

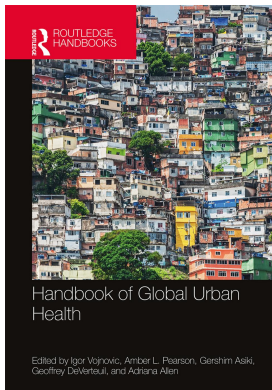
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Adriana Allen

### **Landscape Restructuring in the Shrinking City and Implications for Mental Health**

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# LANDSCAPE RESTRUCTURING IN THE SHRINKING CITY AND IMPLICATIONS FOR MENTAL HEALTH

*Jared Olson, Lora Daskalska, Kelly Hoormann  
and Kirsten Beyer*

## **Introduction: Mental Health as a Public Health Priority**

Mental illness is a significant global health burden with considerable implications for urban public health. The Global Burden of Disease (GBD) 2015 study identifies major depression (third) and anxiety (ninth) among the top ten causes of global disability, and other mental health problems among the top 20 (Vos et al. 2016). Vigo et al. have argued that the GBD study underestimates the actual burden of mental illness owing to overlap between psychiatric and neurological disorders and the separate categorization of self-harm and chronic pain syndromes (Vigo et al. 2016). They estimate that mental illness accounts for 32.4% of all years lived with disability, in contrast with a 2013 GBD estimate of 21.2% (Vigo et al. 2016). While precise and accurate estimates of mental illness may not be possible, it is clear that mental illnesses contribute significantly to global morbidity and mortality. For example, self-harm, including suicide, is the 14th leading cause of global mortality (Wang, H. et al. 2016), and mental health problems are known to contribute to other causes of death, including cardiovascular disease (Taylor et al. 1997). Accounting for the contribution of mental illness to mortality, Vigo et al. estimate that mental illnesses constitute 13.0% of global disability adjusted life years (DALYs) (Vigo et al. 2016).

In the United States, it is estimated that approximately half of the population will meet the criteria for a mental disorder (according to the DSM-IV) at some point during their lifetimes, and approximately one-fourth of the population meets the criteria in any given year (Kessler and Wang 2008). Nearly 29% of the US population has an anxiety disorder, and 21% a mood disorder, in their lifetimes (Kessler and Wang 2008; Kessler et al. 2005). The most prevalent disorders overall include major depressive disorder (16.6%), alcohol abuse (13.2%), and specific phobias (12.5%) (Kessler and Wang 2008; Kessler et al. 2005). Within a 12-month period, nearly one-fifth of the US population will have some type of anxiety disorder (Kessler and Wang 2008; Kessler et al. 2005).

Despite their prevalence and adverse impacts on global morbidity and mortality, mental illnesses are often stigmatized (Sartorius 2007). In turn, there has been a lack of recognition for some mental health problems and a lack of insurance coverage or available treatment for mental health conditions in many countries. In the United States, after many years of efforts to enact federal mental health parity legislation (Frank 2017), insurance coverage for mental health problems was significantly expanded with the arrival of the Mental Health Parity and Addiction Equity Act of 2008 and

the Affordable Care Act of 2010. Together, this legislation categorized mental health services as an essential health benefit and extended federal parity protections to an estimated 60 million Americans (Beronio et al. 2014).

Despite nascent improvements in mental health coverage, significant disparities remain in the provision of mental health services across the United States. Communities in both rural and urban areas struggle to meet the mental health service needs of their populations. In the US state of Wisconsin, a map ([www.dhs.wisconsin.gov/publications/p0/p00515a.pdf](http://www.dhs.wisconsin.gov/publications/p0/p00515a.pdf)) illustrating the distribution of federally designated mental health professional shortage areas (HPSAs) reveals shortages in sparsely populated rural areas across the state. In Wisconsin's most urban county (Milwaukee County), containing the racially segregated city of Milwaukee (Beyer et al. 2016; Tolan and Glauber 2010), the map reveals a systemic pattern of under-resourcing in Milwaukee's north side African American communities, some of the most densely populated areas in the state. Of note, those urban, north side Milwaukee neighborhoods designated as mental health care shortage areas are also areas characterized by low socioeconomic status, high levels of crime and violence, larger numbers of vacant lots, and few job opportunities (Levine 2008). Not surprisingly given the lack of mental health resources and the mental health challenges of residing in areas of concentrated disadvantage, residents report higher numbers of poor mental health days than residents in the more affluent areas of the metropolitan region (Center for Urban Population Health 2013).

Lower socioeconomic status (SES) individuals are at greater risk of mental health disorders and illness. Poverty and deprivation during different life stages are risk factors for later mental health disorders (Allen et al. 2014). Furthermore, the most common mental health disorders are influenced by the social and physical environments of neighborhoods (WHO 2014). This link between SES and mental health appears to be mediated both by significant stressful life events such as job loss (Businelle et al. 2014) and by everyday neighborhood conditions like safety (Meyer 2014). Neighborhood characteristics such as material deprivation, crime, and violence all negatively impact psychological well-being (Williams and Collins 2001; Williams and Williams-Morris 2000). Additionally, personal experiences of racial discrimination are associated with depressive symptoms and maladaptive coping behaviors like drug use (Gibbons et al. 2007; Schulz et al. 2006). Even internalized negative stereotypes can contribute to poor psychological and health behavior outcomes (Gibbons et al. 2007; Williams and Mohammed 2013). While ethnic and racial enclaves may in some cases provide a protective mental health effect (Pearson et al. 2013), the history of segregation in the US means that segregated neighborhoods are more likely to be socioeconomically disadvantaged and thus exacerbate mental health disparities (Williams and Collins 2001). Higher concentrations of poverty in segregated neighborhoods mean that residents are exposed to higher rates of crime, lower quality housing, less accessible neighborhood amenities, and more limited public services (Cummins et al. 2007; Williams and Collins 2001). These neighborhood features are risk factors for mental health illness, and the combination of depopulation and segregation in "shrinking cities" (e.g. the post-industrial American Rust Belt) further increases and concentrates these risks in some urban neighborhoods. Disparities in mental health created by systemic differences in place and clusters of disadvantage are compounded by unequal access to mental health treatment, and as a result post-industrial urban environments may play a particularly salient role in influencing mental health.

### **Mental Health and the Urban Environment**

Neighborhood conditions, as well as biological antecedents and life events, play a key role in inducing and exacerbating mental illness. In recent years, aspects of the social, built, and natural environments have received greater attention from researchers, advocates, and policymakers. The World Health Organization has released a number of reports linking mental health to environmental factors

including urban green space (WHO 2013, 2016, 2017). In the scientific literature, a number of neighborhood characteristics have been examined and found to be associated with mental health status. In a review of US studies examining neighborhood factors and depression, Mair et al. (2008) found that 37 of 45 studies reported significant associations between neighborhood factors and mental health outcomes (Mair et al. 2008). They note that the associations with the characteristics of social processes (e.g. neighborhood disorder, social interactions, and violence) were more consistent than those with neighborhood characteristics (e.g. socioeconomic status, racial composition, residential stability, and the built environment) (Mair et al. 2008). Further, eight of nine studies found that perceived neighborhood conditions and disorder were associated with greater depressive symptoms, and 11 of 16 studies found that positive social interactions among neighbors were a protective factor (Mair et al. 2008).

In the Multi-Ethnic Study of Atherosclerosis (MESA) cohort, drawn from several US communities (Baltimore City and Baltimore County, MD; Chicago, IL; Forsyth County, NC; Los Angeles County, CA; New York, NY; and St. Paul, MN), Mair et al. found that perceptions of higher levels of neighborhood violence were associated with higher average depression scores, while social cohesion and perceived aesthetic quality were associated with lower depression scores (Mair et al. 2009). In the same cohort, Echeverría et al. (2008) found similar results, including that higher reports of neighborhood problems (a social/physical disorder score reflecting excessive noise, heavy traffic or speeding cars, lack of access to adequate food shopping, lack of parks, litter, no sidewalks or poorly maintained sidewalks, and violence) were associated with increased likelihood of depression, as well as unhealthy behaviors like smoking and drinking (Echeverría et al. 2008). In contrast, higher social cohesion was associated with reduced depression, as well as beneficial health behaviors including reduced smoking and increased walking for exercise (Echeverría et al. 2008).

The associations observed in quantitative research linking neighborhood characteristics with mental health outcomes may be explained in several ways. First, the notion of a “psychology of place” offers some clues. Fullilove (1996) argues that “the sense of belonging, which is necessary for psychological well-being, depends on strong, well-developed relationships with nurturing places.” These relationships are formed through the development of familiarity, attachment, and identification with a place (Fullilove 1996). It is likely that evidence of physical or social disorder (e.g. litter, or poorly maintained buildings, streets, or sidewalks) negatively influences an individual’s sense of belonging to his/her neighborhood, disturbing these “essential place relationships” and ultimately leading to psychological disorders. Of note, childhood is an important time for the cultivation of place attachment, as children develop place attachment through play (Fullilove 1996). Gray (2011) argues that play promotes mental health, and “the decline in play [observed in the US population since 1955] has contributed to the rise in psychopathology of young people,” a sentiment also expressed in the popular book *Last Child in the Woods*, by Richard Louv (2008). Given the importance of play—and specifically outdoor play—in cultivating a sense of belonging to a place, it is not a stretch to consider a place with high levels of traffic or crime as an unhealthy environment for outdoor play, and thus less conducive to individuals forming an attachment to the neighborhood. Neighborhood social environments, as we discuss later, can also play a significant role as a protective factor against mental illness.

Another way that neighborhoods may “get under the skin” and lead to mental health disorders is via stress and, specifically, chronic exposure to neighborhood stressors (Taylor et al. 1997). Neighborhood stressors like fear of crime are associated with lower levels of social cohesion, while exposure to violence is associated with poor mental health outcomes (Scarborough et al. 2010; Stockdale et al. 2007). Similarly, fear of crime is associated with lower levels of self-reported mental well-being (Pearson and Breetzke 2014). Exposure to violence can lead to a range of specific mental health issues, as it can induce fear or the “fight or flight” response and may also result in the need

to cope with loss (Taylor et al. 1997), as in after the death of a loved one. In the landmark Adverse Childhood Events (ACEs) study, exposure to violence and other types of familial dysfunction (e.g. substance abuse) were associated with greater odds of numerous health conditions later in life (Felitti et al. 1998). Of particular note, individuals in the highest category examined (those reporting four or more types of adverse exposure in childhood) reported upwards of fourfold increased risk of mental health problems—specifically depression, suicide attempt, and substance abuse (Felitti et al. 1998). However, acute stress during childhood is not the only environmental risk factor. Theoretical research approaches to the life course such as John Henryism and the weathering hypothesis have argued that cumulative lifetime exposure to circumstances and environments that induce a physiological and psychological stress response can contribute to poorer health outcomes later in life (Bennett et al. 2004; Geronimus et al. 2006; Merritt et al. 2011).

When the neighborhood environment negatively affects the mental health status of residents, it should be a public health priority to address these riskscapes. In the context of the American shrinking city, the question becomes twofold. What are the mental health implications of the changing nature of the urban landscape, and how can this risk be mitigated through planning and policy?

### **The Unique Context of the Shrinking American City and Mental Health Challenges**

While the world has become increasingly urbanized, not all 21st century cities are following the same pattern of growth. While some cities have witnessed population growth and sprawl, other cities are facing the seemingly paradoxical challenge of shrinking. Cities have long wrestled with the challenges of expansion, overcrowding, and peri-urban slums and development, but now some cities are facing a new set of obstacles associated with depopulation, shrinking city centers after natural disasters, and a number of related consequences.

In the United States, deindustrialization and depopulation have been a particularly acute problem for legacy cities of the Northeast and Midwest, also known as Rust Belt cities (Heckert and Mennis 2012; Schilling and Logan 2008). The effects of deindustrialization and depopulation have varied from city to city, and cities have employed a diverse array of responses with varying levels of success (LaLumia 2011). At the same time, many cities have witnessed similar patterns, despite their own histories and geographic characteristics. A number of authors have described the processes associated with deindustrialization and depopulation (Bluestone and Harrison 1982; High 2003; LaLumia 2011; Schilling and Logan 2008). In the United States, deindustrialization meant the closing of manufacturing plants and the evaporation of manufacturing jobs in numerous central cities across the country. In some cases, the collapse of industry—particularly steel and automobile manufacturing—meant the loss of the primary employer in an entire metropolitan region (High 2003). The decline of manufacturing was also accompanied, in some cases, by a transition to service sector jobs such as finance, insurance, and real estate (LaLumia 2011). From the 1960s onwards, deindustrialization occurred in the context of decentralization of industry already underway and was paired with (primarily white) population migration from the urban core to the suburbs or “edge cities” (Phelps and Ozawa 2003; Scott 1982). Suburban migration was subsidized and promoted by government programs such as FHA loans, the GI Bill, and the creation of a highway transportation infrastructure, but these benefits were restricted to white Americans, while non-white citizens were excluded (Katznelson 2005). Additionally, both federal policies and local zoning promoted the creation of racially segregated neighborhoods, with non-white residents restricted to less desirable areas with poorer conditions and older, more dilapidated housing inventories (Rothstein 2017). Residents, almost exclusively white, who were willing and able to follow employment opportunities left the central cities, leaving behind heavily segregated inner cities that were systemically under-resourced (Pallagst et al. 2009).

Rust Belt cities large and small have faced weak housing markets and an aging housing stock alongside environmentally contaminated land from previous industrial and manufacturing uses. Furthermore, shrinking cities in the US struggle with high levels of racial segregation, geographically concentrated poverty, continued disinvestment in aging infrastructure, and high levels of unemployment (Sampson, N. et al. 2017). With depopulation came an erosion of the tax base, leaving fewer resources to support the provision of city services or high quality urban landscapes (Burkholder 2012; Schilling and Logan 2008; Schulz et al. 2002). Further, the loss of both population and employers meant a proliferation of abandoned houses and vacant lots from formerly residential or industrial sites, with little economic value and slim prospects for redevelopment. These vacant and abandoned lots, in the context of few resources for maintenance or redevelopment, have, in many cases, become blighted spaces that invite crime and violence. While seismic shifts in technology and the global economic order are in large part responsible for the decline of post-industrial cities, urban planners and city leaders have been forced to navigate the city-level fallout on their own.

Overall, addressing deindustrialization and depopulation has meant seeking to address declining economic fortunes and patching city budgets first. But economic problems are often also health problems, and the health of a city is inexorably intertwined with the health of its residents. Likewise, the fast-evolving landscapes of these cities present a unique constellation of challenges to urban mental health. Shrinking cities have degraded physical landscapes and social environments, and both of these changes have implications for mental health status. Two primary characteristics of shrinking cities pose significant challenges for urban mental health. First, the quality of the built environment is often compromised, including the increased prevalence of vacant and deteriorating properties, coupled with dwindling municipal financial resources for maintenance and upkeep. In addition, depopulated neighborhoods face an eroding social fabric and the rise of social problems, including crime. Below, we detail the potential mental health impacts of these changes to the built and social environment.

While green space has traditionally been considered a health benefit of the urban landscape and was deliberately planned in many shrinking, post-industrial US cities, the current magnitude of the number of vacant hectares has become more of a “liability” than a “luxury” (Burkholder 2012). These lots contribute to urban blight in the forms of both physical and social disorder (Garvin et al. 2013). In some cities, property vacancy rates exceed 50% (Burkholder 2012). Vacant lots are hypothesized to be a potential expression of physical incivilities or disorder within a neighborhood, similar to graffiti and litter, and vacant lots can also contain these features of disorder when they are the sites of litter dumping or arson (Garvin et al. 2013; Jones et al. 2014; McCord et al. 2007; Pearsall and Lucas 2014; Sampson, R.J. and Raudenbush 2001). Further, vacant lots have long been known to be associated with higher levels of crime (Garvin et al. 2013; Pearsall and Lucas 2014) and violence (Boyle and Hassett-Walker 2008; Stucky and Ottensmann 2009; Zuravin 1989). Abandoned and vacant spaces can be used as locations for illegal drug sales, as well as places to hide and sell firearms (Yonas et al. 2007). Neighbors of vacant lots can even experience psychological harm caused by the devaluing of a neighborhood and the people who live in those spaces (Yonas et al. 2007). Studies have shown that community members perceive vacant land as a contributing factor to physical disorder in a neighborhood, and physical disorder has been associated with resident fear, stress, and an overall negative impact on health outcomes (Cohen et al. 2003; Ross and Mirowsky 1999; Sampson, N. et al. 2017). *Visually*, vacant lots may contribute to a sense of the neglect or economic decline of an area. Overall, vacant lots can send the message: “No one cares about this place, so you don’t have to either.” Because of the linkages with crime and violence, measures of vacancy are often included in neighborhood environmental assessments designed to identify neighborhood indicators of violence and general social disorganization (Furr-Holden et al. 2008).



Clearly, addressing the problems of increasing vacancy has benefits for neighborhood stabilization and community reinvestment; however, cities find themselves in a precarious position where they are responsible for the maintenance of more land and infrastructure, while at the same time they must contend with declining property values and thus tax revenues. The loss of a strong tax base not only is a barrier to funding stabilization and green space efforts, but also negatively impacts other programs and services, including public institutions such as public schools, municipal services such as street maintenance, police, and firefighting, medical services such as hospitals and pharmacies, and retail establishments like grocery stores (Mallach 2012; Schulz et al. 2002). The loss of city services and neighborhood resources can reinforce patterns of flight and depopulation and further erode the already fragile tax base (Burkholder 2012). Too often residents of high poverty neighborhoods disproportionately bear the brunt of the shrinking tax base and suffer the loss of critical infrastructure maintenance and essential city services including public safety (Schulz et al. 2002).

With these extraordinary levels of abandoned properties, it's little wonder that social environments may erode in parallel with built environments. With increased outmigration in shrinking neighborhoods, combined with housing insecurity and residential turnover driven by rent poverty (defined as families who spend more than 35% of their income on housing costs), bonds both between neighbors and within a neighborhood can be jeopardized and weakened (Desmond 2016). Smaller neighborhoods with higher rates of unemployment are less viable locations for retail outlets and other businesses as well (Galster 2017). The loss of neighborhood businesses is a blow not only to the local availability of services but also to the social fabric. Private businesses like bars, coffee shops, diners, bookstores, and general stores provide spaces for the formation and maintenance of social capital (Butler and Diaz 2017). In the absence of these “third place” spaces, social capital lost during population decline may be even more difficult to revitalize (Oldenburg and Brissett 1982). Both quantitative and qualitative findings suggest that the built environment is associated with social capital and the related concept of collective efficacy (Cohen et al. 2008; Hanibuchi et al. 2011). Collective efficacy is the belief that a group has the capacity to cooperatively take action and address problems. Neighborhood features such as parks and community gardens that provide space for social interactions may promote the development of social cohesion (Giles-Corti et al. 2016) and collective efficacy (Teig et al. 2009). The absence of accessible community spaces may inhibit the development of strong social ties and collective efficacy in a neighborhood. At the same time, the depressed perceptions of safety and high levels of crime associated with vacant lots and abandoned properties constitute another barrier to social interactions and the development and maintenance of neighborhood social cohesion. Not surprisingly, high vacancy rates are associated with lower levels of neighborhood cohesion (Kondo et al. 2016; Sampson, R.J. et al. 2002). Erosion of neighborhood cohesion can lead to increased feelings of isolation, loneliness, and even mental health illness, especially for long-tenured older adults, and perceptions of poor neighborhood quality are associated with loneliness and depression (Pierce et al. 2009; Wen et al. 2006). Lower levels of collective efficacy are associated with depression (Ahern and Galea 2011), while high levels may help mitigate some of the mental health consequences of violence exposure (Browning et al. 2014). Research also suggests that loneliness and its attendant risks of depression are associated with lower levels of social capital (Dahlberg and McKee 2014; Nyqvist et al. 2016). Social capital, which links individuals together, may play a particularly important role in promoting mental health among low resource populations (Stafford et al. 2008).

Taken as a whole, the slow destruction of the built and social environments of the hardest hit shrinking cities' neighborhoods presents a significant mental health risk for residents. However, both cities and communities are pursuing innovative and promising responses to address decline and, indirectly, its associated health risks. In the next section we explore some of the strategies used by cities to overcome these challenges.

## **Contesting, Engaging, and Greening: How Community Responses to Shrinkage Could Benefit Mental Health**

While the loss of population, services, and investment and the proliferation of vacant and abandoned land are of great concern to cities, these landscape transitions have encouraged a “large-scale reconsideration of the city” (Burkholder 2012). Given that neighborhood conditions are known to have important beneficial implications for mental health, this large scale reconsideration offers an unprecedented opportunity to redesign cities to provide mental health benefits.

The opportunity to redesign urban spaces with specific goals in mind has not passed by unnoticed. In the context of the shrinking city, new attention is being paid to vacant lots (Burkholder 2012). Municipalities that were once more concerned with maintaining the potential future tax revenue that could be gained by developing vacant properties have now turned toward possibilities for temporary use projects and alternative strategies—such as using vacant spaces for the provision of resources (e.g. parks or gardens) to neighborhood residents (Burkholder 2012; Németh and Langhorst 2014). New partnerships linking city initiatives with non-profit organizations and coalitions have sprung up. Community development funders, land banks, and city projects that have spun off into independent non-profit organizations have tackled the reimagining of vacant land. Vacant land reuse possibilities that have been suggested and implemented include community gardens, pocket parks, orchards, market gardens, native plantings, social spaces, play areas, storm water management infrastructure, and even maple sugar bushes (Detroit Future City 2017). Detroit Future City and Reimagining Cleveland (Cleveland Neighborhood Progress 2014) provide two leading examples of municipalities that have recently begun to reconsider the meaning, value, and potential of vacant urban spaces. The city of Milwaukee has developed a vacant lot redevelopment book (City of Milwaukee Department of City Development 2013) detailing how-to strategies for redevelopment, and describing a wide range of alternatives, including urban agriculture and farming, infill development, and active multi-use strategies such as art exhibits, a seasonal market, or a playground.

In general, shrinking cities have thus far employed two main types of approaches to address the excess land and space and associated maintenance cost: right-sizing and the conversion of vacant land to intentionally developed green space.

Right-sizing seeks to better match city geographies to the needs of the current population, not the population size of the city at its peak (Schilling and Logan 2008). In practice, this means shrinking the overall quantity of housing and consolidating populations in select city neighborhoods while converting now excess land into other uses, such as green space (Hollander and Németh 2011). One approach for city-owned and maintained property is to “off-line” properties and neighborhoods by no longer providing city services (e.g. garbage collection, water access) to depopulated neighborhoods. In some cases, cities may even de-annex portions of their city, moving the city boundary and excluding areas that were previously serviced from the new, smaller city footprint (Schilling and Logan 2008). Alternatively, cities may mandate urban growth boundaries that limit the geographic sprawl of development and force developers to consider existing urban areas in city centers for investment. This forced infilling can revitalize areas that might otherwise have been hollowed out by continued suburban development (Schilling and Logan 2008).

Right-sizing approaches carry both potential population-level mental health benefits and risks for individual city residents. Consolidation of population in remaining neighborhoods is beneficial: cities can provide functioning services, and communities can coalesce and develop economically and socially. However, at an individual level, the dislocation of residents from their homes and neighborhoods (for example, those selected to be off-lined) carries its own set of mental health risks. The complete destruction of a neighborhood, even a struggling one, along with its social structure, is not something to be undertaken lightly. Uses of eminent domain to construct large scale infrastructure and renewal projects such as highways in the 20th century had devastating impacts on



neighborhoods, especially on black neighborhoods in major American cities (Fullilove 2016; Gurda and Looze 1999; Rothstein 2017). To be sure, these neighborhoods were more functional and better maintained than some heavily depopulated locations today, but the previous experience of social engineering on this scale should be a cautionary tale.

In addition to right-sizing, the conversion of blighted vacant land to green space is a common response, with proponents arguing primarily that green infrastructure supports goals for urban environmental sustainability—including protecting air quality (Kim, G. et al. 2015), managing storm water (Burkholder 2012), the provisioning of healthy food, and encouraging climate change resilience (Dunn, A.D. 2010). One way to provide ecosystem services sustainably and combat the problem of urban vacancy and blight is to promote greening and stabilization approaches on vacant lots in residential neighborhoods (Burkholder 2012). These green space initiatives range from removing litter and providing turf grass to making fully realized community gardens and urban forests (Detroit Future City 2015).

The benefits of greening the city reach beyond the commonly described goals for sustainable urban development and have important implications for mental health. Given what we know about the strong relationship between place and human health, we must also consider these urban structural changes as an unprecedented opportunity to transform the post-industrial shrinking city into a more therapeutic landscape to benefit the mental and physical health of residents (Gesler 1992). The presence of urban green space is now widely viewed as a health-promoting characteristic of neighborhoods and has been linked to numerous health benefits, including improved social cohesion and/or sense of community (Kim, J. and Kaplan 2004; Maas et al. 2009; Pretty et al. 1994; Prezza et al. 2001), increased physical activity (Bell et al. 2008; Maas et al. 2008; Tzoulas et al. 2007), reduced stress levels (Alcock et al. 2013; Beyer, Kaltenbach et al. 2014; Gilchrist et al. 2015; Ward Thompson et al. 2012), and reduced mental fatigue through attention restoration (Berman et al. 2012; Faber Taylor and Kuo 2009; Hartig 2008; Kaplan 1995), which have direct relevance for mental health. In addition, there has been a growing interest in the benefits of community gardening, one of the most popular approaches to repurposing vacant land. Beyond improved nutrition and the alleviation of food insecurity, there is also the potential for mental health benefits. For example, Milligan et al. (2004) found that adults over 65 years old living in a city with some of the most deprived neighborhoods in northern England benefited from communal gardening in several ways. This form of therapeutic landscape acted as a site of relaxation and security for participants, combated social isolation by supporting the development of social networks, and elicited the practice of nurturing one another (Milligan et al. 2004). Preliminary work in Milwaukee indicates that gardeners who cultivate green spaces in their own neighborhoods are motivated to volunteer their time both to relieve stress and to enjoy the social benefits of joining with neighbors to work together to improve their neighborhood. These benefits are more often cited by these urban gardeners than the food and nutritional benefits typically associated with gardening (Olson et al. 2018).

The benefits of green space and community gardens in a neighborhood go above and beyond the positive health impact of alleviating the blight and disorder associated with vacancy. Addressing the blight of vacant lots and abandoned properties has been shown to have desirable effects on the surrounding neighborhoods. In a landmark study, Branas et al. (2011) found not only that the conversion of blighted lots to maintained green space was associated with a decline in some violent crimes, but also that residents reported greater levels of exercise and lower levels of stress (Branas et al. 2011). Similar approaches to addressing built environment blight such as abandoned building maintenance have led to similar reductions in violent crime (Kondo et al. 2015). Not surprisingly, in a randomized controlled trial, Garvin et al. (2012) found that Philadelphia residents near greened vacant lots reported feeling significantly safer, as compared to reports of control subjects living near lots that were not greened (Garvin et al. 2012). Studies have examined the impact of vacant lot redevelopment on measures of health and safety and

have found impacts of vacant lot greening on levels of violence, crime, and stress (Branas et al. 2011; Garvin et al. 2012; Kondo et al. 2016). These findings are particularly interesting, given a historical understanding that urban foliage and the presence of urban parks may be associated with *increases* in crime, as public green spaces have been thought to encourage crime by providing potential assailants with a place to hide or by providing public spaces in which conflicts are manifested. As Kuo and Sullivan (2001) note, “park authorities, universities, and municipalities across North America engage in active programs to remove vegetation because it is thought to conceal and facilitate criminal acts” (Michael and Hull 1994; Nasar and Fisher 1993; Weisel 1994). This historical association may hinder the enthusiasm for greening interventions among public health authorities and municipalities and may need to be addressed to continue green space efforts.

Urban greening could be a cost-effective approach to changing the neighborhood environment for the benefit of human health. Indeed, when reinvestment is possible, greening vacant lots and repurposing them for community spaces like gardens is associated with an increase in property values (Heckert and Mennis 2012). Research linking green space to health provides a strong evidence base upon which to build structural, scalable, and sustainable population health interventions (Branas 2013). Developing green space to encourage restorative experiences, social interactions, and crime reductions could have meaningful, large scale impacts on population mental health (Branas et al. 2016; Hartig 2008).

### **Repurposing Vacant Land: Examples from Milwaukee, Wisconsin**

A number of place-based initiatives including greening of vacant lots have been established in cities across the US, including initiatives in Philadelphia (Pennsylvania Horticultural Society 2014), Cleveland (Cleveland Neighborhood Progress 2014), Youngstown (Kondo et al. 2016), Detroit (Detroit Future City 2017), and Milwaukee (City of Milwaukee Department of City Development 2013). These place-based approaches are emerging as a way to increase community health and wellness by promoting physical activity, transforming the food environment, decreasing violence and crime, increasing sustainability practices, and strengthening community relationships.

Milwaukee has struggled with the classic shrinking city problems of deindustrialization, blight, and abandoned properties, and a declining revenue stream, similar to other cities from Buffalo, New York, to Philadelphia, Pennsylvania, to New Orleans, Louisiana. Although Milwaukee’s population loss has not been as extreme as Detroit’s, its loss of nearly 20% of its peak is substantial enough to promote the reevaluation of land use goals by city officials (US Census Bureau 2013). The failures and successes of vacant land conversions of Milwaukee, as a mid-sized city, may provide insights into how vacant land can be repurposed for community well-being and individual health, both in large municipalities like Detroit and in small locales like Flint. Conversely, Milwaukee may be able to draw on successful programs from small and large cities alike. An in-depth examination of diverse approaches to vacancy in a single city may help illustrate the range of partners, projects, and mental health impacts that are possible.

Milwaukee has taken a multi-pronged approach to greening conversions of previously vacant land, depending on both the characteristics of the vacant land and the relevant stakeholders. With brownfields in two previously industrial corridors in the city (30th Street Corridor and the Menomonee Valley), specialized clean-up and conversion have meant mobilizing a combination of federal funding from the Environmental Protection Agency, city resources, and funding from local institutions (EPA Brownfields Program 2009). In the 30th Street Corridor, private businesses, the USDA, EPA, and the Metropolitan Milwaukee Sewage District have collaborated with city leaders to support a farmer’s conversion of a contaminated site into an urban farm with underground water storage (Julson 2017). Green space investment has meant better storm water management, improved fresh food access, and beautified green space.

Milwaukee's Menomonee Valley was home to 50,000 employees at its peak, but now vast swaths of its 1,500 acres of industrial land lie empty (McAvoy et al. 2004). The redevelopment non-profit Menomonee Valley Partners Inc. partnered with the education-focused Urban Ecology Center to revitalize area neighborhoods which were hardest hit by the decline of the corridor. The partnership's "From the Ground Up" project implemented a series of multifaceted projects to connect "communities to jobs, environmental education, restored natural resources and new recreational opportunities" (Beyer, Heller et al. 2014). The project transformed a large brownfield into an outdoor classroom for environmental education, complete with community garden plots and green space play landforms. As a community-engaged project, "From the Ground Up" has engaged residents in the redevelopment process and, by extension, potentially increased local collective efficacy, a neighborhood characteristic that may help protect against mental health illness, such as depression (Ahern and Galea 2011). The project also created a bike and pedestrian corridor, reaching from Lake Michigan to Waukesha County, for recreation and commuting needs (Menomonee Valley Partners 2016). The development of physical spaces that promote engagement may help improve mental health by encouraging increased social interaction and social support, while also providing for outdoor recreation activities associated with mental health and well-being (Thompson Coon et al. 2011). Further, the creation of three new pedestrian and bike bridges has connected the residential neighborhoods south of the Menomonee River to the new employment opportunities on the previously pedestrian inaccessible northern side of the river. Increased job opportunities and employment help improve mental health outcomes among working age adults (Paul and Moser 2009). "From the Ground Up" is an example of a multi-sector collaboration to facilitate community repurposing of a blighted space for community-identified greening priorities. The connection of under-resourced residential areas to newly developed green space provides an environmental asset to support residential mental health and well-being.

For vacant lots in residential neighborhoods with fewer contamination concerns, the city developed the HOMEGROWN program to begin to reduce its management of the approximately 8,000 lots of which it took ownership, mostly after the 2008 Great Recession. The shift in seeking to have vacant lots repurposed in ways that would remove them from tax rolls for the foreseeable future is a tacit acknowledgement that the city is facing a mismatch of housing and population. While not as severe a burden as the over 20,000 vacant lots in Philadelphia or the 90,000 vacant lots in Detroit, the ongoing, year-round maintenance, including mowing, litter pick-up, and sidewalk snow removal, of the 8,000 lots remains a budgetary challenge (Brown 2014). Instead of taking on the long-term cost as a taxpayer burden, the city sought to ensure appropriate management and stewardship of these spaces. Hundreds of lots were sold for \$1 to adjacent homeowners, thus creating large lots akin to those in suburban lots in the city center and lowering the density of housing in these areas. Other lots have been developed and stewarded by local neighbors and community organizations and repurposed for community beautification and garden spaces (City of Milwaukee 2014). The city of Milwaukee collaborates with the non-profit Groundwork Milwaukee to guide and direct this network of gardens on previously vacant lots and promote the adoption of lots for valued community uses across the city. No two community gardens appear the same, as they are shaped by particular neighborhood preferences and constrained by available resources and volunteer labor. Many lots provide some combination of public art, green space, open play space, growing beds for flowers and vegetables, and memorials to lost loved ones. Community garden spaces function as hyper-local parks where neighborhood families from the immediate vicinity use the space as a communal backyard (Olson et al. 2018). Residents report that these garden spaces and the neighborhood programming in these spaces provide them with opportunities to reduce stress, strengthen social ties, develop a sense of community, and undertake physical activity. These benefits may help mitigate the impact of stressful life events and offer advantages to

support mental health (Olson et al. 2018). Improvements to the built environment like gardens can indirectly address mental health by providing for psychological needs like personal control and autonomy (Ng et al. 2012; Srinivasan et al. 2003). Residents describe taking charge of gardens by actively prioritizing neighborhood needs, planning how vacant lots will be converted, and collectively executing a neighborhood vision for these spaces. Additionally, the natural elements of these spaces such as plants, flowers, and gardening beds constitute mental health assets because of their ability to promote psychological restoration (Evans 2003). A growing body of research suggests that community gardens help develop social environments with higher levels of social cohesion and support that are associated with improved mental health, while gardens also lessen threats to mental health by reducing physical disorder, fear of crime, and social isolation (Alaimo et al. 2010; Kondo et al. 2016; Litt et al. 2011; Teig et al. 2009).

Across the country, strategic development of vacant land has been accomplished through purposeful partnerships between cities, academic institutions, and community groups. These multi-sector partnerships have the potential for sustained, measurable impact on community health. While there has been some research to measure the impacts of these changes for mental health and public health, by and large there remains much to be done.

### **Future Research to Explore Intentional Greening Approaches**

The need to address declining populations in legacy cities and the associated conversion of now vacant or blighted land to less population-intensive uses presents a key opportunity for urban planners, city developers, public health practitioners, and communities to collaborate to build adaptively for smart urban decline. While investments in greening conversions and right-sizing practices are functional responses to manage city shrinkage, they also present opportunities for public health researchers to evaluate these changes as natural experiments. The body of evidence created by these cooperative endeavors showcases the impacts of planning on urban health, and research should utilize these for outlining future best practices. While best practices in Milwaukee may not be a fit in all other cities, these practices, as part of an expansive set of rigorously evaluated shrinking city case studies, could provide a pivotal resource for cities that are scrambling to tackle blight and disinvestment in the context of dwindling city revenues. At the same time, shrinking cities may be able to learn from green space creation during other urban transitions such as disaster recovery in Christchurch, New Zealand or coping with rapid urbanization in Dalian, China (Brand and Nicholson 2016; Wang, X. et al. 2018).

Research partnerships provide value for municipalities that might not otherwise have the resources and expertise to evaluate the health impact of their policies and investments. At the same time, these scaled city interventions present researchers with an all too rare opportunity to evaluate population-level environment changes. While neighborhood conditions, both social and built, are known to have a profound effect on the health of individuals, there are vanishingly few opportunities to evaluate these impacts in quasi-experimental or experimental study designs (Branas and MacDonald 2014; Petticrew et al. 2005). The scale of substantial environmental interventions is most often too resource-intensive and outside the purview of public health experts. Instead, strategic partnerships with cities, states, and other governmental entities may be necessary to implement larger projects like large scale greening programs. And, while public health researchers may attempt to study these changes without the cooperation of city partners, an established line of communication with city hall provides greater project detail and can help ensure that research designs can match city implementation timelines. Too often baseline health and environmental data may be lost if a project begins before researchers are able to mobilize resources to evaluate the project. Academic-municipal partnerships should seek to include community partners that can provide insights and value in both

the design and the evaluation of large scale environmental projects (Dannenberg et al. 2003; Garvin et al. 2013). Examples of productive partnerships employing participatory mapping and geographic analysis may provide models to guide future work (Dunn, C.E. 2007; Olson et al. 2016).

Partnerships for research, while time-intensive to cultivate, can provide the needed foundation for complex research designs. Even when the timeline and location of environmental intervention are constrained, as in, for example, the conversion of brownfields to a new park, a partnership can ensure that appropriate longitudinal data is collected before, during, and after implementation. When multiple sites or potential sites are considered for city projects, then matched comparisons between treatments and controls may be a possibility. Given the right circumstances, city and community partners may even be able to facilitate randomization of interventions and the delay of some interventions to help develop valuable evidence of impact, as long as resources are ultimately deployed in an equitable fashion at the conclusion of the project.

A growing chorus argues that the changing nature of post-industrial, shrinking US cities is a significant opportunity to carefully reconsider and redesign urban landscapes. These changes also offer an unprecedented opportunity to study the effects of landscape restructuring on mental health, among other outcomes. Ultimately, environmental interventions will only be embraced for their potential public health impact if their causal impact can be better described and supported by evidence obtained from rigorous scientific research and evaluation.

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