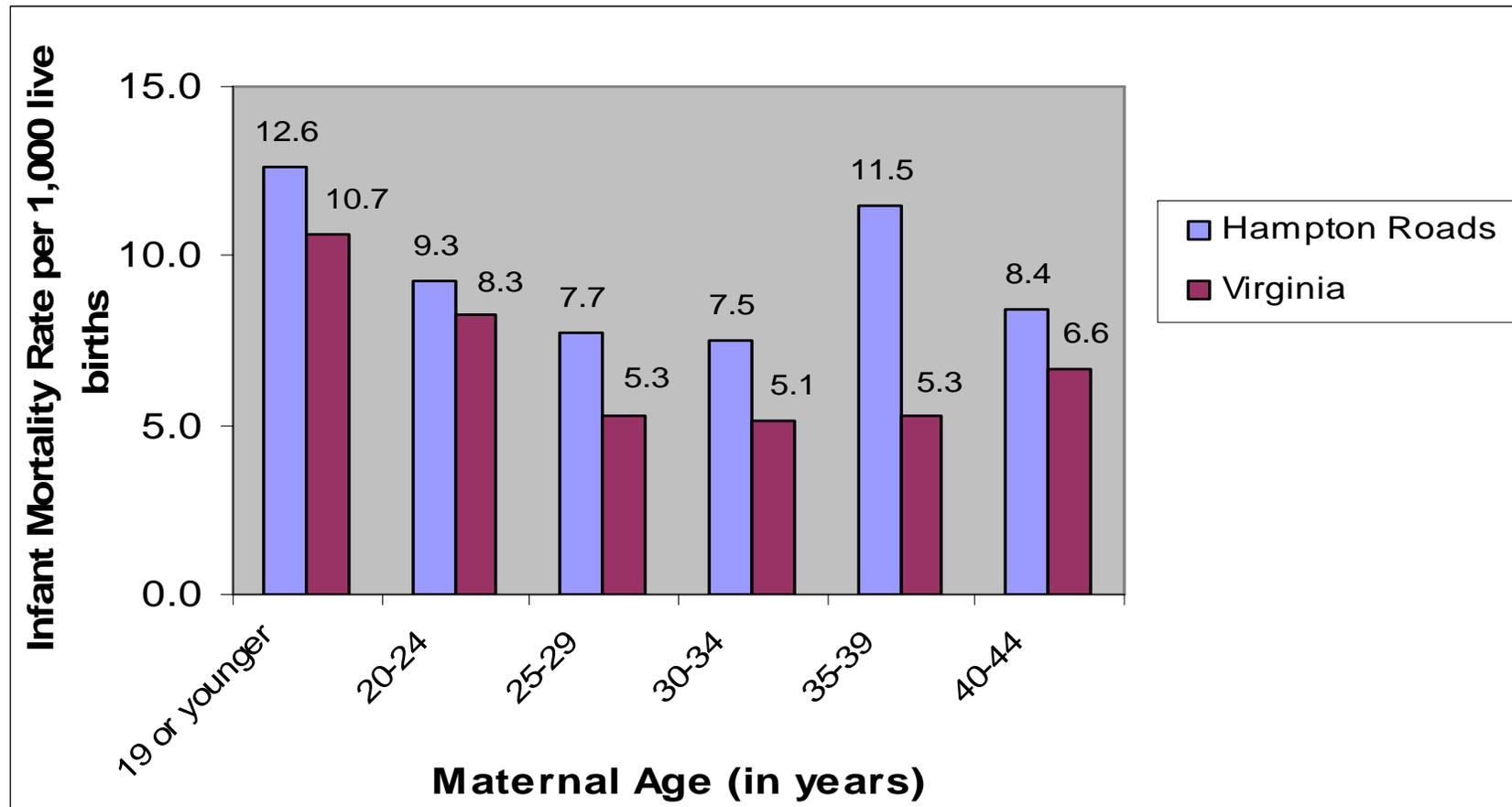
Source: Virginia Department of Health, Division of Health Statistics, 2004-06 Death Certificate data, compiled by the Office of Family Health Services, Division of Women's and Infants' Health

Educational Inequities in Infant Mortality 2004-2006



Source: Virginia Department of Health, Division of Health Statistics, 2004-06 Infant Death Certificate linked to Birth Certificate data, compiled by the Office of Family Health Services, Division of Women's and Infants' Health

Age Disparities in Infant Mortality: Maternal Characteristics, 2004-2006

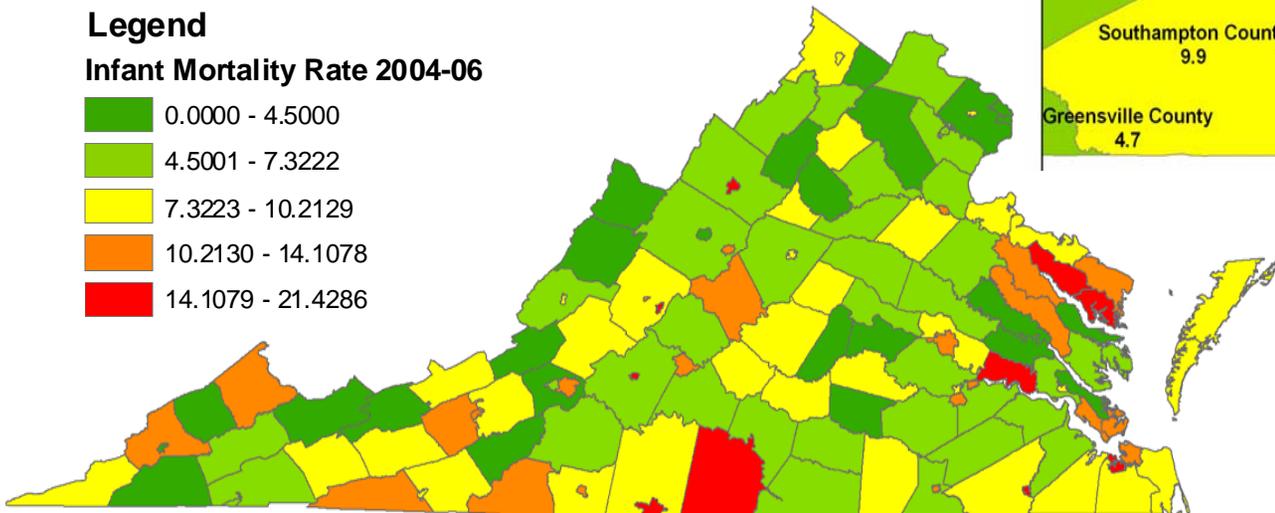
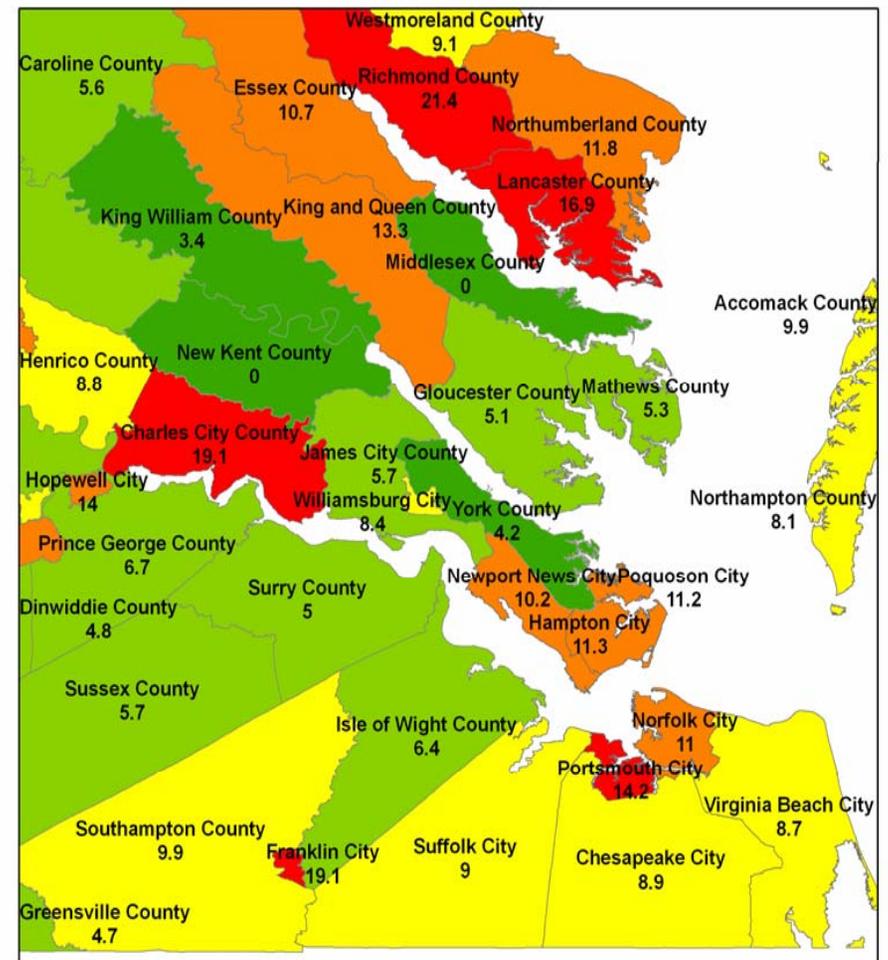
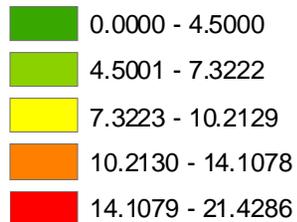


Source: Virginia Department of Health, Division of Health Statistics, 2004-06 Infant Death Certificate linked to Birth Certificate data, compiled by the Office of Family Health Services, Division of Women's and Infants' Health

Infant Mortality Rate 2004-2006

Legend

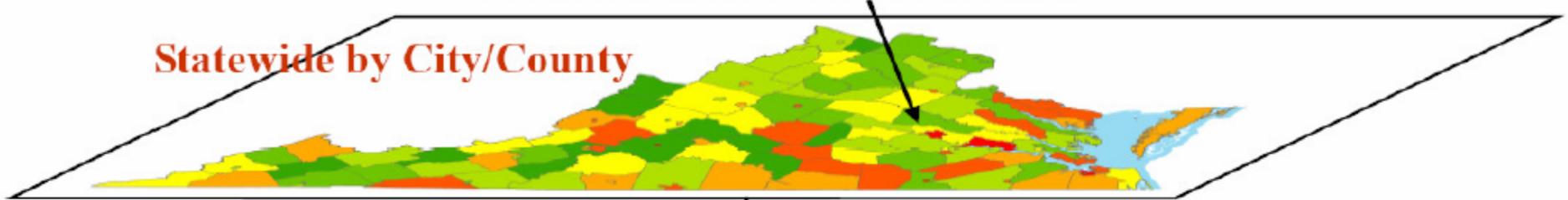
Infant Mortality Rate 2004-06



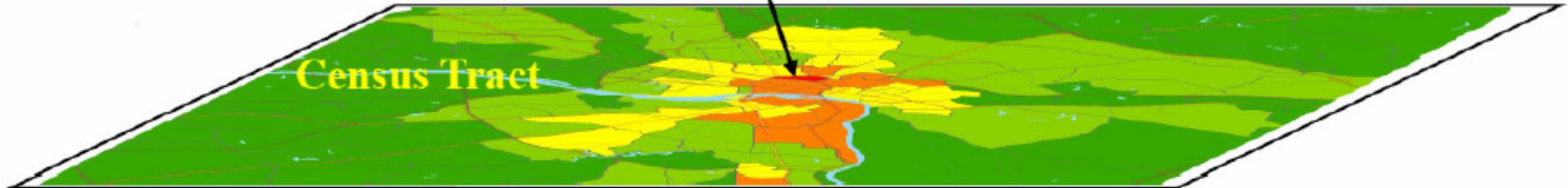
Source: Virginia Department of Health, Division of Health Statistics, 2004-06 Death Certificate data, compiled by the Office of Family Health Services, Division of Women's and Infants' Health

Multilevel Spatial Analysis of Fundamental Causes & the Social Determinants of Health

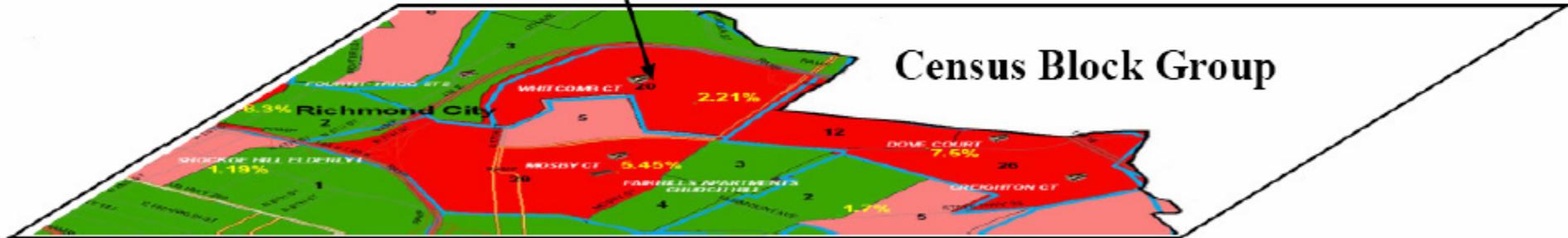
Statewide by City/County



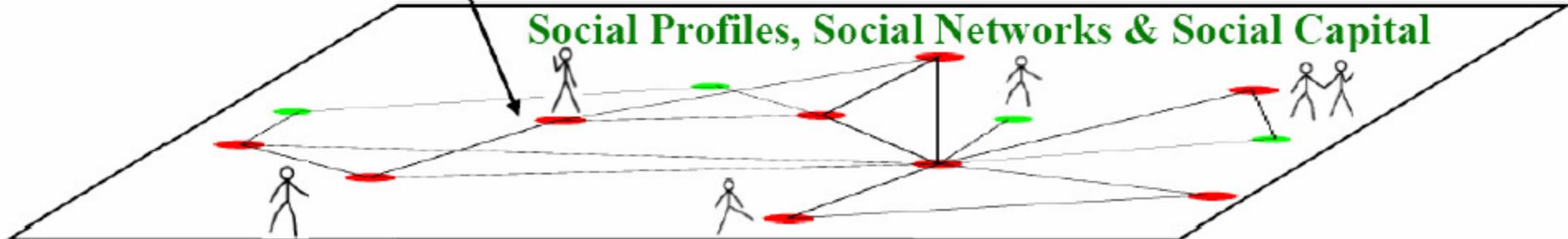
Census Tract



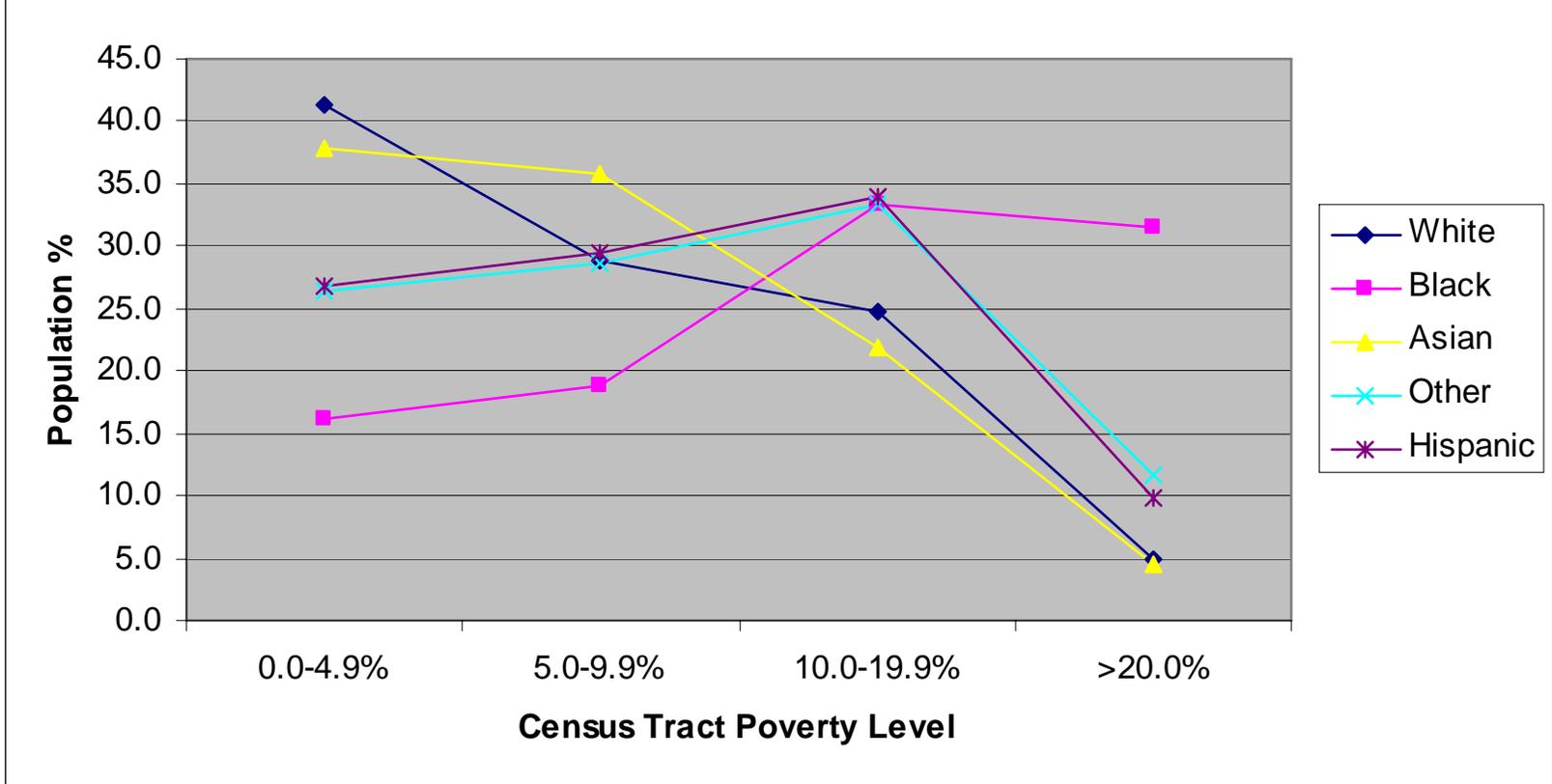
Census Block Group



Social Profiles, Social Networks & Social Capital



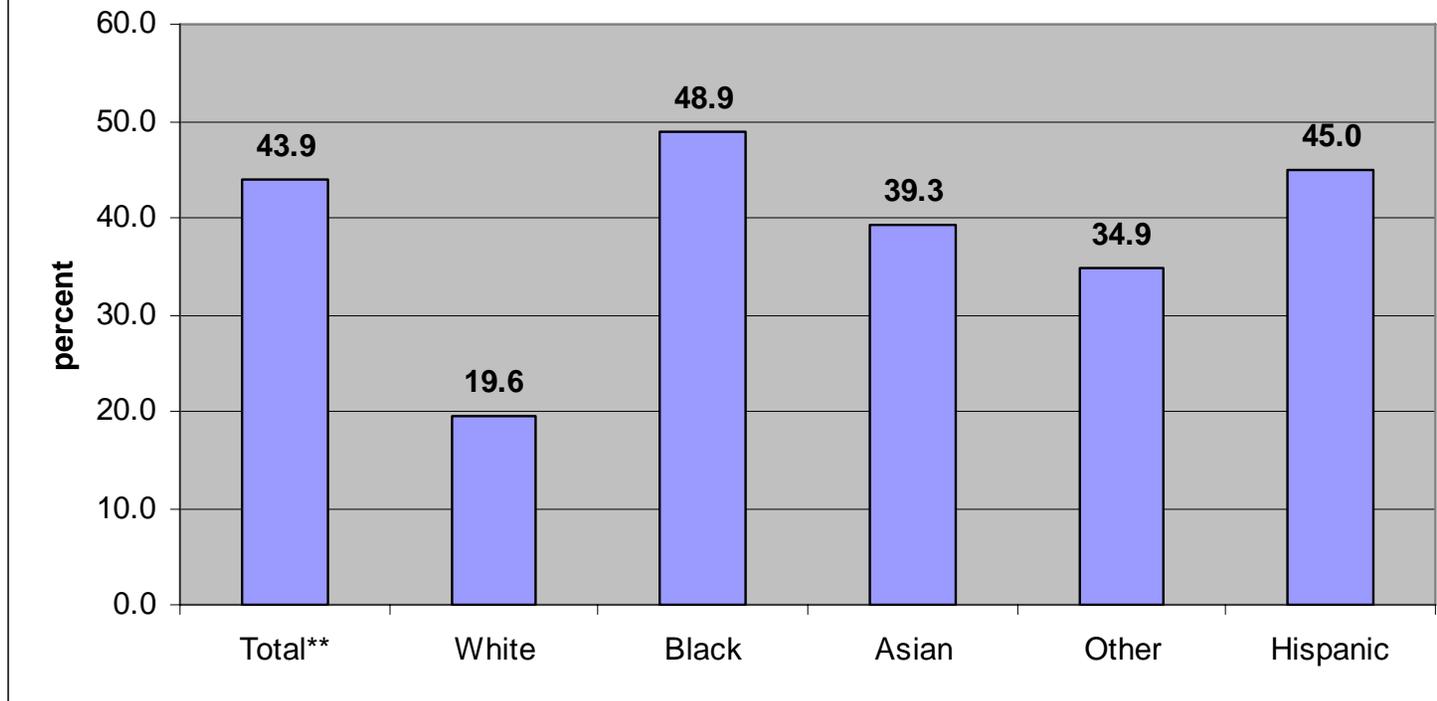
Hampton Roads Area* - Population by Race/Ethnicity and Census Tract Poverty, 2000



* Hampton Roads Area includes Chesapeake, Norfolk, Portsmouth, Suffolk, Virginia Beach, Williamsburg, James City, York, Gloucester, Hampton, Newport News, Poquoson, Accomack and Northampton.

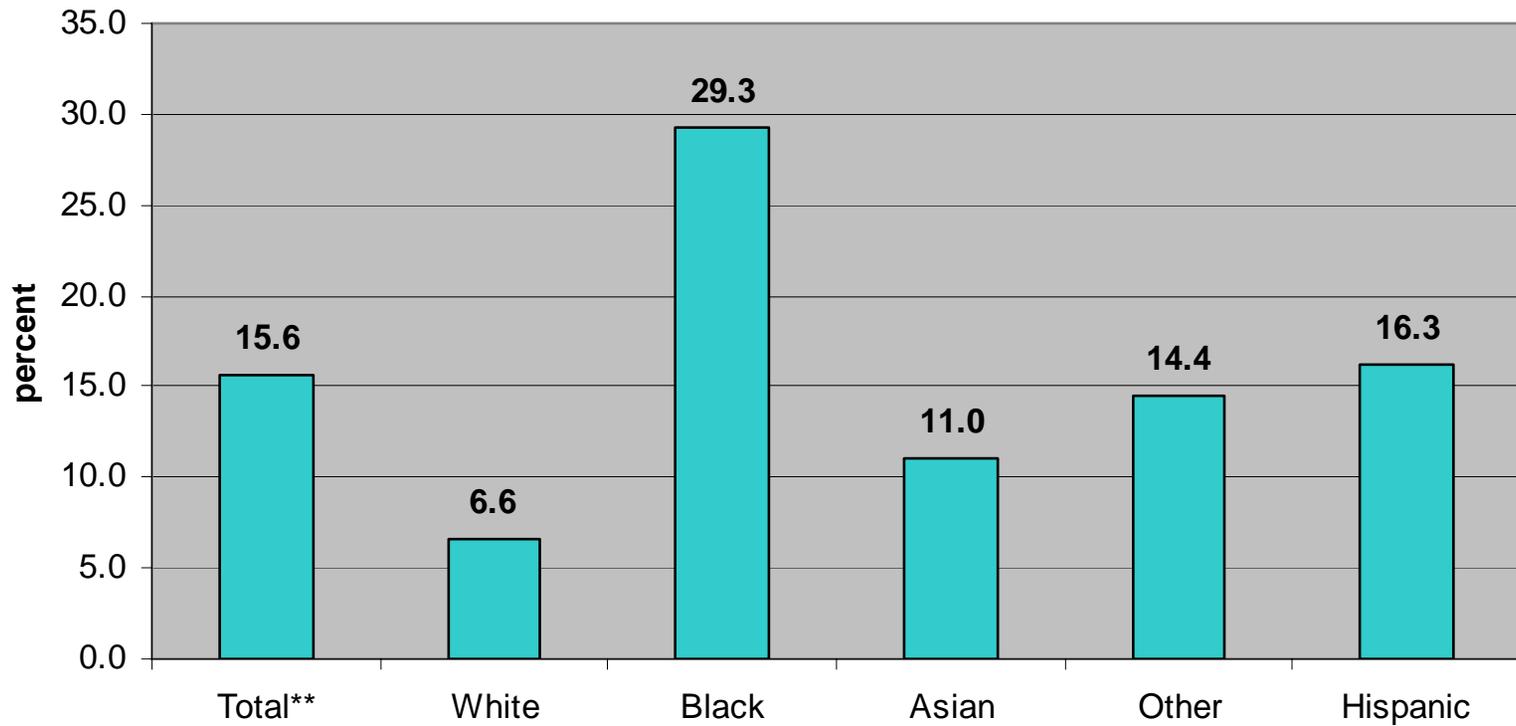
Source: US Census 2000; Poverty (SF3, P87); Race (SF1 P7); Hispanic ethnicity (SF1 P4).

Hampton Roads Area - Percent of Children by Race Living in Poor Neighborhoods*, 2000



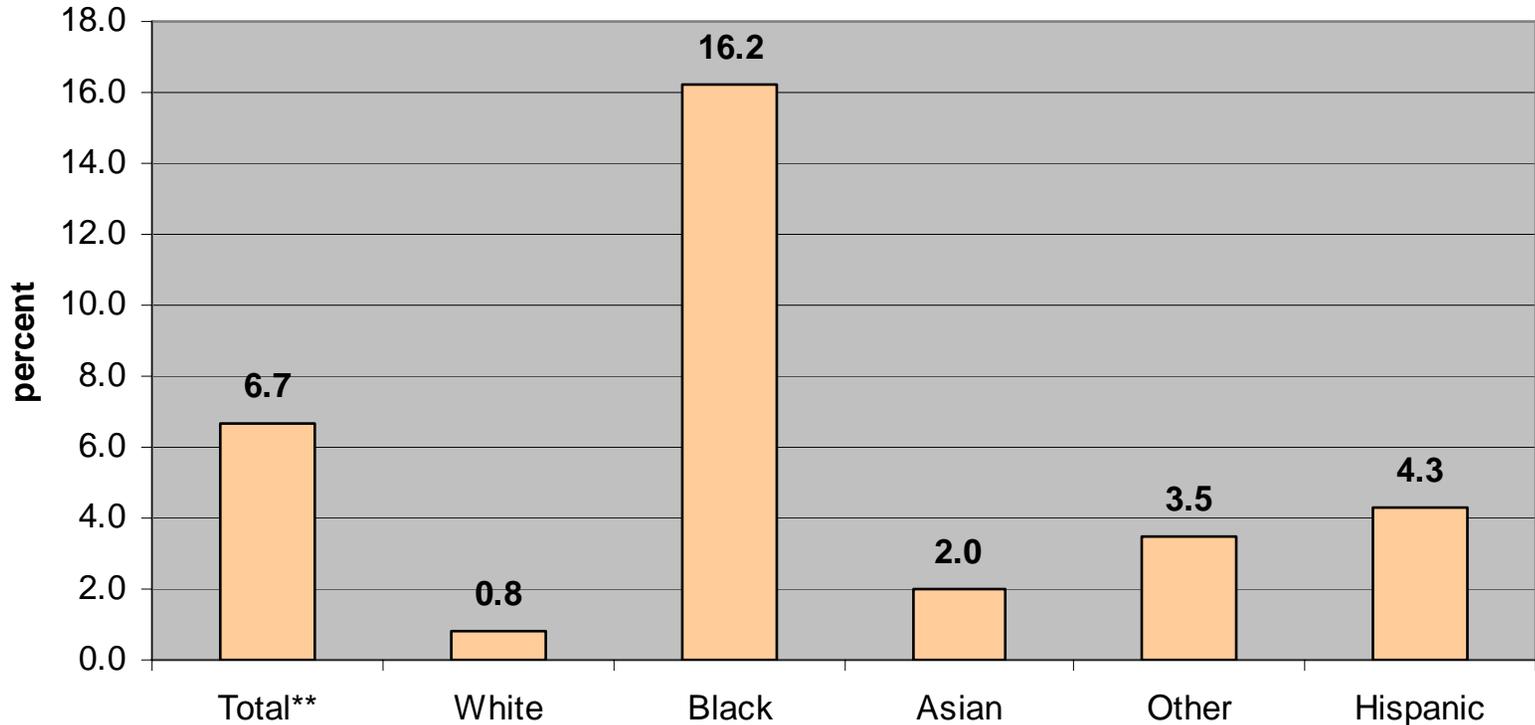
* Children (under 18 years old); Poor neighborhoods - census tracts (CTs) with greater than 20.0% poverty. The racial categories include persons of Hispanic and non-Hispanic origin; 'Other' includes American Indian, Alaska Native, Native Hawaiian and other Pacific Islander, some other race alone, and two or more races. **Total number of children living below the federal poverty level reflects the sum of the four racial categories since Hispanic ethnicity could not be determined for each race. Source: Census 2000, SF3, P159.

Hampton Roads Area - Percent of Children Below Federal Poverty Level by Race, 2000



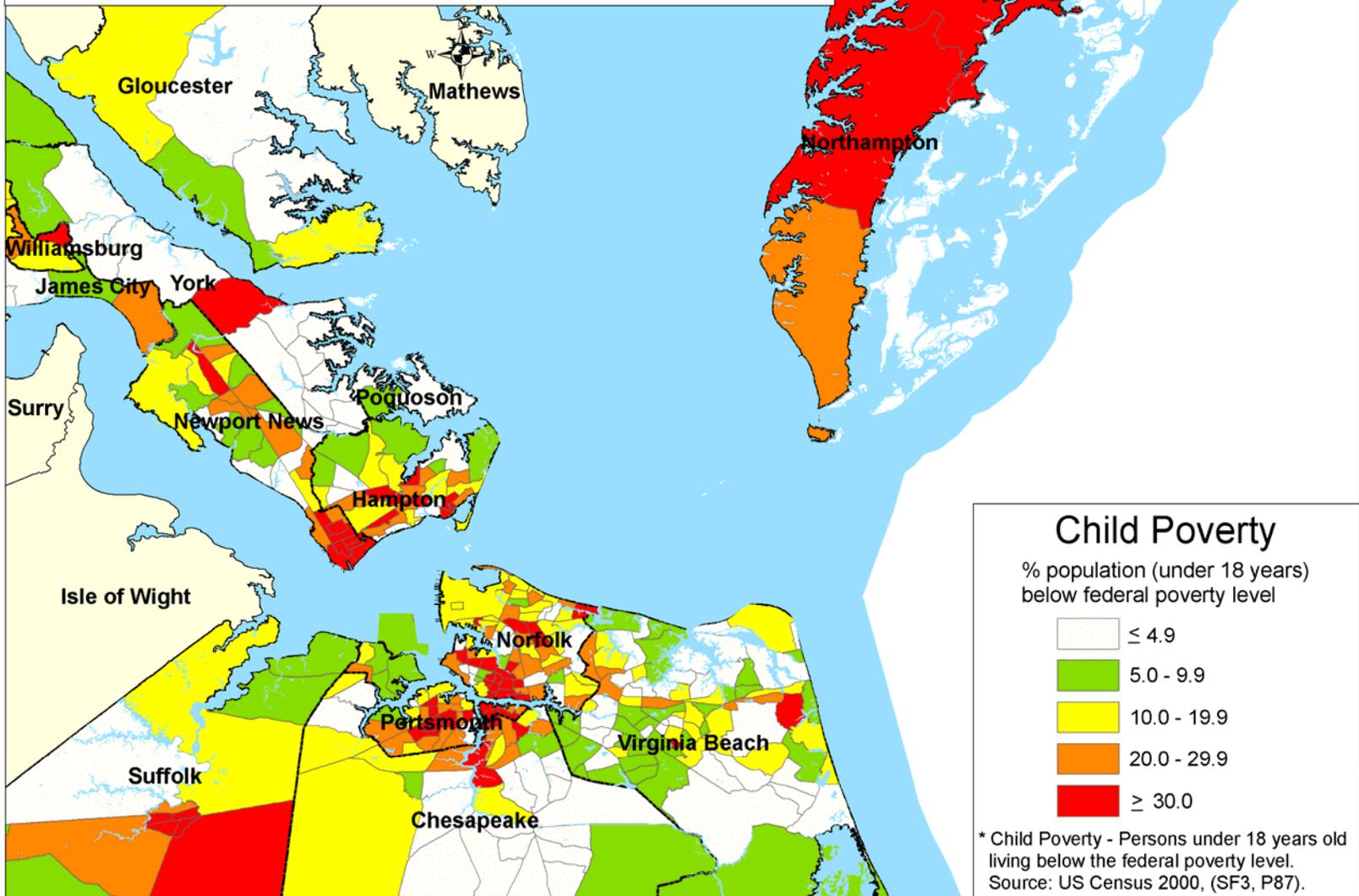
Source: U.S. Census Bureau, 2000

Hampton Roads Area - Children who experienced 'Double Jeopardy', 2000



Double Jeopardy describes children (under 18 years old) that live in poor families and in poor neighborhoods. Poor neighborhoods are defined as census tracts (CTs) with greater than 20.0% poverty. The racial categories include persons of Hispanic and non-Hispanic origin; 'Other' includes American Indian, Alaska Native, Native Hawaiian and other Pacific Islander, some other race alone, and two or more races. **Total number of children living below the federal poverty level reflects the sum of the four racial categories since Hispanic ethnicity could not be determined for each race. Source: Census 2000, SF3, P159.

Hampton Roads Area Child Poverty* by Census Tract



Hampton Roads Area Poverty by Census Tract

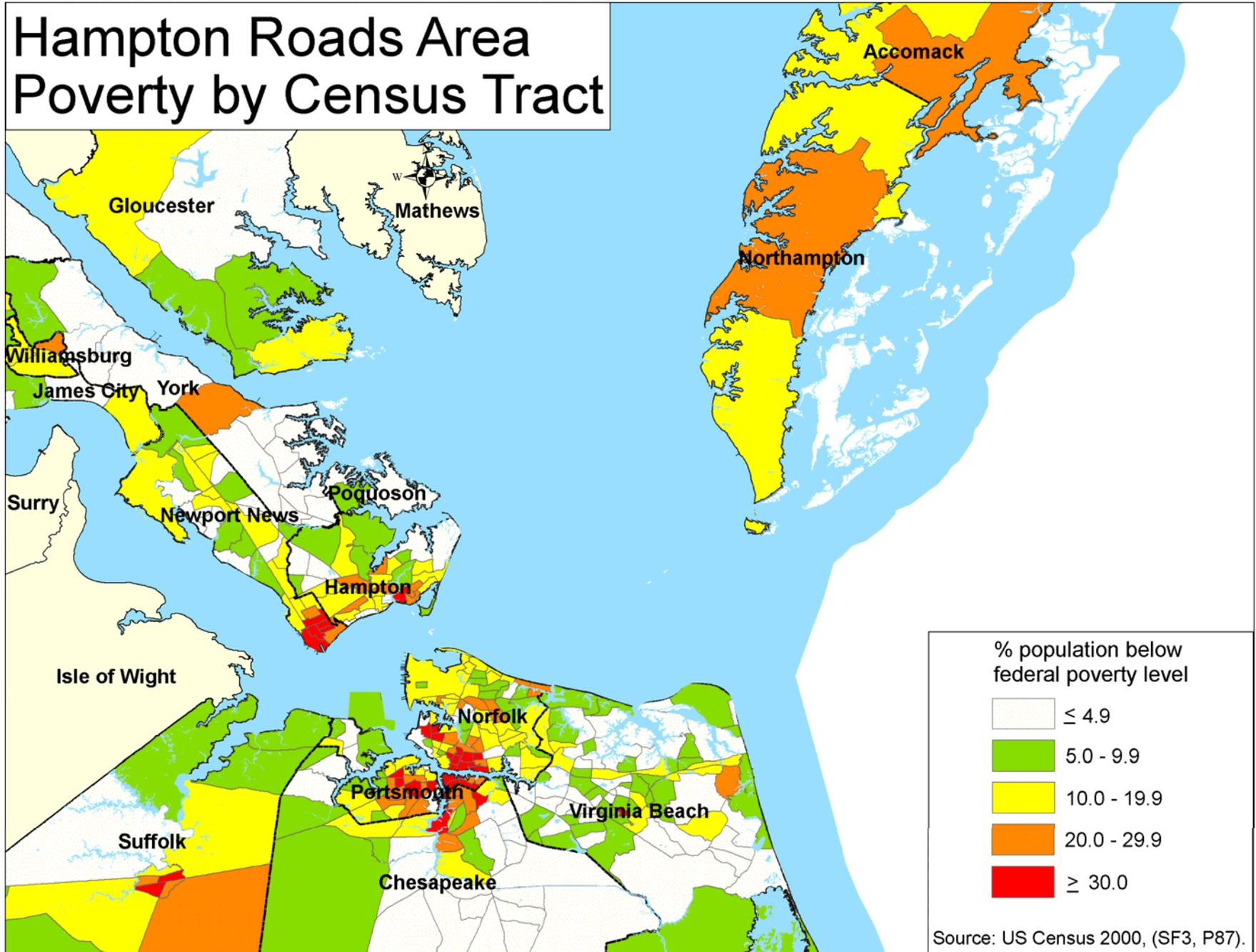


TABLE A. Distribution of Low Birth-Weight Infants and Rates (LBW, per 100), by Race/Ethnicity* and Census Tract (CT) Poverty: Hampton Roads Area: 1996-2005**

CT Poverty Level	Total		White		Black		Hispanic		Other	
	n	LBW	n	LBW	n	LBW	n	LBW	n	LBW
0-4.9%	3,074	5.3	1,876	4.3	928	9.4	98	4.8	172	5.9
5.0-9.9%	3,535	6.2	1,709	4.7	1,433	9.6	163	5.6	230	7.0
10.0-19.9%	4,849	7.5	1,785	5.5	2,688	10.2	212	6.3	164	6.3
≥ 20.0%	3,779	10.4	466	6.5	3,201	11.6	63	-	49	7.7

TABLE B. Distribution of Infant Deaths and Rates (IMR, per 1,000), by Race/Ethnicity* and Census Tract (CT) Poverty, Hampton Roads Area: 1996-2005**

CT Poverty Level	Total		White		Black		Hispanic		Other	
	n	IMR	n	IMR	n	IMR	n	IMR	n	IMR
0-4.9%	363	6.2	214	4.9	121	12.3	10	-	18	-
5.0-9.9%	393	6.9	192	5.3	164	11.0	18	-	19	-
10.0-19.9%	601	9.3	225	6.9	333	12.6	26	-	17	-
≥ 20.0%	434	11.9	50	7.0	374	13.6	2	-	8	-

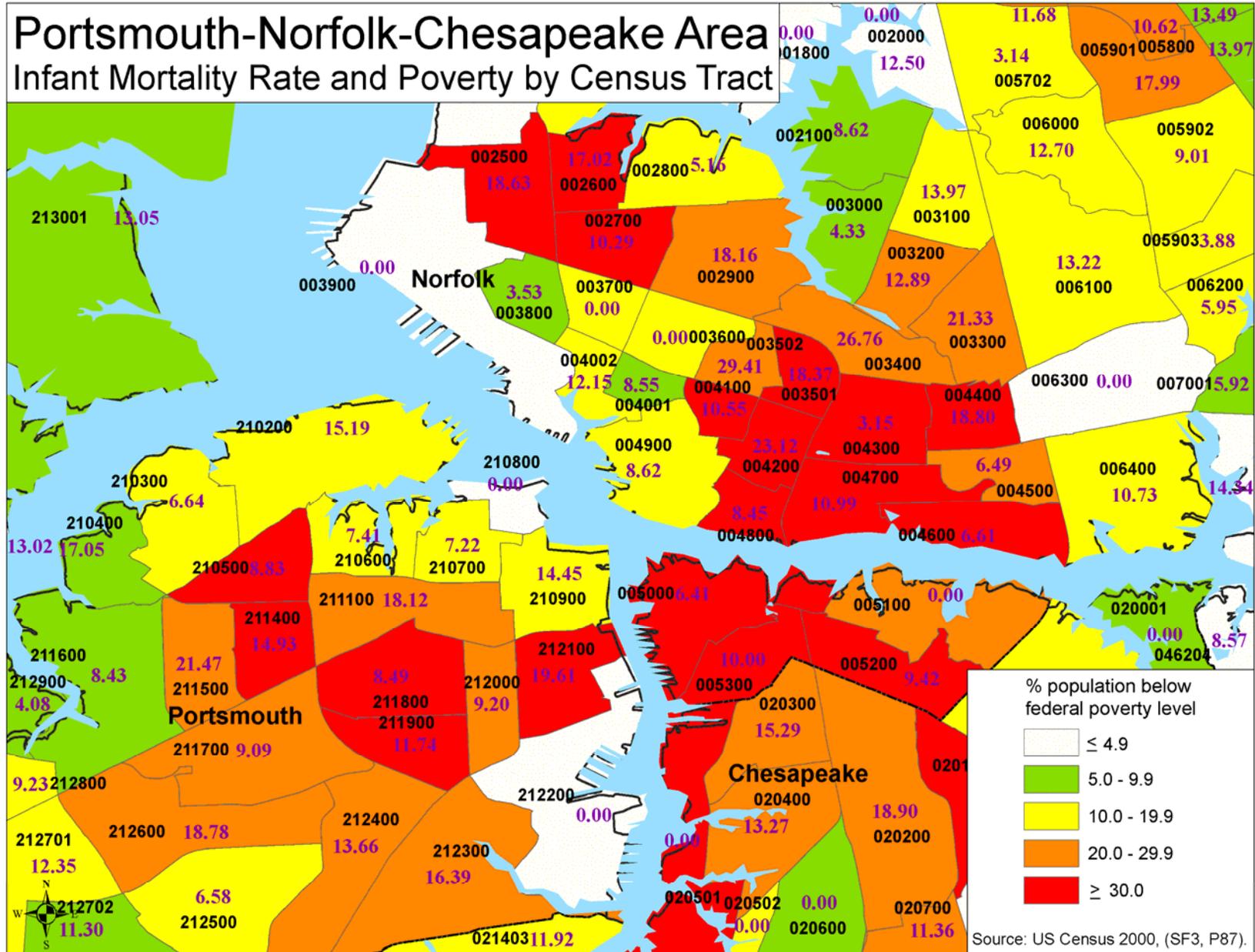
* White and Black classifications are non-Hispanic. Data consists of singleton births for mothers aged 15-44 years that geocoded correctly, (error rate = 10%). Rates were not calculated on sample sizes less than 30 or when the geocoding error rate exceeded 10%.

** Hampton Roads Area includes Chesapeake, Norfolk, Portsmouth, Suffolk, Virginia Beach, Williamsburg, James City, York, Gloucester, Hampton, Newport News, Poquoson, Accomack and Northampton.

Kernel Density Map

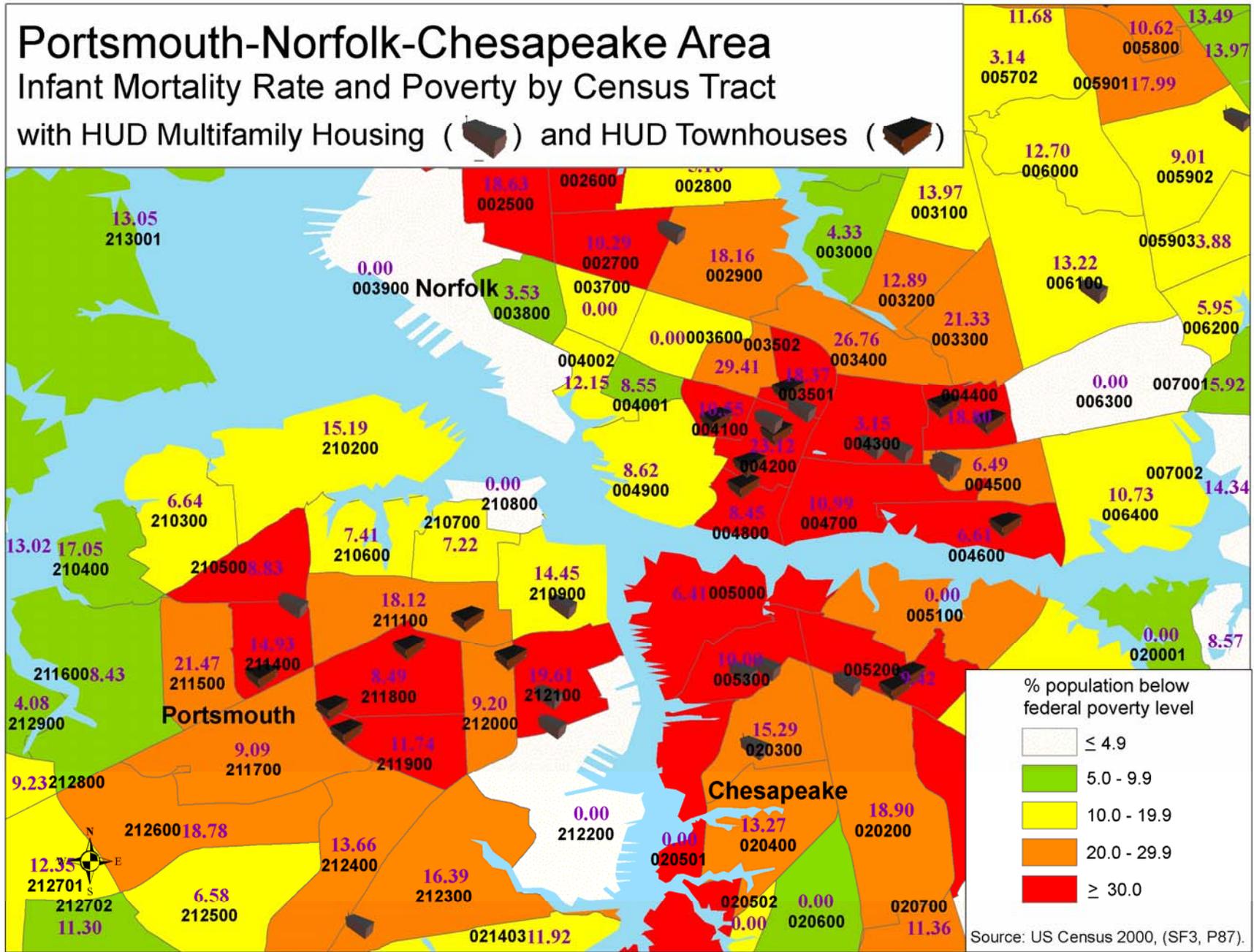


Portsmouth-Norfolk-Chesapeake Area Infant Mortality Rate and Poverty by Census Tract



Portsmouth-Norfolk-Chesapeake Area Infant Mortality Rate and Poverty by Census Tract

with HUD Multifamily Housing () and HUD Townhouses ()

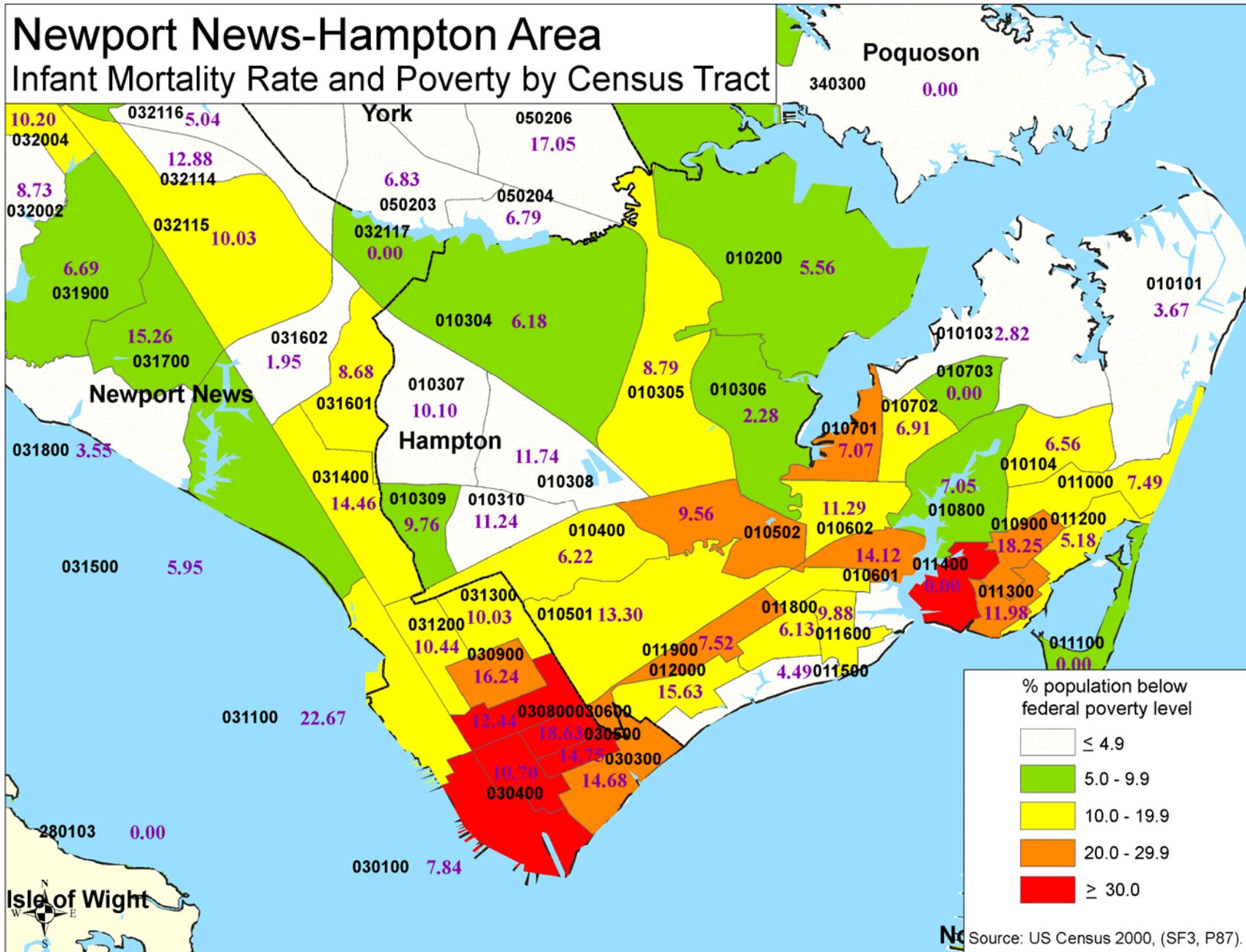


Infant Mortality Rate (per 1,000 live births) shown in purple on map. Source: VDH Vital Statistics, (1996-2005, geocoding error rate= 10%); Data consists of singleton births for mothers aged 15-44 years.

Source: US Census 2000, (SF3, P87).

Newport News-Hampton Area

Infant Mortality Rate and Poverty by Census Tract

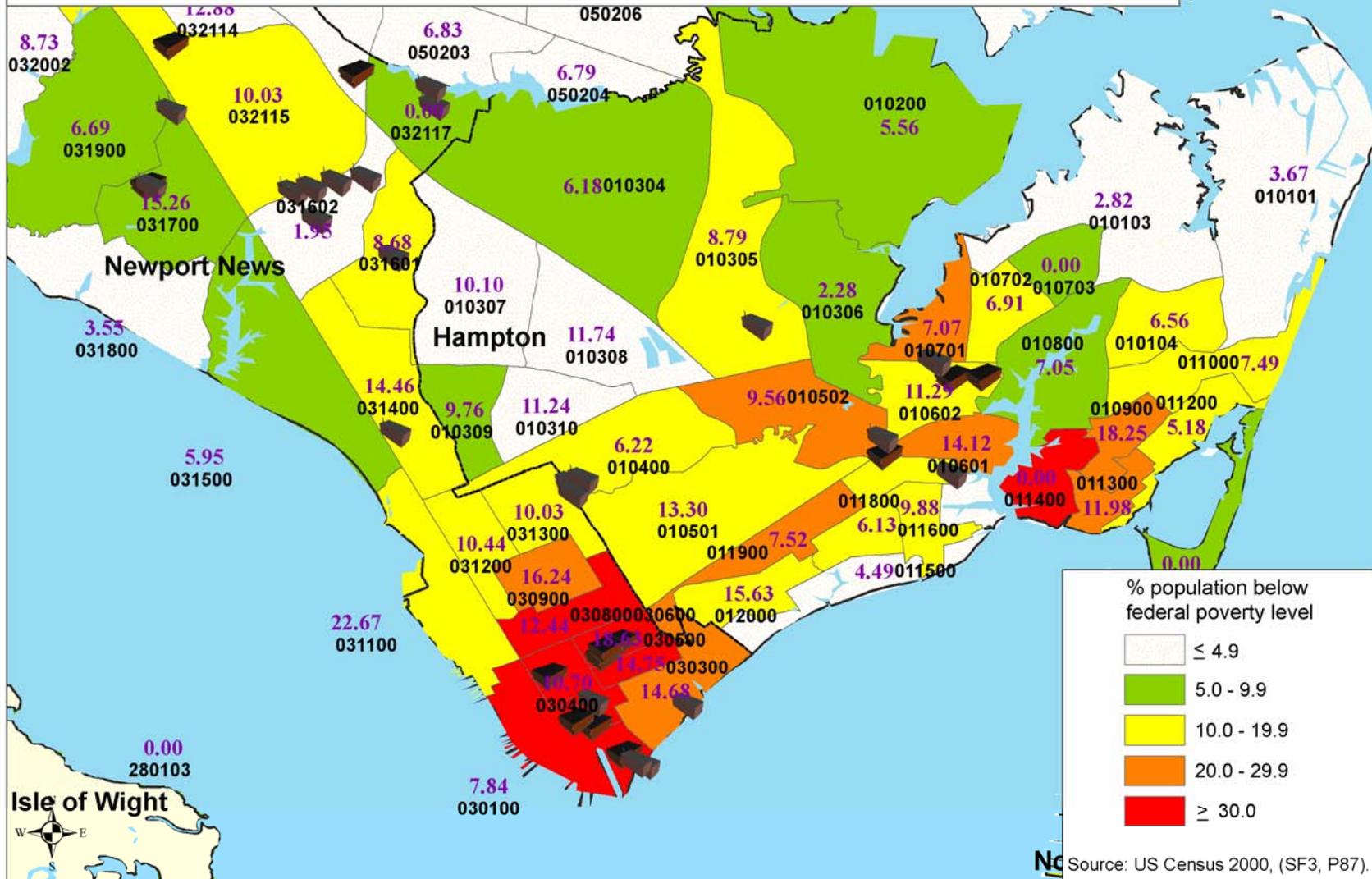


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Newport News-Hampton Area

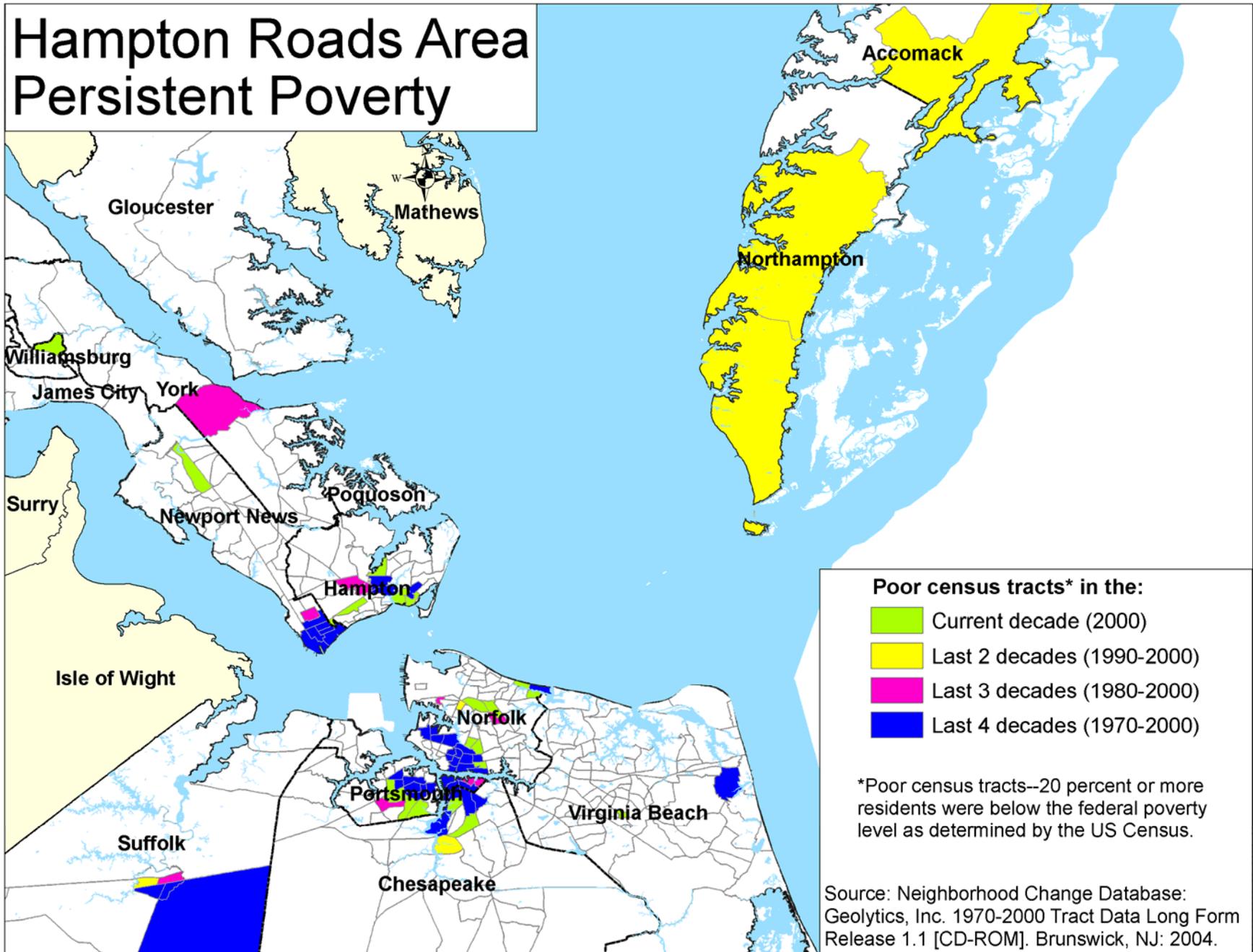
Infant Mortality Rate and Poverty by Census Tract

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Infant Mortality Rate (per 1,000 live births) shown in purple on map. Source: VDH Vital Statistics, (1996-2005, geocoding error rate= 10%); Data consists of singleton births for mothers aged 15-44 years.

Hampton Roads Area Persistent Poverty



Portsmouth-Norfolk-Chesapeake Area

Persistent Poverty and Low Birth Weight*

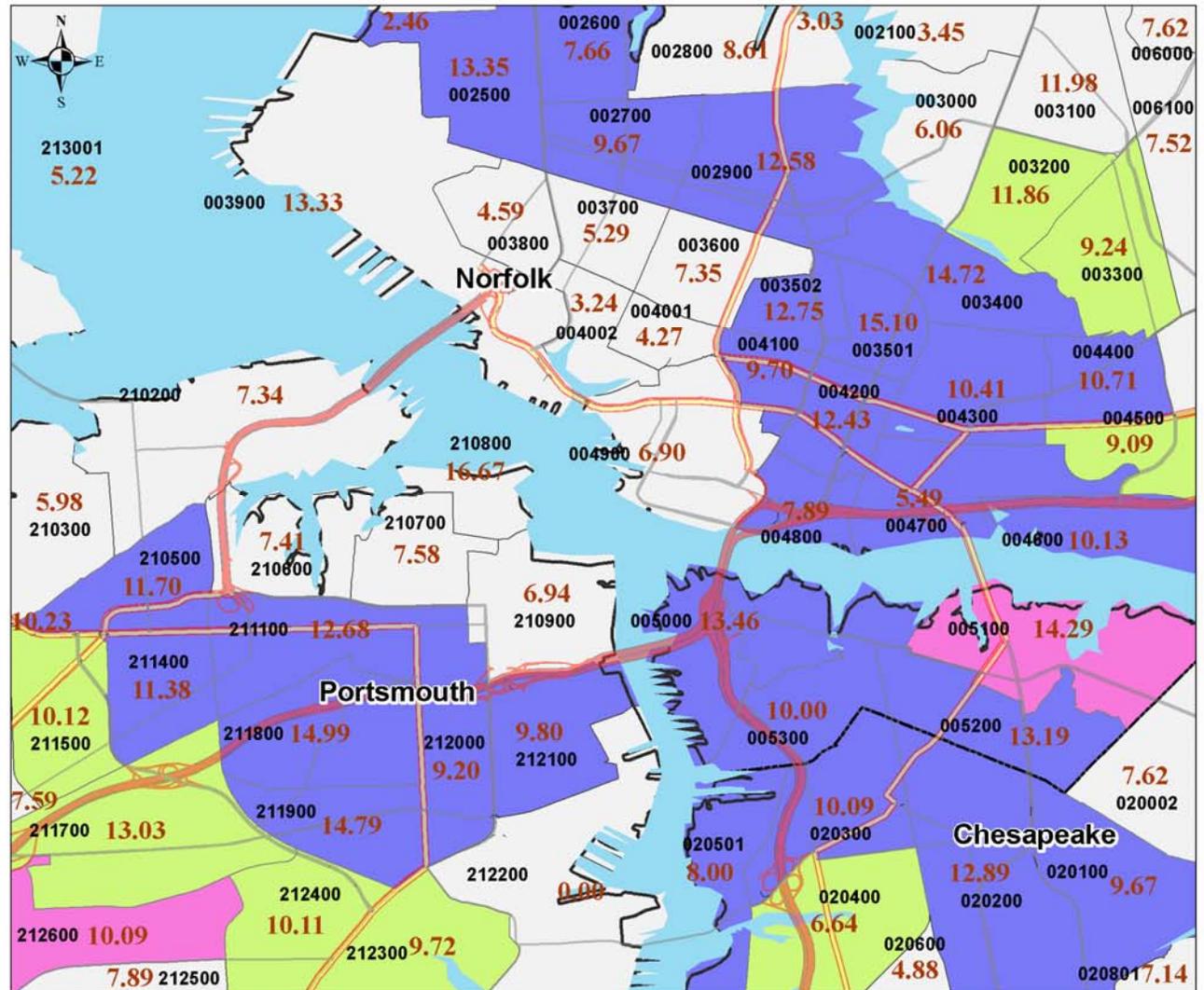
Poor census tracts** in the:

- Current decade (2000)
- Last 2 decades (1990-2000)
- Last 3 decades (1980-2000)
- Last 4 decades (1970-2000)

*Low Birth Weight Rate: (per 100 live births); shown on map. Source: VDH Vital Statistics, (1996-2005, geocoding error rate= 10%); Data consists of singleton births for mothers aged 15-44 years.

**Poor census tracts--20 percent or more residents were below the federal poverty level as determined by the US Census.

Source: Neighborhood Change Database: Geolytics, Inc. 1970-2000 Tract Data Long Form Release 1.1 [CD-ROM]. Brunswick, NJ: 2004.



Newport News-Hampton

Persistent Poverty and Low Birth Weight Rate*

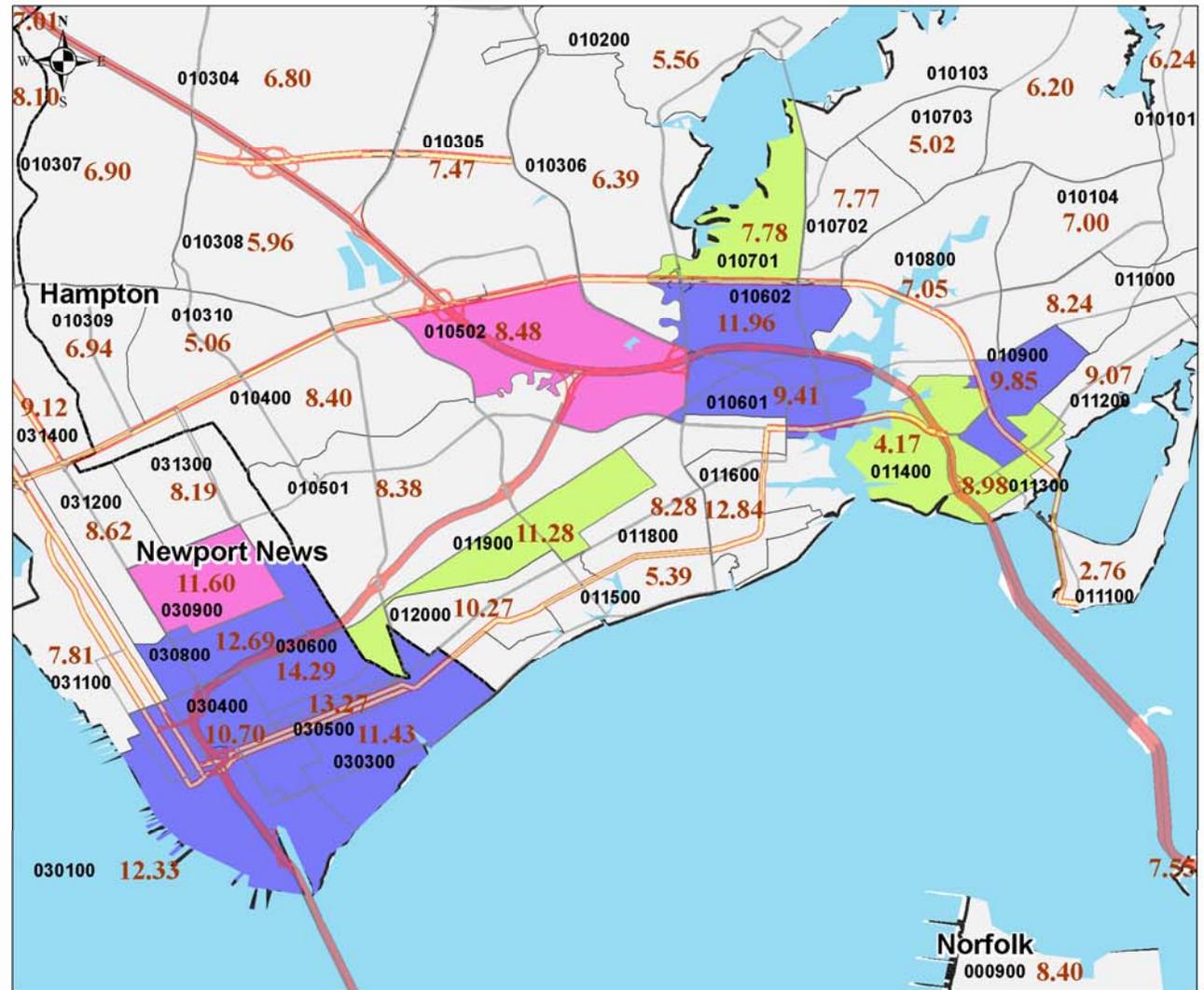
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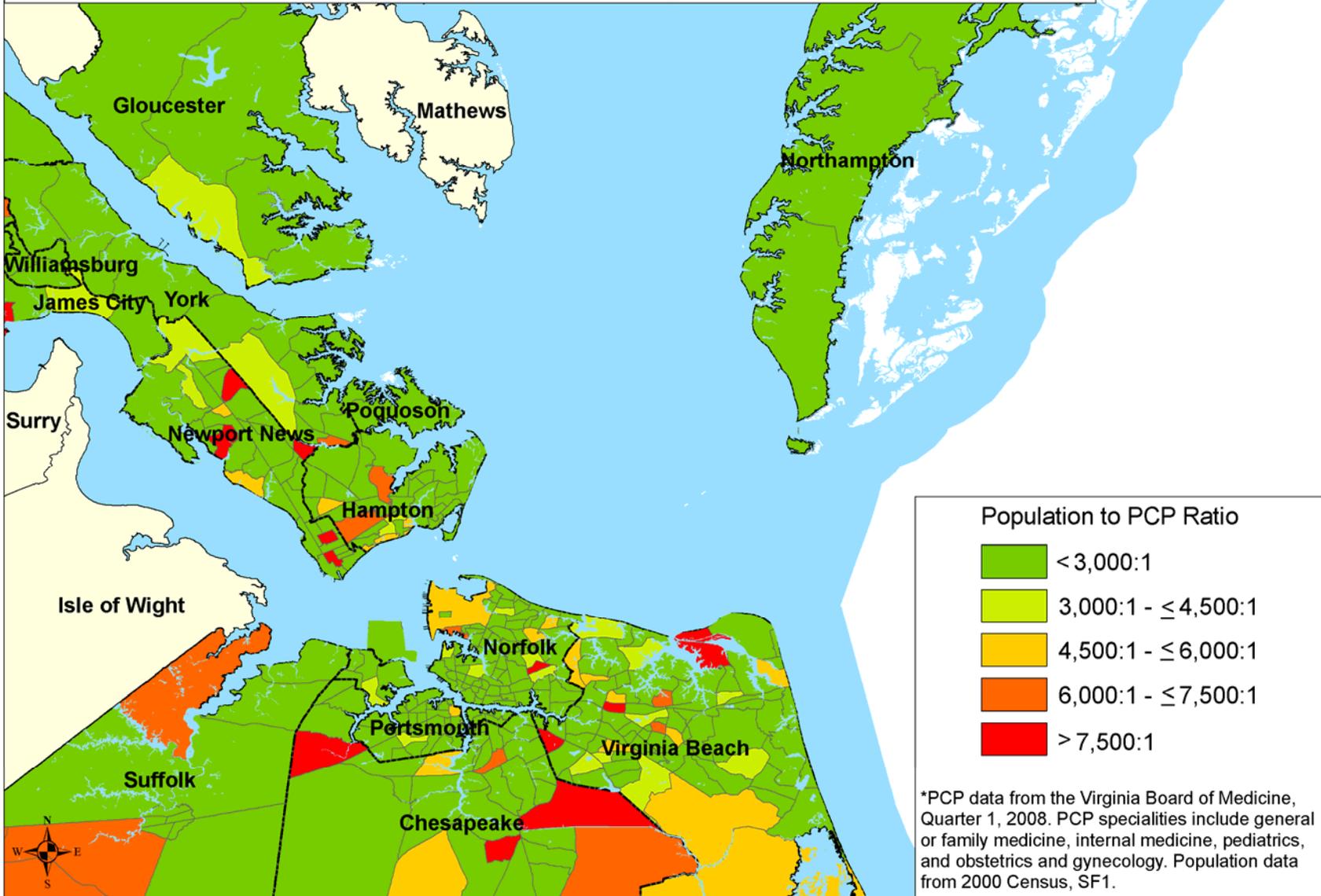
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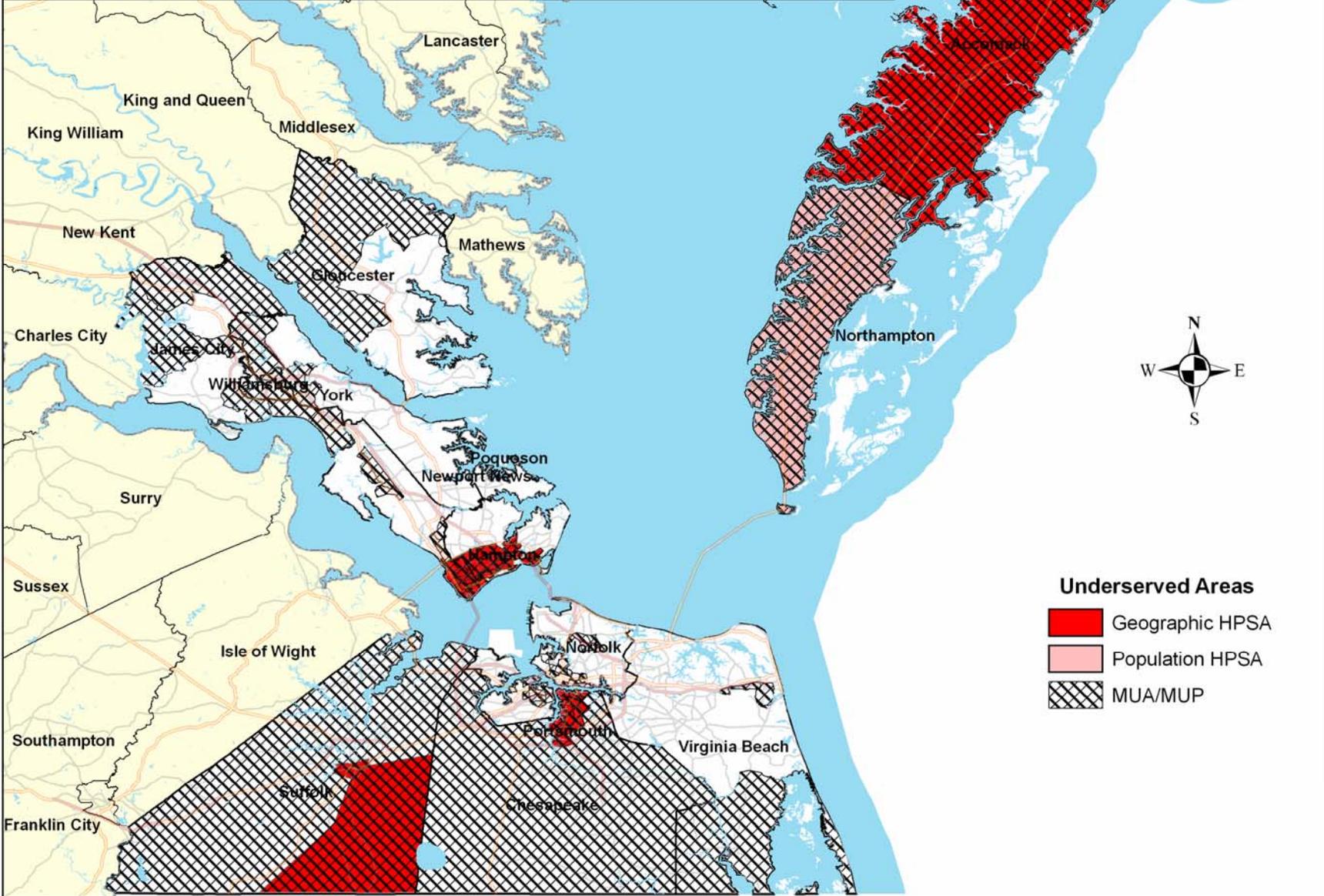


Hampton Roads Area

Population to Primary Care Provider* (PCP) Ratio by Census Tract

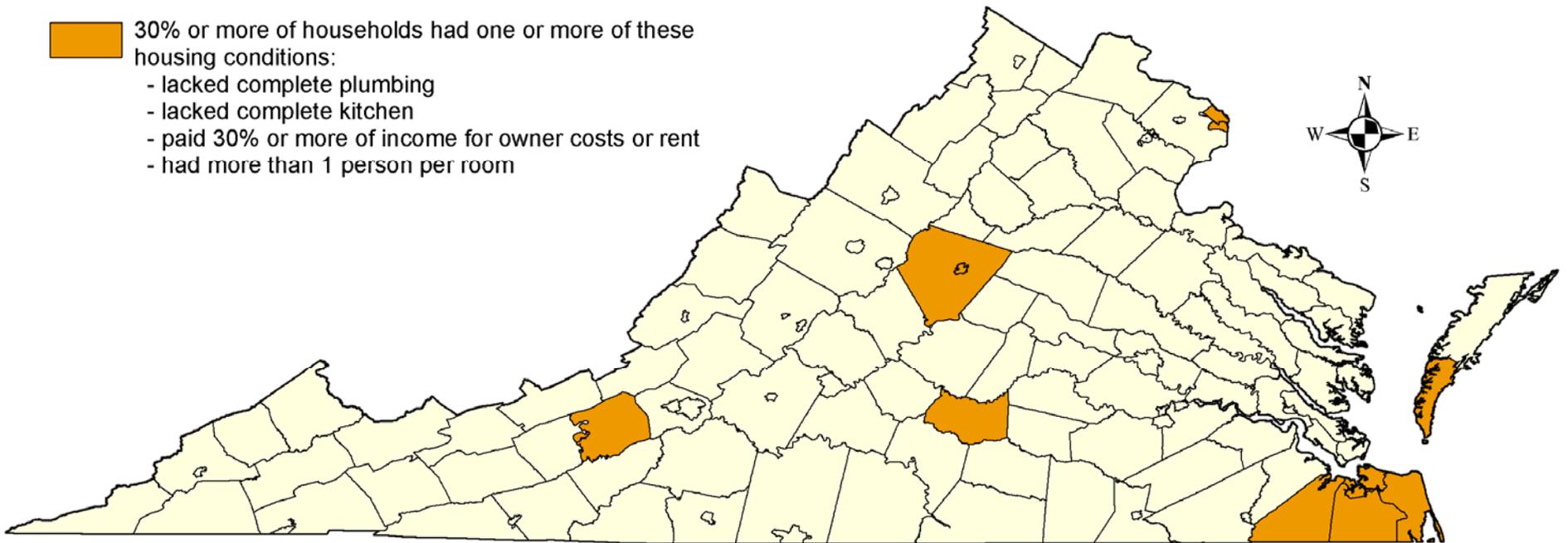


Hampton Roads Area
Primary Care Health Professional Shortage Areas (HPSA)
Medical Underserved Areas/Populations (MUA/MUP)



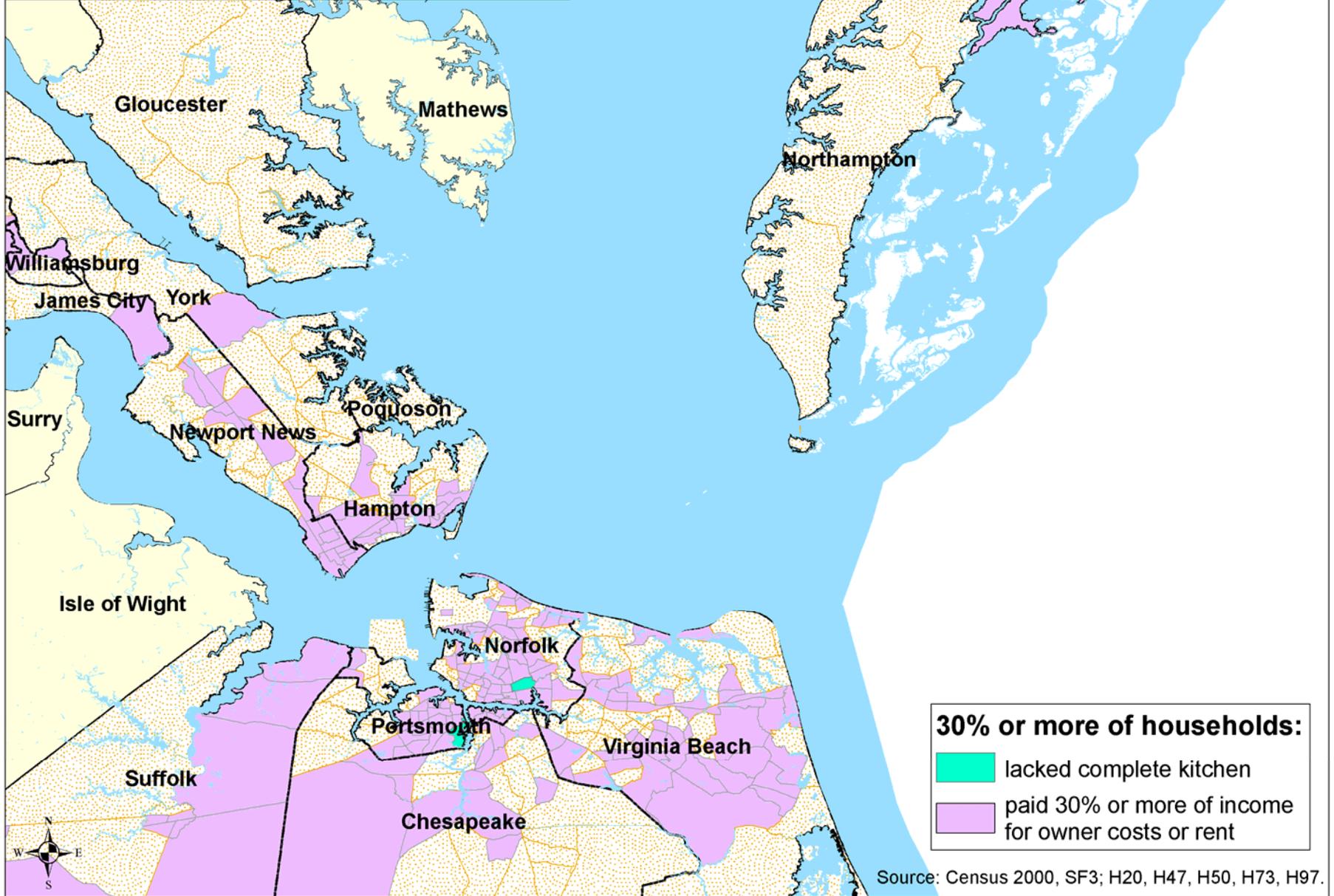
Housing Stress Virginia Counties

-  30% or more of households had one or more of these housing conditions:
- lacked complete plumbing
 - lacked complete kitchen
 - paid 30% or more of income for owner costs or rent
 - had more than 1 person per room



Source: United States Department of Agriculture: Economic Research Service, 2004 County Typologies.

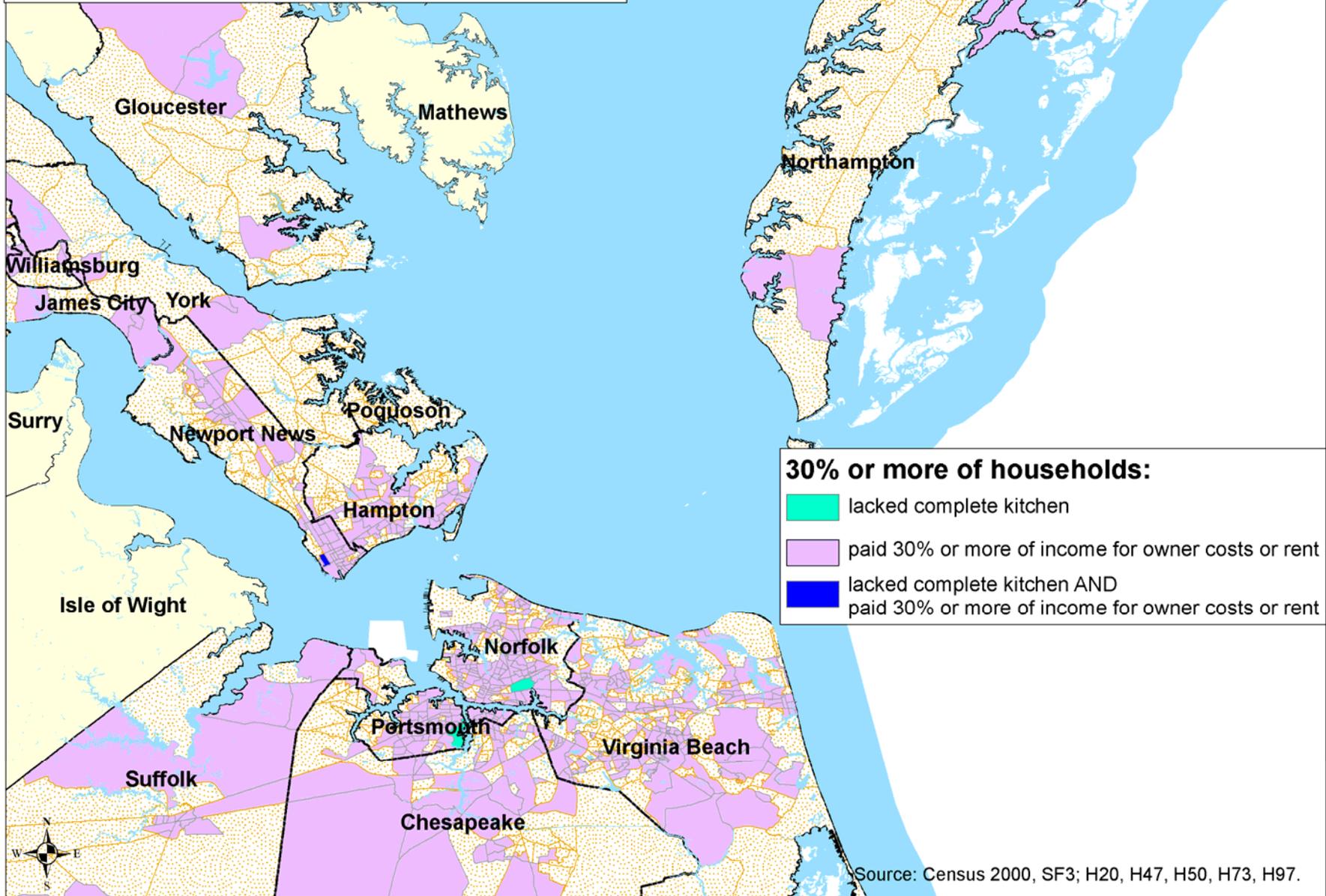
Hampton Roads Area Housing Stress Census Tracts



Source: Census 2000, SF3; H20, H47, H50, H73, H97.

Hampton Roads Area

Housing Stress Census Block Groups



Conclusions

- Inequities exist in birth outcomes in Hampton Roads
 - Low education attainment, African American, High poverty **communities**
- Analyses with additional social, economic, and medical variables is necessary
- GIS and spatial analysis allow **targeting of scarce resources** to high risk communities
- GIS and spatial analysis lead to new questions and new answers

Some 'New' Questions

- How does individual SES shape the risk for infant mortality?
- How does neighborhood SES shape the risk for infant mortality?
- What other social determinants of health influence infant mortality?
- How does spatial analysis support the life course perspective?
- What types of strategies might address these factors?

Some 'New' Answers

- Preconceptional care
- Community-based participatory approach
 - Ask and involve affected women, families, and neighborhoods
- Collaboration among agencies and community organizations to target high risk neighborhoods

Some 'New' Answers

- Target social networks and social capital
- Targeted and new health messages
- Address policy issues that affect the SDOH
 - Childhood poverty, childcare and preschool, insurance coverage, zoning, transportation, neighborhood redevelopment, education quality, economic opportunity, public housing rules, public safety

Acknowledgements

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- Kathleen Moline- Division of Women's and Infant's Health, VDH
- Ken Studer- Office of Minority Health and Public Health Policy, VDH