Published in final edited form as:

J Environ Psychol. 2007 March ; 27(1): 79–89. doi:10.1016/j.jenvp.2006.12.001.

Housing environment and mental health outcomes: A levels of analysis perspective

Patricia Ann Wright^{*} and Bret Kloos

Department of Psychology, University of South Carolina, 1512 Pendleton Street, Columbia, SC 29205, USA

Abstract

This study examines the effects of perceived housing environment on selected well-being outcomes of a seriously mentally ill population in supported housing programs. Individuals live independently in their own apartments and use supportive mental health services as needed. The study conceptualizes one's housing environment as existing at the apartment, neighborhood and the surrounding community levels of analysis that, taken together, form a multi-dimensional construct of housing environment. Self-report data from interviews with a sample of seriously mentally ill adults is paired with (a) observer ratings of housing environments, (b) census profiles of the surrounding community and (c) case manager ratings of clients' functioning in order to explore the effects of supported housing environments on well-being outcomes. Well-being is operationalized here as levels of psychiatric distress, recovery orientation, residential satisfaction, and adaptive functioning. Hierarchical regression models posit that apartment, neighborhood and census tract level variables are unique predictors of these domains of well-being. Results show that neighborhood level variables, especially those relating to the social environment, are the most influential predictors for understanding variance in well-being, with apartment level variables also contributing to understanding of housing environment effects. The census tract level predictors did not contribute a significant amount of explanation of the variance in well-being outcomes. Implications for supported housing programs and the role of ecological levels of analysis in conceptualizing and measuring housing environment influence are discussed.

Keywords

Housing environment; Levels of analysis; Serious mental illness

1. Introduction

Ecological models of human experience posit that authentic understanding of any organism is inextricably linked with an understanding of its habitat. Applying an ecological, or person-in-context, paradigm to the study of housing influence on outcomes for adults with serious mental illness means that both individual level and environmental variables—and the interaction between them—must be taken into account (Bronfenbrenner, 1979; Rudkin, 2003). Within this framework, the arduous process of recovery from serious mental illness is seen as contextually embedded and influenced by a host of factors at multiple levels of a person's psychological and social experience (e.g., Carling, 1993; Kloos, 2005b; Seybolt & Linney, 2001; Tsemberis & Eisenberg, 2000). The position that environments can have deleterious or enhancing effects on human outcomes is clear and substantiated across the social science literature, and yet, the

^{*}Corresponding author. Tel.: +1 803.777.8408. E-mail address: patriciaannwright@yahoo.com (P.A. Wright).

specific conditions of a housing environment that serve as risk or protective factors for general well-being are only broadly understood.

1.1. Theoretical framework

This study explores the relationships between factors of housing environments and psychosocial functioning for seriously mentally ill residents of supported housing programs run by community mental health centers. Several principles of ecological models and community psychology guide the research questions asked here. First, understanding the interaction between personal and environmental variables is necessary to understand a wide range of human experiences (Bronfenbrenner, 1979; Lewin, 1951; Rudkin, 2003). Second, an individual's subjective experience, including the interpretation and attribution of environmental cues, is more predictive of one's psychological or emotional experience than objective measures of the same environment (Stiffman, Hadley-Ives, Elze, Johnson, & Dore, 1999; White, Kasl, Zahner, & Will, 1987). While methodologies that take into account respondents' subjective impression of their environment provide better predictions of psychological outcomes than methodologies that rely on third party assessments of the tangible qualities of environment such as deterioration of structures or amount of trash, these two methodologies are rarely used in combination with one another. Pairing self-report data with other data sources facilitates the development of a broader perspective on the multifaceted effects of housing environments on individuals' well-being. A final tenet of ecological paradigms emphasized in this study is that levels of analysis are embedded within environments and influence on an individual—whether enhancing or deleterious—diminishes as the levels radiate away from the individual (Rudkin, 2003). For instance, factors embedded in a micro level of analysis, such as one's family context or living situation, are thought to have more immediate influence on individual outcomes than macro level factors such as the economic stability of the region.

1.2. SMI populations and supported housing programs

Supported housing programs emerged from the broader deinstitutionalization movement that created a need for alternative treatment and rehabilitation services for previously hospitalized seriously mentally ill populations (Rudkin, 2003). Such programs were designed to provide a comprehensive range of services to consumers, with different levels of supervision available to meet individuals' needs (Aiken, Somers, & Shore, 1986). Further, supported housing programs are designed to supply enough budgetary control over service provision that consumers are assured of consistently receiving services and making stable and safe housing affordable (Aiken et al., 1986; Cohen & Somers, 1990).

Supported housing models facilitate independent living for mentally ill persons through financial aid (e.g., a housing subsidy, Section 8 certificates) and mental health services by the provision of case managers, Assertive Community Treatment (ACT) teams or other service providers (Carling, 1993; Newman, Rechovsky, Kaneda, & Hendrick, 1994; Rog, 2004; Wong & Solomon, 2002). In most states, it is typical for individuals to be referred to a supported housing program by staff at their community mental health center once they have reached a threshold for clinical stability. Once in the programs, they are still usually connected with their mental health center, but hold the lease to the apartment in their own names and are responsible for paying portions of their rent and utilities. The degree to which supported housing residents utilize mental health services from their community mental health center may vary widely.

Supported housing models that facilitate recovery and community reintegration for persons with serious mental illness have been shown to have a positive influence on overall psychosocial well-being across various domains (Kloos, 2005a). For instance, housing quality among SMI populations has been shown to be associated with increased housing stability, or

tenure, higher rates of housing satisfaction, reduced utilization of mental health services, mastery over environment, and improved family and other social ties (Gulcur, Stefancic, Shinn, Tsemberis, & Fischer, 2003; Newman et al., 1994; Rog, 2004; Rosenfield, 1991; Tsemberis & Eisenberg, 2000; Tsemberis, Gulcur, & Nakae, 2004). Further, recent studies document links between individuals' participation in supported housing and a reduction in their psychiatric symptoms (Greenwood, Schaefer-McDaniel, Winkel, & Tsemberis, 2005).

Previous research on supported housing and its influence on mental health outcomes provide methodological and theoretical foundations for subsequent studies. However, there is further methodological sophistication that can be applied to the conceptualization and measurement of housing environments and their influence on individuals. The current research adds to the body of literature on supported housing in two ways. First, this research incorporates data from multiple sources of measurement and secondly, examines housing environment influence on well-being through a levels of analysis lens. By conceptualizing housing environment as existing in different ecological levels, the study seeks to answer whether perceived characteristics of one's dwelling, immediate neighborhood or broader surrounding area have different relationships with domains of well-being.

1.3. Defining housing environment

Housing environments have physical, social and psychological attributes (Hartig & Lawrence, 2003; Kloos, 2005b). For instance, while the physical environment may encompass tangible and observable attributes such as available green space or broken windows, litter and structural damage of buildings, the social and psychological factors encompass the experience of community living, including such experiences as forging relationships with neighbors, feeling safe or feeling discriminated against and unwelcome, and feeling a sense of belonging (Kloos, 2005b). These aspects of environments are largely "unavailable" to a rater making observations of an unfamiliar neighborhood at one point in time.

This study conceptualizes these interconnected elements of housing environments and includes examples of each in its measurement model. Physical characteristics consist of the self-reported and observed rated qualities of dwellings and of the surrounding neighborhood. For psychosocial elements of the housing environment, this study investigates the self-reported quantity and quality of social interactions between neighbors, the level of acceptance individuals from diverse backgrounds feel within their neighborhood, crime rates and other forms of victimization, transportation adequacy, feeling safe and feeling that one has an important social role in the neighborhood.

1.4. Well-being outcomes in housing research for persons with SMI

Much of the literature on environmental influences uses broad measures of psychological or physical well-being as outcome indicators of influence. Depending on the specific population and environmental effects under study, individual-level outcome measures may include stress, anxiety, family discord, or physical health measures (Rog, 2004). In housing research with SMI populations, commonly cited outcomes are length of residency, quality of family and other social relations, re-hospitalization rates and various other related indicators of symptom severity (Newman, 1994; Rog, 2004). In the current study, four outcome measures were chosen for their conceptual relevance to the social and psychological factors that are part of one's overall housing experience. They are (a) psychiatric distress, (b) orientation to recovery from episodes of mental illness, (c) residential satisfaction, and (d) adaptive functioning. Each construct is described more fully in Section 2.

1.5. Conceptual framework and hypotheses

This study broadly asks how housing environment factors, those perceived by research participants and those observed by raters, may influence individual level well-being outcomes. The housing environment predictors for the study are multi-method and multi-level in nature. First, they represent multiple modes of measurement, including self-report, observer ratings and census data. Secondly, the predictors represent the apartment, neighborhood and census tract levels of one's housing environment. That is, predictors from the apartment level capture the physical quality of participants' dwellings, while neighborhood level predictors capture physical and social qualities of the surrounding community. Finally, the most macro predictor is an aggregate of census data reflecting socioeconomic conditions in a participant's census tract. Variables at each of these levels are used to predict outcomes on psychiatric distress, orientation to recovery, residential satisfaction and adaptive functioning. Fig. 1 is a schematic representation of this model, which includes the measures used to create each level of analysis.

Hypotheses were first, that the self-report and observer ratings of one's environment would be *moderately* (Cohen, Cohen, West, & Aiken, 2003) and positively correlated with individual psychosocial factors: a more favorable report of one's housing environment by multiple methodological sources was expected to be related to better well-being outcomes. More specifically, the analyses examined the differential relationships between levels of environmental influence and outcomes, asking which levels of analysis, and which factors within each level, were most salient to mental health outcomes for this special population. Given tenets of the ecological model, i.e. that more proximal spheres of influence have the most impact on individuals, the following results were hypothesized: (a) the apartment level of the housing environment would explain the most variability in well-being outcomes, (b) that the neighborhood level would explain the second largest amount of variability and (c) that the census tract would explain the third largest amount—with a predicted small effect size—of variability in the well-being outcomes of psychiatric distress, residential satisfaction, recovery and adaptive functioning.

2. Methods

The Housing Environment Survey (HES), an original instrument with multiple subscales, was used to interview mental health consumers. Participants ($N = 249$) represented 10 different cities and 34 different housing sites across a southeastern state. Participants' utilization of social and mental health services varied widely, depending on the nature of the supported housing program and participants' needs: some housing sites provided on-site services, while other participants lived in settings where no professional mental health services were provided (Stillman, Kloos, & Murff, 2005).

Study participants were nearly evenly divided by gender, with 51.8% being female. Racial categories broke down along the following lines: 52.8% were Black, 37.8% of the participants were White, 1.2% were Alaskan Native or Native American, 0.4% were Asian, 4.8% reported being multiracial, and 2.8% reported their ethnicity as "other." The average age of the participants was approximately 46 years. The average level of educational attainment was high school graduation or completion of a GED. At the time of the interview, 4.4% reported being married or living with someone in a marital-like relationship, while 48.6% had never been married or never lived with someone in a marital-like relationship. Only a small proportion of participants, 2.8%, had children under the age of 18 living with them. The majority of participants (65.9%) lived in one-bedroom dwellings, most commonly apartments, while 30.5% lived in two bedroom dwellings and the remainder lived in settings with more than two roommates. The number of bedrooms in the apartment appeared to mirror whether the participant lived alone, as 67.9% lived alone and 30.5% had more than one person living in the home.

2.1. Measures

2.1.1. Predictor variables—There are six predictor variables included in this study, each of which measures different elements of the housing environment and each of which represents different levels of analysis. Table 1 provides descriptive statistics for the predictor and outcome scales, and includes internal consistency alphas as well as test–retest reliability coefficients, where available.

2.1.1.1. Apartment and neighborhood levels of analysis: The Housing Environment Survey (HES) is a structured interview measuring multiple domains of ecological settings and adaptive functioning (Kloos, Shah, Frisman, & Rodis, 2005). Each of the three HES scales used in the current analyses use a 5-point Likert response set, ranging from “Strongly Agree” to “Strongly Disagree”. First, the Physical Quality Scale (HES-PQ) measures participants’ perceptions of the physical quality of their living space, including having adequate space and perceiving the structure of the dwelling to be in good condition. Second, the Neighborhood Quality Scale (HES-NQ) measures participants’ perceptions of the quality of their neighborhood, and focuses on physical attributes of the area as well as availability of services, perception of crime and perceived utility of public spaces. Third, the Neighborhood Social Climate Scale (HES-NSC) measures the social and interpersonal relationships that are considered part of one’s overall housing environment. The HES-NSC includes perceptions of belonging, acceptance and community tolerance. Based upon data from a sub-sample ($n = 85$), one-week test–retest reliability of the HES scales indicates adequate reliability. Pearson correlations were significant ($p < .001$) and were .75 for the HES-PQ scale, .71 for the HES-NQ scale and .68 for the HES-NSC scale.

In addition to the self-report data provided by the HES interview, an observer-rating checklist of each participant’s living space and surrounding neighborhood was completed by interviewers trained in its use. There was an average number of 3.14 raters completing the HERS checklist for any one site, with a range from 1 to 7 raters. The Housing Environment Rating Scale (HERS) provides an alternative method of measuring the physical quality of the participants’ living space and of the surrounding neighborhood that does not rely on the self-report of the participant. Instead, the HERS measures the observations of the researchers trained in using the instrument in a standardized manner. The HERS is a dichotomous, “present” or “absent” checklist divided into two sections, (1) the HERS-physical quality (PQ), which corresponds with the HES-PQ and focuses on qualities of the participant’s living space, and (2) the HERS-neighborhood quality (NQ), which focuses on the physical qualities of block area surrounding the participant’s apartment or home. The items of the HERS-PQ checklist were summed to create the HERS-PQ scale, and the items of the HERS-NQ checklist were summed to create the HERS-NQ scale. In order to limit possible rater bias, average ratings of each housing site were calculated. This allowed the use of a single, average HERS-NQ score for each housing site.

The HERS had limited variability, which is a likely manifestation of the relative homogeneity of the housing sites included in this sample: possible reasons for this homogeneity as well as proposals to sample more diverse housing environments in future research are included in Section 5 of this paper.

2.1.1.2. Census tract level of analysis: The Community Profile (CP) reflects a proxy measure of environmental factors in the form of 2000 Census data reported at the census tract level. The elements included in the construction of the CP include the following: (a) number of inhabitants living under the poverty level, (b) number of residents unemployed, (c) percentage of owner occupied households¹, and (d) educational attainment, operationalized as percentage of (age appropriate) people living in the tract with no high school education. Higher percentages

on the CP reflect worse socioeconomic conditions for the tract. The CP was created by geocoding the addresses of each site and matching it up with data for its appropriate census tract. Geocoding involves mapping each address on an electronic map of the state, which is then overlaid onto an electronic map of census tract boundaries.

2.1.2. Outcome variables—Four well-being outcome constructs are independently examined in the current study. Three of the domains are self-report measures taken from the HES interview. Additionally, in order to provide a second mode of measurement of overall well-being, the perspectives of case managers of their clients' adaptive functioning are included. Table 1 provides descriptive statistics and alphas for the following outcome variables.

2.1.2.1. Psychiatric distress: The 53-item Brief Symptom Inventory (BSI) (Derogatis, 1993) provides a measure of symptom severity, which is a frequently used outcome variable in housing research with SMI populations (e.g., Evans, Wells, & Moch, 2003). The Global Severity Index (GSI) of the BSI is used in the current analyses. The GSI, calculated using all 53 items, is the most sensitive indicator available with the use of the BSI, as it measures participants' global distress level by combining information about the number of symptoms experienced as well as their intensity. Participants respond on a five-point scale ranging from "Not at all" to "Extremely." Mean imputation was also used for the BSI-GSI, as very few data were missing from these items, with the largest percentage being 1.07% ($n = 4$ items). The missing data in the BSI-GSI is of negligible concern, as validation research on the scale has shown that randomly deleting items from completed tests only begins to alter the GSI substantially when upwards of 25% of data is missing (Derogatis, 1993).

2.1.2.2. Orientation to recovery: This Recovery Scale (RecS) was developed by the South Carolina Department of Mental Health to track the efficacy of their various recovery initiatives. Constructs included in this operationalization of recovery include feelings of personal control and worthlessness, self-knowledge, efficacy surrounding self-management, degree of service utilization and satisfaction with services. Participants respond on a five-point scale ranging from "Strongly Agree" to "Strongly Disagree." This measure captures an orientation toward issues thought to aid or enhance recovery efforts.

2.1.2.3. Residential Satisfaction: The Residential Satisfaction scale is composed of four, five-point self-report items from the HES interview that inquire into the degree of satisfaction participants feel towards their neighbors, landlord or property manager, housing and surrounding neighborhood. Responses range from "Extremely Dissatisfied" to "Extremely Satisfied."

2.1.2.4. Adaptive functioning: Case managers for each research participant were asked to complete a 10-item survey inquiring into the adaptive functioning of their clients. Adaptive functioning as a construct encompasses social and vocational functioning as well as the client's ability to cope effectively with their mental illness and other life circumstances. The dimensions surveyed include alcohol and other substance abuse, degree of social interaction, housing stability, level of clinical stability, psychiatric symptom severity, experiences of victimization, and medication compliance. Case managers responded on five-point scales indicating the extent to which they found statements about the above-mentioned dimensions to be true for each of their clients.

¹This measure was reverse coded for analyses.

3. Results

Hierarchical regression models were used to test the main hypotheses, and post hoc stepwise regressions were used to provide more information about the nature of housing environment influence. Four linear hierarchical regressions—one for each outcome variable—were run. The blocks were entered in the following order: (a) apartment level (HES-PQ and HERS-PQ), (b) neighborhood level (HES-NQ, HERS-NQ, and HES-NSC), and (c) census tract (CP). Pearson's correlations, which are in the expected directions, are presented in Table 2.

3.1. Overview of results

Findings supported the primary stated hypothesis: more favorable ratings of participants' housing environments were found to be associated with better well-being outcomes. Specifically, better overall ratings of housing environment—from multiple sources—correlated with more favorable reports of psychiatric distress, recovery, residential satisfaction and adaptive functioning. However, as expected, the different levels of analysis had varying predictive value for the four independent outcome measures. While it had been hypothesized that apartment level predictors would explain more variance in well-being outcomes than neighborhood, the neighborhood level predictors proved most helpful in explaining variance in outcomes. Additionally, although the census tract variables had been hypothesized to add at least a small amount of significant explanation, these variables proved non-significant in the hierarchical regression models. The summaries of the hierarchical regression results are presented in Tables 3–6.

3.1.1. Psychiatric distress—As shown in Table 3, the first regression asked how much variance in psychiatric distress could be explained by housing environment factors at different levels of analysis. The apartment level predictors alone explained 5% of the variance in distress ($F(2, 246) = 5.87, p < .01$). The entry of neighborhood level variables explained an additional 12% of the variance in distress ($F(5, 243) = 9.32, p < .01$). No additional variance was explained with the addition of the CP tract variable to the model ($F(1, 242) = 7.742, p < .90$).

3.1.2. Recovery—As shown in Table 4, the second regression examined how much variance in scores on the recovery scale could be explained by the housing environment variables. Apartment and neighborhood level variables explained the bulk of the variance in the recovery variable. The apartment variables explained 14% of the variance ($F(2, 246) = 19.6, p < .01$), and the neighborhood level variables explained an additional 10% ($F(5, 243) = 15.44, p < .01$). The tract level variables did not contribute a significant amount of explanation of variance in recovery ($F(6, 242) = 12.86, p < .01$).

3.1.3. Residential satisfaction—As shown in Table 5, the third regression run posited residential satisfaction as the outcome, and asked how well satisfaction could be explained by the model. The apartment level variables explained 16% of the variance in reported residential satisfaction ($F(2, 246) = 24.18, p < .01$). The neighborhood variables added explanation of 12% of the variance ($F(5, 243) = 19.04, p < .01$). Again, the tract level variables did not enhance the predictive validity of this model ($F(6, 242) = 15.81, p < .01$).

3.1.4. Adaptive functioning—Finally, the fourth regression asked how well variance in case manager ratings could be explained by the housing environment variables, as shown in Table 6. The apartment level predictors explained 2% of the variance in the case manager report ($F(2, 246) = 3.04, p = .05$). The neighborhood level variables as an additional predictor did not add a significant amount of explanation ($F(3, 243) = 2.51, p < .10$). The tract level variable continued its insufficient contribution and did not add significant explanation to the model ($F(1, 242) = 2.18, p < .50$).

3.2. Post hoc stepwise analyses

The hierarchical regression models demonstrated that (1) the community profile at the census tract level of analysis was not a strong predictor of any of the examined well-being outcomes, and (2) neighborhood level variables consistently had higher Beta weights than the apartment level variables. Ecological models posit that levels of environment closest to the individual exert the strongest influence on the individual and that this influence lessens as one moves away from the “epicenter” of one’s home or dwelling. However, the findings from the above regressions suggested that the neighborhood level, not the apartment level variables were more salient in the interpretation of environmental influence on well-being for the current population. This suggested that the order of entry of predictor variables may have been obscuring important trends in the data. Therefore, post hoc stepwise regressions (omitting the community profile predictor) were run in order to determine whether individual predictor variables in the model were more predictive when taken out of their level of analysis and no longer entered as blocks. Table 7 summarizes the significant findings from the four stepwise regressions.

3.2.1. Psychiatric distress—The stepwise model showed that in predicting symptom severity, the HES-NSC and HES-NQ scales were the only two housing environment variables included in a predictive model, and they explained 15% of the variance in the BSI-GSI score $F(2, 246) = 8.60, p < .01$.

3.2.2. Recovery—For recovery, the HES-NSC explained the most variance, followed by the HES-NQ and then the HES-PQ. Together, these HES variables explained 23% of the variance in the SCDMH-R score $F(3, 245) = 24.93, p < .01$.

3.2.3. Residential satisfaction—The residential satisfaction outcome was also explained by the three HES scales, though order of entry was slightly different: HES-NSC was again entered first, but it was followed by the HES-PQ and then the HES-NQ. This was the only well-being domain in which perceived physical qualities of the apartment “outperformed” perceived qualities of the neighborhood, though neither was as predictive as neighborhood social climate. Taken together, however, these variables explained 28% of the variance in residential satisfaction $F(3, 245) = 30.94, p < .01$.

3.2.4. Adaptive functioning—For the case managers’ ratings of adaptive functioning, the HES-NSC alone accounted for a small yet significant amount (4%) of variance in case manager ratings $F(1, 247) = 9.26, p < .01$.

4. Discussion

In congruence with the stated hypotheses, results of this study indeed show that more favorable ratings of one’s housing environment are related to multiple well-being outcomes. Further, different levels of housing environments—apartment, neighborhood, and census tract level—were shown to have differential effects on various domains of individuals’ well-being. Specifically, results of these analyses lead to the conclusion that the perception of one’s immediate surrounding neighborhood is more powerful for predicting well-being than (1) the perceived physical quality of the dwelling and (2) distal socioeconomic factors. In three of the four planned hierarchical models—those exploring psychiatric distress, recovery and residential satisfaction—neighborhood focused variables explained more variance in well-being than the apartment and census tract variables. In particular, for this sample, perceptions of neighborhood social climate proved to be the single most predictive housing environment factor for understanding variability in well-being outcomes.

4.1. Role of perceptions of environment

Although this study successfully combined self-report and observer rating data into an overall predictive model of well-being, the self-report perceptions proved more salient in explaining variance in the measured outcome variables than observer ratings and census data. The relative efficacy of self-report measures in predicting outcomes is a common finding in research on environmental influence that speaks to the power of individuals' perceptions of environment in mediating effects of the environment itself (Evans et al., 2003). Perceptions of environment are consistently better predictors of outcomes than objective measures of constructs such as deterioration of structures and crowding (Stiffman et al., 1999; White et al., 1987), likely because they include aspects of understanding environments that are not captured by observer ratings made by persons unfamiliar with the location (e.g., impressions formed from multiple experiences, place attachment). However, the perceptions of individuals are indeed a subjective measure. Therefore, the inclusion of the HERS observer rating scales in the original hierarchical models help mollify concerns that participants' general orientation—whether grossly positive or negative—accounts for their reported perceptions of their apartment or neighborhood.

4.2. Implications for supported housing programs

The current study shows that individuals' perceptions of the physical quality of their apartment does have a relationship with well-being outcomes. Given the context of supported housing programs, this construct not only represents the physical aspects of the apartments, but also represents, to some extent, the amount of attention and care given residents by the property or case managers responsible for maintaining the physical qualities of the housing site. This study suggests that continued attention to the physical attributes of housing operated by community mental health centers or their partners is warranted. Additionally, this study suggests that particular attention be paid to the amenities available to consumers in their surrounding neighborhoods. Qualities such as traffic, good lighting and sidewalks, availability of transportation and services, and accessibility to other areas of the community appear to influence well-being for this population. These neighborhood level elements should be taken into account when choosing where to locate new developments, although the financial difficulty in securing affordable housing and community resistance to Section 8 Housing developments is recognized as a clear barrier to placing such developments in the most prime areas.

Finally, participants' perceptions of the neighborhood social climate proved to be quite important in predicting a variety of well-being outcomes. This suggests the appropriateness of a wide range of community level interventions aimed at increasing tolerance for diversity and disability as well as increasing the frequency and quality of contact between neighbors. In this sample, many of the participants live in apartment complexes with other people with serious mental illness; that is, their neighbors are also their fellow mental health consumers. It is less clear what role social climate would play for persons not living with or near many other persons with SMI. Further, many of the housing programs have on-site staff that could help facilitate neighborhood-level social interactions. This speaks to the possibility for mental health centers to guide interventions aimed at enhancing a psychological sense of community within the smaller group of consumers in an apartment complex as well as with their surrounding community.

5. Limitations

As alluded to above, the primary limitations of this study for detecting environmental influences on well-being were methodological in nature. A premise of the study was that by combining (1) self-report of perceptions of environment and well-being, (2) observer and

census ratings of environment, and (3) case manager ratings of well-being, a more comprehensive picture of how housing environment influences SMI individuals would be obtained. This was partially achieved. The self-report scales were the best predictors of overall well-being, three domains of which were also self-reported. This alludes to the primacy of that measurement method given the modes of data analysis used here. The HERS observer rating scales—and particularly the HERS-PQ—turned out to have limited variance and therefore less power to detect differences and effects. The analyses may also have been improved by a more detailed census tract level community profile. The elements of that predictor were intentionally chosen to be macro measures of socioeconomic conditions, yet it does not appear to have adequately captured the experiences of the study participants. Future studies should seek to use more and different variables available through census databases to create proxy measures for community level data that is more accurately descriptive of individuals' experiences. It is likely that community data at a level of analysis slightly "closer to" the individual would have stronger predictive validity for well-being.

A finding that was counter to the stated hypotheses was that neighborhood quality explained more variance in well-being outcomes than apartment quality. What are the implications of this finding for thinking about the importance of apartment quality in supported housing programs? First, there is a possible sampling issue that might attenuate the importance of apartment level quality for well-being outcomes. That is, the population included in this study receives public housing assistance (e.g., Section 8), which makes better quality housing more affordable. Further, this sample's placement in their apartment is facilitated and maintained by their contact with their local mental health center. Because the apartment quality is monitored by mental health services, there may have been homogeneity to apartment quality that cloaked more dramatic effects. While the "quality control" provided by the mental health services is likely beneficial for individuals, it stunts the range of physical quality in housing that may be found within matched samples who do not have this type of monitoring. Future studies will include a wider variety of housing environments, purposefully sampling those apartments which are not subsidized and do not have regular inspections or upkeep, as Section 8 Housing often does. These future studies may more aptly capture the effects of stable and higher quality housing for seriously mentally ill adults.

Future studies will also employ modeling techniques in order to better demonstrate the relative impact of various factors and the multiple levels of one's housing environment. In addition, future studies will also systematically measure the impact of variability in the nature of mental health services received in different housing sites and examine the interaction of these services with the housing environment itself and individual level facets of recovery.

Finally, a conceptual issue may help explain the unexpected, yet moderate, greater influence of neighborhood over apartment level variables. Ecological models posit that levels most proximal to individuals have the greatest amount of influence. Indeed, emerging research reinforces this paradigm by demonstrating that the physical qualities of one's housing—both interior and exterior appearance of a dwelling—explain more variance in socioemotional health of children than qualities of their neighborhood in a one block radius (Gifford & Lacombe, 2006). Again, the limited variability in physical quality of apartments sampled in the current study may help explain the strong emergence of neighborhood level predictors over apartment level predictors. However, an important difference here is also the inclusion of participants' perceptions of neighborhood social climate in addition to the perception of observable properties of the physical neighborhood. Perhaps more than anything, the importance of the current study is the augmentation to existing research demonstrating relationships between housing quality and well-being outcomes for various populations: our results point to the importance of social relationships and individuals' overall sense of comfort in a neighborhood, both of which are contextualized by physical qualities of the housing environment.

From an ecological lens, an initial assumption of the current analyses that apartment level variables are “closer” to individuals than their physical neighborhood or their neighborhood social climate was made. Perhaps the inherently social qualities of the neighborhood level predictors (the HES-NSC) made them more salient, and therefore more *proximal* than the measures of observable apartment quality.² Alternatively, it is possible that the apartment and neighborhood level variables more accurately reflect a single level of analysis, and that future investigations of levels of housing environment should conceptualize the ecological level closest to the individual as a larger concentric circle of influence.

6. Conclusion

This study demonstrates that, for a sample of adults with serious mental illness, neighborhood level variables, especially those relating to participants’ perceptions of the social environment, are influential predictors for understanding variance in well-being. Importantly, neighborhood level predictors were more influential than apartment and community level predictors in explaining variance in psychiatric distress, recovery, residential satisfaction and adaptive functioning. By conceptualizing housing environment in a way that categorized levels of environment, the salience of social relationships was allowed to emerge as one of the most important elements that a supported housing program might hope to facilitate.

Acknowledgements

Preparation of this manuscript was supported by funding from the National Institute of Mental Health—K23-MH65439. Thanks to staff and consumers of the South Carolina Department of Mental Health who made this research possible, and to Lynn Shirley, Geography Department, University of South Carolina.

References

- Aiken L, Somers S, Shore M. Private foundations in health affairs: A case study in the development of a national initiative for the chronically mentally ill. *The American Psychologist* 1986;41(11):1290–1295. [PubMed: 3813187]
- Bronfenbrenner, U. *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press; 1979.
- Carling PJ. Housing and supports for persons with mental illness: Emerging approaches to research and practice. *Hospital and Community Psychiatry* 1993;44(5):439–449. [PubMed: 8509074]
- Cohen, J.; Cohen, J.; West, SG.; Aiken, LS. *Applied multiple regression/correlation analysis for the behavioral sciences*. 3. Mahwah, NJ: Lawrence Erlbaum Associates; 2003.
- Cohen MD, Somers S. Supported housing: Insights from the Robert Wood Johnson Foundation program on chronic mental illness. *Psychosocial Rehabilitation Journal* 1990;13(4):43–50.
- Derogatis, LR. *Administration, scoring and procedures manual*. 4. Minneapolis, MN: National Computer Systems; 1993. BSI Brief symptom inventory.
- Evans GW, Wells NM, Moch A. Housing and mental health: A review of the evidence and a methodological and conceptual critique. *Journal of Social Issues* 2003;59(3):475–500.
- Gifford R, Lacombe C. Housing quality and children’s socioemotional health. *Journal of Housing and the Built Environment* 2006;21:177–189.
- Greenwood RM, Schaefer-McDaniel NJ, Winkel G, Tsemberis SJ. Decreasing psychiatric symptoms by increasing choice in services for adults with histories of homelessness. *American Journal of Community Psychology* 2005;36:223–238. [PubMed: 16389497]
- Gulcur L, Stefancic A, Shinn M, Tsemberis S, Fischer SN. Housing, hospitalization and cost outcomes for homeless individuals with psychiatric disabilities participating in continuum of care and housing first programmes. *Journal of Community & Applied Social Psychology* 2003;13(2):171–186.

²A reviewer’s comments have been helpful here in encouraging this research methodology, as well as future designs, not confound psychosocial and physical issues inherent in the housing environment.

- Hartig T, Lawrence RJ. The residential context of health. *Journal of Social Issues* 2003;59(3):455–476.
- Kloos, B. Creating new possibilities for promoting liberation, well-being, and recovery: Learning from experiences of psychiatric consumers/survivors. In: Nelson, G.; Prilleltensky, I., editors. *Community psychology: In pursuit of well-being and liberation*. London: Macmillan; 2005a. p. 426–447.
- Kloos, B. Mapping the social ecology of supported housing for persons with serious mental illness. Symposium at the 10 biennial meeting of the Society for Community Research and Action; Champaign, IL. 2005b. Chair
- Kloos B, Shah S, Frisman L, Rodis E. Housing environment survey. 2005 Unpublished manuscript
- Lewin, K. *Field theory in social science*. New York: Harper and Row; 1951.
- Newman SJ. The housing and neighborhood conditions of persons with severe mental illness. *Hospital and Community Psychiatry* 1994;45(4):338–343. [PubMed: 8020918]
- Newman SJ, Rechovsky JD, Kaneda K, Hendrick AM. The effects of independent living on persons with chronic mental illness: An assessment of the Section 8 Certificate program. *The Milbank Quarterly* 1994;72:171–198. [PubMed: 8164607]
- Rog D. The evidence on supported housing. *Psychiatric Rehabilitation Journal* 2004;27(4):334–344. [PubMed: 15222146]
- Rosenfield S. Homelessness and rehospitalization: The importance of housing for the chronically mentally ill. *Journal of Community Psychology* 1991;19:60–69.
- Rudkin, JK. *Community psychology: guiding principles and orienting concepts*. Upper Saddle River, NJ: Prentice-Hall; 2003.
- Seybolt, DC.; Linney, JA. A community integration model for persons with serious mental illness. Poster presentation at the 8th biennial conference of the Society for Community Research and Action; Atlanta, GA. 2001.
- Stiffman AR, Hadley-Ives E, Elze D, Johnson S, Dore P. Impact of environment on adolescent mental health and behavior: Structural equation modeling. *American Journal of Orthopsychiatry* 1999;69(1):73–86. [PubMed: 9990438]
- Stillman, LR.; Kloos, B.; Murff, M. Building an evidence base: Supported housing environments & adaptive functioning. In: Hunter-Williams, J., (Chair) , editor. *How can housing research inform public policy*; Symposium at the annual convention of the American Psychological Association; Washington, DC. 2005.
- Tsemberis S, Eisenberg RF. Pathways to housing: Supported housing for street-dwelling homeless individuals with psychiatric disabilities. *Psychiatric Services* 2000;51(4):487–493. [PubMed: 10737824]
- Tsemberis S, Gulcur L, Nakae M. Housing first, consumer choice and harm reduction for homeless individuals with a dual diagnosis. *American Journal of Public Health* 2004;94(4):651–656. [PubMed: 15054020]
- White M, Kasl S, Zahner GEP, Will JC. Perceived crime in the neighborhood and mental health of women and children. *Environment and Behavior* 1987;19(5):588–613.
- Wong YI, Solomon PL. Community integration of persons with psychiatric disabilities in supportive independent housing: A conceptual model and methodological considerations. *Mental Health Services Research* 2002;4(1):13–28. [PubMed: 12090303]

Fig. 1.
Regression models tested in current study.

Photo 1.

A research participant proudly displays her decorated front door. Of her home she said, “I Love this place and I have freedom and I have peace and I’m comfortable.”

Photo 2.
A research participant stands in front of his home.

Photo 3.
A research participant shows off his keys to the community room of his apartment complex.

Table 1

Description of scales used in analyses

Scale title	Source	Scale description	Number of items	Internal consistency alpha	Mean (SD)	Skewness	Test-retest reliability ^a
<i>Housing environment predictor variables</i>							
HES-PQ	Self-report	Perceived physical quality of home	14	.79	55.72 (6.43)	-.08	.75***
HES-NQ	Self-report	Perceived quality of neighborhood	14	.72	49.59 (6.76)	-2.56	.71***
HES-NSC	Self-report	Perceived social climate in neighborhood	17	.79	45.31 (6.79)	-.04	.68***
HES-PQ	Observer rating	Physical quality of home	17	n/a	15.04 (1.65)	-.25	n/a
HES-NQ	Observer rating	Physical quality of neighborhood	17	n/a	14.54 (1.05)	-1.79	n/a
CP	Census data	Proxy socioeconomic factors	4	.84	1.00 (2.01)	.57	n/a
<i>Well-being outcome variables</i>							
BSI	Self-report	Psychiatric distress	53	n/a	.83 (.68)	.92	.90 ^b
RecS	Self-report	Recovery from serious mental illness	27	.85	102.81 (11.60)	.26	n/a
HES-RS	Self-report	Residential satisfaction	4	.63	16.63 (2.40)	-.77	n/a
CMR-AF	Case managers' rating	Adaptive functioning	10	.84	24.98 (6.32)	.53	n/a

* $p < .05$,

** $p < .01$,

*** $p < .001$.

^a As the HES scales were under development during the current study, one week test-retest reliability was analyzed with a sub-sample ($n = 85$) and measured only the HES scales.

^b Derogatis (1993).

Table 2
Pearson correlations among housing environment and well-being variables

	1	2	3	4	5	6	7	8	9	10
<i>Predictor variables</i>										
1. Housing Environment Survey-Physical Quality	—									
2. Housing Environment Rating Scale-Physical Quality	.15*	—								
3. Housing Environment Survey-Neighborhood Quality	.50**	.10	—							
4. Housing Environment Survey-Neighborhood Social Climate	.48**	.03	.55**	—						
5. Housing Environment Rating Scale-Neighborhood Quality	.11	.32**	.09	.11	—					
6. Community Profile	.01	.01	-.06	-.11	-.02	—				
<i>Outcome variables</i>										
7. Brief Symptom Inventory-Global Severity Index	-.19**	.08	-.31	-.37	-.03	.03	—			
8. Recovery Scale	.36**	-.03	.40**	.43**	.00	.00	-.48**	—		
9. Housing Environment Survey-Residential Satisfaction	.41**	.06	.42**	.46**	-.01	-.03	-.19**	.29**	—	
10. Case Manager Report-Adaptive Functioning	-.15*	-.04	-.07	-.19**	-.09	-.04	.08	-.24**	-.20**	—

* $p < .05$,

** $p < .01$.

Table 3

Summary of hierarchical regression analysis for predicting psychiatric distress from housing environment factors

	Beta	R^2	R^2 change
Block 1: apartment level		.05**	—
HES-PQ	.02		
HERS-PQ	.11		
Block 2: neighborhood level		.16	.12**
HES-NQ	-.18*		
HES-NSC	-.28**		
HERS-NQ	-.02		
Block 3: census Tract		.16	.00
CP	.01		

*
 $p < .05$,**
 $p < .01$.

Table 4

Summary of hierarchical regression analysis for predicting recovery from housing environment factors

	Beta	R^2	R^2 change
Block 1: apartment level		.14**	—
HES-PQ	.16*		
HERS-PQ	-.07		
Block 2: neighborhood level		.24	.10**
HES-NQ	.18		
HES-NSC	.26**		
HERS-NQ	-.04		
Block 3: census tract		.24	.00
CP	.03		

*
 $p < .05$,**
 $p < .01$.

Table 5

Summary of hierarchical regression analysis for predicting residential satisfaction from housing environment factors

	Beta	R^2	R^2 change
Block 1: apartment level		.16**	—
HES-PQ	.19**		
HERS-PQ	.03		
Block 2: neighborhood level		.28	.12**
HES-NQ	.18*		
HES-NSC	.28**		
HERS-NQ	-.09		
Block 3: census tract		.28	.00
CP	-.01		

*
 $p < .05$,**
 $p < .01$.

Table 6

Summary of hierarchical regression analysis for predicting adaptive functioning from housing environment factors

	Beta	R^2	R^2 change
Block 1: apartment level		.02 [*]	—
HES-PQ	-.10		
HERS-PQ	-.01		
Block 2: neighborhood level		.05	.03
HES-NQ	.07		
HES-NSC	-.18 [*]		
HERS-NQ	-.06		
Block 3: census tract		.05	.00
CP	-.04		

*
 $p < .05$,**
 $p < .01$.

Table 7
Summary of stepwise regression analyses for predicting well-being outcomes from housing environment factors

	Beta	R^2	R^2 change
Psychiatric distress			
HES-NSC	-.28	.13 **	—
HES-NQ	-.16	.15	.02 *
Recovery			
HES-NSC	.26	.18 **	—
HES-NQ	.17	.22	.04 **
HES-PQ	.15	.23	.02 *
Residential satisfaction			
HES-NSC	.27	.21	—
HES-PQ	.19	.26	.04 **
HES-NQ	.18	.28	.02 **
Adaptive functioning			
HES-NSC	-.19	.04 **	—

*
 $p < .05$,

**
 $p < .01$.