THE PREDICTIVE POWER OF PLACE: EFFECTS OF RACIAL AND ECONOMIC SEGREGATION ON DIFFERENCES IN LIFE EXPECTANCY ESTIMATES AT THE NEIGHBORHOOD LEVEL — District of Columbia, 2009-2013

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BACKGROUND

The catalyst for this research was participation in a pilot study supported by the Centers for Disease Control and Prevention (CDC) and the Council of State and Territorial Epidemiologists (CSTE) that provided technical assistance in determining small area estimates (SAEs) for life expectancy.

With the myriad health outcome data indicators that describe a population's health status, life expectancy estimates are one of the more straightforward and comprehensive. Nationwide, and in the District of Columbia, we have seen a positive trend in life expectancy at birth.[1] Over the past several years, the District has improved at a faster rate than the U.S. (Figure 1). However, disparities in life expectancy persist, often in communities of color and those experiencing low socioeconomic status. Many times, these communities overlap and are segregated into separate geographical regions.

Figure 1. Life Expectancy Estimates at Birth, District of Columbia and the United States, 2009-2013[1,2]

DC Data Source: District of Columbia Department of Health, Center for Policy, Planning and Evaluation

In our quest to achieve health equity, it is vital not only to document and understand differences in disease patterns, but to 1) know which social factors play a larger role in predicting key health outcomes and 2) be able to effectively target impactful interventions at the neighborhood level.

Hypothesis: Racial and economic segregation impact the expected differences seen in life expectancy across District neighborhoods.

OBJECTIVES

1) To determine life expectancy estimates for the District of Columbia at the neighborhood level.

2) To describe the association between life expectancy estimates and racial/economic segregation.

METHODS

For life expectancy estimates, vital records mortality data from years 2009-2013 were geocoded and aggregated at the census tract level while population estimates were gathered from the Census' American Community Survey (ACS) 2009-2013. Ninety seven percent of addresses (n = 22,699) were properly geocoded and included in the analysis.

Estimates were calculated using the South East Public Health Observatory (SEPHO) life expectancy calculator[3], and census tracts were grouped iteratively to reduce standard error to less than or equal to 2.0, resulting in 46 neighborhoods. Census tracts were suppressed if standard errors remained high (usually related to the presence of Universities and other institutions with special populations).

Using ACS 2009-2013 data and the same geographical areas, racial segregation was calculated as percent Black population and economic segregation as percent population living in poverty within the past 12 months.

Data were mapped and visualized using ArcMap 10.2.2 and a linear regression analysis was conducted using Microsoft Excel 2010 to determine how much, if at all, racial and/or economic segregation affect life expectancy estimates.
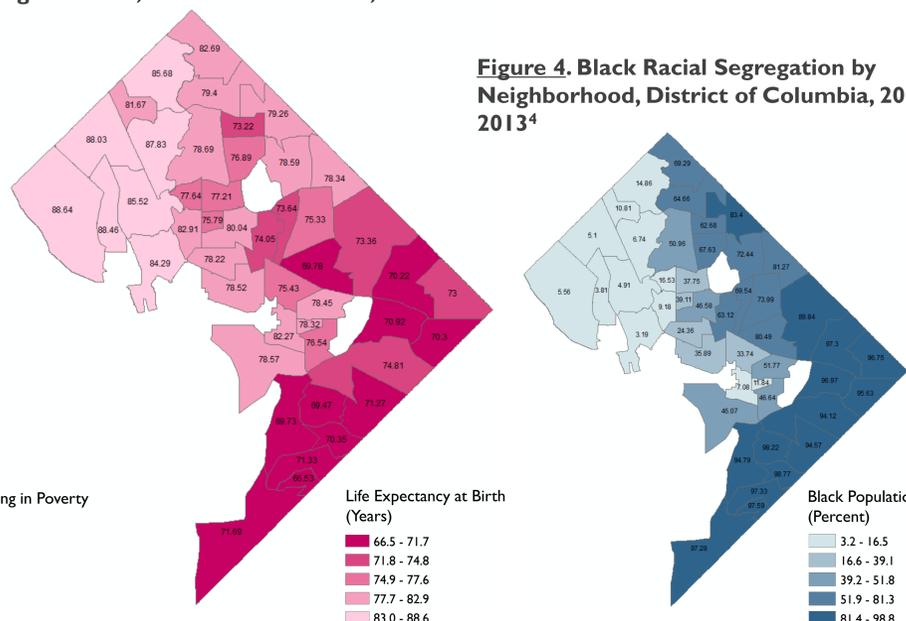
RESULTS

Figure 2. Life Expectancy Estimates by Neighborhood, District of Columbia, 2009-2013[2]

Figure 3. Economic Segregation by Neighborhood, District of Columbia, 2009-2013[4]
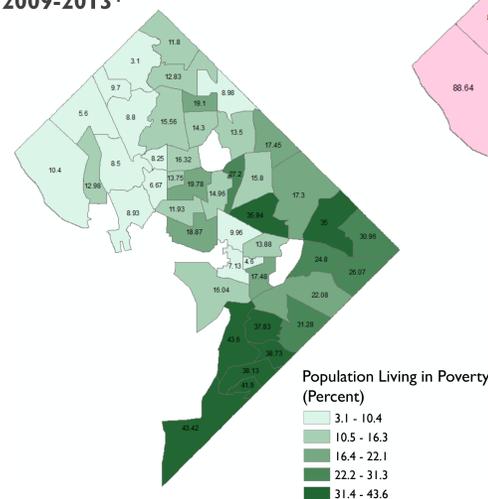
Figure 4. Black Racial Segregation by Neighborhood, District of Columbia, 2009-2013[4]

Life expectancy at birth estimates for 46 District of Columbia neighborhoods span 22.1 years of expected life. Life expectancy for the District as a whole is 78.1 years; however, residents in the neighborhood with the lowest life expectancy can expect to live only 66.5 years while those living in the highest look forward to 88.6 years.

Figures 2-4 show the geographic distribution by neighborhood of life expectancy estimates, percent below poverty and percent Black population, respectively.

Racial segregation explains 71.2% of the life expectancy variation, but taking both racial and economic segregation into consideration improves the model, explaining 5 more percentage points (76.0%) with associated p-values below 0.0001 and 0.005, respectively (Tables 1 and 2).

Table 1. R Square Results of Linear Regression Analysis

Variable(s)	Adjusted R Square Value
Percent Black Population only	0.7119
Percent Black Population and Percent Below Poverty	0.7603

Table 2. Results of Linear Regression Analysis (final model)

Variable	Coefficients	P-value
Percent Black Population	-8.920838109	4.51E-05
Percent Below Poverty	-19.05116983	0.002729

LIMITATIONS

- There are multiple factors that could affect life expectancy estimates, only two of which are considered in this study.

- Life expectancy estimates did not account for differences in sex, race, or ethnicity.

- Due to rapidly changing demographics, population characteristics may not be stable over time.

CONCLUSIONS

The disparity in life expectancy estimates among District of Columbia neighborhoods is stark, and it is unsurprising that the most segregated parts of the city correspond to lower life expectancy. The model predicts a decrease in life expectancy for increases in both racial and economic segregation.

FUTURE RECOMMENDATIONS

Not only where you live, but with whom and how you live can affect how long you live. Policies and programs to alleviate segregation and bolster communities disproportionately affected by poverty could improve the large differences observed in life expectancy. Thoughtful and inclusive development without forced displacement is key in improving life expectancies of all District residents.

Future research can include contributions to life expectancy estimates by spatial factors and other important social determinants of health such as educational attainment, housing status, and access to community resources.

Breaking life expectancy estimates down by region as well as by race/ethnicity will allow researchers to better understand the nuances among segregated, integrated, and isolated communities of color.

Finally, these data can be used to further analyze outliers and help point to strategies that can improve life expectancy for those disproportionately affected.

REFERENCES/DATA SOURCES

1. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, *Health, United States, 2014*.

2. District of Columbia Department of Health. Center for Policy, Planning and Evaluation.

3. Public Health England. Health Inequalities Gap Measurement Tool. Last Accessed 4/20/16. http://www.sepho.org.uk/gap_intro.aspx.

4. Census, American Community Survey 2009-2013.