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## Housing to Health: A Literature Review Analyzing Housing Pathways and Policy Initiatives

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Housing to Health: A Literature Review Analyzing Housing Pathways and Policy Initiatives

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## Abstract

Housing is a vital aspect of an individual's ability to enjoy a healthy lifestyle. It is so integral that the United Nations has stated that housing is a human right and extends beyond just basic shelter where housing should provide a certain level of structural integrity of the infrastructure, security, affordability, and access to surrounding resources. Existing research studying the relationship between housing and health outcomes suggest those with poor housing exhibit higher levels of chronic conditions such as asthma, heart disease, and diabetes, and higher chances of accidents within the home. The goal of this literature review, which has not been done previously, is to organize all studies with housing factors impacting health outcomes into two pathways, the Affordability and Stability (AS) pathway and the Housing and Environmental Quality and Safety (HEQS) pathway and see how each of these pathways and housing factors impact health outcomes. Fifteen articles were organized into the AS pathway and 24 articles into the HEQS pathway. Ten of the fifteen articles in the AS pathway and 22 of the 24 articles in the HEQS pathway has significant association with health outcomes suggesting these pathways have significant implications for health outcomes. Policy initiatives should consider policies that take advantage of the most amount of housing factors and pathways for greatest impact on health outcomes such as permanent supportive housing (PSH) to provide affordable, stable, and quality housing to people most at-risk of homelessness, increase public housing availability, and improve designs of neighborhoods, communities, and environments following evidence-based research to impact health outcomes.

## Chapter 1 - Introduction

Access to safe, affordable, and high-quality housing has been identified as a crucial piece of public health and there are many studies done that show the impact housing can have on one's health. So much so that housing is defined as a social determinant of health. The cost of adequate quality housing is increasing at its fastest pace in decades making housing less affordable and therefore less achievable especially for younger generations[1]. These high costs, and moreover poor quality and environmental standards disproportionately impact minorities and others of lower socioeconomic standing[1]. As of today, the connection between housing and health outcomes is well established. However, there are many factors of housing that have shown can be improved upon to impact health outcomes but often with so many variables and factors to consider, developing evidence-based policies can be difficult for policy makers and other stakeholders. To organize the vast amount of research in linking housing to health, it has been suggested that housing can be organized into four pathways of housing. They are affordability, quality and safety, stability, and neighborhood/environmental factors[2]. Housing affordability refers to the cost of obtaining a stable home, either through home ownership or through rent and people's ability to transition from renting to ownership. A contributing factor to people's inability to afford a home is the increasing share of one's income to contribute to housing costs. The safety and quality of housing refers to factors inside one's home that keeps one safe. Examples of safety and quality measure of housing include the insulation quality of the home to keep people warm during the winter and cool during the summer, water quality, electricity, and internet access, and also the occurrence of domestic abuse or violence in the home. The stability pathway refers to one's ability to remain housed and being in one location for a significant period, such as not moving from one location to the next frequently or "couch surfing." The

neighborhood or the surrounding environment refers to the surrounding community resources that can be accessed by community members. This includes access to public transportation, schools, libraries, hospitals and other medical facilities, parks, or other sources of greenery with clean rivers or beaches, etc.

When searching through available literature on housing and health outcomes, I felt these four pathways could be combined into two pathways. These pathways are the AS and HEQS pathways. Affordability and stability in housing are very similar. The affordability pathway is the price to enter the housing market, whether that be to rent or purchase. Stability on the other hand considers the longevity and consistency of one's housing tenure and a significant factor in one's stability is one's ability to be able to afford rent or their mortgage payments. In the available research, it was hard to delineate a study to be just looking at the affordability of housing when they also look at the stability of the housing and the amount of time participants lived in one location. It was necessary to combine these sources into one pathway. The other two pathways that were combined were quality and safety and neighborhood/environmental pathways into the HEQSP. When researching the available literature, the quality and safety pathway referred to factors that dealt with inside the home and neighborhood and environment dealt with factors outside the home and within the surrounding community. Studies defined the quality and safety of the housing of interest as the "built environment" which can lead to some confusion if they were talking about factors inside the home versus outside of the home. Therefore, I felt these two pathways could be combined into one pathway and which would refer to all factors inside the home and outside the home in the surrounding community.

With our pathways established I want to examine each of these pathway's impact on health outcomes, examine if there are factors outside of these pathways that can describe the

relationship between housing and health, if studies can be organized into these two pathways, and briefly describe potential policy solutions that target these pathways.

## **Chapter 2 - Background**

Making housing more affordable is crucial to improving housing availability to the public and improve health outcomes. There are significant affordability concerns in the U.S. today outlined by the Joint Center for Housing Studies by Harvard University. Between 1960-2016, median rents increased 61% and median home values increased 112% which has doubled the amount of home renters who are cost burdened [3]. Median rent is rising 20% faster than overall inflation and median home price 41% faster from 1990-2016 [4]. Between 2000-2017 the cost of the lowest cost units have risen about 80% [4]. Housing affordability is more of a concern for minority populations in the U.S. In 2016, median income of white households was 10 times greater than black households, and 8 times greater than Hispanic households. Homeowner equity also makes up a larger share of household income among black and Hispanic households than their white counterparts, 56%, 65%, and 38% respectively [4].

Many studies show correlation between health outcomes and housing. Dramatic improvements in death rates from infectious diseases and other communicable diseases such as typhoid, cholera, pneumonia, and tuberculosis, can be attributed as much to an increased standard of housing as much as medical intervention, and can explain why chronic diseases are the most common reasons for death [5]. In 2016, an intervention called the Housing & Health partnership was created in Seattle, Washington that analyzed health outcomes among Medicaid beneficiaries in low-income, public housing units. The results showed residents with Medicaid living in public housing units had higher rates of chronic and mental health conditions across

age, ethnicity, race, and sex [6]. This created insights into the relationship between housing initiatives and health outcomes for various stakeholders in the area.

Several literature reviews have examined various connections and potential associations between housing factors and health outcomes. Two reviews searched the available literature with the main housing focus on stability [7, 8]. Both studied the available literature on PSH programs, one on specifically Housing First (HF), the other on all available PSH models. Both literature reviews found mixed associations between housing stability in these models and health outcomes. While both literature reviews found improved outcomes in emergency department use and hospitalizations, there was little association among the literature reviewed that showed these housing programs having an impact on health outcomes. Three additional literature reviews focused on the quality and safety within homes, specifically two of these studies on the architectural design on mental facilities and their impact on mental health outcomes [9, 10] and the impact that cold and damp environments within the home can have on mental health outcomes [11]. Each of these studies found associations between various housing characteristics, whether it be in a mental health facility or in private homes and their impact on mental health. Four additional literature reviews reviewed available literature on the impacts the neighborhood and community have on health outcomes [12-15]. These studies found negative association between neighborhood quality and psychiatric symptoms [13], found statistically significant associations between at least one characteristic of the living environment and depressive mood [15], observed significant associations between at least one neighborhood level variable (neighborhood deprivation, disorder, instability, and social ties) and depressive symptoms [12], and found measurable associations between the urban environment (including housing with deck

access, neighborhood quality, amount of green space, land-use mix, industry activity and traffic volume) and psychological distress[14].

While these literature reviews served to find associations between housing factors and health outcomes, this literature review serves to organize this literature into two groups of pathways and see how these pathways are associated with health outcomes that can be used as a model to organize the expansive amount of research studying the relationship between housing factors and health outcomes. The goal of which is to help researchers, policy makers, housing authorities, and other stakeholders make better decisions when targeting each of these factors to improve health outcomes using housing factors.

### **Chapter 3 - Methods**

This literature review used PubMed for its primary search and then supplemented that search with Medline through reference lists. Key terms used for searching literature included housing, health, affordability, cost, quality, safety, stability, neighborhood, community, and environment. Article types included were quantitative and qualitative studies. These were case control studies, cohort studies, randomized control trials, systematic and literature reviews, cross-sectional studies, longitudinal studies, phenomenological studies, and ethnological studies. All sources searched were from 2011 – 2021 and came from within the U.S. All literature outside of the U.S. was excluded to limit the context that had to be analyzed when recommending policies. All health outcomes were included, whether they be physical, mental/psychological, or behavioral and among any age group. Only studies examining the association between housing factors and health outcomes were included. For all abstracts returned based on the key terms search, an initial review was conducted to ensure that all articles are relevant to the discussion of housing and health outcomes and meet the inclusion criteria of the literature review. All included



articles were organized into tables with authors, years, methods used, health outcomes, housing factors, other factors, key results, and policy implications. These papers were organized into two pathways, affordability and stability (AS), and housing and environmental quality and safety (HEQS).

## **Chapter 4 – Results**

### **AS Pathway**

After searching the key terms there were 60 total abstracts for the AS pathway, 35 of which were removed because they were outside the date range and six studies were removed because they were from outside of the US. After reading through each abstract, two additional studies were removed because they lacked either housing or health outcomes, one study was removed because it was an intervention study, and one study was removed because while it had housing and health outcomes, the housing outcome (stability), was not a focus of the study. This left a total of 15 articles for the AS pathway (Table 1). Of these 15 articles, five focused on housing affordability and its association with health outcomes[16-20] and nine focused on housing stability[7, 8, 21-28].

Of the five studies focusing on housing affordability and health outcomes, one was qualitative[17] and four were quantitative[16, 18, 19]. The qualitative study measured affordability as “housing access,” using semi-structured interviews of participants who were diagnosed with type 2 diabetes and met the income criteria for subsidized housing eligibility[17]. The three quantitative studies obtained affordability data from nationally representative data surveys of the general population which were the Behavioral Risk Factor Surveillance System (BRFSS)[18],linked nationally representative data of the general population from the National

Health Interview Survey with US Department of Housing and Urban Development (HUD) administrative data[16, 19], and data from the US Postal Service address lists by Survey Sampling International[20]. Housing affordability was defined/measured in these studies by interview questions, for example, “how often in the past 12 months were you worried or stressed about having enough money to pay the rent/mortgage...”[18], measuring housing status either current or future recipient of HUD housing assistance[19], and type of housing financial assistance received [16, 20].

Of the 10 studies focusing on housing stability and health outcomes, one was qualitative[24], seven were quantitative[21-23, 25-28], and two were literature reviews[7, 8]. The qualitative study defines housing stability through an ontological grounded framework that develops, “a place of constancy, where daily routines can be enacted/carried out... which identities can be constructed,” among young adults in permanent supportive housing, and focuses on the importance of remaining in one place for participants[24]. The remaining articles measured stability specifically as the length of time participants stayed in one place, the frequency by which participants moved from one location to the next, whether that be to a new home, homeless shelter, supportive housing program(s), rehab facilities, and recorded the amount of time participants spent being homeless for chronically homeless populations that were currently homeless at the time of the study, were considered chronically homeless in the past, or who were at great risk of experiencing homelessness[21-23, 25-28]. Articles using stability factors also included two literature reviews, one focusing only on randomized-control trials and one using randomized control trials along with other experimentation designs such as quasi-experimental studies, single-group time-series design studies, and systematic reviews[7, 8]. The articles included in these literature reviews measured housing stability that was provided by PSH

models and looked at the impact that providing stable housing (in the form of PSH) has on health outcomes. The populations in these studies were PSH residents who were experiencing unstable housing and chronic homelessness or were at risk for chronic homelessness.

All the articles that focused on housing affordability had positive associations with health outcomes[16-20]. Two focused on just physical health outcomes (diabetes self-management and CVD outcomes)[17, 20], one focused on just mental health outcomes (stress and worry)[18], one focused on both physical and mental health outcomes (reported health status that takes into account current health conditions and individual health trajectories over time, and psychological distress)[16], and one focused on healthcare access and delay in care[19].

Five of the 10 studies focusing on housing stability showed a positive association with health outcomes[21, 24-27]. Of these studies, one focused on just physical health outcomes (HIV suppression) of 471 unstably housed people with HIV[25], two focused on just mental health outcomes (psychiatric symptoms and alcohol dependency, and reported mental health and outlook on life) of participants in supportive housing settings[24, 27] and two focused on physical and mental health outcomes. These outcomes were physical safety from abuse and depression, anxiety, and posttraumatic stress symptomology of unstably housed domestic violence survivors[21], and health-related quality of life (HRQL) calculated by physical component (PCS) and mental component scores (MCS) of PSH residents[26].

Five articles showed partial or no association between housing stability and health outcomes[7, 8, 22, 23, 28]. Three of these articles were quantitative and measured both physical and mental health outcomes[22, 23] and mental and behavioral health (substance use) outcomes[28]. The first measured HIV suppression status and HRQL, calculated by MCS and PCS among a cohort with HIV experiencing homelessness or were at risk of homelessness[22].

The second measured chronic physical and mental health conditions (including cardiovascular diseases, mobility, and dementia) among a geriatric population in PSH[23]. The third measured overall mental health status, including observed psychotic behavior, depression, and anxiety, and substance use using the Addiction Severity Index[28]. The other two studies were literature reviews whose health outcomes were mental health (self-reported and clinically assessed), self-reported physical health and quality of life, substance use, and non-routine use of healthcare services[7] and mental health and substance use disorders[8]. Both of these literature reviews focused on studies whose participants were residents of PSH but only one of them had exclusion criteria of study populations with families, children, and adolescents[8]. One literature review reviewed four total articles, each saw small improvements in mental and self-rated physical health outcomes with no statistical difference between treatment and control groups but found greater statistical improvements in health service use and housing stability between treatment and control groups[7]. The other literature review found a majority of the 20 total studies reviewed showed no impact of permanent supportive housing has on psychological symptoms or alcohol or drug use[8].

### **HEQS Pathway**

There were 102 search results for the HEQS pathway, 51 were removed because they were either outside of the date range and 11 were removed because they were outside of the US, leaving 43 articles. After reading through each of these articles, an additional 14 articles were removed because they either had no health outcomes or housing factors, and 2 articles were removed because they were intervention studies. This left a total of 24 articles for this literature review (Table 2). Of these 24 articles, 9 of them focused on housing quality and safety and 15 of them focused on environmental quality and safety.

Of the 9 articles that focused on housing quality and safety, one was qualitative[29], five were quantitative[21, 30-33], and 3 were literature reviews[9-11]. Each of these articles were identified as being in the HEQS pathway because they each focused on housing factors that dealt with the quality and safety within one's home or shelter. The qualitative study focused on characteristics within the homes of migrant farm workers and their families working in rural North Carolina[29]. They used semi-structured interviews and photographs to discuss housing conditions this population faced and potential health impacts[29]. The five quantitative studies obtained data on housing quality and safety factors from the 2014 Survey of Income and Program Participation (SIPP), a nationally representative surveys of individuals 18 years or older[30], from interviews and housing inspections of Spanish-speaking Latino migrant farm workers[31], randomly selected household units in 16 Boston Housing Authority (HBA) developments[32], the Fragile Families and Child Wellbeing Study (FFCWS) following a sample of mother-child pairs from 20 large cities in the US[33], and from interviews with unstably housed domestic violence survivors[21]. The three literature reviews obtained internal housing quality and safety factors by looking at literature concerning the internal architectural designs of mental health facilities on users[9] the internal built and architectural quality of PSH communities in both the US and Canada[10], and the impacts of living in a cold and damp environment within the home with poor insulation[11]. The studies analyzed in these literature reviews included peer-reviewed articles that only excluded government reports and non-English language texts[9], and quantitative, qualitative, and mixed-methods studies or literature reviews[10, 11].

Of the 15 articles focusing on environmental quality and safety, two were qualitative[34, 35], eight were quantitative[36-43], one mixed qualitative-quantitative study[44], and four were

literature reviews[12-15]. Each of these articles were identified as being in the HEQS pathway because they dealt with quality and safety, but in the surrounding environment, neighborhood, and/or community and how those factors impact health outcomes. The qualitative studies aimed to provide the “context” for which housing takes place and how that context explains health outcomes. These were both ethnographic studies of impoverished women living in single room occupancy (SRO) hotels in an urban space[35], and navigating risk environments in PSH among formerly homeless adults in Los Angeles[34]. The eight quantitative studies obtained neighborhood characteristic data for low-income adolescents, primarily African America, from primary caregivers[37], neighborhood green space among a representative sample of Wisconsin residents[36], transportation barriers mobility resources faced by nondriving older adults from the National Health and Aging Trends Study[38], spatial relationships (such as walking destinations and community design features) from the 2008 Boston Youth Survey Geospatial Dataset between Boston high school students and residential information[39], the Healthy Aging Research Network (HAN) study the neighborhood environment among community-dwelling senior adults across five counties in four different states[41], neighborhood conditions from the Multi Ethnic Study of Atherosclerosis among residents in a variety of locations within New York City, NY and six other communities [42, 43], and neighborhood demographic proportions of Mexican Americans aged 75 and older from Wave 5 of the Hispanic Established Population for the Epidemiological Study of the Elderly[40].

All of the articles focusing on housing quality and safety had positive association or impact on health outcomes[9-11, 21, 29-33]. Two focused just on physical health outcomes; physical health status rated from poor to excellent in relation to occurrences of poor housing characteristics[30] and chemical/pesticide exposure[29]. Five focused on just mental health

outcomes, which were depressive symptoms[32], depression and generalized anxiety disorder (GAD)[33], and generalized mental health outcomes among the three literature reviews[9-11]. The first literature review qualitatively identified 13 major themes between mental health care and architecture of mental health facilities[9]. The second literature review resulted in 17 articles that met inclusion criteria all suggested that the PSH built environment, both spatially and architecturally, matters by having great potential to impact PSH residents health outcomes and are worthy of future study[10]. The third literature review resulted in nine articles that focused on the impact that cold and damp living environments can have on mental health outcomes with all nine articles indicating an early consensus that there is an association between these types of living environments and negative mental health stressors, including persistent worry about debt and affordability to fix such conditions, thermal discomfort, and worry about the negative consequences these environments can have for health[11]. The articles reviewed in this literature review also showed positive association between energy efficiency and significant improvements in mental well-being(the ability to cope with normal stress of life, and can work and live productively and fruitfully without any obstruction)[11].

Thirteen of the 15 articles focusing on environmental quality and safety and a positive association or impact on health outcomes[12-15, 34-36, 38, 40-44]. Of these articles, nine focused on mental health outcomes, including psychiatric or psychological distress[13, 14], depression and depressive symptoms[12, 15, 38, 40, 41], depression, anxiety and stress[36], and stress, violence, and depressive symptoms[42]. One article focused on just behavioral health outcomes (substance use)[34]. Three articles focused on both mental and behavioral health outcomes[35, 43, 44], including recording experiences of current and past drug use, mental health (including experiences with diagnosis and psychiatric medications), and experiences with

violence and trauma among women living in SRO hotels[35], baseline elevated depressive symptoms and adiposity (waist circumference influenced by eating behaviors) among men and women aged 45-84 years from the Multi-Ethnic Study of Atherosclerosis (MESA) [43], and alcohol use and depressive symptoms among women apart of the Michigan Longitudinal Study[44].

All four literature reviews showed positive association or impact between environmental quality and safety on health outcomes. These each focused on just mental health outcomes. Out of 11 peer-reviewed cross-sectional articles, most showed association between neighborhood-level variables (architectural design, walkability, land use, and general neighborhood and housing quality) with psychological distress[14]. Neighborhoods were generally defined as participants living in the same locality, postcode area, street, and/or block[14]. Out of a total of 14 longitudinal studies, 11 articles observed a significant relationship between depression and at least one neighborhood-level variable (neighborhood deprivation, disorder, instability, and social ties)[12]. Most of the 57 articles that measured urbanization, population density, aesthetics of living environment, house/built environment, green areas, walkability, noise, air pollution and/or services available, had a significant association with depressive mood[15]. Eight of 17 studies focusing on urbanization had an impact on depressive mood, four of seven studies focusing on population density had a significant association with depressive mood, three out of eight studies showed significant association between aesthetics of living environment and depressive mood, nine out of 12 studies on housing and built environment showed significant association with depressive mood, nine out of 12 studies on green areas had significant association with depressive mood, two out of six studies showed significant association between walkability and the accessibility of the living environment among older adults showed significant association



with depressive mood, five studies showed significant association between noise pollution from different sources (traffic, surrounding area, neighborhood and indoor noise) was significantly associated with depressive mood, and 4 out of 10 studies showed significant association between available services and depressive mood[15]. A thematic analysis of 13 qualitative and quantitative studies focusing on the impact the built environment has on residents of PSH communities showed associations with well-being (psychiatric distress), privacy and social identity of said residents with documented mental health disorders[13].

Two articles showed partial or no association between environmental safety and quality factors and health outcomes[37, 39]. Both studies were quantitative, analyzing the effect of housing relocation and neighborhood environment on adolescent mental and behavioral health outcomes (psychiatric diagnoses and depressive disorder and adolescent behavior checklist and sexual behaviors)[37] and the built environments impact on depressive symptoms among urban youth[39]. The goal of the first article was to move families from high-poverty neighborhood to a low-poverty neighborhood as part of a federal housing relocation program in hopes of achieving better mental and behavioral health outcomes but instead saw worse health outcome[37]. The other article found significant positive spatial autocorrelation in all of the built environment features at both spatial scales and depressive symptoms, however, found little association between the built environment and youth depressive symptoms[39].

## **Chapter 5 – Discussion**

Based on these findings, all housing and health domestic literature within PubMed was able to be organized into two main pathways, AS and HEQS. There were more results for the HEQS pathway than the AS pathway with 24 compared to 15. This could be because it is more difficult to design an experiment attempting to link affordability and stability to health outcomes.

There were additional studies that used the affordability association with health but made conclusions that didn't directly impact health outcomes and focused purely on accessibility to health services. For example, having to not spend as much on housing allows people to spend their money on other needed services, namely healthcare services. This is especially true for people with chronic physical and mental conditions. While having improved access to healthcare services is very important, these studies did not link this improved access to health outcomes. Moreover, stability housing factors may require researchers to study a group of people over a length of time while controlling for other factors that may impact health outcomes which could make carrying out these experimental designs more difficult to do.

Most of the studies included in this review focused on mental health outcomes, compared to physical and behavioral health outcomes. In fact, none of the articles that focused on environmental quality and safety focused on physical health outcomes, and predominantly focused on mental health outcomes, with some focusing on behavioral health outcomes. It is unclear why this is the case, but it is recommended for future research to consider physical chronic conditions when analyzing the impact the surrounding environment, neighborhood or community characteristics have on the local population.

All articles focusing on affordability factors and housing quality and safety factors showed positive associations or impact on a variety of health outcomes, and all but two articles focusing on environmental quality and safety factors did the same. Half of the studies that focused on the relationship between housing stability showed either partial or no association with health outcomes. This could be attributed to a few things. The participants involved in these studies are more difficult populations to treat and tend to require more comprehensive care. These participants were chronically homeless, had HIV[22], or were older adults with geriatric

conditions[23]. These studies noted how difficult it can be to care for these populations, suggesting that while housing outcomes improved, and things like hospitalizations and the use of other emergency services decreased, it was difficult to reach a consensus on the association between housing stability and all desired health outcomes physical and mental health outcomes. For example, in one study, housing stability was the only factor that was positively associated with physical component score (PCS – which considers physical health characteristics), but no association with mental component score (measures mental health characteristics)[22]. However, the other studies mentioned previously found associations between housing stability and health outcomes of interest among similar cohorts. The other two literature reviews that did not find a clear association between housing stability and health outcomes still found significant evidence that providing rapid-access non abstinence housing (or permanent supportive housing), has potential to provide better health outcomes for recipients but more studies are needed to determine what housing model is best[7, 8].

Studies linked to the HEQS pathway appeared to more directly link the quality and safety of the home and surrounding environment to health outcomes. Most of these studies looked at mental and behavioral (substance/alcohol use) health outcomes and it seemed that researchers were more interested in developing the relationship that housing and neighborhood quality can have on these outcomes. For example, the impact that highways, sidewalks, and green spaces can have on depressive symptoms, or negative characteristics of the home (such as broken windows, holes in the ceiling and floor, faulty wiring, or dirty water) and their impact on mental health outcomes which can be self-reported in surveys and interviews. There were significantly more literature and systematic reviews among this pathway that suggests a great interest among researchers in understanding how the structure and organization of the community and

environment as well as the structural integrity and architectural design of the home impact health outcomes. I believe more research in connecting this pathway to physical chronic conditions is necessary to create a better picture of what housing factors and outcomes could have for improving health outcomes.

It is important to note these pathways, as defined in this literature review, are not exclusive from one another. That is to say just because a study is focusing on affordability or stability factors does not mean they cannot or should not focus on housing factors concerned with quality. These pathways and factors are linked and researchers and housing stakeholders should rely on each of these factors and pathways interacting with each other to have the greatest potential in achieving housing and health goals. For example, studies can look at both safety (in terms of safety from domestic abuse in the home) and stability (the length of time they have lived in their current home, do they expect to be living there more than six months, what are the reasons they feel they will not be able to live there in the near future)[21]. Articles in this review also noted that in their conclusions, it is necessary to conduct future research concerning another pathway or housing factor, without strictly saying it. For example, while comparing participants in different types of subsidized public housing programs (housing affordability factors), it was important to note that the neighborhoods in which public housing, or homes bought by housing vouchers, could be the reason why health outcomes were different between the two groups and that future research should consider measuring these neighborhood-level characteristics to provide further context in why they obtained their results[20].

In conclusion, all articles in this review were able to be organized into two pathways, the AS and HEQS pathways, each consisting of two different types of housing factors, housing affordability and stability, and internal housing and environmental quality and safety.

Subsequently, some light was shed on how these housing factors and pathways impact health outcomes and what current trends in the research show, notably, what health outcomes tend to be focused on more and what directions for future research should be. While housing stability, showed less positive associations with health outcomes, it was noted that the populations these articles studied are populations that are already susceptible to worse health outcomes, with existing complicated medical histories, coupled with poor mental health outcomes, and where substance use is common. While housing has been studied extensively and is considered to be a social determinant of health, the challenge remains for researchers to continue to prove that housing, or improvements therein, are worthwhile to improve population health.

### **Policy recommendations**

HUD administers housing assistance through several different programs. The three largest programs are public housing, housing vouchers, and multifamily housing[16]. Public housing is owned by publicly owned and operated by a public housing authority for low-income family occupancy. Housing vouchers are housing subsidies provided directly to the recipient who uses that subsidy to shop for housing on the private marketplace. Multifamily housing programs involve partnering with private housing developments that reserve a certain number of housing units that are below market rates, with the difference subsidized by HUD. Multifamily housing and housing vouchers are designed to give recipients more choice and live in more economically diverse neighborhoods while public housing tends to be in more densely populated, poorer neighborhoods. However, in practice, voucher and multifamily housing recipients also tend to live in poorer neighborhoods[16].

These studies also provided some direction for policies to take to improve upon housing factors and health outcomes. A strategy that is gaining popularity in recent years is permanent

supportive housing (PSH) and has links to both pathways analyzed in this literature review. PSH is provided by housing departments on a federal, state, and local level and provides housing assistance, in the form of long-term leasing and rental assistance, and supportive services to at least one adult member of the household. Support services can include but are not limited to, moving costs, child care services, education services, employment assistance and job training, food education and food assistance programs, housing search and counseling services, mental health services, and substance abuse treatment services[45]. There are two examples of this type of supportive housing that came up in this literature review. They are Housing First and Treatment First. As stated previously, Treatment First provides housing vouchers but requires the applicant to show proof they are already receiving intensive treatment for psychological treatment and/or substance or alcohol use. It also requires abstinence from substance and alcohol use. Housing First has no such contingencies but still provides intensive case management if those services are needed and desired. This literature review has shown evidence from studies that suggest Housing First programs prove to have better housing and health outcomes compared to Treatment First programs but there was not a unanimous consensus on this and requires more research to determine if Housing First models are superior. Further research comparing these programs is necessary to determine if a national recommendation should be made to transition to Housing First programs.

Furthermore, these types of programs are greatly dependent on the quality of the architectural design of the building, the quality of services provided, having up-to-date appliances within the home, and being in neighborhoods and communities with access to public walking spaces, greenery, outpatient medical services, that have a diverse makeup of demographics and income levels. As seen here, these programs are linked to each of the

pathways and factors outlined in this study. They impact housing factors through the AS pathway by being an affordable solution for those struggling with affording a home and providing stable, long-term housing with no term limit on leases. It is also crucial that these programs provide housing in high-quality (or standardized quality) apartments or homes that are up-to-date on quality and safety codes, modern appliances, cleared of pest infestations, and are located in neighborhoods or communities with access to necessary services including food, entertainment, social, and healthcare. As stated in many of these studies, often times these types of public housing programs are located in neighborhoods with dilapidated buildings and host a variety of negative influences which can make it harder for chronically homeless individuals to fully acclimate to society, especially those struggling with drug addiction or have one or more chronic conditions.

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## Appendices

Table 1. Literature results for all papers that defined housing using the affordability and stability pathway

Author(s) (year of publication)	Methods used	health outcomes	factors related to housing	other factors if needed	results
Danya E. Keene, Monica Guo, and Sascha Murillo (2018)	Qualitative; interviews with low-income adults with type-2 diabetes	diabetes self-management	Affordability; housing access (subsidized housing, unsubsidized housing, and homelessness)	Age, gender, race/ethnicity, source of income, insurance type	Housing access affects prioritization of diabetes self-management, affects routinization of diabetes behaviors, housing costs compete with diabetes related expenses

<p>Shiho Kino, Koryo Sato, and Ichiro Kawachi (2018)</p>	<p>Quantitative cross-sectional; individuals aged 18-64 years in 12 U.S. states asked if they had sufficient money to pay for rent or mortgage and ability to purchase nutritious meals</p>	<p>Access to health insurance, stress</p>	<p>affordability of rent and mortgage</p>	<p>affordability of nutritious meals, age, sex, race/ethnicity, education, household income, employment status, marital status, self-reported general health status, household size, living with children, percentages of the state population uninsured, the unemployment rate, poverty rate, white population rate, education rate, foreign-born rate, and proportion of people aged over 65</p>	<p>10%-point increase in the repropotion of those who obtained health insurance reduced the probability of being worried and stressed related to purchasing nutritious meals 7.2%, and paying rent or mortgage by 8.6% among people living below 138% of the federal poverty line</p>
<p>Andrew Fenelon, Patrick Mayne, Lauren Rossen, Veronica Helms, Patricia Lloyd, Jon Sperling, and Barry Steffen (2017)</p>	<p>Quantitative cross-sectional; linked National Health Survey data to HUD to examine housing assistance associated with health outcomes among low-income adults</p>	<p>reported physical health and psychological distress</p>	<p>Public Housing, housing assistance status (present and future resident), affordability</p>	<p>Age, gender, race/ethnicity, family size, number of children, education, family income, poverty, employment status, insurance status, other assistance program participation, census data</p>	<p>Reduced likelihood of fair or poor health for current public housing and multifamily housing residents compared with future residents. Public housing residents had reduced odds of psychological distress</p>

Alan Simon, Andrew Fenelon, Veronica Helms, Patricia Lloyd, and Lauren Rossen (2017)	Quantitative cross-sectional study; interviewed 18–64-year-olds population receiving HUD housing assistance is associated with improved access to healthcare	health insurance status, healthcare access having a usual source of care, mental health care, specialist care, dental care, or prescription drugs	HUD assisted housing and affordability	age, sex, race/ethnicity, education, census region, family size, income, self-reported health status, number of chronic physical conditions, and serious psychological distress	31.8% current recipients were uninsured compared to 37.2% of future recipients. 40.4% of current recipients experienced unmet needs due to cost compared to 46.3% of future recipients
Earle C. Chambers and Emily Rosenbaum (2014)	Quantitative cross-sectional; Prevalence of cardiovascular disease (CVD) measured for different groups based on the type of housing they have (public housing, units subsidized by vouchers, and units unassisted by any federal program)	CVD, blood pressure, heart attack, stroke, smoking, obesity/weight, eating habits	Affordability, type of housing assistance; public housing, subsidized housing, vouchers, unassisted housing	Income, age, sex, marital status, race, ethnicity, employment, monthly rent	Public housing residents have exhibited highest rates of CVD. CVD outcomes were similar for those in voucher housing and those who were unassisted in housing payments

<p>Danielle Chiaramonte, Cortney Simmons, Noora Hamdan, Oyesola Oluwafunmilayo Ayeni, Gabriela Lopez-Zeron, Adam Farero, Mackenzie Sprecher, and Cris M. Sullivan (2011)</p>	<p>Quantitative longitudinal study; examining impact of COVID-19 on domestic violence survivors' safety, housing stability, and mental health before, during and after the onset of COVID-19</p>	<p>mental health and physical safety</p>	<p>safety and stability</p>	<p>employment, income, social support, number of children, outcome scores, race, ethnicity, education, disability status</p>	<p>Safety, housing stability, and mental health were all improving among participants before COVID-19 stay-at-home orders which then plateaued during the onset of said orders. Those who received housing-related services and had greater social support networks reported less abuse, less housing instability, and lower mental health distress</p>
<p>Andrew J. Baxter, Emily J. Tweed, Srinivasa Vittal Katikireddi, and Hilary Thomson (2019)</p>	<p>Literature review of randomized control trials of interventions providing rapid access to non-abstinence-contingent, permanent housing</p>	<p>mental health, self-reported physical health and quality of life, substance use, use of healthcare services</p>	<p>housing stability</p>	<p>N/A</p>	<p>Intervention groups experienced fewer emergency department visits, fewer hospitalizations, and less time spent hospitalized. Spent more days housed at 18-24 months. Association between housing stability and short-term health outcomes was unclear and no change in substance use was seen</p>

<p>Serena Rajabiun, Kendra David-Plourde, Melinda Tinsley, Emily K. Quinn, Deborah Borne, Manisha H. Maskay, Thomas P. Giordano, Howard J. Cabral (2020)</p>	<p>Quantitative prospective study; evaluating program for people with HIV who are unstably housed</p>	<p>HIV suppression</p>	<p>Stability</p>	<p>N/A</p>	<p>Housing stability had a direct impact on viral HIV suppression. Navigation activities to guide those with HIV did not have a direct effect on housing stability but directly impacted retention in the care program</p>
<p>Sam Tsemberis, Douglas Kent, and Christy Respress (2012)</p>	<p>Quantitative prospective program evaluation for Pathways Housing First program in a 2-year period in Washington DC in 2007 and 2008</p>	<p>Psychiatric symptoms and alcohol dependency</p>	<p>Stability</p>	<p>client-centered psychiatric rehabilitation and harm reduction approaches for participants in the program</p>	<p>Housing retention for severely disabled and chronically homeless needing extensive service was 97% in the first year and 84% in the second year. Highly distressed individuals showed significant reduction in psychiatric symptoms within the first year of housing. Demand for intensive rehabilitative services to clients was reduced to less intensive and costly community support services for 14% of clients within 2 years</p>



Antoinette L. Spector, Katherine G. Quinn, Timothy L. McAuliffe, Wayne DiFranceisco, Arturo Bendixen, and Julia Dickson-Gomez (2020)

Quantitative cross-sectional study to assess health-related quality of life (HRQL) of permanent supportive housing (PSH) residents in Chicago

Physical component summary (PCS) and mental component summary (MCS). Higher score means better HRQL

Stability, Permanent supportive housing (PSH)

age, gender, race, ethnicity, education, employment, HIV status, mental health symptoms, substance use

Mean score for PCS was 39.5 (out of 100) and mean score for MCS was 46.1 (out of 100). Older age and being on disability associated with worse PCS. Having HIV was associated with better PCS. Being non-Hispanic Black, living in fixed-sited (stable) housing, and being in PSH for longer durations associated with better MCS. More depressive symptoms associated with worse PCS and MCS

Thomas P. Giordano, Kerrin Gallagher, Jo Ann Whitlock Davich, Mobeen Rathore, Deborah Borne, Erika Davies, Frederick L. Altice, and Howard Cabral (2018)

Quantitative cohort study in 9 US states to improve HIV and housing status. Longitudinal data analysis to determine impact of changes in housing status and HIV to determine HRQL

HIV suppression status, CD4 cell counts, HRQL, mental and physical component scores (MCS and PCS)

Housing status - stability

Socioeconomic factors

Upon program enrollment, 75.1% were homeless, 51.6% did not have HIV suppression, and 23.6 % had a CD4 count less than 200 cells per cubic millimeter. Median MCS and PCS scores were 35.4 and 38.9 respectively. These all improved after 6 months. Stable housing predicted higher PCS at 12 months. CD4 and HIV suppression improvements did not. Improvements in housing, CD4 count, and HIV suppression did not predict MCS score at 12 months

Debra J Rog, Tina Marshall, Richard H Dougherty, Preethy George, Allen S Daniels, Sushmita Shoma Ghose, and Miriam E Delphin-Rittmon (2014)

Literature review - looking at the effects permanent supportive housing has on housing and health factors

hospital inpatient and emergency room use, behavioral health, and mental health measures

stability

N/A

Regardless of housing model used, providing housing had a strong positive effect on housing stability and reducing homelessness. Studies that used Housing First models found participants in these programs obtained housing earlier, were housed longer, experienced less hospitalizations, and fewer emergency room visits. Majority of studies found no effect of permanent supportive housing has on mental health outcomes

Benjamin F.  
Henwood, John  
Lahey, Harmony  
Rhoades, Deborah B.  
Pitts, Jon Pynoos,  
and Rebecca T.  
Brown (2019)

Quantitative; interviews  
gathered self-reported on  
health conditions from 37,  
formerly homeless, 45  
and older PSH residents in  
Los Angeles, California

chronic physical and  
mental health  
conditions, mobility,  
hospitalizations,  
emergency  
department use,  
substance use

stability

age, gender, race,  
ethnicity, insurance type,  
marital status, education

Association between  
tenure at a PSH using a HF  
model was unclear with  
health outcomes.  
Potential association with  
performing ADLs  
(activities of daily living)

Alvin S. Mares and Robert A. Rosenheck (2011)	Quantitative; comparing treatment scores of chronically homeless clients receiving comprehensive housing and healthcare services (CHHS) and similarly chronically homeless individuals receiving usual care	mental health, substance use, access, and use of healthcare services	Stability, time of homelessness	Cost, satisfaction, location of facility	Those receiving CHHS clients more likely to be housed, have a mental health and substance use treater, have a primary care case manager, receive community case manager visits, outpatient visits, mental health and substance use treatment, and more likely to receive all other forms of healthcare compared to control group receiving usual care. CHHS clients were a little over \$1,000 more expensive per client and expressed slightly less satisfaction with their primary mental health/substance abuse provider. No significant differences were found between the groups on measures of substance use, community adjustment, or health status.
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Benjamin F.  
Henwood, Brian  
Redline, Sara  
Semborski, Harmony  
Rhoades, Eric Rice,  
and Suzanne L.  
Wenzel (2018)

Qualitative; interviews of  
29 adults aged 18-25  
years old living in four  
public supportive housing  
units in Los Angeles

mental health,  
socialization, sense of  
self

stability, housing  
arrangement (living  
with others or alone)

age, gender, race,  
ethnicity, sexual  
orientation, education,  
employment status,  
history of foster care,  
history of incarceration,  
benefits received, services  
used,

Authors developed a  
grounded theory of  
ontological security for  
young adults. Participants  
experienced improved  
mental health outcomes,  
improved relationships,  
and improved sense of  
self.

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Table 2. Literature results for all papers that defined housing using the housing and environmental quality and safety pathway

Author(s) (year of publication)	Methods used	health outcomes	factors related to housing	other factors if needed	results
Kimberly Rollings and Christina Bollo (2021)	Literature review for both U.S. and Canada attempting to associate built environment design characteristics and mental health outcomes of recently homeless individuals	Mental health	dwelling unit type, privacy, control, safety, housing quality and location, access to amenities, shared common spaces	N/A	Results suggest influences of environment on resident's mental health of permanent housing residents is significant
Samantha Boch, Danielle Taylor, Melissa Danielson, Deena Chisolm, and Kelly Kelleher (2020)	Quantitative; survey of Income and Program Participation (SIPP) to estimate logistic regression models to find relationship between housing quality and health outcomes	Health status (from excellent to poor), hospitalizations in previous year, number of other medical visits not including hospitalization	Housing quality (number of poor housing characteristics), e.g. holes in walls, ceilings, or floors, pest problems with rodents or insects, plumbing issues, electrical problems, etc. Home rental status, household size, receipt of government housing assistance, neighborhood safety, metropolitan status	Age, sex, race, ethnicity, education, disability status, income, food security, health insurance, employment	Each additional housing characteristic associated with health status and medical utilization higher likelihood of hospitalization housing receipt government food security neighborhood partially explained associations housing quality outcomes

<p>Jessica Keim-Malpass, Chaya R. Spears, Sara A. Wuandt, and Thomas A. Arcury (2015)</p>	<p>Qualitative descriptive data gathered from interviews and photographs</p>	<p>Chemical/pesticide exposure</p>	<p>Lack of storage, safety issues, pests, water supply and air quality, electrical problems, temperature, moisture</p>	<p>Food spoiling</p>	<p>Found consistent among participants including exposure to pesticides, safety issues including exposed wiring, dust supply, poor ventilation and moisture problems</p>
<p>Snehal N. Shah, Alan Fossa, Abigail S. Steiner, John Kane, Jonathan I. Levy, Gary Adamkiewicz, Willia Maie Bennet-Fripp, and Margaret Reid (2018)</p>	<p>Quantitative; cross-sectional study analyzing association between household pest infestation with depressive symptoms among public housing residents</p>	<p>Mental health depressive symptoms</p>	<p>Pest infestations including insects and rodents</p>	<p>N/A</p>	<p>Individuals with pest infestation homes with cockroach infestation three times more likely to experience depressive symptoms compared to those without infestation. Cockroach and rodent infestation associated with other five-fold odds of experiencing depressive symptoms</p>



<p>Joanne C. Sandberg, Jennifer W. Talton, Sara A. Quandt, Haiying Chen, Maria Weir, Walkiria R. Doumani, Arjun B. Chatterjee, and Thomas A. Arcury (2015)</p>	<p>Quantitative cross-sectional survey; interviewed 371 male Latino farmworkers in North Carolina and data on housing and sleep quality were collected</p>	<p>Sleep quality (time to fall asleep and length of time of sleep), pain, depression, and anxiety</p>	<p>Access to air conditioning</p>	<p>Behaviors included smoking, alcohol intake, marriage status, and age</p>	<p>Access to air conditioning was positively associated with good sleep and remained significant after other housing and individual characteristics were controlled. Good sleep quality associated with low levels of depression, a</p>
<p>Shakira Franco Suglia, Cristiane S. Duarte, and Megan T. Sandel (2011)</p>	<p>Quantitative case-control; women recruited from 75 hospitals who birthed a child in 20 US cities of over 200,000 population. Interviews took place to determine housing quality and housing instability (how often they had moved within certain time interval)</p>	<p>Mental health scores, intimate partner violence</p>	<p>Housing quality including broken windows, cracked windowpanes, open cracks or holes in walls, ceiling or floor, hazards including frayed electrical wires, presence of mice or rats, broken glass, broken stairs, among others. Housing stability measured how many times participant moved in the past two years</p>	<p>economic hardship, race, ethnicity, education level, age, and marital status</p>	<p>16% of women were identified as having probable general anxiety disorder. Mothers experiencing housing dissatisfaction were more likely to screen positive for depression. No association between housing deterioration and maternal mental health.</p>

Kathleen Connellan, Mads Gaardboe, Damien Riggs, Clemence Due, Amanda Reinschmidt, and Lauren Mustillo (2013)	Literature review; effects architectural design on mental healthcare facilities can have on mental health outcomes	Mental health	Architectural design of mental health facilities	N/A	Themes: nursing home, light, therapeutic, security, patient, designing, adolescent, facilities, interventions, patients' role, dementia, mood, gardens, post-occupancy evaluation, engagement, process
Danielle Chiamonte, Cortney Simmons, Noora Hamdan, Oyesola Oluwafunmilayo Ayeni, Gabriela Lopez-Zeron, Adam Farero, Mackenzie Sprecher, and Cris M. Sullivan (2011)	Quantitative longitudinal study; examining impact of COVID-19 on domestic violence survivors' safety, housing stability, and mental health before, during and after the onset of COVID-19	mental health and physical safety	safety and stability	employment, income, social support, number of children, outcome scores, race, ethnicity, education, disability status	Safety, housing and mental health, all improving, participant, COVID-19 status, orders which plateaued during onset of said. Those who housing-related and had greater support network reported less housing instability, lower mental distress

C. Liddell and C. Guiney (2015)	Literature review of nine recent sources to find relationship between cold and damp housing conditions and mental health	mental health/well-being	Cold and damp environments	energy efficiency	Living in cold environments different mental stressors in persistent work debt and affordable thermal discomfort worry about consequences of damp for health efficiency v associated with mental well
Kelly R Knight, Andrea M Lopez, Megan Comfort, Martha Shumway, Jennifer Cohen, and Elise D Riley (2014)	Qualitative, ethnographic study; reported data from interviews of 30 women who were unstably housed living in single room occupancy hotels (SROs) in various built environments in San Francisco	Mental health, substance use and addiction	Single room occupancy hotels varying in built environment quality	N/A	Women who in SROs that feelings of anxiety (wh located in ph dilapidated bu neighborhood being less likely strategies that them to man own menta

<p>Jan Georg Friesinger, Alain Topor, Tore Dag Boe, Inger Beate Larsen (2019)</p>	<p>Literature review examining the built environment's impact on the recovery of tenants living in supportive housing</p>	<p>Sense of well-being (psychiatric distress, recovery) and potential to help tenants recover from addiction</p>	<p>supported housing, neighborhoods, regulation, mental health facilities, location, security, privacy</p>	<p>Professionals present in supported housing either on-site or off-site</p>	<p>Well-being is linked to housing location, neighborhood, social identity, link to housing places. Privacy by architecture. These factors promise help to recover from a traumatic event.</p>
<p>Gayle R. Byck, John Bolland, Danielle Dick, Greg Swann, David Henry, Brian S. Mustanski (2015)</p>	<p>Quantitative; community-based, multiple cohort longitudinal study collected from interviews with African American families who were relocated from public housing in a southeastern U.S. city to a lower poverty neighborhood. These interviewees were compared to the control group of adolescents aged 13-18 who stayed in public housing and did not move</p>	<p>self-reported mental health behavioral health outcomes</p>	<p>Public housing, lower poverty level neighborhood</p>	<p>N/A</p>	<p>Adolescents relocated to a lower poverty neighborhood reported worse mental health outcomes than control participants who stayed in public housing.</p>

Nina Rautio, Svetlana  
Filatova, Heli Lehtiniemi,  
and Jouko Miettunen  
(2018)

Literature review to  
determine if the  
surrounding environment  
is related to depressive  
mood

depressive symptoms and  
depression

Urbanization, population  
density, aesthetics of  
living environment,  
house/built environment,  
green areas, walkability,  
noise, air pollution and  
accessible services.

N/A

57 articles in  
review. Most  
showed sta  
significant as  
with at least  
characteristic  
environme  
depressive mo  
in relation to  
density, aest  
walkability  
environme  
availability of s  
depressive m  
more incor

Benjamin F. Henwood,  
John Lahey, Taylor Harris,  
Harmony Rhoades, and  
Suzanne L. Wenzel (2018)

Qualitative; ethnography  
with risk environment  
framework for individuals  
who recently moved to  
public supportive housing

substance use

Environment and  
community around  
assigned housing,  
exposure to negative and  
positive influences

age, gender, race,  
ethnicity, sexuality,  
veteran status, location

10 of 27 participants  
noted having  
use substance  
isolation in the  
Many sug  
connections  
social interact  
subsequent  
Each partici  
matched wi  
worker but  
participar  
supported l

Kirsten M. M. Beyer,  
Andrea Kaltenbach, Aniko  
Szabo, Sandra Bogar, F.  
Javier Nieto, and Kristen  
M. Malecki (2014)

Quantitative cross-  
sectional; measuring  
environmental green  
space and its association  
with mental health  
outcomes in an area that  
includes both urban and  
rural environments

Depression, anxiety, and  
stress

environmental green  
spaces within  
neighborhood spaces,  
urban and rural  
designation, population  
density, residential  
instability, percent  
ownership, percent  
residential racial  
segregation

age, gender,  
race/ethnicity, marital  
status, income, education,  
employment, type of  
residence, and type of  
insurance

Higher le  
neighborho  
space were a  
with significa  
levels of symp  
for depression  
and str

Alexandra Blair, Nancy A. Ross, Geneviève Gariépy & Norbert Schmitz (2014)	Literature review examining neighborhoods effects on depressive symptoms in adults	depressive symptoms	neighborhoods	N/A	Total of 14 longitudinal studies found, observed a significant relationship between depression and one of the features of the neighborhood variables: neighborhood deprivation, neighborhood instability, and
Namkee G. Choi, and Diana M. DiNitto, (2016)	Quantitative; older nondriving adults interviewed and measured for their depressive symptoms, driving status, alternative modes of transportation, and perceived barriers to transportation	depressive symptoms, social participation, health and mental health status	alternative modes of transportation, perceived barriers to transportation, driving status	age, gender, race/ethnicity, native born to US, marital status, living arrangement, income, education, employment	Nondrivers were interviewed for transportation-related depressive symptoms than those who walk from both directions. Interviewees perceived transportation-related barriers to visiting friends and family associated with depressive symptoms among the first-time interviewees.
Dustin T. Duncan, Gianfranco Piras, Erin C. Dunn, Renee M. Johnson, Steven J. Melly, and Beth E. Molnar (2013)	Quantitative; interviews to gather depressive symptoms from Boston high school students in an attempt for association with features of the built environment	Depressive symptoms	features of built environment (i.e. concentration of highways, average speed limit, length of sidewalks),	age, gender, race/ethnicity, nativity, presence of other youth in household, percent of houses below poverty level, percent of household that is foreign born	Overall, results showed that the built environment was minimally associated with depressive symptoms among youth, which may vary by spatial location, gender and race.

<p>Yi Gong, Stephen Palmer, John Gallacher, Terry Marsden, David Fone (2016)</p>	<p>Literature review to find objective measurements of the urban environment and psychological distress. All studies used were cross-sectional</p>	<p>Psychological distress</p>	<p>housing quality and attributes, neighborhood quality, amount of green space, land-use mix, industry activity and traffic volume</p>	<p>N/A</p>	<p>Overall findings of the urban environment has measured associations between psychological distress and neighborhood characteristics including housing quality, amount of green space, land-use mix, industry activity and traffic volume</p>
<p>Susan L Ivey, Melissa Kealey, Elaine Kurtovich, Rebecca H Hunter, Thomas R Prohaska, Constance M Bayles, and William A Satariano (2015)</p>	<p>Quantitative; cross-sectional study of adults aged 65 and older and relating neighborhood characteristics with depressive symptoms</p>	<p>depressive symptoms</p>	<p>neighborhood and environmental characteristics</p>	<p>study sight, age, gender, race/ethnicity, education, financial needs</p>	<p>Reports of neighborhood crime, unsafe conditions, unwillingness of neighbors to help each other significantly associated with depressive symptoms among participants</p>



C. Mair, A. V. Diez Roux, S. H. Golden, S. Rapp, T. Seeman, S. Shea (2015)

Quantitative; study uses data from the Multi-Ethnic Study of Atherosclerosis (MESA) to describe changes in neighborhood social cohesion, stress, violence, safety, and the aesthetic environment and relate these changes to depressive symptoms among residents.

social cohesion, stress, violence, depressive symptoms

safety, neighborhood quality

age, race/ethnicity, gender, annual income, highest level of education achieved, and antidepressant use

Neighborhood less stressful, socially cohesive, and less violent. Wealthy, high-income individuals tend to live in neighborhoods with greater social cohesion and less violence and safety. Individuals in neighborhoods with adverse characteristics are more likely to experience increased depressive symptoms.

Rosemay A Remigio-Baker, Ana V Diez Roux, Moyses Szklo, Rosa M Crum, Jeannie-Marie Leoutsakos, Manuel Franco, Pamela J Schreiner, Mercedes R Carnethon, Jennifer A Nettleton, Mahasin S Mujahid, Erin D Michos, Tiffany L Gary-Webb, Sherita H Golden (2014)

Quantitative; used data obtained by the Multi-Ethnic Study of Atherosclerosis (MESA) of randomly selected men and women

elevated depressive symptoms (EDS), adiposity (waist circumference), health behaviors

physical neighborhood characteristics, social environment

age, race/ethnicity, gender, marital status, income level

A greater increase in adiposity in participants with EDS was observed living in poor physical environments not in those with better-neighborhood environments. Associations with body mass index (BMI) and overweight/obesity were not associated with change in depressive symptoms and no modification by neighborhood factors.

Anne Buu, Wei Wang, Jing Wang, Leon I Puttler, Hiram E Fitzgerald, and Robert A Zucker (2011)

Mixed quantitative and qualitative; participants gathered from drunk-driving records and family members who had a family member who were diagnosed with alcoholism

Alcohol use, social behavior, depressive symptoms, social support, stress

Neighborhood instability

participant age, partner age, number of children, education, employment

Neighborhood instability was associated with higher rates of alcoholic and symptomatic women.

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Kerstin Gerst, Patricia Y Miranda, Karl Eschbach, Kristin M Sheffield, M Kristen Peek, and Kyriakos S Markides (2011)	Quantitative; Hispanic Established Population for the Epidemiological Study of the Elderly (H-EPESE) is a prospective study examining the health and healthcare needs of Mexican American elders.	Depressive symptoms	Neighborhood characteristics (including percentage of neighborhood living in poverty)	age, gender, marital status, immigrant status, education,	Among very among the c percentage o Americans wa associate depressive s There was no association Mexican A wom
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