

Chapter 8

Spatial Analysis of Successful Aging in Older Adults based on Objective and Subjective Measures

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8.1 Introduction

Methodological approaches advocated by Dr. Gerard Rushton [1] for analyzing geocoded health data inform this study's explorations of geographical patterns of (un-)successful aging using individual-level data from a statewide survey of community-living older people in New Jersey. Successful population aging may be measured in a number of ways. Some measures, such as diagnosis of chronic conditions, are objective. Other measures are subjective, such as an individual's own assessment of how well he or she is aging. Global and local colocation quotients are used in this analysis to compare spatial patterns for the different measures of successful aging [2].

8.2 Successful versus Unsuccessful Population Aging

Population aging is a major unprecedented demographic process affecting every region of the world [3]. Rowe and Kahn [4] [5] have defined three objective criteria for successful population aging: The ability to maintain low risk of disease and disease-related disability; high levels of mental and physical health; and active engagement with life.

Researchers adopting these definitions tend to utilize objective criteria for measuring them from records or by self-report of chronic conditions including arthritis, hypertension and osteoporosis, or functional disability such as difficulty walking a specific distance, standing for two hours, or stooping. More recent studies have however examined the extent to which older adults perceive their own aging experience as successful.

Subjective criteria include individuals' own assessments of how well they are aging and how they rate their lives at present. Objective and subjective measures of success do not always agree. In one study comparing the two, an approximate one third of older adults with chronic conditions rated themselves as aging successfully, while a similar proportion of those without chronic conditions believed they were not aging well [6]. This study's research question in light of these types of differences is whether those differences vary geographically?

Analyzed data for this study were sampled from the ORANJ BOWLsm (Ongoing Research on Aging in New Jersey – Bettering Opportunities for Wellness in Life) panel of 5,688 adults who completed interviews between November, 2006 and April, 2008. Included participants were between the ages of 50 and 74, lived in New Jersey, and were able to participate in a one-hour English-language telephone interview. Panel members were recruited by telephone cold-calling using list-assisted random-digit-dialing (LA-RDD) procedures.

Coverage of residential POTS numbers for sample population represented by the panel's sample is estimated at 95%. Comparison of ORANJ BOWL respondent characteristics with those of all persons aged 50 to 74 years-old living in New Jersey reveals similar racial composition, rates of being born in the state, and marital status. The

ORANJ BOWL sample has a slightly higher proportion of females (63.7% to 53.3%) and a slightly higher percentage of individuals with advanced secondary degrees (18.5% to 14.8%). It under-represents persons of Hispanic descent, since participants were restricted to those fluent in English. A two-factor model of successful aging is developed in this study for a classification of every participant as aging successfully or not on objective or subjective measures [7].

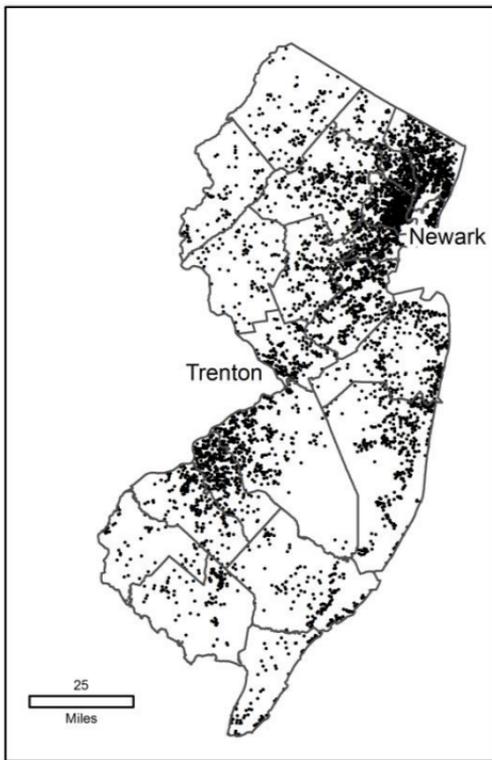


Figure 8.1 Residential locations of study participants by block centroid.

8.3 Appropriate Use of Individual-level Geocoded Data

The U.S. federal government estimates today that 80% of health records are geocoded, a significant increase over the last several decades. Yet, access to this type of data is still not assured. In Connecticut, for example, the Tumor Registry, one of the oldest in the country, provides access to data only at the census tract level, owing to concerns about privacy and confidentiality. For the research presented in this article, data on survey residential locations were available at the census block level, but not for the individual residence of 98% of participants (Figure 8.1). Rushton has been an advocate for use of individual-level geocoded health data, based on his research using geographic data to study cancer [1]. Especially important in this work were the techniques to ensure the suitability of such data for geographic analysis.

8.4 Innovative Use of Spatial Statistical Methods and Spatially Adaptive Filters

In seeking to explore patterns of health and disease in local populations, Rushton also advocated the use of spatially adaptive filters [8]. The method selected to investigate patterns of successful and unsuccessful aging in older adults incorporates spatially adaptive filters in assessment of colocation. Colocation refers to the degree of spatial association between categories in a population. Many geographic databases are of this type, such as, different types of ‘populations’ of retail establishments, crimes, health outcomes including cancers or respiratory conditions, or plants. In the research on successful aging, we were seeking to understand whether older adults in different categories of

successful or unsuccessful aging are more or less likely to be located near to each other than expected?

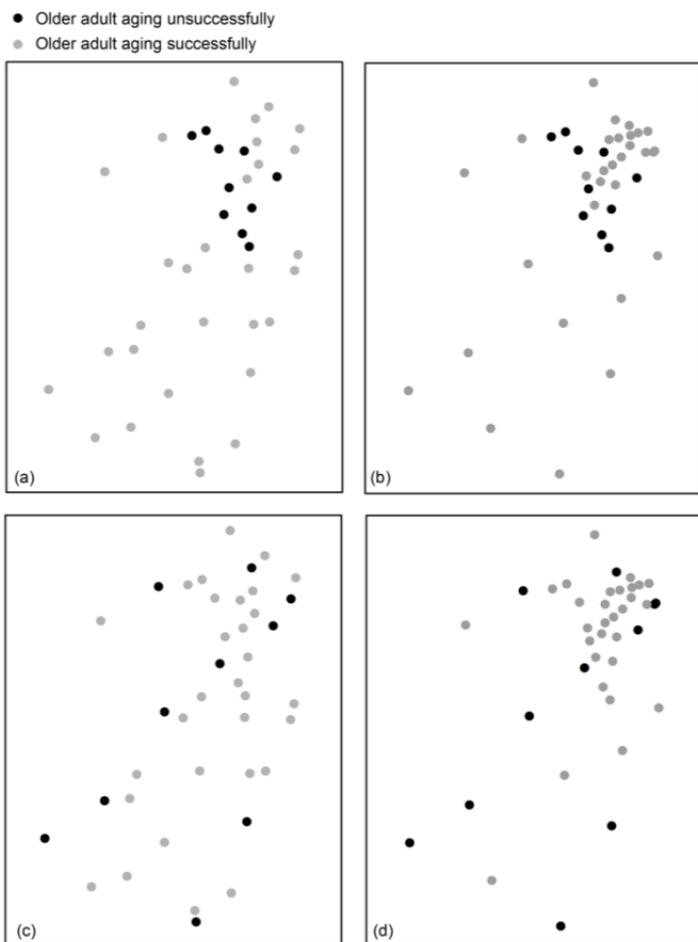


Figure 8.2 Hypothetical patterns of colocation of unsuccessful and successful agers.

For example, in each of four schematic examples in Figure 8.2, we imagine 40 adults, 30 of whom have aged successfully and 10 of whom have aged unsuccessfully. Note, regardless of the population distribution, unsuccessful agers

may be more highly collocated with other unsuccessful agers in Figure 8.2(a) and Figure 8.2(b). Or they may be more highly collocated with other successful agers in Figure 8.2(c) and Figure 8.2(d).

To statistically measure spatial patterns of collocation, we used both global [9] and local [10] collocation quotients (CLQs) for objective and subject measures of successful aging. Then, for the group of survey participants who aged successfully on both measures, we assessed the difference in their local collocation quotients with unsuccessful agers on objective and subjective measures. Gaussian weights were used for the global and the local analyses. A spatially adaptive filter identifying 100 nearest neighbors was used.

8.5 Spatial Patterns of (Un-)Successful Aging

Most adults in the survey (73%) were aging successfully on both objective and subjective measures. Less than 10% of adults in the survey (8.3%) were not aging successfully on both measures. Some participants would be considered aging successfully on one measure, with a slightly higher proportion aging successfully on the subjective measure (10%) than on the objective measure (8.6%). The global collocation quotients for participants in different categories of aging show that, in terms of the objective measure, adults not aging successfully are somewhat more likely to have other adults not aging successfully as their neighbors (CLQ = 1.06). Otherwise, the level of collocation is very close to expected. On the subjective measure of successful aging, both unsuccessful and successful agers are somewhat more likely to have unsuccessful neighbors than expected, with CLQs slightly greater than unity.

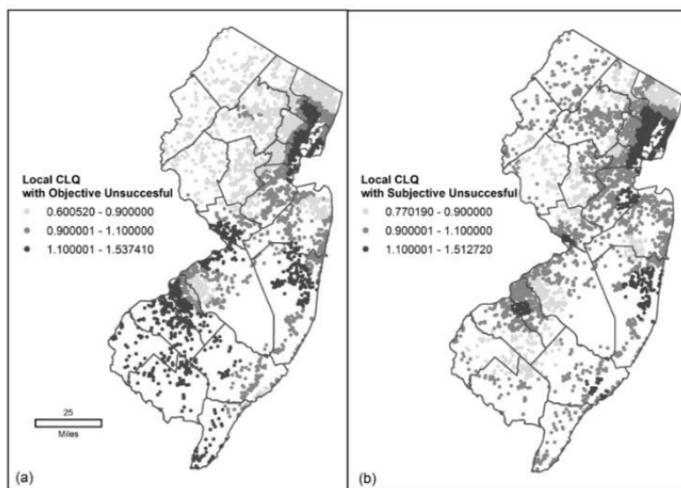


Figure 8.3(a) Older adults who aged successfully on the objective measure of aging; and Figure 8.3(b) Older adults who aged successfully on the subjective measure of aging.

The local CLQs show strong regional variation in the patterns of colocation of successful and unsuccessful agers. Figure 8.3(a) shows the locations of 4,456 older adults aging successfully on objective measures and their local colocation with older adults aging unsuccessfully on objective measures (who are not mapped). Individuals living near Newark, Trenton, and the southwestern counties of the state are more likely to have older adults in their midst who were not aging successfully based on objective criteria. In Bergen County in northeastern New Jersey and three counties (Warren, Hunterdon, and Somerset) in the northwestern part of the state, older adults who aged successfully on objective measures are much less likely to have neighbors who were aging unsuccessfully based on these measures. For the 4,632 older adults who aged successfully based on subjective criteria in Figure 8.3(b), individuals living near Newark are more likely to have older adults in their local areas who were not aging successfully based on subjective criteria.

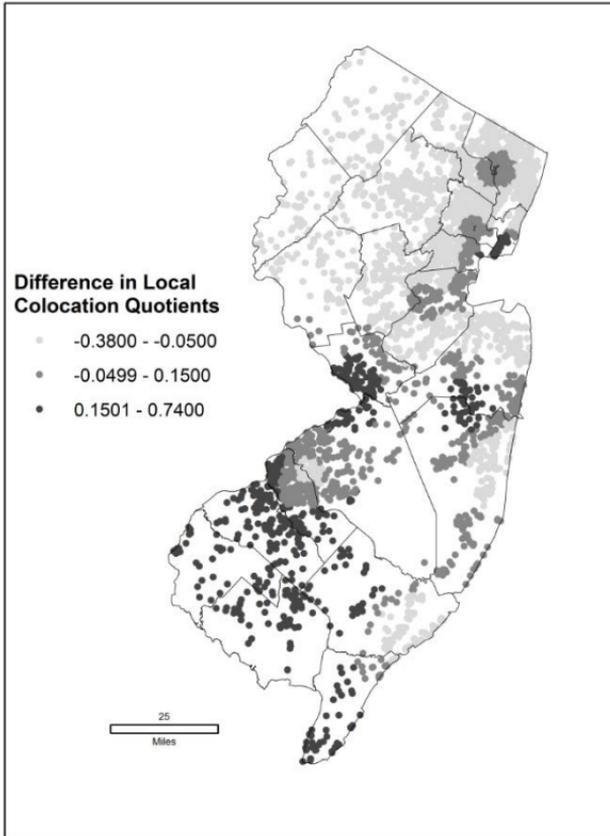


Figure 8.4 Difference in local collocation coefficients.

Finally explored are spatial differences for the 4,076 participants who aged successfully on both subjective and objective dimensions. Their local collocation quotient measuring spatial association with subjectively unsuccessful agers was subtracted from their local collocation quotient measuring spatial association with objectively unsuccessful agers (Figure 8.4). This map shows a strong regional pattern. In northern New Jersey and along the southeast coast, successful agers on both dimensions were more likely to be colocated with unsuccessful subjective agers (as the

difference is negative). In southern New Jersey, especially in the southwest in Gloucester, Salem, and Cumberland counties, successful agers on both dimensions were more likely to be colocated with unsuccessful objective agers (as the difference is positive).

8.6 Discussion and Conclusion

Older individuals not aging successfully are more likely to be colocated in some regions and communities in the study area. This strong evidence of local colocation is however different depending on whether the measure of successful aging is objective or subjective. These patterns reveal communities where older adults are more positive about their own aging experiences than are indicated by their objective health problems.

Age and gender were associated with objective but not subjective measures of success in aging in the study population as a whole. Older survey participants and women reported more chronic conditions than younger participants and men. Note there were no statistical differences in the age and gender composition of the regions in northeast and southwest New Jersey than in the state as a whole.

Further research will focus on three main questions. First, are the effects of objective limitations mitigated by the environment? If older people live in automobile environments with detached houses that do not require them to go up and down steps, their possible inabilities to walk or handle stairs may not be perceived as functional limitations.

Second, do shared community norms affect individuals' views of how successfully they are aging? Research into social networks and aging [11] provides a foundation for this line of inquiry.

Third, what explains resilience? We can identify individuals who are aging successfully, and yet are colocated with older adults who are not aging successfully. How are the successful individuals different from nearby residents? To explore these questions fully, we would need data on the panel over time.

Acknowledgments

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