

Examining the Intersection of Life Expectancy and Social Vulnerability by Locality

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Social vulnerabilities affect life expectancy across North Carolina. From 2018 to 2020, we observed that counties with low life expectancy had higher Social Vulnerability Index (SVI) scores. Counties with low SVI scores had higher life expectancy compared to sister counties with higher SVI scores.

Life Expectancy: The State of Our Nation

Much can be determined about the overall health of a nation by assessing various aspects of the ultimate health-related outcome—mortality. Historically in the United States, life expectancy has been utilized as a key indicator of population health. In recent decades the United States has fallen into a rather disturbing downward trend as it pertains to life expectancy, in comparison to peer nations. Despite consistent advances in health technologies and resources, we have seen an overall decline in the absolute life expectancy of US citizens [1]. Amid this decline, we have seen disparities in life expectancy across various marginalized groups [2]. Furthermore, a recent assessment by the National Center for Health Statistics indicates that the life expectancy of US residents varies substantially depending upon the state in which they were born. This is supported by the fact that structural and social determinants of health are dictated by state policies that have an impact on nearly every aspect of people's lives. Health indicators commonly considered when predicting life expectancy of a population have been found to be associated with the political environment of a state [3]. A 2020 study examining life expectancy from 1970 to 2014 demonstrated that changes in life expectancy were associated with changes in state policies based on a conservative-to-liberal continuum [3]. Researchers identified that states that deployed more "liberal" policies that expanded the economic resources available to constituents provided protection for the most vulnerable groups, while states that implemented "conservative" policies were more likely to experience a reduction in life expectancy [3].

So, where does North Carolina fit in as it pertains to life expectancy? How can public health workers assess the interconnection between life expectancy and policy to make effective change? We submit that to adequately evaluate these connections we must expand the factors and data included when determining life expectancy at birth. Here we

will examine life expectancy in North Carolina by exploring the intersections of social vulnerability and locality.

Social Vulnerability

Indicators commonly used to evaluate life expectancy—including socioeconomic status, household composition, and minority status—are often also used to describe the social vulnerability of populations [4]. The Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR) describe social vulnerability as the potential negative effects on communities caused by external stresses on human health [5]. In 2011, the CDC's Geospatial Research, Analysis, and Services Program (GRASP) established a Social Vulnerability Index (SVI). The SVI is a tool to aid public health agencies in accurately and efficiently prioritizing needs and deploying interventions for populations most vulnerable to social indicators in response to public health crises or hazardous events. This tool utilizes combinations of 15 social factors that can increase a community's social vulnerability risk. The themes utilized to categorize these 15 factors include socioeconomic status, household composition and disability, minority status and language, and housing and transportation. The North Carolina SVI tool set a priori ranges to rank SVI in our state as follows: 0–0.25 (low vulnerability), 0.2501–0.50 (moderate-low vulnerability-*implied*), 0.5001–0.75 (moderate-high vulnerability-*implied*), and 0.7501–1.00 (high vulnerability) [6]. Literature states that communities with high social vulnerability scores are more likely to experience higher rates of morbidity and mortality [7]. Positive correlations between SVI scores and leading preventable causes of death, such as cardiovascular disease, have been established [8].

Our Brother's Keeper: Exploring the Intersection of SVI and Life Expectancy by Locality

The 2022 National Vital Statistics report found that, as of 2019, the residents of Hawai'i had the highest life expectancy

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TABLE 1.**North Carolina 2018–2020 Counties with the Lowest Life Expectancy at Birth and 2017 SVI Score**

Ranking	County	L.E. ^a	C.I. (95%) ^a	2017 SVI Score ^b
1	Swain	70.6	69.1–72.1	0.616
2	Robeson	71.6	71.1–72.2	1
3	Edgecombe	71.9	71.0–72.8	0.939
4	Halifax	73	72.1–73.8	0.899
5	Richmond	73.1	72.3–74.0	0.889
6	Scotland	73.1	72.1–74.1	0.99
7	Vance	73.2	72.3–74.2	0.949
8	Anson	73.3	72.0–74.5	0.909
9	Columbus	73.6	72.8–74.4	0.828
10	Cleveland	73.7	73.2–74.3	0.707

Abbreviations: L.E. = life expectancy; CI = confidence interval; SVI = social vulnerability

^aCenter for Health Statistics, & Avery, M., 2020 State of North Carolina and 2018–2020 County Life Expectancy at Birth (2022). NC DHHS.

^bStory map series. www.arcgis.com/apps/MapSeries/index.html?appid=5ed91aafb26e44698c9efeeb6c708991

in the nation at 80.9 years, while Mississippi had the lowest life expectancy at 74.4 years [9]. In North Carolina, we see a similarly extreme range, with the lowest life expectancy at birth of 70.6 years in Swain County and the highest being maintained less than five hours east in Orange County, at 82.1 years [10]. Tables 1 and 2 display the 10 counties with the lowest and highest life expectancy estimates and their corresponding SVI scores. Unsurprisingly, Table 1 depicts a potential positive correlation between SVI and life expectancy in that all 10 counties with the lowest life expectancy have moderate-to-high SVI scores, with values ranging from 0.616 to 1. Table 2 illustrates the same correlative pattern, with all 10 counties with the highest life expectancy maintaining an SVI score on the low end with a range of 0.02 to 0.4.

However, the summaries provided in Table 3 depict the differences between SVI and life expectancy in the 10 counties with lowest life expectancy and their sister counties; sister counties are defined as counties that share a border with one another. Here we see stark differences in life expectancy and SVI in low-life-expectancy counties and sister counties, ranging from 70.6 years to 80 years for life expectancy and 0.03 to 1.00 for SVI scores. When evaluating ZIP codes (which are enumerated by the US Postal Service and are not aligned with municipal borders) in highly vulnerable counties, it is evident that huge disparities exist [6]. We established comparisons between highly vulnerable counties and sister counties based on counties with the lowest life expectancies that also have a difference in SVI score of greater than or equal to 0.50 in comparison to their sister counties. Utilizing these criteria, we found that individuals born in Swain County residing in ZIP codes closest to 28719 have a life expectancy of 70.6, while their neighbors in 28721 of Haywood County have a life expectancy of 76.5 years. In Scotland County, residents born to ZIP code 28396

have a life expectancy of 73.1 years while in neighboring Moore County residents in 28315 have a life expectancy of 79.1 years. Lastly, Anson County residents in ZIP codes near 28133 have a life expectancy of 73.7 years, while their neighbors in Union County in 28103 have a projected life expectancy at birth of 80 years. In examining these localities, by a matter of mere miles we find differences in life expectancy for Swain, Scotland, and Anson counties to be 5.9 years, 6 years, and 6.7 years, respectively.

According to the same North Carolina SVI tool used for these evaluations, authors abstracted that 49% of counties in North Carolina fall within the moderate-to-high SVI ranges [6]. With this, one must ask how many counties in that 49% have sister counties with better SVI scores and higher life expectancy estimates. And, what are the policies that enable these disparities to occur, and in such proximity? We must continue to cultivate a culture in public health research of establishing multifaceted and multifactorial approaches in our surveillance and reporting. There can be significant differences in health outcomes within a county, thus we must continue to strive for higher levels of data granularity to ensure equity across demographics and localities down to the level of the neighborhood.

So, What Does It All Mean?

In summary, we can conclude that the axiom in demography and public health as it pertains to life expectancy increasing over time no longer reigns true for all North Carolinians [1]. As public health officials, researchers, and advocates, we must sound the alarm about the decline of life expectancy among groups within counties and across ZIP codes. To institute effective change and combat these troubling trends, we must obtain a better understanding of the intersection of policy and public health outcomes, and how

TABLE 2.**North Carolina 2018–2020 Counties with the Highest Life Expectancy at Birth and 2017 SVI Score**

Ranking	County	L.E. ^a	C.I. (95%) ^a	2017 SVI Score ^b
1	Orange	82.1	81.6–82.5	0.091
2	Wake	81.7	81.5–81.8	0.212
3	Watauga	81.4	80.7–82.2	0.121
4	Transylvania	80.9	79.9–82.0	0.071
5	Chatham	80.5	79.8–81.2	0.192
6	Mecklenburg	80.1	79.9–80.2	0.323
7	Durham	80	79.7–80.3	0.495
8	Union	80	79.7–80.3	0.03
9	Camden	79.4	78.0–80.8	0.101
10	Polk	79.4	78.1–80.6	0.02

Abbreviations: L.E. = life expectancy; CI = confidence interval; SVI = social vulnerability

^aCenter for Health Statistics, & Avery, M., 2020 State of North Carolina and 2018–2020 County Life Expectancy at Birth (2022). NC DHHS.

^bStory map series. www.arcgis.com/apps/MapSeries/index.html?appid=5ed91aafb26e44698c9efeeb6c708991

TABLE 3.
North Carolina 2018–2020 Counties and Sister County Life Expectancy and 2017 SVI Score

County	L.E ^a	C.I. (95%) ^a	2017 SV Score ^b	Sister County	L.E ^a	C.I. (95%) ^a	2017 SV Score ^b
Swain	70.6	69.1–72.1	0.616	Haywood	76.5	75.8–77.2	0.05
Robeson	71.6	71.1–72.2	1	Cumberland	75.7	75.4–76.0	0.65
Edgecombe	71.9	71.0–72.8	0.939	Martin	74	72.7–75.3	0.55
Halifax	73	72.1–73.8	0.899	Martin	74	72.7–75.3	0.55
Richmond	73.1	72.3–74.0	0.889	Moore	79.1	78.5–79.7	0.08
Scotland	73.1	72.1–74.1	0.99	Moore	79.1	78.5–79.7	0.08
Vance	73.2	72.3–74.2	0.949	Granville	77.5	76.7–78.2	0.39
Anson	73.3	72.0–74.5	0.909	Union	80	79.7–80.3	0.03
Columbus	73.6	72.8–74.4	0.828	Brunswick	79.3	78.7–79.8	0.13
Cleveland	73.7	73.2–74.3	0.707	Lincoln	77.2	76.6–77.8	0.11

Abbreviations: L.E. = life expectancy; CI = confidence interval; SVI = social vulnerability

^aCenter for Health Statistics, & Avery, M., 2020 State of North Carolina and 2018–2020 County Life Expectancy at Birth (2022). NC DHHS.

^bStory map series. arcgis.com. (n.d.). Retrieved July 14, 2022, from <https://www.arcgis.com/apps/MapSeries/index.html?appid=5ed91aafbf26e44698c9efeeb6c708991>

the decentralized infrastructure of public health in North Carolina detrimentally impacts its residents. National studies indicate that we must begin to explore how interactions between life expectancy, SVI, and geographic location empirically affect the individual-level and county-level risk of early mortality [11]. In a recent needs assessment conducted for 90% of North Carolina local public health directors, participants expressed concerns and frustrations around the lack of centralized reporting of health data. The theme commonly expressed was that there is no efficient way to access and share data and resources with one another. They expressed that there is no “feedback loop” when it comes to the data reported on successful disparity interventions and solutions deployed by state-funded efforts. Limited access to these success stories and methods may stifle interdepartmental collaboration and the initiation of intervention efforts across county lines. These sentiments were realized during the pandemic, where we found that the limited ability of state agencies to provide instant data also limited the capacity of entities and organizations to deploy proficient emergency response plans at the local level.

There’s an African proverb that states: “If you want to go fast, go alone. If you want to go far, go together.” The authors believe these words of wisdom have never rung truer than they do today. With this, we must push ourselves to look at data resources in new and creative ways. We must promote the utilization of dynamic data models that incorporate and interconnect a wider variety of factors and data sources. Only then will we be able to inform on and apply adequate data-driven strategies for remedying the problems that undergird the deterioration of North Carolina residents’ health and longevity. NCMJ

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DATA & TRENDS - SIDEBAR

