

Obstacles to Rural Health
and Current Directions in Overcoming Them

Jake Gigliotti
Washington and Lee University
Dr. Howard Pickett
April 2020

Introduction

Increasing life expectancies and falling birthrates are leading to aging populations in many communities around the world. This shifting population distribution brings about both benefits and challenges, which have been extensively documented in Japan and are becoming increasingly clear in the US, where funding is projected to fall short of benefits for Social Security in the near future and Medicare spending constitutes 15% of the federal budget.¹ In light of this, finding sustainable ways to address the challenges of aging is of the utmost importance.

In the US, the rural elderly are of particular interest. People who are elderly make up a larger share of the population in rural communities than urban ones, while low population density is a major obstacle to efficient delivery of services. Fortunately, all is not lost. Many organizations are committed to promoting the wellbeing of rural seniors, and technological innovation provides new tools for tackling these challenges. As a result, there is an extensive body of literature linking the accessibility of healthcare to its utilization and outcomes. Furthermore, much research has been conducted analyzing the role of various social determinants of health (SDH). It is my view, however, that between these fields lies an underexamined factor: access to health-promoting community institutions such as gyms, community centers, and libraries. Exploring this field and identifying ways to enhance access on a case-by-case basis may yield real benefits to the residents of the areas studied through improved health outcomes, without the expenses often associated with healthcare system overhaul or making drastic changes to the social structure of a community. Furthermore, such findings may be generalized to provide useful insights for communities far and wide.

¹ Cubanski, Neuman, & Freed (2019)

In the following pages, I will describe the methodology used in writing this essay before analyzing the situation as it exists today in rural American communities. This will be followed by an examination of three behaviors that have been found to promote different facets of health (physical, mental, and emotional), and of how they can be encouraged, using the Rockbridge area community as a case study. I will conclude by discussing how and why we ought to act on this knowledge.

Methodology

An extensive interdisciplinary literature review was conducted in order to identify current challenges to rural health, behaviors efficacious for health promotion, and directions in the delivery of services. Analyzing the situation in Rockbridge County, however, demands the use of local data. Interviews with local stakeholders are particularly important, both because there is a lack of published data regarding access to health promoting institutions in this area and because collaborating with stakeholders empowers them and provides researchers with valuable insights into a community. The literature review was then revisited in order to contextualize these interviews and ground them and my recommendations in the ongoing conversations regarding healthcare access and social determinants of health.

Literature Review

Literature review was conducted using Google, Google Scholar, SCOPUS, the Washington and Lee Library catalogue, and PubMed. Papers were found using combinations of terms including “social determinants of health,” “rural health,” “urban-rural divide” “healthcare access,” “cancer,” “mental health,” “social connectedness,” “physical activity,” and so on. From these, relevant papers were identified. Selected papers were those that contributed in a

fundamental way to understanding the overarching research question or the set of sub-questions, viz., what are the major mental and physical problems affecting older rural adults, what community-based institutions are effective in preventing or mitigating such issues, and how have people gone about expanding access to and use of these institutions? Furthermore, the bibliographies of relevant papers were searched for additional resources. Priority was given to studies using experimental or quasi-experimental design. When such evidence was not available, I endeavored to find studies that used instrumental variable strategy or other techniques for identifying potential confounding variables and establishing a causal relationship. In some cases, there were few or no studies using any of these tools, which limited the discussion to describing a correlation and a theoretical pathway through which a causal effect may take place. In particular, there is a shortage of studies investigating the degree to which individuals will utilize health promoting community resources should they be made more accessible. This provides a ripe field for future research. The bulk of the sources consulted provided quantitative results, however, a handful of studies utilized qualitative and categorical data.

Additionally, none of the studies identified directly investigated the effects of increased access to community institutions of interest (gyms, libraries, coffee shops, etc.) on health outcomes. Instead, the investigations either focused on connections between access and behaviors, for example, how likely someone is to reach an activity threshold given their proximity to a gym, or on the relationship between a behavior and a health outcome, for instance, aerobic exercise and heart disease. Therefore, though I strive to present a logically sound argument, I must rely on the transitive property rather than direct proof, suggesting another potential future research project.

Furthermore, research on these issues centered on Rockbridge County is in short supply,

thus, most of the research cited was conducted elsewhere and generalized. While it is likely valid in Rockbridge due to the sampling techniques used and selection of studies on areas like Rockbridge, when available, the possibility exists that there were unobservable characteristics of the study populations that prevent the research from being generalizable, or features of the Rockbridge County population that mean even if the research is generalizable, it is not valid here.

Interviews

Interviews were informed by the community-based participatory research (CBPR) model. This model emphasizes a collaborative approach to public health. It highlights the relationship between researchers and the community, drawing on the relative strengths, backgrounds, and understandings of each to conduct meaningful research that is responsive to the needs of the community. CBPR is valuable not only because it allows for additional insights from community members, but because it promotes the dignity of everyone involved by giving them an equitable stake and say in the research, and is intended not merely to understand, but to address the issues at hand.

Interview subjects were selected from among the residents of two area assisted living centers, as well as representatives from these organizations, hospice, Carilion Clinic, and the Maury River Senior Center. Selection was non-random but was intended to capture a diversity of perspectives and opinions held by stakeholders and experts in the field. In many cases, the participants were known to the researcher, but this is in fact a benefit of CBPR, which postulates that the relationship between the researcher and the community will allow for a freer flow of information and additional insights. Furthermore, participants were aware of the nature of the project, but this was not expected to significantly bias their answers, as there is no clear incentive

to advocate for something for which they perceive no need either personally or for the county, and their personal needs are of interest to the investigation.

Interviews were unstructured and conversational, generally directed towards the research question with prompts such as “What are Rockbridge County’s biggest needs?” and “Have you ever had trouble using the gym or YMCA?” These surveys led primarily to qualitative data, which informed later interviews and provided new avenues for literature review. This format was selected because it was expected to enable the researchers to answer the questions of interest, while ensuring that the conversation focused on the concerns of the participants and no insights or grievances were missed because the scope of the interview was too narrow.

Important limitations to interviews exist. There is certainly a possibility for bias, particularly as the sample size is small, so the possibility exists that the results are not truly representative of the population. Additionally, they are not quantitative, which makes it challenging to estimate the true impact of any potential changes.

Proposals

Potential actions were formulated by combining the interviews and literature to identify the greatest health needs of elderly members of this community, then using the existing literature to develop strategies for addressing these needs through enhancing access to health promoting community institutions, accounting for the unique features of Rockbridge County and her residents. Furthermore, potential solutions were scrutinized using Childress and Beauchamp’s principles of medical ethics, the prevailing standard of the American medical community. This approach is meant to ensure that all recommendations are, inasmuch as is possible, in keeping with the principles of beneficence, non-maleficence, respect for persons, and justice. Such a

framework is useful because it is consistent with the classical end of healthcare: to help people live healthy lives, minimally disrupted by pain and illness, while also acknowledging that humans have an innate dignity which should be promoted, including care for autonomy and self-determination. Additionally, as this framework is widely agreed upon, accordance with it may be important for, but does not guarantee, political feasibility and implementation. No framework is perfect, however, and other lenses may provide useful insights.

The Health Burden of the Rural Elderly

What is the health status of rural Americans?

Rural America is increasingly older and sicker than its urban counterparts.² In rural areas, people 65 and over make up 16.8% of the population, compared to just 12.6% in urban areas.³ Those dwelling in rural communities are also “more likely to die of heart disease, cancer, unintentional injury, chronic lower respiratory disease, and stroke than their urban counterparts.”⁴ In fact, they are almost 50% more likely to die of unintentional injury.⁵ The death rate from cancer is declining – but declining more slowly in rural areas than urban ones, at 1% per year compared to 1.6%.⁶ COPD is another pressing issue: although it affects only 4.7% of people in metro areas, the prevalence in rural regions is 8.2%, where it also contributes to more hospitalizations and deaths.⁷ Researchers have also found that rural Americans are at higher risk for both dementia and cognitive impairment in the absence of dementia.⁸ Some research has suggested that, despite their idyllic charm, depression may also be more prevalent in rural

² Centers for Disease Control and Prevention (CDC) (2017)

³ Morken and Warner (2012)

⁴ CDC (2017)

⁵ Ibid.

⁶ CDC (2018)

⁷ Croft, Wheaton, Liu, et al. (2018)

⁸ Weden, Shih, Kabeto, & Langa (2018)

regions, though the evidence for this is mixed.⁹¹⁰¹¹

Although Medicare and Medicaid help alleviate financial barriers to healthcare for elderly and poor ruritans, Medicare doesn't kick in until age 65, and it cannot retroactively address years of forgone healthcare leading up to that point. Therefore, even for elderly persons eligible for Medicare, the 12.3% uninsured rate in rural areas, compared to 10.1% for urban counties, is significant.¹² Furthermore, among rural Medicare recipients, 43% lack drug coverage, compared to 27% of urban recipients.¹³

Healthcare access

What is access to healthcare?

The US Committee on Monitoring Access to Personal Healthcare defines access to health care as “the timely use of personal health services to achieve the best possible health outcomes.” There are many components of access to healthcare – the World Health Organization (WHO) delineates them in three “A”s: Physical accessibility, financial affordability, and acceptability.¹⁴ Others prefer smaller, more descriptive categories – the Patient Access Partnership lists five “A”s: availability, adequacy, accessibility, affordability, and appropriateness. However one chooses to categorize the components of health care access, access clearly correlates with positive health outcomes.¹⁵

Interestingly, despite the strong correlation, access to clinical care appears to have only a modest, though significant, causative effect on health outcomes. For example, studies using

⁹ Probst. et al. (2006)

¹⁰ Abner, Jicha, Christian, & Schreurs (2015)

¹¹ Wang (2004)

¹² Day (2019)

¹³ National Rural Health Association (n.d.)

¹⁴ Evans, Hsu, and Boerma (2013)

¹⁵ Healthy People 2020 (n.d.)

random or quasi-random controlled conditions to measure the causative effect of health insurance (a useful proxy for affordability) on health outcomes generally find slight improvements in self-reported health, blood pressure, and all-cause mortality for both adults and children.¹⁶¹⁷¹⁸ Although a diligent reader may wonder whether small effects are seen because simply giving people health insurance is insufficient to significantly change health care utilization or health behaviors, further research demonstrated that utilization did change: random assignment to groups receiving insurance caused an increase in primary care utilization and in engagement in preventative medicine while decreasing delays in seeking care and emergency department (ED) visits.¹⁹ This suggests that while access is important, particularly for the treatment of acute conditions, it is insufficient for promoting long term health outcomes.

How much access to healthcare do people have?

Traditional barriers to healthcare are compounded in rural areas by “a scarcity of services, a lack of trained physicians, insufficient public transport, and poor availability of broadband internet services.”²⁰ The “Life in Rural America” poll reported that over a quarter of rural Americans did not have access to adequate health care.²¹ Rural communities are disadvantaged compared to urban centers in that they are less able to attract and retain physicians and do not have the population density required to support major hospitals or medical centers. Pew Research Center data suggests that the average travel time for rural residents is 63% longer than for urban dwellers and 43% longer than for suburbanites to reach the nearest hospital.²²

¹⁶ Levy and Meltzer (2001)

¹⁷ Quimbo, Peabody, Shimkhada, Florentino, & Solon (2011)

¹⁸ Brook et al. (1984)

¹⁹ Freeman, Kadiyala, Bell, & Martin (2008)

²⁰ Douthit, Kiv, Dwolatzky, & Biswas (2015)

²¹ T.F. Chan School of Public Health (2019)

²² Lam, Broderick, & Toor (2018)

Furthermore, despite the fact that about 20% of the nation's population lives in rural areas, only 9% of physicians practice there.²³ The AAMC anticipates a dearth of nearly 122,000 physicians by 2032, the impact of which will be felt most strongly in rural areas, where there are already only 39.8 physicians per 100,000 people, compared to an urban ratio 53.3:100,000.^{24,25}

Others have highlighted some of the challenges to rural medical delivery, such as closures of rural hospitals, along with opportunities for improvement and innovation, including managed care, telemedicine, and programs to lower barriers to medical school, expand residency opportunities, recruit more physicians from abroad, and incentivize practicing in underserved areas through programs like loan forgiveness and restructuring Medicare and Medicaid reimbursement strategies.^{26,27}

In keeping with the adage “an ounce of prevention is worth a pound of cure,” it becomes clear that the obstacles to getting affordable health care make avoiding the need for health care paramount.

Innovations in access

Many potential means of improving access are emerging. Telemedicine, for instance, enables doctors to see patients remotely. To date, one of its greatest accomplishments is enabling small groups of doctors in urban centers to provide full-time staffing to hundreds of small rural hospitals across the West and Midwest. Many of these hospitals do not have the resources for 24/7 staffing by an in-person physician, and waiting for the physician on-call to arrive can delay

²³ Rosenblatt and Hart (2000)

²⁴ Heiser (2019)

²⁵ Hing and Hsiao (2014)

²⁶ Weisgrau (1995)

²⁷ Rosenblatt and Hart (2000)

the administration of life-saving treatment. In those that formerly had constant physician staffing, switching to telemedicine for off-peak hours can spell savings of hundreds of thousands of dollars, which can be invested in other resources.²⁸ However, telemedicine is not a perfect solution. In most cases, patients must still travel to reach the hospital or other telemedicine-equipped facility. While in-home care through PCs, phones, or Smart TVs, may be an option, they enable the practitioner to do only minimal testing. Even in hospital settings with advanced telemedicine setups, doctors lose the opportunity for hands-on contact, including the capacity for palpating, long an essential part of the diagnostic process. Furthermore, there have been some instances where nurses, PAs, or other on-site hospital staff have failed to properly execute procedures like intubation, which become second nature to emergency medicine physicians.²⁹

Another technological innovation that bodes well for health care delivery is the rise of self-driving cars. As people age, they begin to lose their ability to drive safely. Currently, life expectancy exceeds driving expectancy by about 6 years for men and 9 years for women.³⁰ Only 31% of people over age 85 are driving, and many of them perhaps should not be – in the absence of alternatives, people may choose to continue driving even when it is not safe to do so.^{31,32} As additional safety features, including self-driving cars, become standardized, people will be able to drive safely longer, enabling them to go to doctor's appointments and attend to daily activities like grocery shopping. In the meantime, improvements to public transportation infrastructure may provide a safer alternative to get older adults where they need to go.

In the short term, mobile clinics are one compelling option. They flip the problem,

²⁸ Ward et al. (2018)

²⁹ Saslow (2019)

³⁰ Foley, Heimovitz, Guralnik, & Brock (2002)

³¹ National Aging and Disability Transport Center (NADTC) (2017)

³² Farber, Shinkle, Lynott, Fox-Grage, & Harrell (2011)

bringing the services to the client rather than trying to bring the client to the services. They may be particularly beneficial for patients who face unusually large barriers to travel and may introduce cost savings over providing individual rides to and from the clinic. Another burgeoning solution is “social prescribing,” in which physicians match patients with local resources to help them meet their needs. These might include food pantries, gyms, sports clubs or counseling, depending on the needs of the patient. These sorts of personalized one-on-one interventions may be invaluable for helping patients with limited means identify new resources, but it is unclear whether such prescribing can practically be included in primary care practices, and the benefits are concentrated on those who can and do see a doctor. The Carilion system uses similar interventions facilitated by teams including social workers and case managers, but it is unclear whether such teams would be sustainable at other area practices.

In the intermediate term, reimbursement reform may be critical to ensuring that rural areas have adequate health care. Several interviewees expressed frustration with the way the current US health system is financed. Each private insurance plan works slightly differently, such that even those tasked with implementing them often find themselves baffled, while providers are reluctant to take on patients with Medicaid, as they are guaranteed to lose money on them due to the reimbursement structure. Therefore, in order to make ends meet, they must balance patients with Medicaid with other patients. As a result, patients with Medicaid may find it difficult to find doctors who will even see them. This is particularly problematic in rural areas, where a high proportion of the population qualify for Medicaid, but few receive employer sponsored health insurance. Medicare, meanwhile, brings about its own problems and pitfalls. Furthermore, rural providers may not have high enough patient volume to hire an expert to handle billing, leading to further losses and inefficiency. Restructuring reimbursement to

streamline it and ensure that doctors don't lose money by seeing patients may help trim inefficiencies in the system and enable all people to get the healthcare they need.

Social determinants of health

Health is, in many ways, a social phenomenon. While innovations in health care itself, such as improved diagnostic and imaging techniques, minimally invasive surgeries, and a host of pharmaceutical innovations, have contributed substantially to life expectancy increases in recent decades, the most important developments have taken place outside of the clinic: clean water, sanitation, and adequate nutrition account for the vast majority of lifespan increases.³³ Similarly, living in a high-pollution area, such as in a heavily industrial community or near a highway can contribute to the development of adverse health effects, while the presence of green spaces and opportunities for recreation promote health. A number of institutions have attempted to estimate the impact of various factors on health, and while the exact figures vary, the consensus seems to be that health care accounts for only 10% of health outcomes. Environmental factors have a similar weight, while biology and social factors come in between 20 and 25%. By almost every account, individual behavior plays the biggest role at around 35%.³⁴ A few institutions report a larger influence of social factors, with a decreased emphasis on behaviors. Braveman and Gottlieb (2014) have attempted to address this discrepancy by elaborating on the influence of social factors on individual behaviors.³⁵ Similarly, having a community with many boarded up windows and ABC stores tends to contribute to undesirable health outcomes, while grocery stores with affordable produce, gyms, and community centers have a positive impact.³⁶

³³ Cutler & Miller (2005)

³⁴ Choi, Sonin, Hrothgar, & Kittelson (2018)

³⁵ Braveman and Gottlieb (2014)

³⁶ Epstein (2003)

What behaviors can help promote health?

Physical Activity

Numerous studies have assessed the effects of physical activity on wide-ranging health outcomes. Halbert *et al.* summarize the extensive literature demonstrating that regular aerobic exercise, including moderate-intensity walking, can lower blood pressure, while Slentz, Houmard, and Kraus (2012) detail the role of exercise in combatting obesity, visceral fat, and metabolic disease. Meanwhile, others have highlighted a lack of activity as a major contributor to diseases including heart disease, type 2 diabetes, non-alcoholic fatty liver disease, hypertension, and many more.³⁷ Although the effects of exercise are generally understood to be dose dependent, even small doses can yield large benefits. Following discharge from hospital rehabilitation, older adults in a once-weekly gym-based exercise program fared as well as those in a twice-weekly program on a variety of health measures including pain, balance, and quality of life at a 3 month follow-up, with both groups significantly outperforming those in a control group not engaged in an exercise program.³⁸ Furthermore, the US Dept. of Health and Human Services (DHHS) reports that regular physical activity reduces the morbidity and mortality of diseases including coronary heart disease, diabetes, hypertension, and colon cancer (2002).

Perhaps less intuitively, physical activity also plays a role in mental health. Acute bouts of exercise of any intensity leads to a significant reduction in mood depression (that is to say, it improves mood) for at least 30 minutes after the workout in participants with major depressive disorder (MDD).³⁹ Furthermore, Anderson and Shivakumar describe the association between

³⁷ Booth, Roberts, & Laye (2012)

³⁸ Foley, Hillier, & Barnard (2010)

³⁹ Meyer, Koltyn, Stegner, Kim, & Cook (2016)

physical activity and both short- and long-term improvement in anxiety symptoms (2013). Citing a host of literature, they describe various physiological and psychological mechanisms that contribute to the observed improvements.

One such pathway operates through neurogenesis. Russo-Neustadt, Beard, and Cotman (1999) find that access to exercise wheels enhances brain-derived neurotrophic factor (BDNF) levels in rats. Liu and Nusslock (2018) extend these findings, reiterating the role of exercise in modulating BDNF levels, then describing the role of BDNF in neurogenesis, particularly in the hippocampus. This is acutely relevant for to the prevention of Alzheimer's disease (AD) and dementia, which involve, among other traits, diminished BDNF and neurogenesis in the hippocampus. Research from Laurin, Verreault, Lindsay, MacPherson, and Rockwood (2001) explicitly tie these findings to humans by relating the dose-dependent inverse relationship between exercise and risk for AD, dementia, and other cognitive impairment in elderly people. These findings are concordant with Baumgart et al.'s review of modifiable Alzheimer's risk factors (2015). Contrasting evidence exists regarding the effect of exercise on individuals with preexisting cognitive pathology. In an RCT, individuals with dementia who underwent a 4-month exercise regimen did not show significant improvements compared to a control group (Toots et al., 2017). However, after surveying 13 intervention-based studies, Cai and Abrahamson (2015) report improvements on several measures, including executive function, memory, and global cognition in older adults with mild cognitive impairment.

Beyond disease prevention, exercise plays an important role in promoting brain function in older adults. Even acute bouts of aerobic exercise have been found to enhance working memory (Voss et al., 2020). Long term training can even counteract the natural shrinkage of the hippocampus in older adults – Erickson et al. report hippocampal volume increases overturning

one to two years of loss over the course of a 6-month aerobic exercise program (2011).

Furthermore, participants in this study displayed significant special memory performance gains.

Intellectual Stimulation

Much like physical exercise, mental workouts can have a preventative effect on cognitive decline.⁴⁰ Murphy, O’Sullivan, and Kelleher (2014), for example, report that even such simple activities as doing a daily crossword puzzle can significantly enhance phonemic verbal fluency. Further evidence suggests that engaging in activities with higher cognitive demands, in particular learning a new skill, has a larger, more robust impact. Park et al. compared doing “non-intellectual” behaviors, like doing crossword puzzles, to learning to quilt, digital photography, or both, and found that each of the learning conditions led to greater gains in episodic memory than the non-intellectual crossword condition. Interestingly, all interventions led to significant gains in mental control compared to the pretest, but they were not statistically different from one another. Additionally, different interventions had effects of different magnitudes on different aspects of mental function – for example, the photo condition had the strongest return for episodic memory, but the smallest impact on processing speed. In a separate study that examined skill-learning in older adults, researchers found that individualized piano lessons for musically naive participants brought about significant, generalizable improvements in executive functioning and working memory at the end of the 6-month training period. These trends persist, though not at a statistically significant level, for three months following the discontinuation of lessons.⁴¹

Interestingly, one’s “cognitive reserve” seems to play an important role in the resiliency

⁴⁰ Solan (2016)

⁴¹ Bugos, Perlstein, McCrae, Brophy, & Bendenbaugh (2007)

of cognitive function in the face of brain changes. Cognitive reserve is generally understood as the reserve, or level of cognitive enrichment procured across the course of one's life. Things like higher education and lifelong learning, bilingualism, complex work environments and leisure activities, and other cognitive stimulation all contribute to one's cognitive reserve.^{42,43} In rodents, dogs, and humans, subjects with larger cognitive reserves began experiencing cognitive decline later in life and initially were less affected by it.⁴⁴ A particularly fascinating finding is that large cognitive reserves seem to delay the onset of AD, but that once it is diagnosed, patients with large cognitive reserves deteriorate and die more quickly, leading researchers to conclude that the resiliency provided by the cognitive reserve enabled the brain to maintain normal functioning until a critical point is reached, beyond which the brain cannot support even basic functions.⁴⁵

Social Engagement

Social networks are an essential part of one's health, so much so that social support is considered when judging candidates' fitness for organ donation.⁴⁶ Similarly, one's social network plays an important role in shaping mental and emotional health. For example, in a large-scale meta-analysis, Kuiper et al. (2015) found that low social participation, infrequent social contact, and loneliness are all predictive of future incident dementia. Furthermore, strong social networks can be protective: Crooks, Lubben, Petitti, Little, and Chiu (2008) found that in elderly women (none of whom had dementia), larger social networks at baseline were associated with a lower rate of dementia and a smaller loss of cognitive functioning in follow-up interviews. One might question whether having a larger social network is protective against dementia, or whether

⁴² Bak, Nissan, Allerhand, & Deary (2014)

⁴³ Stern (2012)

⁴⁴ Milgram, Siwak-Tapp, Araujo, & Head (2006)

⁴⁵ Andel, Vigen, Mack, Clark, & Gatz (2006)

⁴⁶ Ladin et al. (2019)

these results in fact stem from underlying factor which both causes people to have smaller social networks and leads to dementia, however, pre-testing of participants did not reveal any significant cognitive disparities between the groups.

Are all social interactions equal? The evidence suggests not, and rather, that who you interact with and the makeup of your social network (more friends? family?) matter. However, although there is consensus that social network makeup affects the influence of social networks on cognitive ability and mental health in older adults, there is disagreement about what the optimal composition is – some researches find that friends play a more significant positive role,⁴⁷ while others find that family members have a more positive effect.⁴⁸

In a two-year Japanese study, older adults were given a health assessment then assigned to either visit elementary schools to read with children or to a control group. At the conclusion of the study, health was again assessed. The researchers found that those in the volunteer group maintained or saw improvement in both social network scores and self-rated health at a significantly higher level than those in the control group, suggesting that even social interaction with “non-friends” can have a beneficial effect on health.⁴⁹ In a study of a rural Indian population, however, Singh, Singh, and Arokiasamy (2016) suggest that higher shares of “friends/neighbors” in a social network offer the most protection against depression.

Institution usage

The question remains, if you build it, will they come? A Swedish study found that people who live within 1000 m of an exercise facility exercise get an average of 5 minutes more

⁴⁷ Li & Dong (2018)

⁴⁸ Tomini, Tomini, & Groot (2016)

⁴⁹ Fujiwara et al. (2009)

moderate to high intensity activity per day and have a 69% greater chance of meeting weekly physical activity recommendations.⁵⁰ Additionally, a British study found that providing free access to leisure centers (pools, gyms, etc.) for which there was formerly a charge significantly increased pool usage, gym usage, and overall daily physical activity levels for members of the communities containing the leisure centers.⁵¹ A similar study in the US involved physicians referring patients to the local YMCA and giving them vouchers for a free membership. After 2 years, a \$10 copay was instituted, after which 80% of formerly free users terminated their membership.⁵²

Importantly, enhancing access to institutions may be necessary, but insufficient. If one is to play soccer, they must have a ball, but they must also have a goal. Furthermore, they must want to play soccer. Similarly, for people to exercise, they must have access to an appropriate facility for doing so. Furthermore, they must know that the facility exists, want to go, and be able to get there. Therefore, in the recommendations section I strive to ensure that the most basic level of need is met, so that even if some obstacles remain, some may still benefit from the intervention. I also attempt to anticipate major obstacles so that these might be addressed, but it is not always feasible to do everything at once, and unfortunately sometimes barriers are not evident until other barriers have been removed. Therefore, some interventions may have a small immediate benefit, but they are necessary to larger benefits down the road.

Analysis

What do we know?

Adequate access to healthcare is, at best, a challenge for nearly all groups of people.

⁵⁰ Eriksson, Arvidsson, & Sundquist. 2012

⁵¹ Higgerson, Halliday, Ortiz-Nunez, Brown, & Barr (2018)

⁵² Silva, Cashman, Kunte, & Candib, (2012)

Rural dwellers are particularly disadvantaged: they tend to be older, poorer, and sicker than their urban counterparts.⁵³ There is a significant divide in health outcomes between urban and rural America. Rural communities, like Rockbridge county, have higher death rates from heart disease, cancer, unintentional injury, chronic lower respiratory disease, and stroke than urban ones.⁵⁴ Despite having a higher burden of illness, rural communities are less likely to have their medical needs met, with far fewer doctors, both primary care physicians and specialists, per person than urban areas.⁵⁵ Furthermore, they must often travel further to see medical professionals.⁵⁶ Old age compounds these health challenges, as the elderly are both sicker and in many cases less able to travel: life expectancy is several years longer than driving expectancy,⁵⁷ and declines in energy and balance make accessing public transportation more difficult, while the double whammy of digital divide, that of being both elderly and rural, renders solutions like Uber or other ridesharing apps less feasible.

The health disadvantage of rural communities makes them an important focus for health policy, but many characteristics of such communities make it difficult to design efficient interventions. Population density is low, so localized institutions are inherently either far from many of those they serve, or they can serve only a small number of people. Furthermore, they struggle to attract and keep physicians and other highly educated healthcare providers, putting a greater burden on those who do practice in rural communities. These challenges with healthcare delivery make it important, wherever possible, to avoid the need for healthcare.

Interestingly, though it makes up the vast majority of health spending, healthcare itself

⁵³ CDC (2017)

⁵⁴ Ibid.

⁵⁵ Hing and Hsiao (2014)

⁵⁶ Lam, Broderick, & Toor (2018)

⁵⁷ Foley, Heimovitz, Guralnik, & Brock (2002)

plays a relatively minor role in ultimate health outcomes. Of far more importance are individual practices and social circumstances, making these logical points of intervention.⁵⁸ Furthermore, as demonstrated in the literature review, there are numerous effective behavioral interventions for improving mental and physical health. Behavior occurs on a few levels: first, one must have the capability for a behavior. That is to say, they must have access to the resources necessary to carry out the activity and the ability to use them, for instance, in order to read, someone must have something to read and know how to. Additionally, they must have the desire to carry out the behavior: simply giving books to someone who knows how to read will not cause them to read; they must decide to pick up the books and read them. Therefore, in order encourage people to engage in health promoting materials, we must ensure that they have both the capacity and desire to do so.

There are many behaviors that promote health – among them are physical activity, mental stimulation, and socialization, as demonstrated in the Literature Review. Increasingly, there are many ways to go about these behaviors. However, these innovations disproportionately leave the elderly, poor, and rural behind. For example, historically, rural communities have been primarily agrarian, providing a natural source of exercise. Meanwhile, in urban centers, YMCAs, entrepreneurs and others recognizing the lack of natural physical outlets invested in gyms and exercise facilities.⁵⁹⁶⁰ Industrial farming and mechanization have reduced the number of farmers and cut down on the physical demands of farming, rendering many rural dwellers less active.⁶¹ Although YMCAs and other gyms are spreading into rural communities, they often lack the convenience of urban facilities. Similar stories can be told for each of the behaviors of interest.

⁵⁸ Choi, Sonin, Hrothgar, & Kittelson (2018)

⁵⁹ Andreasson & Johansson (2015)

⁶⁰ YMCA (n.d.)

⁶¹ Caballero (2007)

How can we promote (health) behaviors?

Each behavior can also be promoted in various ways: generally speaking, interventions focus primarily on either capabilities or desires. Ultimately, however, both must be present for the behavior to occur. With regard to health behaviors, questions of “capabilities” can often be reduced to discussions of “access” – people know that they should eat healthfully (though they may not know exactly what healthful eating entails), but they may not be able to make it to a store that sells healthy foods, they may not be able to afford them once there, or they may not have time to cook them when they get home. They know that they should go to the doctor, but perhaps there aren’t many doctors around. Maybe those that are won’t accept their insurance, or they’re uninsured and can’t afford the bill. Perhaps there are long waitlists, or a good doctor-patient relationship is absent. To address access problems, we might seek increase the amount of a resource in an area, bringing in more grocery stores or doctors. Alternatively, we might enhance access to existing resources by lowering barriers, perhaps reducing prices or improving the transportation system.

Modifying desires can also involve lowering barriers – I may want to play soccer, and though I technically have time, I do not want to play soccer enough to invest an hour in recruiting other players and getting to the field. However, if my neighbor is aware of a game that has already been planned and offers me a ride, I’ll elect to go. Similar results can be achieved using incentives to make the behavior more desirable, like free t-shirts for blood donors or lollipops at the doctor’s office (though these may not be as effective on adult patients). It might also take the form of lower health insurance premiums for those who don’t smoke. Desire modification could also use “nudging,” structuring choice architecture to promote a particular outcome – for instance, putting healthy produce at the entrance of the store, with the junk food in

some out-of-the-way section (rather than in the check-out line). Another option for choice architecture is bundling, tying desirable activities to less desirable ones – commonly seen with legislation, where a small, perhaps unpopular rider is attached to a more important bill, for example, the attachment of the Hyde Amendment to appropriations bills in order to limit the use of federal dollars for abortions. This might occur on an institutional level, such as when a school requires students to attend X “small sport” games to get highly desirable tickets to football or basketball games, or even the individual level, when someone only allows themselves to watch television while on the treadmill. Given the clear evidence of rural health deficiencies and the wide range of potential interventions, it seems certain that there is some alternative preferable to the status quo. In the following sections, I will present some challenges and possible paths forward for each behavior, concluding with a few observations related to all of them.

Physical Activity

As outlined above, the rise of industrial farming and technological innovation are rendering rural communities increasingly sedentary. Retirement and physical decline, including decreasing energy and balance, have a similar effect on aging populations.⁶² Formal institutions for physical activity, such as gyms and organized sports leagues, are sometimes present in rural communities, but are often inconvenient, perhaps located far from those they serve or closed when people get off from work. Furthermore, most gyms and sports leagues have membership fees or other costs which pose additional barriers for poor families. Indeed, for many people, exercise occurs outside of formal institutions: working out using home gyms, running and biking in streets, walking in parks, and so on. Shopping malls are a preferred walking location for hordes of suburban senior citizens: they’re spacious, climate controlled, and free from

⁶² Smith, Gardner, Fisher, & Hamer (2015)

potholes.⁶³ Rural areas, however, are not generally considered prime real estate for malls, nor are they often graced with bike lanes or sidewalks. With light traffic and low speed limits this may not be a problem, but on curvy, high speed roads this makes walking and biking dangerous propositions, particularly for elderly people who are less able to dive out of the way. There are many ways to workout at home, but improper exercise can lead to injuries, and as people age, becoming frailer and losing their balance, the fear of falling may prevent them from utilizing home exercise. For them, gyms provide a safer alternative, with people to step in or call for help should it become necessary. Additionally, group exercise provides an opportunity for social engagement and may increase motivation and participation.

Some might argue that more full-service gyms should be built to increase access. This would almost certainly reduce the distance people need to travel in order to reach the gym and may in fact be an appropriate intervention in some communities, but I would posit that in most situations, this would be an inefficient use of resources. Opening and operating a gym is expensive, and shaving a few minutes of travel time for a handful of people may indeed increase usage in that group, but this impact would be concentrated on a small population, and those who don't own cars or are unable to drive would likely not benefit at all. Another potential intervention is to promote the use of home gym equipment, such as treadmills and elliptical machines, perhaps through subsidies. While this may be a better option for connecting those with limited transportation to exercise equipment, it lacks the benefits of supervision and socialization. Furthermore, this too is likely to be expensive, and the machines will spend most of the day sitting unused.

I would argue for the Rockbridge Area Recreation Office (RARO) to take a more active

⁶³ National Institutes of Health (n.d.)

role in planning opportunities for adult exercise. Programs like parkrun, a free weekly 5k, have demonstrated efficacy for engaging and retaining previously sedentary and or obese individuals.⁶⁴ Rockbridge county has a plethora of trails suitable for similar events. Furthermore, RARO is uniquely positioned to partner with local schools and businesses to, for example, schedule a senior walking group in Wal-Mart, or offer an after-hours fitness class in partnership with a local gym. Adult sports leagues may also be worth exploring on a trial basis – such programs provide a fun way to stay active in larger cities, but it is unclear whether the population of Rockbridge is large enough to support such an initiative.⁶⁵ A focus should be placed on scheduling evening and weekend activities: on the 2018 Rockbridge Area Community Health Assessment, nearly a quarter of respondents reported that a lack of evening and weekend hours were a barrier to getting healthcare for them. It follows that if they cannot get to the doctor during the day occasionally, they likely cannot access exercise programs during the day routinely.⁶⁶ When possible, data should be collected about participants former activity levels, activity since joining the program, and retention rates to ensure that the target audience is being reached, while time and location preferences should be assessed to enhance participation.

Furthermore, I would advocate for the expansion of programs where insurance companies offer discounts or help pay for gym memberships. Models for such policies exist: the Medicare SilverSneakers program provides recipients membership at participating gyms, while some employer sponsored insurance programs offer discounts to people who reach a step or activity threshold. However, people are not eligible for Medicare until age 65, and many insurance plans do not offer such benefits. However, habit formation begins long before one turns 65, and the

⁶⁴ Stevinson, Wiltshire, & Hickson (2015)

⁶⁵ Castagna, de Sousa, Krstrup, & Kirkendall (2018)

⁶⁶ Carilion Clinic (2018)

earlier exercise habits are formed, the stronger the habit and the more fit the individual will be going into retirement, leaving them better prepared to continue exercising after. Therefore, extending SilverSneakers-like programs into Medicaid and encouraging them in private health insurance plans would enhance access to exercise facilities and to promote the use of these facilities. Opponents of such programs would, quite rightly, argue that it will take money to pay for extended hours and to provide gym memberships. That said, however, evidence from the SilverSneaker program strongly suggests that, in the long run, the costs of the memberships are more than offset by the savings on medical care, with expenses dropping nearly 10%.⁶⁷⁶⁸ Therefore, these policies may be beneficial for all parties involved, bringing savings to government and insurance providers and both financial savings and good health to participating individuals.

Intellectual Stimulation

There are numerous options for lifelong learning – from private music lessons to taking classes at the local college, checking out library books to taking advantage of countless online resources. Of course, private lessons, college fees, and an internet subscription cost money. Furthermore, the communities served by community colleges are often quite large, and even libraries, ubiquitous in towns small and large, are far beyond the walking distance of most of their patrons. Additionally, many rural communities still lack reliable internet access: an estimated 19 million Americans – a quarter of the total rural population -- have little to no internet access,⁶⁹ while older folks in particular are sometimes uncomfortable with technology or unable to use it effectively.⁷⁰

⁶⁷ Nguyen, Ackermann, Maciejewski, Berke, Patrick, Williams, et al. (2008)

⁶⁸ Crossman (2018)

⁶⁹ Johnson (2019)

⁷⁰ McDonough (2016)

An increasingly popular method of increasing access to books is the “Little Free Library” (LFL) movement, in which small structures similar to large birdhouses are erected, typically by private individuals, and stocked with books. They then serve as a book exchange, with members of the community taking new books and leaving ones they’ve finished. LFLs are imperfect: opponents may point out that these small, community-run libraries don’t have the selection of real libraries and are entirely dependent on their users having books to exchange. There are no measures in place to deter theft or vandalism, nor do they provide access to resources like librarians or the internet, all of which can be found in regular libraries. I would respond, however, that if someone has just a single book, LFLs have the potential to effectively turn this into dozens of books. Public libraries play an important role in society, but they can be inaccessible. Rockbridge county, with an area of 601 sq miles, has only four libraries. Nearby Bath county has just one.⁷¹⁷² Patrons needn’t travel all the way to these libraries every time they want a new book. LFL’s are small and cheap to build, so they can be found almost anywhere, maximizing convenience with minimal cost. Their efficacy is demonstrated in the existence of over 100,000 LFLs in over 100 countries, in locations ranging from New York City to Bolgatanga, Ghana.⁷³ Identifying a few high-priority targets and recording book turnover may provide a low-cost way to test the effectiveness of this intervention and determine if it should be expanded.

There is room for improvement at traditional libraries as well: many libraries have a handful of large print (LP) books, but they should consider investing more heavily in these: they are an invaluable resource for patrons with failing vision, while other patrons are no worse off

⁷¹ US Census Quickfacts (2019)

⁷² Rockbridge Regional Library System

⁷³ Little Free Library (2019)

reading an LP book rather than a normal book. In fact, one experiment found that middle schoolers assigned to large print reading groups had two to three times the improvement in Lexile score than their peers in the standard text group and when asked to report their anxiety on a scale of 1-100, reported a 43% reduction. Furthermore, over half of students reported enjoying the large print books more than standard print books.⁷⁴ One interviewee, a library volunteer, noted that it is not uncommon for older adults to seek large print books to read to their grandchildren. Audiobooks are another innovation which may be especially valuable to elderly and blind patrons, as well as children who have not yet mastered reading. The American Library Association points to both large print and audiobooks as resources critical to adequately serving older adults.⁷⁵ Critics might argue that LP and audiobooks are more expensive than regular books, and therefore will reduce the number of other books the library can purchase, but very few libraries are actually suffering from book shortages. In fact, library systems dispose of many books each year to make room for the latest and greatest books.⁷⁶ Purchasing the large print books may slow this turnover slightly, but all but the most dedicated of readers will still find themselves with selection far beyond what they could hope to read in a lifetime, especially given the increasing availability of interlibrary loans. Although the library may be slower to acquire some popular books, the benefits of increased access for elderly patrons coupled with enhanced confidence and enjoyment for younger readers recommend this tradeoff as worthwhile.

The internet is also an incredible, if imperfect, resource. There is quite literally more on the internet than one could ever hope to learn in a lifetime: YouTube videos offering guidance on automotive maintenance, online publications from daily (now constantly updated) newspapers,

⁷⁴ Project Tomorrow (2019).

⁷⁵ Mates (2003)

⁷⁶ The author has helped dispose of many books while volunteering in two library systems

textbooks, even massive open online courses (MOOCs) created and sponsored by institutions like Duke and Harvard, open to anyone, with unlimited seating, free of charge. Some concerned ethicists may point out that many people, especially the worst off, do not have access to the internet, while elderly may not be comfortable using it.⁷⁷ This is true, and investing only in internet learning opportunities would almost surely be unjust and contribute to diminishing the position of those who were already worst off. However, this is not a sufficient reason to ignore a resource that may prove invaluable to hundreds of millions of people who have internet access and are comfortable using it. Beyond the benefits that the internet brings its users, it provides a cheap, convenient service that will replace the demand for resources like LP books for some users, making them more available to those who truly need them without necessitating higher investment in this more expensive resource. Therefore, the internet can and should be a part of a system of resources for intellectual stimulation, maximizing the position of the worst off as well as others.

Another possibility is expanding access to in-person classes. After retirement, older adults often have a lot of time on their hands, and they are frequently more comfortable learning in-person rather than online. Thus, effective methods for inspiring lifelong learning and the building of mental resilience might include offering free or low-cost classes at existing senior centers, adult day cares, or community centers; reducing barriers to community college attendance through tuition incentives or creating sections of classes popular among older adults specifically for non-traditional students in order to reduce perceived stigma and feelings of being out of place. Publicity campaigns to boost enrollment of non-traditional students may serve to further reduce stigma and inspire people to become lifelong learners.

⁷⁷ Jacob (2016)

Similar to discussions of education in prisons, some might question the value of investing in the education of the elderly and other non-traditional students when so many young people lack the opportunity for higher education. Surely, they might argue, with a set number of dollars for education, it would be better to invest in young people with their whole lives ahead of them than in those in the autumn of their lives. I would object to such claims on a few grounds, however. Firstly, all students stand to benefit from having non-traditional students in the classroom. The variety of life experiences they bring will dramatically increase the diversity of perspectives available, providing new opportunities to exercise empathy and critical analysis. Also, Alzheimer's, dementia, and other aspects of cognitive decline contribute to a substantial bill: formal care for people with Alzheimer's and other dementias has a price tag of \$305 billion, while unpaid care is estimated to cost another \$244 billion.⁷⁸ If, as demonstrated in the Literature Review, intellectual engagement and learning can delay the onset of Alzheimer's and dementia, this could bring about significant savings on the cost of care. More research is needed in this area, but these savings could at least partially offset the added education costs, or perhaps even lead to fewer net expenditures.

Social Interaction

The small towns of rural America are notoriously friendly – however, this stereotype conceals the loneliness individuals in such communities might face. Outside of the towns themselves, neighbors are few and far between, reducing the number of people one interacts with on a regular basis if they stay at home. For many people, work, shopping, religious life, and other activities of daily living boost the number of interactions and contribute to strong social networks.⁷⁹ However, when one does not work, for instance, when they retire or are excluded

⁷⁸ Alzheimer's Association (2020).

⁷⁹ Institute of Medicine (2006)

from the labor market, some of these connections are lost.⁸⁰ When one doesn't have much money for shopping, or when old age and difficulty getting out of the house reduce the number of shopping expeditions one embarks on, more ties are lost. Furthermore, interviews suggest that for elderly members of the Rockbridge area community, social connectedness is diminished by the deaths of friends and family, increased difficulty getting out, and, as routine housekeeping becomes more difficult and they may become embarrassed by the state of their house, decreased openness to visitors.

Interestingly, religious life often remains an important part of people's lives, a part that in many cases grows, long after they retire, despite difficulties getting out of the house.⁸¹ This continued involvement suggests that something about religious organizations may be instrumental in keeping people involved. Many institutions help provide transportation for parishioners in need, from busses to pick up the elderly or children to informal carpooling systems in which folks give rides to people who live near them. For example, Intervarsity organizes student carpools to local churches, while the Kendel retirement community provides bus service. Furthermore, they routinely organize social gatherings: luncheons after services, shabbat dinners, bible studies, volunteering, and so on. This deliberate emphasis on involvement and participation motivates people and gives them a purpose, makes them feel needed.⁸² There is a stress on community, for instance, on being brothers and sisters in Christ, or on being God's chosen people.

One notable shortage in rural areas is the lack of diverse religious institutions. Generally, even the smallest of towns has a church or two, with some 384,000 congregations nationwide,

⁸⁰ Lancee & Radl (2012)

⁸¹ Cornwell, Laumann, & Schumm (2008)

⁸² Greenfield, Vaillant, & Marks (2009)

though some denominations may not be represented.⁸³ Mosques, synagogues, and other non-Christian houses of worship are fairly scarce in rural America; there are only 26,000 non-Christian denominations in the country.⁸⁴ For instance, Jewish people in Rockbridge County must travel to Charlottesville, Staunton, or Roanoke to find a synagogue. Although this is not easily remedied through public policy, it should be noted to make sure there are no barriers preventing the establishment of such institutions. It may also be worthwhile to ensure that rentable community institutions, such as parks and community centers, are available to all members of the community, including faith groups, on a fair and equitable basis. For example, if there is interest, Maury River Middle School might be made available to a Jewish organization on Saturdays just as it is to Rockbridge Church on Sundays.

Members of other religious groups or citizens concerned about the mingling of church (or a church other than their own) and state may object to policies allowing religious institutions to use community spaces. However, if these spaces are truly meant for community use, it seems wasteful to have them sit empty when they could be used, while preventing organizations from renting them based solely on religious affiliation seems discriminatory and unjust. I am not suggesting that religious organizations should receive preferential treatment – they should complete the same reservation process and pay the same rental fees as any other group to cover utilities costs and wear-and-tear, but they should also not be denied access because of their beliefs.

Institutions like senior centers or community centers can play a similar role, making people feel like they are a part of something and providing opportunities for collaboration, perhaps through volunteerism or other purpose-giving work. Other organizations might follow

⁸³ Brauer (2017).

⁸⁴ Ibid.

suit – gyms could offer group exercise classes, malls and parks could host walking groups. Making people feel like they're a part of something, like they'll be missed if they don't attend, may boost involvement and motivate people to make the effort to show up.

The primary objection to such practices both by policy makers and private organizations is likely to be the cost and effort required. Organizing and staffing activities, particularly if nurses, artists, or other skilled workers are required, can be expensive. This is unavoidable, but I would argue that, if we are serious about caring for our citizens, particularly the elderly, after they have put in so many years as productive members of the community, some investment in making their retirements healthy and happy is justified. Furthermore, volunteer events may reap benefits that offset some of the costs to the community. Meanwhile, hosting a mall walking group may provide a boost to business by increasing mall traffic, and thereby exposure to stores and advertising. Similarly, gyms offering SilverSneakers group exercise classes will have to invest in getting such certification upfront, but may benefit from increased patronage and profit from this investment in the long run.⁸⁵

Even preexisting, ordinary locations like coffee shops can serve as venues for friends to get together and spend time together, perhaps allowing them to meet halfway and eliminating any guilty feelings over an untidy home. While businesses understandably do not want people to come in and use their resources without paying, such locations might benefit themselves and their patrons using tools like happy hours or senior discounts, increasing business while reducing the cost for individual customers.

Intergenerational interventions seem to be a particularly effective: over the course of their lives, people might be expected to gain experiences and knowledge, insights and wisdom. Young

⁸⁵ Cohen (2005)

people, meanwhile, are often a bit lacking in wisdom but make up for it with bountiful energy. For example, both children and residents of a memory care facility in Fredericksburg, Va. benefit from a partnership between the facility and a local elementary school, in which residents visit and read with the children.⁸⁶ One might also envision a service-learning program of sorts, in which kids go to assisted living centers or hospice homes and play bingo with the residents. Here, the counterarguments are largely expressed as concern for the harm the two groups might do to one another, or fears that the caretakers would be overwhelmed. For example, it is of the utmost importance to avoid child molestation, while permitting elder abuse would be similarly undesirable. Children have bountiful energy, and, without reasonable precautions, could easily tire out the older folks. Meanwhile, the caretakers present would have to watch out for the needs of both the children and the older adults.

Fortunately, such programs are not unprecedented. Interviews revealed that some care homes are visited by local school children on special occasions, and one subject took great joy in showing me the cards the children made for them. In Singapore, a nursing home and day care in the same facility have created several opportunities for intergenerational engagement each day, as does a Seattle based program that placed a childcare facility on the premises of an assisted living center. Both programs report positive outcomes, including decreased loneliness and boredom and enhanced moods for the elderly, while the children exhibit less agism and more comfort around people with disabilities.⁸⁷⁸⁸ While ONEgeneration, an intergenerational daycare program, reports that their elderly patrons experience health benefits such as decreased blood pressure and enhanced mood, while the youngsters see improvements in their grades and have

⁸⁶ Senior Lifestyle (2014)

⁸⁷ Freedman (2019)

⁸⁸ Jansen (2016)

stronger community ties.⁸⁹ In short, challenges do exist, but they are certainly not insurmountable, and once hurdled, intergenerational programs offer benefits to children and older adults alike.

General Remarks

Targeting these specific behaviors has the potential to bring about significant health benefits at a relatively modest cost. In fact, some of the interventions, such as tying insurance to exercise or gym membership, have the potential to substantially reduce long term costs. However, many of the proposed interventions are necessary but not sufficient to achieve the desired health outcomes. Even if they were implemented, those individuals who can no longer drive would not be able to access most of them. Therefore, transportation is another necessary component to maximizing the benefits of the recommendations.

As described in the Literature Review, rural areas face a transportation deficit. Rockbridge County is no exception: in the 2018 Community Health Assessment, nearly 80% of respondents identified transportation as one of “the 2-3 more important issues that must be addressed to improve the health and quality of life of our community.” This tied with “access to healthcare” as the most identified topic. Furthermore, in a survey of community providers, when asked about barriers to health, 65% of respondents identified “Lack of transportation” as the most important barrier to access to services. The second-place answer was “lack of specialty care,” at roughly 18%.⁹⁰ These results suggest that improving local transportation systems could have a real impact on people’s access to health resources, and, presumably, all sorts of other resources as well. A more robust transportation system may make getting to the doctor easier, but it may also make running to the grocery store cheaper or more convenient. It may make the

⁸⁹ McCluskey (2018)

⁹⁰ Carillion Clinic (2018)

park more accessible, or the YMCA, places which enhance people's lives not only by enhancing their health, but also because they are enjoyable. It may make it easier to get to church, or to engage in volunteering. Mobility is a fertile functioning – once you have it, all sorts of other opportunities become available.

Admittedly, rural transportation systems are expensive – like healthcare and health-promoting institutions, they are plagued by inefficiencies introduced by the low population density and the long distances between where people live and where they need to go. It's simply not feasible to have a bus that runs to all corners of the county every hour or so for a handful of riders. However, that doesn't mean that we should simply give up. The Rockbridge area already has a strong starting point in the Rockbridge Area Transportation System (RATS) and the Maury Express. Much like a taxi, RATS can be used to get residents from point A to point B almost anywhere in the county – but trips must be planned two days in advance, and these journeys can get expensive. Furthermore, unless one sees the distinctive vans, they might not be aware of the service's existence. Therein lie three areas for improvement: promptness, affordability, and awareness.

Planning all of one's travel needs two days in advance can be difficult – one might not realize that they're running low on milk and bread, or they may wake up to an unexpectedly beautiful day and want to go to the park. Furthermore, sometimes things just don't go according to plan: there are many cases when one might need to seek medical attention quickly but doesn't need (or can't afford) an ambulance. The ride planning process could be streamlined by using a computer program to assist with planning rides and routes, reducing the time required to ensure ride availability. In the long term, self-driving cars may reduce the need for drivers on many routes, allowing the fleet to expand to the point where little or no planning is required. Drivers

should not be eliminated entirely, as patrons with wheelchairs or other handicaps may need assistance getting to, entering, and exiting the vehicle. Reducing the need for drivers may also contribute to long run cost savings, as will increasingly fuel-efficient vehicles.

Another option for increasing efficiency is to operate from a few regional outposts rather than the single Lexington hub, just as counties with many schools may have a few bus lots spread across the county rather than a single lot. This should be implemented on a trial basis, measuring operating costs, total miles, miles per passenger to determine if it is effective in the specific conditions of the Rockbridge Area. Furthermore, enhanced coordination with between RATS and the Maury Express may cut down on redundancy.

Finally, awareness could be raised by mailing information to new residents when property in the county is purchased. Additionally, information could be distributed to new students at the local universities, perhaps including a representative going to campus during orientation. Advertising space might also be acquired in front of hotspots like the main streets of towns in the county and in front of grocery stores and post offices.

Discussion

Aging is an inevitable process that is typically accompanied by physical and mental decline. Such declines are detrimental to the individual, as they reduce their wellbeing and prevent them from doing all that they want to. They are also detrimental to society as a whole, in the form \$731 billion in Medicare spending each year, a number that is projected to rise with “the greying of America” and increasing sedentariness, obesity, and chronic disease.⁹¹ This is particularly problematic for rural regions, which, proportionally, have a higher concentration of senior citizens, but less infrastructure to facilitate their care. As a result, they often receive less

⁹¹ Cubanski, Neuman, & Freed (2019)

care, leading to earlier decline and death, or the delay in care necessitates more aggressive, expensive treatment.

Fortunately, mental and physical decline can be delayed by behaviors such as physical activity, intellectual stimulation, and social engagement. Considering the biomedical principle of beneficence, it would seem that we should strive to encourage these behaviors, and thereby enhance the wellbeing of elderly members of our community. If not for them, then for ourselves, when we find ourselves in the same position. Furthermore, for their years of service to our communities and to us as individuals, it seems only just that we should care for the elderly in their twilight years just as they did for us at the dawn of our lives.

Conflict arises, however, when the programs intended to better the lives of older adults necessitate the use of tax dollars of younger generations, compromising their autonomy and potentially drawing money from even more worthy causes. This tension between principles may not easily be resolved, but I shall attempt to elucidate why they most important of the above recommendations are the right decision.

Firstly, the expansion of the role of RARO. RARO has a well-established infrastructure for planning athletic activity, appropriate registration and liability procedures, experience scheduling local recreational facilities, and the necessary equipment for a range of sports. Traditionally parkrun is volunteer led and free for participants, suggesting that it is not resource intensive. Therefore, scaling RARO activities up to include adults would primarily be a function of increasing man-hours, and this could likely be accomplished relatively cheaply using volunteers or part-time employees due to the plethora of athletics staff at the local universities and the abundance of students and community members with a passion for exercise. Therefore, a small investment might yield large benefits to the community in the form of health

improvements and enjoyment of the expanded activities.

Expansion of SilverSneakers-like programs are even more compelling. Evidence from existing programs show net cost decreases due to decreased health expenditures. Furthermore, expanding autonomy by providing access to gyms is a good in itself, along with the accompanying health benefits, suggesting that, despite the apparent startup costs, all four principles would be better served by enacting this program.

Expanding investment in LP and audiobooks would not demand any increased spending, though it would necessitate the purchase of slightly fewer books overall. However, libraries already have many books, such that old ones must be thrown away or sold to make room for new titles. While purchasing some second-tier books or multiple copies of top-tier books would be nice, accessible books benefit all members of the library community, from those who can't use standard books to younger readers, who enjoy reading more and feel more confident, expanding the supply of future library patrons and donors. Therefore, this seems like a worthwhile tradeoff in terms of both beneficence and justice.

Ensuring equal access to community resources for religious groups is relatively straightforward. It will likely involve nothing more than reviewing reservation policies and perhaps contacting prominent member of area religious groups to ensure that they feel that their needs are being met appropriately by the community and are aware that spaces may be available. While it is possible nothing will come of it, in which case perhaps eight or ten hours will have been wasted. Alternatively, it may lead to the needs of a local congregation being met, enhancing the social engagement and health of their members and contributing to a more diverse, vibrant Rockbridge community.

Intergenerational daycare centers would almost certainly be challenging and expensive

to begin but may yield substantial benefits down the road. Although not common, numerous precedents for such institutions exist and continue to be going strong, suggesting that the benefits outweigh the costs in those situations. Along with potential savings from shared staffs and facilities, both elders and children stand to benefit significantly from interacting with one another, as demonstrated above. Before investing in with a shared center, it may worthwhile piloting a visitation program between existing facilities, like Yellow Brick Road and Heritage Hall, to see how the children, residents, and staff respond to regular interactions.

Finally, enhanced transportation infrastructure may be the most expensive item on the list, but also perhaps one of the most rewarding. People could more easily get to medical appointments, but they could also more easily satisfy day-to-day needs like grocery shopping. Importantly, it would open up the county to those who are unable to drive, dramatically enhancing their autonomy and providing opportunities for small joys in life, like trips to the park or to visit their grandchildren, along with providing access to gyms and behaviors that promote health and the associated savings on healthcare.

Health is complex, and ways to enhance it are being discovered and refined daily. Herein I have proposed a few ways the health of the local community may be improved, but there are countless others. The recommendations made are informed by both extensive research and my experiences in this community, and while some go far beyond the means of a single county, I've endeavored to highlight a handful that seem both achievable and beneficial to the people I've so greatly enjoyed getting to know.

Bibliography

- Abner, E. L., Jicha, G. A., Christian, W. J., & Schreurs, B. G. (2015). Rural-Urban Differences in Alzheimers Disease and Related Disorders Diagnostic Prevalence in Kentucky and West Virginia. *The Journal of Rural Health, 32*(3), 314–320. doi: 10.1111/jrh.12155
- Agency for Healthcare Research and Quality. (2018). *Elements of Access to Health Care*. Rockville, MD: Agency for Healthcare Research and Quality. Retrieved from: <https://www.ahrq.gov/research/findings/nhqrd/charbooks/access/elements.html>
- Alzheimer’s Association. (2020). *2020 Alzheimer’s Disease Facts and Figures*. Chicago, IL: Alzheimer’s Association. Retrieved from: <https://www.alz.org/media/Documents/alzheimers-facts-and-figures.pdf>
- American Medical Association. (n.d.). 5 ways to improve access to healthcare. Chicago, IL: American Medical Association. Retrieved from: <https://www.ama-assn.org/delivering-care/patient-support-advocacy/5-ways-improve-access-health-care>
- Andel, R., Vigen, C., Mack, W., Clark, L., & Gatz, M. (2006). The effect of education and occupational complexity on rate of cognitive decline in Alzheimer's patients. *Journal of the International Neuropsychological Society, 12*(1), pp. 147-152. doi:10.1017/S1355617706060206
- Anderson, E., & Shivakumar, G. (2013). Effects of exercise and physical activity on anxiety. *Frontiers in Psychiatry, 23* April 2013. <https://doi.org/10.3389/fpsy.2013.00027>
- Andreasson, J. & Johansson, T. (2014). The Fitness Revolution: Historical Transformations in a Global Gym and Fitness Culture. *Sport Science Review, 23*(3-4), pp. 91-112. Doi: 10.2478/ssr-2014-0006
- Bak, T. H., Nissan, J. J., Allerhand, M. M., & Deary, I. J. (2014). Does bilingualism influence cognitive aging? *Annals of Neurology 75*(6), pp. 959-963. <https://doi.org/10.1002/ana.24158>
- Baumgart, M., Snyder, H. M., Carrillo, M. C., Fazio, S., Kim, H., & Johns, H. (2015). Summary of the evidence on modifiable risk factors for cognitive decline and dementia: A population-based perspective.
- Blas, E. & Kurup, A. S. (Eds.). (2010). *Equality, social determinants, and public health programmes*. Geneva, Switzerland: World Health Organization.

- Booth, F. W., Roberts, C. K., & Laye, M. J. (2012). Lack of exercise is a major cause of chronic diseases. *Comprehensive Physiology*, 2(2), 1143–1211.
<https://doi.org/10.1002/cphy.c110025>
- Brauer, S. G. (2017). How many congregations are there? Updating a survey-based estimate. *Journal for the Scientific Study of Religion*, 56(2), pp. 438-448. doi: <https://doi-org.ezproxy.wlu.edu/10.1111/jssr.12330>
- Braveman, P., & Gottlieb, L. (2014). The social determinants of health: it's time to consider the causes of the causes. *Public health reports (Washington, D.C.: 1974)*, 129 Suppl 2 (Suppl 2), 19–31. <https://doi.org/10.1177/00333549141291S206>
- Brook, R., Ware, J., Rogers, W., Keeler, E., Davies, A., Donald, C., Goldberg, G. A., Lohr, K., Masthay, P., & Newhouse, J. (1984). Does Free Care Improve Adults' Health? Results from a Randomized Controlled Trial. *N Engl J Med* 309(23), pp. 1426-1434. doi: 10.1056/NEJM198312083092305
- Bugos, J. A., Perlstein, W. M., McCrae, C. S., Brophy, T. S. & Bedenbaugh, P. H. (2007). Individualized Piano Instruction enhances executive functioning and working memory in older adults, *Aging & Mental Health* 11(4), pp. 464-471. doi: <10.1080/13607860601086504>
- Caballero, B. (2007). The Global Epidemic of Obesity: An Overview, *Epidemiologic Reviews* 29(1), pp. 1-5. Retrieved from: <https://doi.org/10.1093/epirev/mxm012>
- Carillion Clinic (2018). Rockbridge Area Community Health Assessment. Roanoke, VA: Carillion Clinic. Retrieved from: https://issuu.com/carilionclinic/docs/2018_rockbridge_area_community_heal
- Castagna, C., de Sousa, M., Krstrup, P., & Kirkendall, D. T. (2018). Recreational team sports: The motivational medicine. *Journal of sport and health science*, 7(2), 129–131.
<https://doi.org/10.1016/j.jshs.2017.12.001>
- Centers for Disease Control and Prevention (2017). About Rural Health. *Rural Health*. Retrieved from: <https://www.cdc.gov/ruralhealth/about.html>
- Centers for Disease Control and Prevention (2018). Cancer in Rural America. *Rural Health*. Retrieved from: <https://www.cdc.gov/ruralhealth/cancer.html>
- Choi, E., Sonin, J., Hrothgar, & Kittelson, K. (2018) Health Determinants. *GoInvo*. Retrieved from: <https://www.goinvo.com/vision/determinants-of-health/#references>

- Cohen, A. (2005). SilverSneakers Program Seeing Success. *Athletic Business*, June 2005.
Retrieved from: <https://www.athleticbusiness.com/health-fitness/benefit-plan.html>
- Cornwell, B., Laumann, E. O., & Schumm, L. P. (2008). The Social Connectedness of Older Adults: A National Profile*. *American sociological review*, 73(2), 185–203.
<https://doi.org/10.1177/000312240807300201>
- Croft, J. B., Wheaton, A. G., Liu, Y., et al. (2018). Urban-Rural County and State Differences in Chronic Obstructive Pulmonary Disease — United States, 2015. *MMWR Morb Mortal Wkly Rep* 67, pp. 205–211. DOI: <http://dx.doi.org/10.15585/mmwr.mm6707a1>
- Crooks, V. C., Lubben, J., Petitti, D. B., Little, D., & Chiu, V. (2008). Social network, cognitive function, and dementia incidence among elderly women. *American journal of public health*, 98(7), 1221–1227. doi:10.2105/AJPH.2007.115923
- Crossman, A. F. (2018). Healthcare Cost Savings over a One-year Period for SilverSneakers Group Exercise Participants. *Healthy Behavior and Policy Rev*, 5(1), 40-46. doi: <https://doi.org/10.14485/HBPR.5.1.4>
- Cubanski, J., Neuman, T., & Freed, M. (2019). *The Facts on Medicare Spending and Financing*. San-Francisco, CA: Kaiser Family Foundation. Retrieved from: <https://www.kff.org/medicare/issue-brief/the-facts-on-medicare-spending-and-financing/>
- Cutler, D. & Miller, G. (2005). The Role of Public Health Improvements in Health Advances: The 20th Century United States. *National Bureau of Economic Research Working Paper*. Retrieved from: <https://www.nber.org/papers/w10511.pdf>
- Day, J. C. (2019). Rates of Uninsured Fall in Rural Counties, Remain Higher than Urban Counties. Washington, DC: US Census Bureau. Retrieved from: <https://www.census.gov/library/stories/2019/04/health-insurance-rural-america.html>
- Department of Health and Human Services. (2002). *Physical Activity Fundamental to Preventing Disease*. Washington: U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. Retrieved from: <https://aspe.hhs.gov/basic-report/physical-activity-fundamental-preventing-disease>
- Douthit, N., Kiv, S., Dwolatzky, T., & Biswas, S. (2015). Exposing some important barriers to health care access in the rural USA. *Public Health* 129(6), pp. 611-620. Doi: 10.1016/j.puhe.2015.04.001

- Epstein, H. (2003). Ghetto Miasma; Enough to Make You Sick? *New York Times* 12 Oct. 2003. Retrieved from: <https://www.nytimes.com/2003/10/12/magazine/ghetto-miasma-enough-to-make-you-sick.html>
- Erickson, K. I., Voss, M. W., Prakash, R. S., Basak, C., Szabo, A., Chaddock, L., ... Kramer, A. F. (2011). Exercise training increases size of hippocampus and improves memory. *Proceedings of the National Academy of Sciences of the United States of America*, 108(7), pp. 3017–3022. doi:10.1073/pnas.1015950108
- Eriksson, U., Arvidsson, D. & Sundquist, K. (2012). Availability of exercise facilities and physical activity in 2,037 adults: cross-sectional results from the Swedish neighborhood and physical activity (SNAP) study. *BMC Public Health* 12, 607. <https://doi.org/10.1186/1471-2458-12-607>
- Evans, D. B., Hsu, J., & Boerma, T. (2013). Universal health coverage and universal access. *Bulletin of the World Health Organization* 91(8), pp. 546-546A. doi: <http://dx.doi.org/10.2471/BLT.13.125450> [PDF]
- Farber, N., Shinkle, D., Lynott, J., Fox-Grage, W., & Harrell, R. (2011). Aging in Place: A State Survey of Livability Policies and Practices. Washington, DC: National Conference of State Legislatures and the AARP Public Policy Institute. Retrieved from: <https://assets.aarp.org/rgcenter/ppi/liv-com/aging-in-place-2011-full.pdf>
- Faridi Z., Grunbaum J. A., Gray B. S., Franks A., & Simoes E. (2007). Community-based participatory research: necessary next steps. *Prev Chronic Dis* 4(3). Available from: http://www.cdc.gov/pcd/issues/2007/jul/06_0182.htm.
- Freedman, M. (2019). What's a nursing home combined with a childcare center? A hopeful model for the future of aging. *TED*. Retrieved from: <https://ideas.ted.com/whats-a-nursing-home-combined-with-a-childcare-center-a-hopeful-model-for-the-future-of-aging/>
- Freeman, J. D., Kadiyala, S., Bell, J. F., & Martin, D. P. (2008). The Causal Effect of Health Insurance on Utilization and Outcomes in Adults: A Systematic Review of US Studies. *Medical Care* 46(10), pp. 1023-1032. doi: 10.1097/MLR.0b013e318185c913.
- Foley, A., Hillier, S., & Barnard, R. (2010). Effectiveness of once-weekly gym-based exercise programmes for older adults post discharge from day rehabilitation: a randomised

- controlled trial. *British Journal of Sports Medicine* **45**, pp. 978-986.
doi:10.1136/bjism.2009.063966
- Foley, D. J., Heimovitz, H. K., Guralnik, J. M., & Brock, D. B. (2002). Driving life expectancy of persons aged 70 years and older in the United States. *American journal of public health*, 92(8), 1284–1289. <https://doi.org/10.2105/ajph.92.8.1284>
- Fujiwara Y., Sakuma, N., Ohba, H., Nishi, M., Lee, S., Watanabe, N., Kousa, Y., Yoshida, H., Fukaya, T., Yajima, S., Amano, H., Kureta, Y., Ishii, K., Uchida, H., & Shinkai, S. (2009). REPRINTS: Effects of an Intergenerational Health Promotion Program for Older Adults in Japan, *Journal of Intergenerational Relationships*, 7(1), pp. 17-39, DOI: [10.1080/15350770802628901](https://doi.org/10.1080/15350770802628901)
- Grantmakers in Aging. (2018). Mobility and Aging in Rural America: The Role of Innovation. Arlington, VA: Grantmakers in Aging. Retrieved from: https://www.giaging.org/documents/180509_GIA_Rural_Mobility_Funding_Guide_FF.pdf
- Greenfield, E. A., Vaillant, G. E., & Marks, N. F. (2009). Do formal religious participation and spiritual perceptions have independent linkages with diverse dimensions of psychological well-being?. *Journal of health and social behavior*, 50(2), 196–212.
<https://doi.org/10.1177/002214650905000206>
- Halbert, J., Silagy, C., Finucane, P. *et al.* (1997). The effectiveness of exercise training in lowering blood pressure: a meta-analysis of randomised controlled trials of 4 weeks or longer. *J Hum Hypertens* **11**, pp. 641–649.
- Harvard T. F. Chan School of Public Health. (2019). Life in Rural America: Part II. Boston, MA: NPR/Robert Wood Johnson Foundation/Harvard School of Public Health. Retrieved from: https://www.rwjf.org/en/library/research/2019/05/life-in-rural-america--part-ii.html?cid=xtw_rwjf_unpd_ini:ruralpoll_dte:20190515
- Healthy People 2020. (n.d.). Access to Health Services. Washington, DC: Office of Disease Prevention and Health Promotion. Retrieved from: <https://www.healthypeople.gov/2020/topics-objectives/topic/Access-to-Health-Services>
- Heiser, S. (2019). New Findings Confirm Predictions on Physician Shortage [press release]. Retrieved from: <https://www.aamc.org/news-insights/press-releases/new-findings-confirm-predictions-physician-shortage>

- Higgerson, J., Halliday, E., Ortiz-Nunez, A., Brown, R., & Barr, B. (2018). Impact of free access to leisure facilities and community outreach on inequalities in physical activity: a quasi-experimental study. *Journal of epidemiology and community health*, 72(3), 252–258. <https://doi.org/10.1136/jech-2017-209882>
- Hing, E. & Hsiao, C. (2014). State Variability in Supply of Office-based Primary Care Providers: United States, 2012. *NCHS Data Brief 154*. Retrieved from: https://www.ruralhealthweb.org/NRHA/media/Emerge_NRHA/PDFs/db151.pdf
- Holkup, P. A., Tripp-Reimer, T., Salois, E. M., & Weinert, C. (2004). Community-based participatory research: an approach to intervention research with a Native American community. *ANS. Advances in nursing science*, 27(3), 162–175. doi:10.1097/00012272-200407000-00002
- Ichida, Y., Hirai, H., Kondo, K., Kawachi, I., Takeda, T., & Endo, H. (2013). Does social participation improve self-rated health in the older population? A quasi-experimental intervention study. *Social Science & Medicine* 94, pp. 83-90. Retrieved from: <https://www.sciencedirect.com/science/article/pii/S0277953613002803>
- Institute of Medicine (US) Committee on Future Directions for the National Healthcare Quality and Disparities Reports. (2010). Ulmer C, Bruno M, Burke S, editors. Future Directions for the National Healthcare Quality and Disparities Reports. Washington (DC): National Academies Press (US). Available from: <https://www.ncbi.nlm.nih.gov/books/NBK220161/> doi: 10.17226/12846
- Institute of Medicine (US) Committee on Monitoring Access to Personal Health Care Services. (1993). Millman M, editor. *Access to Health Care in America*. Washington, DC: National Academies Press (US). Retrieved from: <https://www.ncbi.nlm.nih.gov/books/NBK235890/>
- Institute of Medicine (US) Roundtable on Environmental Health Sciences, Research, and Medicine. (2006). Merchant J, Coussens C, Gilbert D, editors. *Rebuilding the Unity of Health and the Environment in Rural America: Workshop Summary*. Washington (DC): National Academies Press (US). 2, The Social Environment in Rural America. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK56967/>
- Israel, B. A., Schulz, A. J., Parker, E. A., & Becker, A. B. (2001). Community-based Participatory Research: Policy Recommendations for Promoting a Partnership Approach

- in Health Research. *Education for Health* 14(2), pp. 182-197. Retrieved from:
<https://search.proquest.com/openview/54c20d4ae61a9f100b6ddd9a3dc182bd/1?cbl=33821&pq-origsite=gscholar>
- Jacob, B. A. (2016). *The Opportunities and Challenges of Digital Learning*. Washington, DC: Brookings. Retrieved from: <https://www.brookings.edu/research/the-opportunities-and-challenges-of-digital-learning/>
- Jansen, T. R. (2016). The Preschool Inside a Nursing Home. *The Atlantic*. Retrieved from: <https://www.theatlantic.com/education/archive/2016/01/the-preschool-inside-a-nursing-home/424827/>
- Johnson, T. (2019, 10 Apr.). 19M rural Americans have little or no internet access. Here's how they hope to change that. *McClatchy*. Retrieved from: <https://www.mcclatchydc.com/news/nation-world/national/economy/article226599354.html>
- Kart, C. S. & Metress, S. P. (1984). *Nutrition, the Aged, and Society*. Englewood Cliffs, NJ: Prentice Hall.
- Keeler, E. B., Brook, R. H., Goldberg, G. A., Kamberg, C., and Newhouse, J. P. (1985). How Free Care Reduced Hypertension of Participants in the RAND Health Insurance Experiment. Santa Monica, CA: RAND Corporation. Retrieved from: <https://www.rand.org/pubs/reports/R3326.html>.
- Kuiper, J. S., Zuidersma, M., Oude Voshaar, R. C., Zuidema, S. U., van den Heuvel, E. R., Stolk, R. P., & Smidt, N. (2015). Social relationships and risk of dementia: A systematic review and meta-analysis of longitudinal cohort studies. *Aging Res Rev* 22, pp. 39-57. doi: 10.1016/j.arr.2015.04.006
- Ladin, K., Emerson, J., Berry, K., Butt, Z., Gordon, E. J., Daniels, N., ... Hanto, D. W. (2019). Excluding patients from transplant due to social support: Results from a national survey of transplant providers. *American journal of transplantation : official journal of the American Society of Transplantation and the American Society of Transplant Surgeons*, 19(1), pp. 193–203. doi:10.1111/ajt.14962
- Lam, O., Broderick, B., & Toor, S. (2018). How far Americans live from the closest hospital differs by community type. *Fact Tank*. Retrieved from:

- <https://www.pewresearch.org/fact-tank/2018/12/12/how-far-americans-live-from-the-closest-hospital-differs-by-community-type/>
- Lancee, B. & Radl, J. (2012). Social Connectedness and the Transition From Work to Retirement, *The Journals of Gerontology: Series B*, 67(4), pp. 481–490. Retrieved from: <https://doi.org/10.1093/geronb/gbs049>
- Laurin D, Verreault R, Lindsay J, MacPherson K, Rockwood K. (2001). Physical Activity and Risk of Cognitive Impairment and Dementia in Elderly Persons. *Arch Neurol.* 58(3), pp. 498–504. doi:10.1001/archneur.58.3.498
- Levy, H. & Meltzer, D. (2001). What Do We Really Know About Whether Health Insurance Affects Health? Retrieved from: https://web.stanford.edu/~jay/health_class/Readings/Lecture02/levy_meltzer.pdf
- Levy, H. & Meltzer, D. (2008). The Impact of Health Insurance on Health. *Annu. Rev. Public Health* 29, pp. 399-409. <https://doi.org/10.1146/annurev.publhealth.28.021406.144042>
- Li, M. & Dong, X. (2018). Is Social Network a Protective Factor for Cognitive Impairment in US Chinese Older Adults? Findings from the PINE Study. *Gerontology* 64(3), pp. 246-256. doi: 10.1159/000485616
- Little Free Library. (2019). About Us. *Little Free Library*. Retrieved from: <https://littlefreelibrary.org/about/>
- Liu, P. Z., & Nusslock, R. (2018). Exercise-Mediated Neurogenesis in the Hippocampus via BDNF. *Frontiers in neuroscience*, 12, 52. doi:10.3389/fnins.2018.00052
- Marmot, M. & Wilkinson, R. (Eds.). (2005). *Social Determinants of Health* (2nd ed.). Oxford, UK: OUP.
- Mates, B. T. (2003). *5-Star Programming and Services for Your 55+ Library Customers*. Chicago, IL: American Library Association. Retrieved from: http://www.ala.org/aboutala/sites/ala.org.aboutala/files/content/publishing/editions/samplers/mates_55.pdf
- McCluskey, M. (2018). Seniors and Children Find Inspiration Together at a Daycare with a Heartwarming New Approach. *Time*. Retrieved from: <https://time.com/5071129/children-seniors-daycare-onegeneration/>
- McDonough C.C. (2016). The Effect of Ageism on the Digital Divide Among Older Adults. *J Gerontol Geriatr Med* 2(008). doi: 10.24966/GGM-8662/100008

- Meyer, J. D., Koltyn, K. F., Stegner, A. J., Kim, J., & Cook, D. B. (2016). Influence of Exercise Intensity for Improving Depressed Mood in Depression: A Dose-Response Study. *Behavior Therapy* 47(4), pp. 527-537. Doi: 10.1016/j.beth.2016.04.003
- Milgram, N. W., Siwak-Tapp, C. T., Araujo, J., & Head, E. (2006). Neuroprotective effects of cognitive enrichment. *Aging Research Reviews* 5(3), pp. 354-369.
<https://doi.org/10.1016/j.arr.2006.04.004>
- Minkler, M., & Wallerstein, N. (2008). *Community-Based Participatory Research for Health: From Process to Outcomes*. San Francisco, CA: Wiley.
- Morken, L. & Warner, M. (2012). Planning for the Aging Population: Rural Responses to the Challenge. New York, NY: Cornell University, for the National Association of Area Agencies on Aging. Retrieved from:
<http://s3.amazonaws.com/mildredwarner.org/attachments/000/000/196/original/5a05087ac5578fa1f3cbf7b4fcefb24a>
- Murphy, M., O'Sullivan, K., & Kelleher, K. G. (2014). Daily Crosswords improve verbal fluency: a brief intervention study. *International Journal of Geriatric Psychiatry* 29(9), pp. 915-919. <https://doi.org/10.1002/gps.4079>
- National Aging and Disability Transport Center. (2017). 2016 Transportation Trends: A look at the Year's Top Mobility Challenges and Opportunities. Washington, DC: National Aging and Disability Transportation Center. Retrieved from: <http://www.nadtc.org/wp-content/uploads/NADTC-Trends-Report-Mar-2017-FINAL.pdf>
- National Institutes of Health. (n.d.). *Mall Walking*. Retrieved from:
<https://go4life.nia.nih.gov/exercise/mall-walking/>
- National Rural Health Association. (n.d.) About Rural Health Care. Retrieved from:
<https://www.ruralhealthweb.org/about-nrha/about-rural-health-care>
- Nguyen, H. Q., Ackermann, R. T., Maciejewski, M., Berke, E., Patrick, M., Williams, B., et al. (2008). Managed-Medicare health club benefit and reduced health care costs among older adults. *Prev Chronic Dis*, 5(1). Retrieved from: http://www.cdc.gov/pcd/issues/2008/jan/07_0148.htm.
- Nummela, O., Sulander, T., Karisto, A., and Uutela, A. (2009). Self-rated health and social capital among aging people across the urban-rural dimension. *International Journal of Behavioral Medicine* 16(2), pp. 189-194. Doi: <https://doi.org/10.1007/s12529-008-9027-z>

- Patient Access Partnership. (n.d.). 5A's of Access. Etterbeek, Belgium: Patient Access Partnership. Retrieved from: https://www.eupatientaccess.eu/page.php?i_id=19
- Pérès, K., Matharan, F., Allard, M. *et al.* (2012) Health and aging in elderly farmers: the AMI cohort. *BMC Public Health* **12**, 558 (2012) doi:10.1186/1471-2458-12-558
<https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-12-558>
- Probst, J. C., Laditka, S. B., Moore, C. G., Harun, N., Powell, M. P., & Baxley, E. G. (2006). Rural-urban differences in depression prevalence: implications for family medicine. *Fam Med*. **38**(9), pp. 653-660. Retrieved from:
<https://fammedarchives.blob.core.windows.net/imagesandpdfs/fmhub/fm2006/October/Janice653.pdf>
- Project Tomorrow. (2019). *Advancing Literacy with Large Print*. Boston, MA: Cengage. Retrieved from: https://www.gale.com/binaries/content/assets/gale-us-en/campaigns/perpetual-campagins/thorndike-press/thorndike_press_striving_reader_white_paper.pdf
- Quimbo, S. A., Peabody, J. W., Shimkhada, R., Florentino, J., & Solon, O. (2011). Evidence of a Causal Link between Health Outcomes, Insurance Coverage, and a Policy to Expand Access: Experimental Data from Children in the Philippines. *Health Econ* **20**(5), pp. 620-630). doi: 10.1002/hec.1621
- Ratey, J. J. & Hagerman, E. (2008). *Spark: The revolutionary new science of exercise and the brain*. New York, NY: Little, Brown, & Co.
- Rawls, J. (1971). Justice as Fairness. In *A Theory of Justice* (pp. 3-53). Cambridge, MA; London, England: Harvard University Press. Retrieved from www.jstor.org/stable/j.ctvjf9z6v.5
- Rosenblatt, R. A., & Hart, L. G. (2000). Physicians and rural America. *The Western journal of medicine*, **173**(5), 348–351. doi:10.1136/ewjm.173.5.348
- Russo-Neustadt, A., Beard, R. C., and Cotman, C. W. (1999). Exercise, antidepressant medications, and enhanced brain derived neurotrophic factor expression. *Neuropsychopharmacology* **21**, pp. 679–682. [https://doi.org/10.1016/S0893-133X\(99\)00059-7](https://doi.org/10.1016/S0893-133X(99)00059-7)
- Saslow, E. (2019). The most remote emergency room: Life and death in rural America. *Washington Post* 16 Nov. 2019. Retrieved from:

- https://www.washingtonpost.com/national/the-most-remote-emergency-room/2019/11/16/717d08e2-063e-11ea-b17d-8b867891d39d_story.html
- Shephard, R. J. (1997). *Aging, Physical Activity, and Health*. Champaign, IL: Human Kinetics.
- Senior Lifestyle. (2014). *The Fun and Value of Intergenerational Programing*. Chicago, IL: Senior Lifestyle. Retrieved from: <https://www.seniorlifestyle.com/resources/blog/fun-value-intergenerational-programming/>
- Silva, M., Cashman, S., Kunte, P., & Candib, L. M. (2012). Improving population health through integration of primary care and public health: providing access to physical activity for community health center patients. *American journal of public health, 102*(11), e56–e61. <https://doi.org/10.2105/AJPH.2012.300958>
- Singh, L., Singh, P. K., & Arokiasamy, P. (2016). Social Network and Mental Health Among Older Adults in Rural Uttar Pradesh, India: A Cross-Sectional Study. *Journal of Cross-Cultural Gerontology 31*(2), pp. 173-192. <https://doi.org/10.1007/s10823-016-9286-0>
- Slentz, C. A., Houmard, J. A. and Kraus, W. E. (2009). Exercise, Abdominal Obesity, Skeletal Muscle, and Metabolic Risk: Evidence for a Dose Response. *Obesity 17*, pp. S27-S33. doi:[10.1038/oby.2009.385](https://doi.org/10.1038/oby.2009.385)
- Smith, L., Gardner, B., Fisher, A., & Hamer, M. (2015). Patterns and correlates of physical activity behavior over 10 years in older adults: Prospective analyses from the English Longitudinal Study of Aging. *BMJ Open, 5*, e007423. Doi: 10.1136/bmjopen-2014-007423
- Solan, M. (2016). Back to school: Learning a new skill can slow cognitive aging. *Harvard Health Blog*. Retrieved from: <https://www.health.harvard.edu/blog/learning-new-skill-can-slow-cognitive-aging-201604279502>
- Song, X., MacKnight, C., Latta, R., Mitnikski, A., and Rockwood, K. (2007). Frailty and survival of rural and urban seniors: results from the Canadian Study of Health and Aging. *Aging Clinical and Experimental Research 19*(2), pp. 145-153. Retrieved from: <https://link.springer.com/article/10.1007/BF03324681>
- Stern, Y. (2012). Cognitive reserve in ageing and Alzheimer’s disease. *The Lancet Neurology 11*(11), pp. 1006-1012. [https://doi.org/10.1016/S1474-4422\(12\)70191-6](https://doi.org/10.1016/S1474-4422(12)70191-6)
- Stevinson, C., Wiltshire, G., & Hickson, M. (2015). Facilitating Participation in Health-Enhancing Physical Activity: A Qualitative Study of parkrun. *International Journal of*

- Behavioral Medicine* 22(2), pp. 170-177. Retrieved from:
<http://web.a.ebscohost.com.ezproxy.wlu.edu/chc/pdf?vid=4&sid=0bd2f82b-519d-497e-ae28-55cd64dcc07c%40sessionmgr4006>
- Tomini, F., Tomini, S. M., & Groot, W. (2016). Understanding the value of social networks in life satisfaction of elderly people: a comparative study of 16 European countries using SHARE data. *BMC Geriatrics* 16(203). Retrieved from:
<https://bmgeriatr.biomedcentral.com/articles/10.1186/s12877-016-0362-7>
- Toots, A., Littbrand, H., Boström, G., Hörnsten, C., Holmberg, H., Lundin-Olsson, L., Lindelöf, N., Nordström, P., Gustafson, Y., & Rosendahl, E. (2017). Effects of Exercise on Cognitive Function in Older People with Dementia: A Randomized Controlled Trial. *Journal of Alzheimer's Disease* 60(1), pp. 323-332. Doi: 10.3233/JAD-170014
- Upper Great Plains Transportation Institute. (2017). Rural Transit Fact Book. Fargo, ND: North Dakota State University. Retrieved from:
<https://www.surtc.org/transitfactbook/downloads/2017-rural-transit-fact-book.pdf>
- U.S. Census Bureau. (2019). *Quickfacts*. Retrieved from:
<https://www.census.gov/quickfacts/rockbridgecountyvirginia>
- [Voss, M. W., Weng, T. B., Narayana-Kumanan, K., Cole, R. C., Wharff, C., Reist, L., Dubose, L., Sigurdsson, G., Mills, J. A., & Long, J. D. \(2020\). Acute Exercise Effects Predict Training Change in Cognition and Connectivity. *Medicine and Science in Sports and Exercise* 52\(1\), pp. 131-140. doi: 10.1249/mss.0000000000002115](#)
- Wang, J. L. (2004). Rural-urban differences in the prevalence of major depression and associated impairment. *Social Psychiatry and Psychiatric Epidemiology*, 39(1), 19–25. doi: 10.1007/s00127-004-0698-8
- Ward, M. M., Merchant, K. A. S., Carter, K. D., Zhu, X., Ullrich, F., Wittrock, A., & Bell, A. (2018). Use Of Telemedicine For ED Physician Coverage In Critical Access Hospitals Increased After CMS Policy Clarification. *Health Affairs*, 37(12), 2037–2044. doi: 10.1377/hlthaff.2018.05103
- Weden, M. M., Shih, R. A., Kabeto, M. U., & Langa, K. M. (2018). Secular Trends in Dementia and Cognitive Impairment of U.S. Rural and Urban Older Adults. *American Journal of Preventive Medicine*, 54(2), 164–172. doi: 10.1016/j.amepre.2017.10.021

- Weiner, J., & McDonald, J. A. (2013). Three models of community-based participatory research. *LDI Issue Brief 18(5)*. Retrieved from: https://ldi.upenn.edu/sites/default/files/pdf/IssueBrief18_5.pdf
- Weisgrau S. (1995). Issues in rural health: access, hospitals, and reform. *Health care financing review, 17(1)*, pp. 1–14. Retrieved from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4193574/>
- Weng, T. B. et al. (2017). The Acute Effects of Aerobic Exercise on the Functional Connectivity of Human Brain Networks. *Brain Plasticity, 2(2)*, pp. 171 – 190. Retrieved from: <https://content.iospress.com/articles/brain-plasticity/bp1160039>
- Woolhandler, S. & Himmelstein, D. U. (2017). The Relationship of Health Insurance and Mortality: Is Lack of Insurance Deadly?. *Ann Intern Med.* **167**, pp. 424–431. [Epub ahead of print 27 June 2017]. doi: <https://doi.org/10.7326/M17-1403>
- World Health Organization. (2010). *A conceptual framework for action on the social determinants of health*. Geneva, Switzerland: World Health Organization. Retrieved from: https://www.who.int/social_determinants/corner/SDHDP2.pdf
- YMCA. (n.d.). *Our History – A Brief History of the YMCA Movement*. Retrieved from: http://www.mfldymca.org/about_us/history_national.php#top