Rural-Urban Disparities in Disability in the State of Pennsylvania

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BACKGROUND

Understanding *social determinants* of health may help public health make large scale impacts for reducing health disparities. Because health equity is an issue of social justice [1], one Healthy People 2020 goal is to eliminate health disparities in the USA [2]. Healthy People 2020 goals use social determinants of health approach in the hope of advancing effectiveness in public health interventions [3]. Healthy People 2020 aims attempt to "create social and physical environments that promote good health for all" [2]. Because population-wide interventions offer great potential for public health impact, delineating disability prevalence by geographical location is important. Because population density may be a social determinant of health [4], this brief report discusses prevalence of disability by population density in Pennsylvania.

Accounting for prevalence of disability by population density is important as place of residence reflects how *social arrangements* have interacted with an individual's personal resources over the life-course. Attributes in the environment may be treated as markers of stratification when investigating health. Although work has discussed disability in rural populations [5] and compared health between urban and rural populations [6], limited work has been undertaken to show how prevalence of disability varies by population density. The specific aim of this report was to investigate how disability prevalence differs by population density in the state of Pennsylvania.

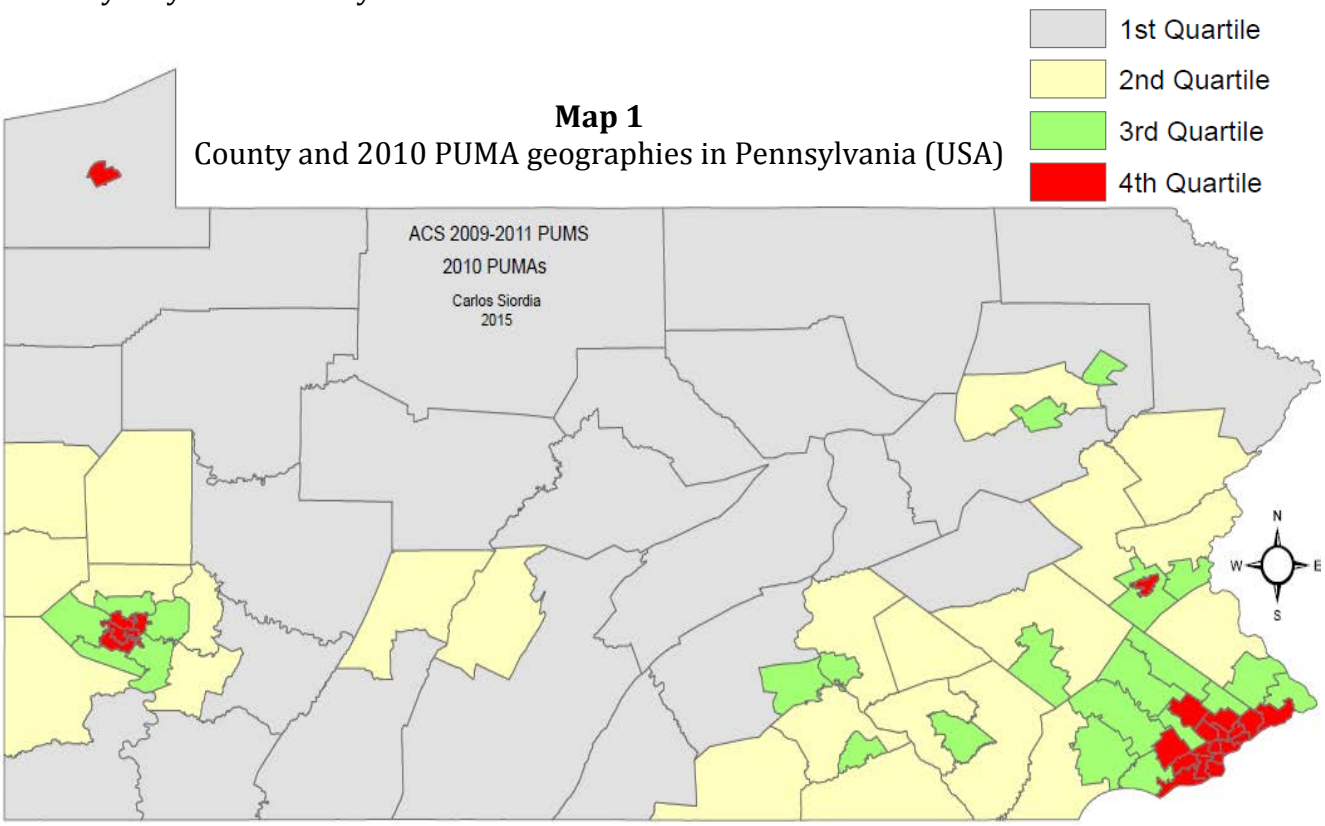
DATA & SAMPLE

Information on individuals was obtained from the American Community Survey (ACS) Public Use Microdata Sample (PUMS) 3-year 2009-2011 file. ACS PUMS files allow for data to be geographically referenced to Public Use Microdata Area (PUMA) geographies. There are 382,473 observations in the microdata. Population-weighted estimates are used in this report. The actual observations represent, when population-weighted, a total of 12,709,154 people in the state of Pennsylvania during the 2009-2011 survey-period.

POPULATION DENSITY BY PUMA

The total population size for each PUMA was computed and used as a numerator in population density calculations to determine the number of people per-square mile by PUMA. **Map 1** shows the PUMAs to which individuals where geographically referenced. The PUMAs where separated into quartiles of population density. Population density was calculated as follows: (population ÷ PUMA area in square miles). Distributions were as follows: 1st quartile population density ≤ 204 people per-mile^2; 2nd quartile population density between 205 and 754 people per-mile^2; 3rd quartile population density between 755 and 2312 people per-mile^2; and 4th quartile population density ≥ 2313 people per-mile^2.

PUMAs in the 1st quartile (color grey in map) are referred to as *rural* PUMAs and those in the 4th quartile (color red in map) as urban PUMAs. PUMAs in the 2nd quartile could be labeled urban-adjacent and PUMAS in the 3rd quartile as rural-adjacent. The discussion focuses on comparing disability estimates between the 1st and 4th quartiles. As shown in Map 1, the largest numbers of urban PUMAs are found in the cities of Pittsburgh and Philadelphia. Note population density may not be evenly distributed over the PUMA.



Map 1
County and 2010 PUMA geographies in Pennsylvania (USA)

MEASURING DISABILITY

The ACS ascertains difficulty with functional activities. Large scale survey data was used to produce population estimates. This means sample data was used to generalize to the population of Pennsylvania. Generalization was obtained from the data by using one population weight variable. Prevalence of disability by population density is provided to highlight "rural-urban disparities in disability." In order to facilitate the discussion, the term "disability" is used to label individuals reporting difficulty with functional activities. Disability was said to be present if person answered yes to one or more of the following questions:

- Does this person have difficulty dressing or bathing?
- Because of a physical, mental, or emotional condition, does this person have difficulty doing errands alone such as visiting a doctor's office or shopping?
- Does this person have serious difficulty walking or climbing stairs?
- Is this person deaf or does he/she have serious difficulty hearing?
- Is this person blind or does he/she have serious difficulty seeing even when wearing glasses?
- Because of a physical, mental, or emotional conditions, does this person have serious difficulty concentrating, remembering, or making decisions?

ACTUAL NUMBER OF OBSERVATIONS

The data contained information on a 382,473 actual observations. These were geographically referenced to PUMAs and stratified by using three racial groups: Non-Latino-Blacks; Non-Latino-Whites; and all others. Table 1 presents "unweighted counts". All the other tables present "population-weighted counts" to provide estimate of disability that are generalizable to the state of Pennsylvania for the 2009-2011 period.

Table 1
Actual number of observations in the analysis

	Non-Latino-Whites	Non-Latino-Blacks	All Others
Population Density			
1st Quartile	124,949	2,219	4,228
2nd Quartile	95,578	2,395	5,186
3rd Quartile	69,426	5,161	8,936
4th Quartile	37,428	15,958	9,196
Total	327,381	25,733	27,546

PREVELANCE OF DISABILITY AMONGST NON-LATINO-WHITES

Table 2 shows prevalence of disability amongst Non-Latino-Whites (NLWs) by population density. The 10.098,633 NLWs represent about 80% of the 2009-2011 population in Pennsylvania. Only 15% of the NLW population resides in urban PUMAs. When compared to urban PUMAs (4th quartile), where 14% of NLWs are disable, rural PUMAs (1st quartile) have a higher (16%) prevalence of disability. Amongst NLWs, disability is more prevalent in rural areas (i.e., where population density is low).

Table 2
Prevalence of disability for Non-Latino-Whites by population density

Population Density	Non-Latino-Whites	Disable	Percent Disable
1st Quartile	2,815,944	455,721	16%
2nd Quartile	3,122,000	400,500	13%
3rd Quartile	2,617,587	322,333	12%
4th Quartile	1,543,102	218,406	14%
Total	10,098,633	1,396,960	14%

PREVELANCE OF DISABILITY AMONGST NON-LATINO-BLACKS

Table 3 shows prevalence of disability amongst Non-Latino-Blacks (NLBs) by population density. Note that unlike the 15% for NLWs, 68% of NLBs reside in urban PUMAs. When compared to urban PUMAs at a 17% of disability, rural PUMAs have a higher (21%) prevalence of disability. Amongst NLBs, disability is more prevalent in rural areas. Also note disability is more prevalent in NLBs than NLWs—regardless of population density.

Table 3
Prevalence of disability for Non-Latino-Blacks by population density

Population Density	Non-Latino-Blacks	Disable	Percent Disable
1st Quartile	69,071	14,831	21%
2nd Quartile	106,497	14,687	14%
3rd Quartile	249,519	35,366	14%
4th Quartile	897,360	153,761	17%
Total	1,322,447	218,645	17%

PREVELANCE OF DISABILITY AMONGST ALL OTHERS

Table 4 shows prevalence of disability amongst all others (i.e., all non NLWs and NLBs) by population density. Unlike 15% for NLWs and 68% for NLBs, 40% of all others reside in urban PUMAs. This group includes Latinos, Asians, Native Americans, and all other groups not included under NLW and NLB. When compared to urban, whose disability rate is at 14%, rural PUMAs have a slightly lower (13%) prevalence of disability. Amongst the 'all others' group, disability is more prevalent in urban areas—a pattern that differs from the NLW and NLB findings. Also note disability seems to be less prevalent amongst these individuals than NLWs or NLBs.

Table 4
Prevalence of disability for 'all others' by population density

Population Density	All Others	Disable	Percent Disable
1st Quartile	128,120	16,838	13%
2nd Quartile	225,684	18,839	8%
3rd Quartile	418,568	44,508	11%
4th Quartile	515,702	71,557	14%
Total	1,288,074	151,742	12%

CONCLUSIONS

Disability is found to be more prevalent amongst rural areas. While 17% of Non-Latin-Blacks are disable, only 14% Non-Latino-Whites and 12% of all others are disable. While the average prevalence of disability in *rural* areas is 17%, the average rate of disability in *urban* areas is lower at 15%. The absolute number of individuals experiencing difficulties with functional activities is 443,724 in urban areas and 487,390 in rural areas. In the state of Pennsylvania, a total of 1,767,347 (14% of state population) experience one or more functional limitations with daily living during the 2007-2011 period. Research should continue to explore how population density, as an environmental marker of social stratification, may play a role in disablement processes. In the meantime, mitigating disability prevalence in Pennsylvania may be aided by targeting public health interventions on residents of rural areas.

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