LIVING SPACE: DETERMINING THE FACTORS THAT AFFECT HEALTH AT THE BUILDING LEVEL IN VANCOUVER’S DOWNTOWN EASTSIDE

by

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Abstract

**Background:** Despite the importance of housing to health, there continues to be a dearth of research on housing in Vancouver’s Downtown Eastside (DTES). The two types of housing available to low-income people in this area are social housing and single room occupancy (SRO) housing. This thesis sought to evaluate low-income housing in the DTES by: reviewing the literature on housing and health; and evaluating the impact of the housing environment on stable and unstable tenants’ change in health compared to 1 year before the survey was taken.

**Method:** This is a secondary analysis of data collected in 2007 as part of the *Downtown Eastside Demographic Study of SRO and Social Housing Tenants*. Tenants were aggregated to the building level based on their length of tenancy. Stable tenants were classified as living at their address for more than 1 year, while unstable tenants had lived at their address for less than 1 year. Multiple-regression analysis was used to determine which factors of the housing-environment contributed to better health-outcomes at the building level. **Results:** The literature review found that no studies have taken a building level approach to exploring the health outcomes of tenants, despite numerous qualitative accounts of the importance of the building-environment. Multiple-regression analyses demonstrated that social housing significantly contributed to health for both stable and unstable tenants. Building level health was also significantly higher if stable tenants were satisfied with building management. Unstable tenants were adversely affected if there were reports of problems-with-safety in the building, especially if they also lived in SRO housing. Furthermore, problems-with-safety was linked to problems-with-drugs.

**Conclusion:** Social housing in all analyses contributed to significantly better health compared to 1 year ago. Consistent with qualitative findings problems-with-safety are especially detrimental
to health for tenants of SRO buildings. Interventions to reduce instability within low-income housing include the facilitation of a safe environment, which is likely related to the quality of building management. Evaluative measures, to ensure quality building management, are essential to promoting stability and health within both SRO and social housing buildings.
Preface

The data used in the following analyses is from the “Downtown Eastside Demographic Study of SRO and Social Housing Tenants” completed in April 2008. The Behavioural Research Ethics Board has reviewed the procedures of this study and found them to be appropriate for research involving human subjects. The certificate of approval; H11-00451 was issued on April 15, 2011 after permission to access the data was granted by the City of Vancouver and BC Housing.
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Dedications

To the Residents and Staff at the Portland Hotel Society who taught me the importance of Housing.
Chapter 1: Introduction

The Research Problem

In 2007 over 1,200 residents living in Vancouver’s Downtown Eastside (DTES) were surveyed as part of a partnership between the City of Vancouver, Province of British Columbia and federal government that sought to revitalize the area. This survey was in response to a call to gain a better understanding of Single Room Occupancy (SRO) and Social housing tenants. In the fall of 2007 it was proposed to Vancouver City Council that:

“A clearer profile of DTES residents is essential to matching existing needs with future housing program objectives. The Vancouver Agreement Hotel Analysis Project recommends the “[initiation of] a survey of residents living in the DTES SROs to better understand their demographic characteristics, health and service needs, quality and cost of housing, and housing history” and says that a “parallel survey of residents of social housing would provide a comparative analysis for residents of the two housing types.”"

(Greenwell 2007)

This study was indeed funded and the initial analysis provided a descriptive summary of people living in SROs and social housing (Lewis et al. 2008). However these descriptives provided only a cursory overview of residents within the two types of housing and did little to shed light on the factors that contribute to higher levels of morbidity and mortality among residents of the DTES (Buxton 2007; Corneil et al. 2005; Shannon et al. 2006). With this in mind I returned to the DTES Demographic Study to explore the social
and structural aspects of the housing environment that intersect to contribute to better or worse health outcomes. The primary hypothesis of this study is that; the average change in health status within a particular building is related to building level stability and the housing environment.

There has been increasing awareness of the importance of housing to health over the last decade (Aidala and Sumartojo 2007; Dunn 1999; Krieger and Higgins 2002) however there continues to be a dearth of research concerning the building-level environmental-factors that contribute to the diverse health-outcomes of tenants. Most research reifies a dichotomy between social housing and privately owned low-income housing without exploring how these two types of housing differ. Within Vancouver’s DTES, Single Room Occupancy (SRO) housing is the main form of market housing available to low-income people. An SRO housing-unit consists of a single room that accommodates a sink and bed. Amenities such as bathrooms and kitchens are shared among residents. Of particular concern, studies have found that tenants living in SRO housing have higher rates of HIV infection (Corneil et al. 2004), are at increased risk of physical assault and are more likely to be injection drug users (Shannon et al. 2005). While these studies have provided insight into the risks that SRO tenants face there is a lack of information concerning the building level characteristics that may contribute to these risks. Furthermore the building level factors that lead to stability and contribute to an improved sense of health among residents of the DTES have not been explored.

This research project brings together a wide range of literature and data to explore how the housing environment contributes to health inequalities. Housing conditions are often ignored
as a determinant of health, despite their universal association with status, power and resources. Stepping away from the dichotomy of structure and agency that has predominated within health research, I draw on Giddens’ (1984) concept of structuration to promote an understanding of structure and agency as interdependent forces that inform the housing environment. The idea of structuration provides a theoretical framework from which an understanding of the fluidity between individual decision-making and structural constraints can be gained. I also draw on the risk-environment framework to situate housing as a site where the responsibility for harm-reduction shifts from individuals alone to “include the social and political institutions which have a role in harm production” (Rhodes 2009: 193). Challenging individual explanations of housing instability are necessary if the processes by which housing contributes to risk are to be transformed in a socially just and progressive way. I also draw on Link and Phelan’s (2006) concept of marginalization, and I.M. Young’s (1997) pragmatic theorization of series to call attention to the material and spatial characteristics of housing that provide the basis for an aggregate analysis.

Following the theoretical outline of this study I provide an overview of the housing environment within the DTES, and the inequalities that the distribution of housing within the City of Vancouver represents. I also discuss the conceptual differences between “housing” and “home,” focusing on the importance of stability and safety that a sense of “home” entails. Finally, I review the literature that links health outcomes to place and housing. This is followed by a review of the data and methods for this analysis. I conclude with the idea that steps towards decreasing health disparities consist of, addressing the longstanding structural and systematic
processes that lead to unequal housing conditions, as well as identifying characteristics of the housing environments that bring stability and a sense of home to low-income people.
Chapter 2: Literature Review

Theoretical Framework: Structuration and the Risk Environment Framework

Often when we think about place, the people that we have experienced as inhabiting those spaces are not simply removed from the picture created in our mind, rather their shadows drift through our ideas of a place. To differentiate between the material aspects of space - such as the structural characteristics of buildings, walkways, gardens and roads, the people that call those spaces home, and the socially constructed stories and narratives that shape our understanding of a certain place, is to attempt to disentangle concepts that gain strength from one another. People’s assessments of their housing are a product of their participation in social situations and environments, and thus are profoundly shaped by their experience of both enabling and constraining aspects of the spaces they inhabit. When thinking about the nature of action the dichotomy of autonomy and structure has shaped many analyses. Within this framework autonomy refers to individual-level decision-making and structure refers to the social and political institutions that shape the types of action that the autonomous actor has access to. This framework tends to essentialize action as autonomous versus structural without recognizing the fluidity between individuals and institutions.

Rather than deconstructing people’s assessments of their housing into those characterized by structural constraints and those characterized by autonomous decision-making this analysis draws on the idea of structuration. Giddens’ (1984) identifies structuration as the relationship between social structures and individuals. Structuration is reciprocal and adaptive; in some cases enabling individuals to shape social structures in order to meet their needs, in other instances
reproducing social inequalities. The interplay between social structures and individuals means that “social systems are both medium and outcome of the practices they recursively organize” (Giddens 1984: 25). Thus the distinction between structure and agency is somewhat arbitrary, and in trying to disentangle the two concepts, the meaningfulness of certain behaviours would be lost. Drawing on the idea of structuration, I propose that tenants’ change in health status cannot be thought of as completely dependent upon individual decision-making, just as it cannot be thought of as completely dependent upon structural factors that shape inequality. Rather, there is interplay between individual decisions and the institutions that shape those decisions. Collectively these two forces determine the housing environment as well as the health and stability of residents.

To better understand the effect of the housing environments on the health and stability of tenants I draw on the risk environment framework. This framework was originally formulated to re-conceptualize the health risks associated with drug-use from individually determined, to also account for the social construction of harm production. Rhodes (2009) proposes that a risk-environment framework “shifts the responsibility of drug harm, and the focus of harm-reduction action from individuals alone to include the social and political institutions which have a role in harm production” (p. 193). Within this framework drug use has been envisioned as the primary source of harm, and therefore it is framed as the primary focus of harm reduction. However, inadequate housing affects the lives of millions of people across the globe and has severe health-consequences for millions more. Furthermore, while the risks associated with drug-use are an outcome of complex interactions that make up the social context (Boyd 2004; Bourgois and Schonberg 2009; Rhodes 2009) housing-conditions available to low-income people can be
directly linked to decision-making within social and political institutions. As I hope to demonstrate within this study, enabling harm reduction requires a significant investment in housing. Yet, the question remains; how do we create healthier living environments for people? In this analysis of the *DTES Demographic Study*, factors that contribute to better or worse health-outcomes will be identified, contributing to a more robust understanding of the building environment and its affect on health.

**Spaces of Marginalization**

It is important to note that this data is spatially located within Vancouver’s DTES. The DTES is a space of marginalization within the City of Vancouver. In this context marginalization refers to direct and systematic barriers to recognition, reconciliation, integration, resources and in general the ability to live a life of dignity. Class, ethnicity, age, ability, gender and sexuality (among others) are all aspects of differentiation that can be used to marginalize specific people, groups and/or populations. Marginalization may occur on a number of distinct levels, however, it implies a distinct relationship to power; in as far as the marginalized person/group/population/institution has less power than the dominant person/group/population/institution (Link and Phelan 2006).

People in positions of power are often involved in the construction of systematic barriers that *marginalize* people, whether it is from jobs, adequate housing or ownership of property (Blomley 2003; Lamont and Small 2008). In thinking of systematic barriers in this way, I do not seek to claim that these barriers are rationally pursued by the dominant group (Coleman, 1986), rather they are constructed and perpetuated through “common” (unquestioned/normative)
perceptions and ways of acting that work to dismiss the “other.” While power and status are often contributing factors to the perpetuation of systematic barriers, they are also important components that facilitate social justice (Polletta 2006). Furthermore, research projects can be powerful tools to challenge systematic barriers. While the factors that contribute to marginalization are complex and diverse, the housing conditions that people face in the DTES provide a site for pragmatic action. Building and managing appropriate housing for low-income people consists of taking account of buildings that have successfully met the needs of people living within them. The collective experience of living within a particular building enable an analysis at the building level that accounts for the shared risks and protective factors that building encompass, while also avoiding the danger of essentializing these factors to the individual.

In thinking of housing as a site of shared experience and potential collective-action for residents of the DTES I draw on I.M. Young’s (1997) discussion of Sartre’s concept, series. Sartre draws on the idea that material resources – which he refers to as practico-inert objects – shape our experience of the world and our relationships to other people. Sartre distinguishes between series and groups to identify between situations where people share a relationship to a particular object but do not think of themselves as related (series), and situations wherein a shared orientation towards an object becomes the foundation for collective action (group). Sartre provides the example of waiting for a bus to exemplify the formation of a series (Young 1997: 24). In waiting for a bus people form a series as they all have a common objective – to board the bus so they can arrive at a destination – however apart from this relationship to a practico-inert object (the bus as a form of transportation) we cannot assume that they know or identify with one
another. In other words, a series of people forms when a practico-inert object necessitates a particular spatially located action (aka waiting for the bus). However, if the bus does not arrive the people waiting for it may become aware of their shared dependence on this form of transportation and may turn to one-another to share stories of similar experiences. Furthermore, over time they may come together as a group to protest the unpredictable bus schedule. In these instances a group is formed, as the situation becomes a salient aspect of identity and collective orientation.

I propose that Sartre’s idea of series is helpful in understanding why an analysis of housing can and should occur at the building level. The practico-inert reality that residents of the DTES face is one where housing structures the actions available to them. In other words, housing is a central indicator of the risk environment. Furthermore, it is important to identify the situational factors within the housing environment (the practico-inert reality) that contribute to risk because by changing these factors I predict that there is a significant potential for better health-outcomes for all. For example, if there is an inverse relationship between safety and health, where buildings with low levels of safety report decreases in health compared to the previous year (and visa versa), increasing the safety within a building should contribute to better health-outcomes. The power of building-level analysis is that it allows for the identification of factors within the housing environment that have the greatest potential to contribute to better health outcomes for all residents within that housing-environment.
The Housing Environment: Current Demographic Characteristics

Vancouver experiences a dearth of adequate housing options as is reflected by the housing available to low-income people. An estimated 1,296 people were staying in shelters in Vancouver during the city’s 2012 homeless count (City of Vancouver 2012). The count provided a snapshot of this population: 61% were found to be male, the average age was 38 and 80% received some type of income assistance (City of Vancouver 2012). Unfortunately shelters are part of the homeless experience. A sobering example of this is provided by the statistic that men in the Toronto shelter system are two to eight times more likely to die when compared to their counterparts in the general population (Frankish Hwang and Quanz 2005: S25). Despite this it is important to recognize that the shelter system is a valuable tool in linking marginalized populations to resources such as housing and healthcare. The shelter system is extremely important when it acts to facilitate the relationship between those who are experiencing homelessness, and the resources that have been developed to meet their needs, however this makes it essential that there are resources beyond the shelter system that staff can link their clients to.

When thinking about any space that people live within, housing is one of the main indicators of the resources available to a community. Housing also often reflects the societal value of people living within a certain space. There are two dominant housing options for low-income people living in Vancouver. Social Housing—also referred to as “Non-Market” Housing—is owned and operated by the City of Vancouver, the Province of British Columbia or Non-

1 David Hulchanski (2000) cautions that the “need” for more accurate statistics on homelessness is a misuse of resources when it is clear that what is needed is adequate affordable housing.
Governmental Organizations. Single Room Occupancy housing, is often privately owned and operated\(^2\). The ownership and management structures that are traditionally understood as the main differential between private and public housing are complicated in the DTES by the acquisition of a number of SRO buildings in the last decade by the City of Vancouver and the province of British Columbia. Many of these SRO building are managed by NGOs that specialize in caring for people that have a history of homelessness (Gurstein and Small 2006).

Nevertheless, there are clear structural differences between social-housing units and SRO units. Social-housing units are self-contained, meaning they provide tenants with their own personal washroom and kitchen facilities. On the other hand, SRO rooms provide residents with a sink and sleeping area, but have shared kitchen and bathroom facilities.

Vancouver’s DTES has seen a steady increase in Non-Market Housing since the 1970’s and in 2005 the City set out a Housing Plan with a commitment to 1 for 1 that would see every lost SRO unit replaced by a non-market unit (City of Vancouver 2005). At that time there were approximately 10,000 low-income units in the DTES, half of which were social housing\(^3\) (City of Vancouver 2005). Since 2005, 439 social-housing units have become available, and as of 2014 an expected 1067 units will also be completed. Nevertheless, the rate of attrition of SRO units is not readily available making it difficult to determine the extent to which a 1-to-1 policy has been fulfilled.

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\(^2\) Although this distinction is less clear due to the acquisition of 26 SRO units in the DTES by BC Housing between 2007 and 2010. Nevertheless, this transition likely occurred following data collection.

\(^3\) The City of Vancouver defines Social Housing as “funded by government and managed by non-profit societies or government. Residents of many of these units are income-tested with rent being geared to income.” (City of Vancouver Plan for the Downtown Eastside 2005)
In the Vancouver context the relationship between affluence and homeownership is especially apparent when the relatively low-income neighbourhood of the Downtown Eastside is compared to the affluent neighborhood of Shaughnessy (census tract 0021.00 and 0028.00) (BC Stats c and d 2010). In 2005 there were only 545 owned units in the two census tracts most often associated with Vancouver’s DTES (census tract 0059.06 and 0058.00) (BC Stats 2010a and b). This was compared to the 6,270 rental-units in the same area. Therefore, at this time 92% of the housing in the DTES was comprised of rental units. In Shaughnessy 1,925 households were owned as of 2005 compared to the 530 rented units in the area. Furthermore, the average total income for individuals was $70,758 (0028.00) and $181,744 (0021.00) in 2005 (BC Stats 2010 c and d). This is approximately 4-12 times higher than total income levels in Vancouver’s Downtown Eastside, where people earned an average of $14,478 and $18,184 in census tracts 0058 and 0059.06 respectively (BC Stats 2010a and b). There is also a spatial aspect of this inequality as despite the fact that there are approximately 2.8 times more dwellings in the DTES, the space that the Shaughnessy census tracts represent is roughly 50% larger than the space that the DTES accounts for (census tracts 0058.00 and 0059.06) (Data correlated from BC Stats 2010 a, b, c, and d).

As of 2003 there were 5,100 SRO units within the DTES (City of Vancouver 2005). These units accounted for the largest share of housing in the DTES as at the time 40% of housing was identified by the City of Vancouver as SRO units, followed by social housing (36%), market housing (17%) and Special Needs Residential Facilities (7%) (City of Vancouver 2005: 17). SRO housing often becomes home for the vulnerably housed, as can be observed from the overlapping demographic profile of these buildings with demographics from the Vancouver
Homeless count in 2010. Data collected in the “Downtown Eastside Demographic Study of SRO and Social Tenants” in 2008 found that among SRO tenants 79% were male, a further 64% were between the ages of 35 and 54 with 77% reporting income under $15,000 a year (Lewis et al. 2008). Finally 60% received income assistance (Lewis et al. 2008).

**Barriers to Housing**

When thinking about the barriers to adequate housing that low-income people face there are a number of controls that are meant to ensure that people accessing social-housing are “deserving” of the better standards of living that it provides. Those who are identified as deserving reflect wider social-hierarchies, structural violence and patriarchal ideals of citizenship. This is exemplified by the continued exclusion of drug-users from many social-housing programs despite the evidence that supportive housing decreases risky drug-use practices (Des Jarlais, Braine and Friedmann 2007), decreases health-care related costs (Larimer et al. 2009; Sadowski et al. 2009) and improves mental health-outcomes, health status and reduces substance use (Perlman and Parvensky 2006; Tucker et al. 2010). There is also an aspect of surveillance associated with low-income housing that can act as a barrier to housing for those most in need (Patton and Loshny 2008: 181). This “hard-to-house” population “is at risk of losing their housing for reasons that go beyond affordability (Popkin et al. as cited by Manzo et al. 2008: 1861; original emphasis). The “hard-to-house” have trouble finding and keeping housing, and often struggle with homelessness and unstable living conditions. Among this population there are higher prevalence rates of mental illness, disability and physical illness (Hep C/HIV), addiction and/or histories of trauma and dislocation (Gurstein and Small 2005). There is
also an increased likelihood that individuals in this group have a criminal record or history of property damage (Manzo et al. 2008; Gurstein and Small 2005).

Among the hard-to-house health is complicated by drug-use, survival sex-work, mental illness and histories of violence that are not deemed deserving of social support due to an underlying assumption that these harms are based on individual decisions. Rather, it is well documented that the egregious living conditions within many SROs contribute to the harms related to these behaviours (Robertson 2007; Shannon et al. 2006; Robertson and Culhane 2005; Gurstein and Small 2005). By exploring people’s change in health status rather than their self-reported health status we can gain insight into the environmental effect on health, while also controlling for people who may report poor health status due to more long-term complications such as disability or chronic illness. Furthermore, it is important to recognize that behaviour associated with the “hard-to-house” is situationally located. By investing in supportive environment that adequately meet people’s needs, social and political institutions have the opportunity to promote stability and health (Tsemberis, Gulcur and Nakae 2004).

**Housing vs. Home**

There are many forces that place people living in Vancouver’s DTES at the bottom of social hierarchies within Canada. Nevertheless, many people call this neighbourhood home, and have found stability and a community within it. Yet this sense of home may not always be related to the housing environment. As Mary Douglas (1991) acknowledges home “is located in space but is not necessarily a fixed space… Home starts by bringing some space under control” (p. 289). The idea of “home” as grounded within “housing” has been questioned by materialist
feminist scholars who point to the violence and lack of control that many women face within their “homes” (Barrett and MacIntosh 1982; Young 1997). The deep distrust of home that these scholars write of stems from home as a site of oppression, and they suggest that the idea of home should be abandoned (Young 1997; 157).

Home as a site of oppression is reflected within many of the narratives that Robertson and Culhane (2005) collected in their interviews with women living in the DTES. Women related stories of growing up in housing where they were not safe and had little control (Robertson and Culhane 2005). Furthermore, losses throughout their lives affected some women’s value of housing. As one woman relates:

“I don’t give a shit about my apartment, and all my clothes and all my furniture… Because of my terrible losses, what value could it be? If your feelings are all screwed up inside – how the hell could all the money in the world help?”

(Robertson 2007: 540)

These stories are not distinct to women; writings by men living in the DTES of “home” are often complicated by the lack of control and the violence they experience (DTES Studio Society 2011). Nevertheless, participants from both projects expressed a longing for the sense of home related to housing where a sense of control and safety was present. Furthermore when they found housing that met these needs they expressed a deep sense of relief (Robertson 2007; DTES Studio Society 2011). As the same woman quoted above expresses, after finally moving into social housing, “I mean you appreciate every bit of comfort that you do have when you come to live in an apartment…I’m happy for the first time in my life.” (Robertson 2007: 543).
What distinguishes housing and home? Housing and “dwellings” often refers to the structural aspect, or “built environment” of the spaces that people take shelter within. Therefore private and public investment in housing denotes an investment in the physical structure. “Home” denotes an individual investment to personalize a space and claim it as one’s own, however it can also be related to the sense of control gained from having the choice to live somewhere or the social networks developed within a particular housing environment (Robertson et al. 2007; Manzo, Cleit and Couch 2008). Furthermore, the ability to gain a sense of home within housing often depends on the extent to which that housing meets a range of needs. From the literature reviewed here it appears that these needs include safety and security of tenure and a sense of control; which can be measured by exploring building level stability as well as the type of building (SRO vs. Social Housing).

**Inadequate Housing**

The housing environment is a space that greatly informs the types of risks that people are likely to be exposed to. In thinking of housing as a site of risk-production I draw on previous literature that has identified the characteristics of housing that are linked to decreased-health outcomes and make it inadequate. To define inadequate housing I draw on two interrelated concepts; “relative homelessness” and “vulnerably housed.” “Relative homelessness” refers to conditions that impede “bringing a space under control” and is defined by the United Nations as “lacking adequate protection from the elements, access to safe water and sanitation, affordability, and security of tenure and personal safety” (Shannon et al. 2006). Of particular concern in Vancouver’s DTES, security of tenure (King 2011) and personal safety (VANDU Women CARE Team 2009; 13) are two factors that continually de-stabilize people.
Housing (in)stability is the second characteristic that I use to identify inadequate housing.

Holton, Gogosis and Hwang (2010) define people who are “vulnerably housed” as those who were living at a fixed address, “however at some point in the past year had either been homeless or had moved at least twice.” Shannon et al. (2006) found that the median number of moves reported by residents of SRO housing was 5! Furthermore, in the DTES Demographic Study, over half (52%) of SRO tenants reported sleeping rough (out of doors) at some point in their lives (Lewis 2008). Therefore inadequate housing consists of a housing-environment that does not meet people’s basic needs (security of tenure, safety etc.) and contributes to their instability.

**Health Inequalities: Place and Health**

There is now substantive evidence that links social characteristics to spatial conditions and health outcomes (Dunn et al. 2007; Frankish et al. 2005; McLeod et al. 2003; Robert 1999). Furthermore, in a study of Vancouver neighborhoods’, Burr et al. (1995) found that the areas with the highest percentage of rental units had the highest all-cause standardized mortality rates between 1990-1992. Even for people with similar demographic characteristics (ethnicity, sex, age, etc.) there are differences based on place (Nettleton 2006). Explanations for unequal health outcomes share with explanations for poverty an overwhelming element of individual blame. Nevertheless, as anti-poverty advocates have argued, “poverty… is about distribution; it results because some people receive a great deal less than others” and “descriptions of the demography, behavior or beliefs [of people who are poor] can’t explain inequality” (Katz 1989: 7). Similarly, attempts to explain health inequalities through describing the demographics, behaviors and beliefs of people have been largely unsuccessful.
When thinking about the characteristics of place, housing is central to an understanding of the environmental factors that may shape risk. In 2005, 90 - 95% of housing within Vancouver’s DTES was rental units (census tracts 0058.00 and 0059.06, see Appendix A, Map 2) (BC Stats 2010a and b). Of considerable concern is the fact that the DTES of Vancouver continues to have a mortality rate that far exceeds that of the province of British Columbia. In a 2007 report on the neighbourhood it was estimated that mortality rates were 33% higher then compared to the province of British Columbia (Buxton 2007). Life expectancy for men living in the DTES is 9 years below the provincial average, while women’s life expectancy falls 3 years short. Deaths due to drug overdose continue to be a concern and in 2005 were found to be 7 times the provincial rate (Buxton 2007; 7). Of these deaths First Nations people and men were over-represented (Buxton 2007; 7).

While these statistics are often characterized as the result of high rates of injection drug use, the characteristics of place have largely been minimized. As Rhodes et al. (2006) acknowledges, focusing on individual behaviours related to injection drug use “are likely to result in only a partial reduction of HIV transmission risk, perhaps in the order of 25% to a maximum of 40%” (p. 1027). It becomes increasingly important to consider factors that affect individual behaviour in order to identify potential avenues that can mitigate the affects of place (Macintyre, Ellaway and Cummins 2008). Housing is an essential characteristic of any spatial environment that humans inhabit. In order to better understand the health disparities between enclaves of affluence and enclaves of poverty it is important to explore the relationship between housing and health.
Housing and Health

Disparities in life expectancy reflect wider structures of inequity where people who are inadequately housed live in an environment in which “risk is produced” (Rhodes et al. 2006). The health-outcomes related to inadequate housing speak of unprecedented inequalities, as reflected by the decreased life expectancy of residents within these environments. Of particular concern is the fact that SRO tenants have a higher frequency of HIV infection (Corneil et al. 2006), increased risk of physical assault and higher frequency of injection drug use (Shannon et al. 2006). The SRO housing environment is a space where social and structural factors combine to shape risk in such a way that dramatic disparities in health emerge, a pattern that has been documented by many researchers (Corneil et al. 2006; Tucker et al. 2010; Aidala and Sumartojo 2007; Rhodes et al. 2006).

There is substantive evidence that inadequate housing conditions are related to poor health outcomes (Dunn 1999; Frankish et al. 2005; Tucker et al. 2010), and recent findings have demonstrated that people who are vulnerably housed “face the same severe health-problems as people who are homeless” (Holton, Gogosis and Hwang 2010). Notably, the poor living-conditions found within many SROs in the DTES have been compared to living on the streets (Robertson 2007: 543) as the comfort and safety within this type of “housing” leave much to be desired. The negative effects of the SRO environments on health have been explored in some depth, especially among women living in the DTES (VANDU Women’s Care Team 2009; Robertson and Culhane 2005). These studies have taken a qualitative approach, using in-depth interviews to identify how the conditions within inadequate housing undermines women’s sense
of control and contribute to risk-related behaviour. Nevertheless, men also suffer from inadequate housing-conditions, and have much higher mortality rates when compared to Canadians’ who are adequately housed.

In 2011, Stats Canada released a report on the “remaining life expectancy at age 25 and probability of survival to age 75, by socio-economic status and Aboriginal ancestry” (Tjepkema and Wilkins). One of the main findings in the report was that men who reported living in a shelter, rooming house or hotel (an SRO unit would be considered a “hotel” by Stats Canada) in 1991 were 34% less likely (than all men in the cohort) to live to age 75 (Tjepkema and Wilkins 2011: 4). This is related to a significant difference in the life expectancy of men living in inadequate housing when compared to their peers in general Canadian population. The study found that men living in inadequate housing at age 25 could be expected to live an additional 41.8 years. The general Canadian male population at age 25 can expect to live an additional 52.6 years (Tjepkema and Wilkins 2011: 4). This is a 10.8-year difference and was the most drastic difference in life expectancy, even when compared to other groups that have been historically disadvantaged on the basis of ethnicity, education and income. Nevertheless it should be noted that people who are vulnerably housed are likely to have an intersection of these demographic characteristics.

The transmission of HIV is one driver of health inequalities. Despite progressive policy-measures that have lead to decreases in the transmission of HIV and innovative pharmaceutical treatments that lessen the burden of illness (Johnston et al. 2010; Palepu et al 2011), empirical evidence has demonstrated that people who are inadequately housed continue to be at higher risk
of HIV infection. Higher rates of receptive syringe sharing (DesJarlais et al. 2007; Shannon et al. 2006; Aidala and Sumartojo 2007; Corneil et al. 2006), low adherence to anti-retroviral medications (Vasarhelyi et al. 2011; Palepu et al. 2011) and lower levels of self-reported well-being (Tucker et al. 2010) are risks associated with inadequate housing. While some researchers have proposed that the relationship between housing conditions and these risks are spurious and can be accounted for by the distinct demographics of this population it continues to be demonstrated that people who experience chronic homelessness and transition to housing report a decrease in these risk related activities (Robertson 2007; Tucker et al. 2010). With the DTES Demographic Data I hope to contribute to a better understanding of which factors contribute to environments of instability, and the effects of this instability on peoples’ health.
Chapter 3: Data

The Downtown Eastside Demographic Study of SRO and Social Housing Tenants (DTES Demographic Study)

The DTES Demographic Study was completed in April of 2008. It collected a wide range of demographic data on approximately 569 single room occupancy residents, and 518 social housing tenants living in Vancouver’s Downtown Eastside (DTES). The data was explored at the building level based on length of tenancy. Two populations were explored at the building level, those who had lived at their address for more than 1 year (stable) and those who had lived at their address for less than 1 year (unstable). The distinction between stable and unstable tenants was based on the idea that exposure to a particular environment was time sensitive, furthermore previous research has suggested that unstable residents have a different set of housing needs than more stable tenants (Holton, Gogosis and Hwang 2010).

A total of 138 buildings were surveyed; 107 buildings had residents who had lived at their current address for less than 1 year, and 127 buildings had residents who had lived there for more than 1 year. This data represents (imperfectly) the two types of housing that the majority of people living in the DTES inhabit; SRO housing and Social Housing and represents 85 SRO buildings and 53 social housing buildings. In general smaller samples were collected from SRO buildings. The data collected includes information on:

- Socio-demographic and economic profiles
- General housing situation
- Income and income sources
- Language and cultural heritage
• Condition and cost of housing
• General satisfaction with housing
• Housing history including history of homelessness
• General health status
• Service and support need

The survey used in the DTES Demographic Study can be found in APPENDIX A.

VanMap Crime Data

The Vancouver Police Department has developed an online mapping tool that allows citizens to view the concentration of specific crimes by year. Using the public edition of VanMap, buildings were located in the VanMap system using their mailing address and the crime count was recorded in the area that had the greatest proximity to the building entrance (associated with the “main” street that the building fronted, see Fig. 1). Crime rates are recorded using 100 by 100 meter “blocks,” buildings were given a “crime count” based on the number of reported incidences of mischief in the year 2007 (Data from the DTES Demographic Study was collected in 2007). It is important to note that by using this data I do not wish to infer that the people living within buildings near areas with high crime rates are committing the crimes. Rather, I wish to provide an additional assessment of “safety.” Charges of mischief are laid when property damage (<$500) or disruption occurs. Exposure to these types of crimes directly effects the housing environment and tenants sense-of-safety.
Chapter 4: Methodology

The Need for Multiple Regression Analysis

There are few data sets that explore the differences between social housing and SROs. The *DTES Demographic Study* provides a wealth of data to identify the varying conditions found within these two types of housing. Furthermore linking these findings to census data and VanMap Crime Data provided by the City of Vancouver will contribute to a stronger understanding of the effects of people’s housing environment on their health and stability. When Peter Greenwall called for funding the *DTES Demographic Study* in 2007 he did so by proposing that; “a clearer profile of DTES residents is essential to matching existing needs with future housing program objectives.” I would argue that a clearer profile of whether the *housing* available to DTES residents meets their needs is what is essential to matching existing needs with future housing program objectives, and it is my hope that this analysis provides such a profile.

Model Overview

This study takes a risk environment approach to thinking about the housing environment as a site of harm production (Rhodes 2009). Using multiple regression analysis the factors that are the best predictors for change in health status over the past year at the building level will be explored. My hypothesis is that the *average change in health-status within a particular building is related to building level stability and the housing environment.*
Figure 1: Overview of Dependent and Independent Variables

Drawing on the idea of structuration (Giddens 1984) and “risk environments” (Rhodes 2009) average change in health status among tenants will be explored within two separate models. One model will explore which factors contribute to health among “stable” tenants who have lived at their current housing for more than 1 year, while a second model will explore the change in health of “unstable” tenants who have lived at their current residence for less than one year. The two models proposed in this study account for the fact that the unit of analysis within this study is at the building level. Summary measures for each building will be calculated. Using two dependent variables accounts for the substantive difference between people who are stably housed (have lived in their housing for more than 1 year) and people who are unstably housed (have lived in their housing for less than 1 year). The literature reviewed above argues that there is a substantive difference between “stable” and “unstable” low-income people and that these two populations have different health outcomes, furthermore stable tenants have been exposed to their building environment for a longer period of time making it more probable that building level measures of housing-conditions reflect building-level changes in health. The four
independent variables of substantive importance to this study are; building level stability, measure of the housing environment and safety, and type of housing (SRO or Social housing).

Checks for Robustness

There is a need to weight buildings differently to adjust for the different confidence in the building level variables identified above. This is due to the fact that there is wide variation in the sample size of respondents within each building, ranging from 1 respondent to 40 respondents. Due to this wide response rate analytical weighting will be used. Therefore buildings with fewer respondents will be weighted less than buildings with a greater number of respondents because there is more confidence in the summary measures if they are based on the responses of more people. While analytical weights are one method of testing for the robustness of the model there are a number of other methods that will be used within this analysis. Model robustness will be analyzed by comparing the weighted model to the unweighted model as well as a model where cases with lower n are dropped. Furthermore some of the more stable housing units have much older populations that represent low-income seniors, so a model will also be explored where senior buildings (average age 65+ ) are dropped from the analysis.

Constructing the Dependent Variable

Change in Health Status – The variable, health compared to one year ago asked tenants to report on their change in health status over the past year. There were five potential responses including; much better (1), somewhat better (2), about the same (3), somewhat worse (4) and much worse (5). This categorical variable was reversed so that a decrease in health was identified
as 1, and an increase in health as 5. Change in health status was explored as a continuous variable and the average change in health status was calculated for each building using the collapse command in Stata. Treating change in health-status as a continuous variable was an effective method for exploring changes in health at the building level because it enabled averages to be calculated without losing the variability within a building.

**Stability** – There are five different time periods that were recorded when residents were asked about the time they had lived at their current address; less than 6 months; 6 months to 1 year; between 1 and 2 years; between 2 and 5 years and finally more than 5 years. Length of tenancy at the individual level was used to aggregate people within a building into two categories. The “unstable” population within a building was identified as having lived in their building for less than 1 year (1 or 2), while the “stable” population had lived within their building for 1 year or more (3-5). A dummy variable was created that reflected this conceptual difference between “unstable” (tenancy less than 1 year) and “stable” (tenancy greater than 1 year) residents. Using this dummy variable separate averages were calculated for unstable and stable residents health (compared to 1 year ago). The dummy variable, “unstable” and “stable” is used to distinguish between different levels of exposure to the building environment. For stable residents building-environment factors that affect health compared to 1 year ago can clearly be linked to exposure to these factors. On the other hand changes in health compared to 1 year ago for unstable tenants cannot be as clearly linked to a particular building environment. Furthermore, the distinction between unstable and stable residents draws on the definition of vulnerable housing. People who are vulnerably housed are defined as having “their own place, but at some time in the past year [has] either been homeless or […] moved at least twice” (Holton, Gogosis and Hwang 2010).
Holton, Gogosis and Hwang’s (2010) research findings suggest that people who are vulnerably housed have similar health outcomes to the homeless population and in fact one population.

Summary statistics show that the average health compared to 1 year ago at the building level is similar for stable and unstable populations (See Figure 2).

**Figure 2: Distribution of Health Compared to 1 Year Ago for Stable and Unstable Tenants**

![Figure 2: Distribution of Health Compared to 1 Year Ago](image)

In fact the average reported change in health at the building level is slightly lower for people who have lived at their address for more than 1 year as can be seen in **Table 1** however these differences are not significantly different from 0 (t=0.0491).
Table 1: Average Health Compared to 1 Year-Ago for Stable and Unstable Tenants

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of Observations</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>(mean) Health compared to 1 year ago, Unstable</td>
<td>107</td>
<td>2.878705</td>
<td>0.7188744</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>(mean) Health compared to 1 year ago, Stable</td>
<td>127</td>
<td>2.818899</td>
<td>0.5952212</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

The Independent Variables

**SRO vs. Social Housing** - Of substantive importance to my analysis is the distinction between SRO hotels and Social Housing buildings. Both types of housing provide a space for low-income people to inhabit, however under widely different conditions. SRO Hotels have been defined as environments of “relative homelessness” because of the high levels of instability and low security of tenure that these buildings afford to their tenants. The advantage of exploring the effect of SRO vs. Social Housing is that there is already a measure of stability so that factors other than stability that may contribute to a change in health status and are related to the differences between the two types of housing can be accounted for. The structural differences discussed in the literature review include the more private spaces that social housing affords residents. Furthermore SRO buildings are often old and in need of repair (City of Vancouver 2005).

Canada’s social housing stock is also aging, however standards of maintenance are regulated to a greater extent within these buildings and they are generally in better conditions than their SRO counterparts. Social housing residents are more likely to have a contained apartment with a personal bathroom and kitchen area. Furthermore there is a wider range of
support available in social housing, which may include home-support, social workers and medical staff. There will always be a need for short-term, low-cost housing, however low-income people who access SROs as a short-term alternative to more stable housing are the minority. *SROs have become the only long-term housing option for low-income people who are unable to access social housing.* Therefore many low-income people living in the DTES find themselves in unstable housing-environments despite their need for adequate affordable stable housing.

Summary statistics show that SRO buildings and Social Housing buildings *do not* appear to have a significantly different range of health outcomes. The exception to this is that Social Housing buildings with new residents (unstable) seem to promote better health outcomes (Table 2). In fact, social housing buildings with new residents have significantly better health outcomes when compared to SRO buildings with new residents ($t=-3.11$, Ha, diff $\neq 0$ (0.0024)) (See Figure 3 2). This illustrates the limitations of the “stable” vs. “unstable” distinction (Figure 3). This distinction does not capture that people who have recently moved into social housing are more likely to stabilize when compared to SRO residents and this “improved health status” may reflect “new” to social-housing residents. It should also be noted that this is a relatively small group and that many of the cases represent very small populations (n<3).

**Table 2: Average Health Compared to 1Year-Ago for SRO and Social Housing Tenants**

<table>
<thead>
<tr>
<th>Housing Type</th>
<th>Variable</th>
<th>Number of Observations</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRO</td>
<td>Health compared*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(unstable)</td>
<td>75</td>
<td>2.73</td>
<td>0.58</td>
<td>1.5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Health compared (stable)</td>
<td>75</td>
<td>2.76</td>
<td>0.64</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Social</td>
<td>Health compared (unstable)</td>
<td>32</td>
<td>3.23</td>
<td>0.89</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Health compared (stable)</td>
<td>52</td>
<td>2.9</td>
<td>0.5</td>
<td>1.75</td>
<td>4.5</td>
</tr>
</tbody>
</table>
Building Level Stability – The average time-period of residence within a particular building was used to develop the measure of building-level stability. As previously mentioned the 5 time-periods that residents could report living at their housing were: 1 (less than 6 months), 2 (6 months to 1 year), 3 (Between 1 and 2 years), 4 (Between 2 and 5 years) and 5 (more than 5 years). As can be seen in Figure 4 below Social Housing buildings had a significantly higher length of tenancy when compared to SRO buildings (t=-9.2177).
The average length of stay at the building level was thought to be important to include in the initial models because it was hypothesized that more stable buildings would be better for residential health while less stable buildings might adversely affect residential health.

Because the intervals between the different categories for time at address were quite different it was also explored as a squared function to account for the fact that the final category, “Five years or greater” really indicated a greater difference in the length of stay than (1) “less than 6 months) however the squared transformation of “Time at address” had a similar significance to Time at address within the models and did not appear to have any significance in the subsequent analysis.
Time at address was also explored as a dummy variable however this analysis was also not included due to its insignificance.

**Age** – A difference that needs to be accounted for in this analysis is the significant difference in age (t=-7.138) between SRO and Social Housing tenants (**Table 3**).

**Table 3: Distribution and Average Age for SRO and Social Housing Buildings**

<table>
<thead>
<tr>
<th>Housing type</th>
<th>Observations (n)</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRO</td>
<td>85</td>
<td>46.60297</td>
<td>8.737449</td>
<td>26</td>
<td>80</td>
</tr>
<tr>
<td>Social</td>
<td>52</td>
<td>59.10526</td>
<td>11.71751</td>
<td>42.5</td>
<td>85.11111</td>
</tr>
</tbody>
</table>

Not only is there a significant difference between the mean age of SRO and Social Housing tenants, the distribution of age in the two types of buildings also appears to be quite different (Figure 5). Because of the differences in the distribution of age between SRO and Social Housing it was included as a variable in the analysis as there was clearly a significant difference that cannot be accounted for by simply adjusting the mean age used in the analyses. The log of age was also explored in order to determine if changes in health related to age followed a non-linear pattern, with greater changes in health occurring later in life. The log of age did not improve the fit of the model and therefore was not used in the following analysis.
One question remains; can the differences between SRO and Social housing buildings be accounted for by different building environments (better management, safety etc.)?

**Housing Environment and Safety** – Residents were asked to rate their rent, neighbourhood, building management, maintenance, ability to have guests, the safety and security of their building and their overall satisfaction (Appendix A: Q. 5). This rating was based on a Likert scale from Very good (1) Good (2), OK (3), Poor (4), Very Poor(5). This scale was transformed so that the rating went from very poor (1) to very good (5) as this intuitively made more sense in the context of the health compared scale that increased as changes in health were reported to be
“better.” Once the resident ratings had been transformed they were collapsed and the average rating was used as the measure of building satisfaction. With the ratings all of the likert scales were treated as continuous variables. This was justified by the continuous nature of aggregating residents’ responses to the building level. Furthermore, the original likert scale represented a concept that was clearly a continuum (e.g. moving from good to very good).

The second set of questions that were used to explore the housing environment and safety asked residents “How big a problem are each of the following in this building?” (Appendix A: Q. 7). Problems were rated on a scale of 1-3 with 1 representing a “big problem”; 2 representing a “small problem” and 3 representing “not a problem.” Pests, noise, concerns for personal safety, drug related activity in the building, strangers in the building and guest fees were all “problems” that residents were asked to report on. For these scales the variables were transformed to continuous variables with 1 representing “not a problem” and 3 representing a “big problem.” Furthermore as with the previous likert scales the measures were treated as continuous and the ratings were collapsed to the building level where the average rating represented the population within a building.

The final measure of the building environment and safety was drawn from the “crime count” identified for each building. VanMap Crime statistics are recorded for certain types of crimes including; Commercial Break and Enters, Mischief (>5000), Mischief (<5000), Theft from Auto (>5000), Theft from Auto(<5000), Theft of Auto, (>5000), Theft of Auto(<5000). I chosen to focus on charges that deal with Mischief resulting in damages under $5000 because these charges are related to crimes that are the most likely to affect the environment that people
have immediate access to. Charges of mischief are laid for; a. destroyed or damaged property; b. renders property dangerous, useless, inoperative or ineffective; c. obstructs, interrupts or interferes with the lawful use, enjoyment or operation of property; or d. obstructs, interrupts or interferes with any person in the lawful use, enjoyment or operation of property (Criminal Code 2011: Section 430). The number of crimes within a 100 by 100 meter area of the buildings identified in this study in the year 2007 ranged from 0 to 22 with an average crime count of 6. Due to the non-normal distribution of mischief charges within the study area the square root of “CrimeCount” was also explored however in all models the number of counts remained highly insignificant.
Chapter 5: Analysis

Analysis of Health Compared to 1 Year Ago at the Building Level for Stably Housed Residents

Table 4 compares predictors for health compared to 1 year ago at the building level for stable residents (time at address > 1 year). Results suggest significant differences between SRO and Social housing buildings however multiple-regression analysis seems to indicate that building level age and satisfaction-with-management are also significant factors (Table 4).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model1</th>
<th>Model2</th>
<th>Model3</th>
<th>Model4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.011**</td>
<td>-0.015***</td>
<td>-0.017***</td>
<td>-0.015***</td>
</tr>
<tr>
<td>Social Housing (vs. SRO)</td>
<td></td>
<td>0.226**</td>
<td>0.184*</td>
<td>0.295**</td>
</tr>
<tr>
<td>Management Rating</td>
<td></td>
<td></td>
<td>0.162**</td>
<td>0.127*</td>
</tr>
<tr>
<td>Building Stability</td>
<td></td>
<td></td>
<td></td>
<td>-0.112</td>
</tr>
<tr>
<td>Neighbourhood Rating</td>
<td></td>
<td></td>
<td></td>
<td>-0.048</td>
</tr>
<tr>
<td>Count of Mischief</td>
<td></td>
<td></td>
<td></td>
<td>-0.002</td>
</tr>
<tr>
<td>Problems with Pests</td>
<td></td>
<td></td>
<td></td>
<td>0.02</td>
</tr>
<tr>
<td>Problems with Safety</td>
<td></td>
<td></td>
<td></td>
<td>-0.181</td>
</tr>
<tr>
<td>Intercepts</td>
<td>3.347***</td>
<td>3.474***</td>
<td>3.004***</td>
<td>3.704***</td>
</tr>
<tr>
<td>N</td>
<td>124</td>
<td>124</td>
<td>123</td>
<td>121</td>
</tr>
<tr>
<td>R²</td>
<td>0.083</td>
<td>0.135</td>
<td>0.206</td>
<td>0.237</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.076</td>
<td>0.12</td>
<td>0.186</td>
<td>0.182</td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>122</td>
<td>121</td>
<td>119</td>
<td>112</td>
</tr>
</tbody>
</table>

Buildings with older populations are more likely to report a decrease in health in the past year. This relationship between age and change in health status was found in all models and was the most significant predictor of changes in health status at the building level. Nevertheless there was a significant difference between SRO and Social housing buildings, with Social housing buildings reporting significantly better health than SRO buildings. The difference between SRO and Social Housing residents was significant in all models.

*0.05, ** 0.01, ***0.001

4 Test for normality and adjustments for Model 3 summarized in Appendix B
The final significant contributor to health was management. Buildings in which the management was reported as good or very good were significantly more likely to also have reported improved health over the past year.

A number of variables that were thought to have substantive importance to this analysis were not found to be significant, including the average stability of the building, measured by “Time at Address.” Buildings that were more stable were expected to have better health outcomes, as housing stability has been identified as an important aspect of providing and stabilizing health-care. This relationship was not a significant predictor of changes in health at the building level in the past year. Other factors that were expected to be important but were not significant in the analyses included building “problem” measures (problems with pests and problems-with-safety), and “street level” measures of safety and sense of home (Crime Count and Neighbourhood Rating). While not reaching significance it should be noted that the safety related measures including, “problems-with-safety” and “Crime Count,” were both negatively related to health. In other words, buildings with more problems-with-safety or in areas with higher counts of mischief were more likely to report poorer health compared to 1 year ago.\(^5\)

Several interactions were explored. With the knowledge that Social housing buildings tended to have older populations, and the finding of a strong negative relationship between age and health compared to 1 year ago it was predicted that this relationship could be due to a minority of social housing buildings that specifically worked with end of life care. To test for

\(^5\) An interaction between problems-with-safety and Crime-Count was tested for and was found to be highly insignificant.
this, an interaction between type of housing and age was explored with the hypothesis that age would be a more significant predictor of health in Social housing buildings when compared to SRO buildings. No significant interaction between housing type and age was found. Age did become less significant (however still significant at the 0.05 level) when buildings with populations averaging retirement age were excluded (See Table 5: Model with Age>65 dropped). An interaction was also tested for between the type of housing and management rating to determine if management was more or less important in SRO or Social housing but no interaction was found.

Checks for robustness and normality were completed for Model 3: Table 4. This model was chosen due to its conciseness and goodness of fit relative to the other models. Analytic weights were used for each of the buildings in Model 3 to adjust for the different sample sizes from each building. Table 5 presents the un-weighted and weighted summary statistics for Model 3; Table 4 as well as the model excluding buildings that had a small sample (n<2) or average age greater than 65 years old. Age was independently and inversely associated with better health outcomes in all of the permutations, losing significance slightly when buildings with “older” populations (mean age = 65+) were dropped from the analysis. The difference between SRO and Social Housing was also robust, however the significance of the difference between these two types of housing became only moderate when buildings with older populations were dropped from the analysis. The relationship between satisfaction with building management and building level health is significant in all models and remains significant when the model is specified more clearly. Finally, when buildings with a small n were excluded the model fit improved and all
variables remained significant suggesting that the findings are robust when buildings with small samples are included.

**Table 5: Robustness of Model 3 for Change in Health in the Last Year at the Building Level for Stably Housed Residents**

<table>
<thead>
<tr>
<th></th>
<th>Un-weighted Model</th>
<th>Weighted Model</th>
<th>Weighted Model with n&lt;2 dropped</th>
<th>Weighted Model with Age&gt;65 dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.016***</td>
<td>-0.017***</td>
<td>-0.017***</td>
<td>-0.017**</td>
</tr>
<tr>
<td>Social (vs. SRO)</td>
<td>0.254*</td>
<td>0.184*</td>
<td>0.201*</td>
<td>0.167†</td>
</tr>
<tr>
<td>Management Rating</td>
<td>0.176**</td>
<td>0.162**</td>
<td>0.155**</td>
<td>0.201***</td>
</tr>
<tr>
<td>Intercept</td>
<td>2.960***</td>
<td>3.004***</td>
<td>3.016***</td>
<td>2.900***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Un-weighted Model</th>
<th>Weighted Model</th>
<th>Weighted Model with n&lt;2 dropped</th>
<th>Weighted Model with Age&gt;65 dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>123</td>
<td>123</td>
<td>92</td>
<td>107</td>
</tr>
<tr>
<td>R²</td>
<td>0.162</td>
<td>0.206</td>
<td>0.228</td>
<td>0.216</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.141</td>
<td>0.186</td>
<td>0.202</td>
<td>0.193</td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>119</td>
<td>119</td>
<td>88</td>
<td>103</td>
</tr>
</tbody>
</table>

† 0.10; *0.05, **0.01; ***0.001

**Analysis of Health Compared to 1 Year Ago at the Building Level for Unstably Housed Residents**

The analysis of health compared to 1 year ago at the building level for unstable residents (time at address > 1 year) differed from the analysis for stable residents in a number of interesting ways. First of all age was not a significant variable in the analysis (Table 6) this seems to indicate that unstably housed people fit outside of traditional understanding of the life-course and health.

**Table 6: Variables Associated with a Change in Health in the Past Year at the Building Level for Unstable Residents**

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.005</td>
<td>-0.008</td>
<td>-0.009</td>
<td>-0.006</td>
<td>-0.005</td>
<td>-0.005</td>
</tr>
<tr>
<td>Social (vs. SRO)</td>
<td>0.549***</td>
<td>0.455**</td>
<td>-1.559</td>
<td>-1.599</td>
<td>-1.741</td>
<td></td>
</tr>
<tr>
<td>Problems with Safety</td>
<td>-0.466**</td>
<td>-0.541***</td>
<td>-0.354</td>
<td>-0.321</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction: Problem Safety (Social compared to SRO)</td>
<td>1.566*</td>
<td>1.604*</td>
<td>1.671*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem with Drugs</td>
<td>-0.247</td>
<td>-0.249</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Level Stability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.01</td>
</tr>
</tbody>
</table>

6 Test for normality and adjustments based on Model 5 summarized in Appendix B
Throughout the analysis of Health compared to 1 year ago for unstable residents at the building level, age remains insignificant. Three factors at the building level that are driving these changes are: type of housing, the level of reported problems-with-safety and perceived problems with drugs. Furthermore as the interaction term demonstrates, problems-with-safety are likely to contribute to change in health in the last year if the building is an SRO building. It is important to note that the difference in the intercepts between SRO and Social Housing when the interaction is present no longer represents the difference in health between the two housing types. Model 3, where no interaction between type of housing and problems-with-safety is present, assumes that problems-with-safety affects health equally for SRO and Social housing buildings. When the interaction term is included in Model 4 it becomes apparent that this is not the case. SRO and Social housing buildings have significantly different levels of problems-with-safety (p-value = 0.015). How the relationship between problems-with-safety and health compared to 1 year ago differs between SRO housing and Social housing is illustrated in Figure 6 (not adjusted for Age and problems-with-drugs).
Figure 6: Fitted values for SRO and Social-Housing Buildings

The top red line represents the relationship between problems-with-safety and health compared to 1 year ago for social housing buildings. From the graph it appears that social housing buildings with more reported problems-with-safety have better health than buildings with low reported problems-with-safety however this relationship is not significant (p-value=0.100). The non-significance of the relationship between problems-with-safety and health compared to 1 year ago for social housing buildings seems to indicate that if problems with safety are reported in social housing buildings they are not affecting health. However, there is a significant difference between the affect of problems-with-safety on health compared to 1 year ago when SRO buildings are compared to Social housing buildings. Furthermore, there is a significant relationship between problems-with-safety and health compared to 1 year ago among SRO buildings (p=0.000 – prior to adjusting for age and problem-with-drugs). These results
indicate that SRO buildings with low-levels of reported problems-with-safety significantly contribute to health when compared to SRO buildings with high-levels of reported problems-with-safety.

A number of the variables that were thought to have substantive importance to this analysis were not found to be significant, including the average stability of the building, measured by “Time at Address.” Buildings that were more stable (as measured by average “Time at Address” for all residents) were expected to have better health outcomes, and potentially promote a sense of stability among social housing residents however this relationship was not significant. Furthermore satisfaction with management was not a significant predictor of reported changes in health despite its significance in the previous analysis. Other factors that were expected to be important but were not significant in the analyses included building “problem” measures, including; problem-with-pests, and “street level” measures of safety and sense of home, including; Crime Count and Neighbourhood Rating. Finally among the variables there was a very low level of multicollinearity (See Appendix B: VIFs for Table 6: Model 5)

Table 7 presents the un-weighted and weighted summary statistics for Model 4(Table 6). The interaction is significant in both of these models however the fit of the model is better when the model uses analytic weights to adjust for the sample size from each building. When smaller cases are dropped, also shown in Table 7, the fit decreases and the interaction term is no longer significant. Finally dropping buildings that had an average age of 65 or older from the analysis had relatively no effect on the robustness of the weighted model, which should not be surprising due to the non-significance of age previously discussed for unstable tenants.
Table 7: Robustness of Model 4 for Change in Health in the Last Year at the Building Level for Unstably Housed Residents

<table>
<thead>
<tr>
<th></th>
<th>Unweighted</th>
<th>Weighted</th>
<th>Buildings with n=1 dropped</th>
<th>Buildings with population mean age&gt;65 dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.007</td>
<td>-0.005</td>
<td>-0.006</td>
<td>-0.011</td>
</tr>
<tr>
<td>Social (vs. SRO)</td>
<td>-1.257</td>
<td>-1.599</td>
<td>-1.376</td>
<td>-1.528</td>
</tr>
<tr>
<td>Problems with Safety (SRO)</td>
<td>-0.256</td>
<td>-0.354</td>
<td>-0.331</td>
<td>-0.368</td>
</tr>
<tr>
<td>Interaction: Problems with Safety (Social compared to SRO)</td>
<td>1.454*</td>
<td>1.604*</td>
<td>1.428</td>
<td>1.529*</td>
</tr>
<tr>
<td>Problem with Drugs</td>
<td>-0.152</td>
<td>-0.247</td>
<td>-0.287</td>
<td>-0.222</td>
</tr>
<tr>
<td>Intercepts</td>
<td>3.628***</td>
<td>3.893***</td>
<td>3.945***</td>
<td>4.131***</td>
</tr>
</tbody>
</table>

N: 103 103 79 96
R²: 0.246 0.272 0.269 0.261
Adjusted R²: 0.207 0.234 0.219 0.22
Degrees of Freedom: 97 97 73 90
† 0.10; *0.05; **0.01; ***0.001

Due to the fact that the interaction term drops from significance when buildings with n<1 are dropped, and the non-normality of the dependent variable (see APPENDIX B) that approaches a more normal distribution when buildings with n≤1 are excluded, an analysis of health compared to 1 year ago for unstable residents was preformed (Table 8).

Table 8: Variables Associated with a Change in Health in the Past Year at the Building Level for Unstable Residents (n≤1 dropped)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.006</td>
<td>-0.008</td>
<td>-0.009</td>
<td>-0.008</td>
<td>-0.011</td>
</tr>
<tr>
<td>Social Housing (vs. SRO)</td>
<td></td>
<td>0.551**</td>
<td>0.430*</td>
<td>0.440**</td>
<td>0.419*</td>
</tr>
<tr>
<td>Problems with Safety</td>
<td>-0.502**</td>
<td>-0.308</td>
<td>-0.249</td>
<td>-0.278</td>
<td>0.02</td>
</tr>
<tr>
<td>Problems with Drugs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Stability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management Rating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.134</td>
</tr>
<tr>
<td>Problem with Pests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.159</td>
</tr>
<tr>
<td>Counts of Mischief</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>Intercepts</td>
<td>2.530***</td>
<td>3.094***</td>
<td>3.866***</td>
<td>3.866***</td>
<td>3.196***</td>
</tr>
</tbody>
</table>

N: 79 79 79 79 78
R²: 0.005 0.126 0.225 0.241 0.267
Adjusted R²: -0.008 0.103 0.194 0.2 0.182
Degrees of Freedom: 77 76 75 74 69
† 0.10; *0.05; **0.01; ***0.001
Results for this analysis (Table 8) suggest that the difference between Social housing and SRO housing remains significant in the models even when buildings with less representative samples have been dropped (n≤1). Nevertheless it should be noted that the number of Social housing buildings that the model is now drawing from is less than 30, which is generally understood as one of the lower values acceptable for linear regression analysis. Problems-with-safety remain significant however, it becomes insignificant when reported problems-with-drugs in the building are also taken into account. This seems to indicate that these two variables are related. Nevertheless, tests for multicollinearity of the variables in Model 4 (Table 8) demonstrate that although problems-with-safety and problems-with-drugs have the highest variance inflation factors (0.47 and 0.49 respectively) they remained below a level that would provide grounds to aggregate these two variables. Furthermore from a substantive position it is clear that while problems-with-safety and problems-with-drugs are likely related they are nonetheless two different characteristics of the building environment and therefore should be treated as distinct variables. Future analyses should determine whether problems-with-safety are mediated by problems-with-drugs. Finally, while Model 4 has the best fit to the data it does not predict as much of the variability in change in health as Table 6: Model 5 which includes the interaction term (Adjusted R²=0.20 vs. 0.234). Despite some problems with the robustness of Table 6:Model 5 that are most likely related to the non-normal distribution of the dependent variable, it does appear that there are significant differences between SRO and Social housing, as Table 8 demonstrates. Nevertheless there is a need for further sampling of unstable residents from both SRO and Social housing buildings in order to determine the extent of these differences.
Chapter 6: Discussion

In this analyses, the first to my knowledge that explores changes in health in the past year at the building level in Vancouver’s Downtown Eastside, I have observed that a different set of factors seem to be driving changes in health for stable and unstable tenants. In the analyses of health outcomes for stable residents, age, type of housing (SRO vs. Social), and building management, were all significantly related to changes in health. On the other hand, for unstable tenants, problems-with-safety in SRO housing were observed to have the most significant effect on health-outcomes however, did not having a significant affect for Social-housing buildings. These findings suggest that buildings that contribute to improvements in health among their residents provide environments where the needs of both of these populations are met.

Stable tenants in buildings with older populations are more likely to report a decrease in health in the past year. The inverse relationship between age and change in health status was found in all models and was a significant predictor of changes in health status at the building level. This finding is surprising because it suggests that the relationship between health and age at the building level is linear rather than curvilinear, as research on the life-course and health would suggest. However, these studies tend to use mortality rates rather than self-reported change in health in the past year. Despite this, the significance of this relationship should be cause for concern and is most likely related to the low socio-economic status (SES) of the area. Higher SES populations are able to draw on a wider range of resources that act as protective factors against morbidity and mortality (Link, Phelan and Tehranifar 2010). This is reflected by the lower-mortality rates of high-SES groups when compared to low-SES groups (Hemingway, Nicholson and Marmot 1997; Smith 2007). The theory that age can be used as a proxy for SES
cannot be tested for in this analysis because the survey does not include a higher-income population that would allow for a comparison of the age affects of change in health between different SES groups. Nevertheless, among these building the negative relationship between age and change in health appear to be somewhat attenuated if residents are provided with social housing and/or report that building management is good.

The finding that stable residents in social housing buildings have significantly better health outcomes than their SRO counterparts echoes previous studies that have found that SRO have higher morbidity and mortality rates (Corneil et al. 2006; Shannon et al. 2006). Nevertheless, there was no interaction between the type of housing and other significant factors associated with a change in health. This is substantively interesting because it suggests that factors likely to lead to increases in health will be effective in both social and SRO housing. For example, programs developed to improve the health of older populations are likely to be effective in both SRO and social housing buildings if the population is stable. The lack of a significant interaction between the type of housing and other significant variables suggests that the better health outcomes within social-housing buildings are directly related to the physical environment (e.g. having a private bathroom/kitchen).

Within the Downtown Eastside Demographic studies there were many proxy-measures of the social environment, including age and management rating, however there were no questions that directly related to people’s living spaces. There is a large body of literature that has demonstrated the effects of SRO buildings are relatively uniform - providing residents with a single room, in-suite sink and shared bathroom and kitchen facilities – the living units within
social-housing buildings provide a range of accommodations, from simple bachelor suits to apartment style multi-room residences. Qualitative research has demonstrated that these structural differences can make dramatic differences in people’s lives especially after periods of homelessness (Gurstein and Small 2005). Furthermore, studies from New Zealand using the Canadian National Occupancy Standards (CNOS) demonstrated that crowding contributes to hospitalization (Baker et al. 2006). While SRO buildings in the DTES challenge traditional understanding of “crowding” by providing each person a “room” (Lauster and Tester 2009), they maintaining material inequalities and challenge home-making strategies that are available in Social housing buildings. These differences likely contribute to the poorer health outcomes in the past year within SRO buildings.

Rating of management and change in health were positively correlated, with better management significantly related to better health outcomes compared to one year ago at the building level. The lack of an interaction between management rating and the type of housing brings credence to the hypothesis that residents who live in SRO buildings and feel that their needs are being met by management are equally likely to benefit in health from the positive implications of good management. Nevertheless it is interesting to note that it is difficult to determine what “good” management consists of as management had a very low variance inflation factor (vif) with other variables that would have been suspected to correlate with it. The variance inflation factor tests for multicollinearity between variables (the idea that variables are measuring the same underlying concept). Variables that would have been thought to be associated to good management such as lower reported problems-with-safety and pests did not seem to be correlated to rating of management. The low level of collinearity between the
management rating and other factors suggests a need for further exploration of the successful characteristics of buildings where management is satisfactory.

Age was also included in the analysis of unstable residents health outcomes, however it remained insignificant in all of the analyses. This is important since most populations do experience decreasing health as they age. The analysis of unstable residents seems to indicate that other factors are driving changes in health contributing to decreases in health at an early age that out-weight the life-course forces. I would predict that as populations age there would be a greater likelihood in reporting poorer health compared to 1 year ago however there “is curiously little empirical evidence on the dynamics of self-assessed health” (Vaillant and Wolff 2008). On the other hand the adverse effects of unstable-housing on health for all age-groups have been widely documented (Shapcott et al. 2010; Tjepkema and Wilkins 2011). With this in mind the fact that buildings with younger populations of unstably housed resident are not significantly more or less likely to report better health than buildings with older populations should not come as a surprise. However, it is cause for concern because it is reflected by higher mortality rates among unstably housed people (Holton et al. 2010; Tjemkema and Wilkins 2011). Nevertheless, the analysis of unstable tenants also provided some insight into factors that contributed to better health outcomes.

There was a significant positive correlation between improved health in the last year and social housing for unstable residents. The higher overall-rates of stability within social housing also suggest that once people gain access to social housing buildings they are less likely to make a subsequent move. Recalling the discussion of structural-environmental differences between SRO buildings and social housing buildings, the improved living-environment that social
housing affords its residents is likely the main influencing factor for these changes. This aligns with previous qualitative research that provides insight into the importance of having a private space, especially after living on the streets or in shelters (Gurstein and Small 2005; Robertson and Culhane 2005). Of further interest, while problems-with-safety were significantly correlated to poorer health outcomes among SRO residents, they were not a significant determinant of health for new social housing residents. This finding suggests that the private spaces that social housing buildings afford their residents may act as a protective factor against the problems with safety that affect unstable residents in SRO housing.

The interaction term between type of housing and problems-with-safety demonstrates that the extent to which problems-with-safety affected health depended on the type of housing. More specifically, problems-with-safety were a significant determinant of health for SRO residents, however they were not significant for social-housing residents. The significance of the interaction between type of housing and problems-with-safety echo qualitative findings that feeling un-safety contributes to instability (Robertson and Culhane 2005; VANDU Women’s Care Team 2009). Unfortunately studies have not been done that explore the relationship between building-level stability and problems-with-safety. This finding has important implications, and contributes to a better understanding of the steps that can be taken to improve the health outcomes of SRO residents. Clearly SRO buildings that address problems-with-safety can contribute to a more stable living environment while also contributing to the health of building residents.
Findings from the “Positive Spaces, Healthy Places” project in Ontario suggests that feelings of un-safety are especially likely to affect the mental health of residents (Greene et al. 2010). Within their research problems-with-drugs were often associated with instability (Green et al. 2010). As one participant describes:

“People were constantly knocking on my door; um call this dealer, here come smoke a twenty piece with me and I found I was getting too much into the crack and I didn’t like the person I was and I didn’t like who I was becoming so I said fuck it. I locked my door and I went to a shelter.”

(Green et al. 2010)

When trying to understand the main factors contributing to feelings of un-safety, problems with drugs appear to be linked to fear of drug related risk and violence and instability (Shannon et al. 2006). While problems-with-safety and problems-with-drugs were not collinear they did appear to have a similar effect on the analysis, especially when cases with smaller samples were removed (Table 8). In Table 7, the robustness of the interaction term comes into question, as it is no longer significant when buildings with low-response rates are dropped (n≤1). Table 8 provides a summary of the findings when these cases are removed. The interaction term is no longer significant (likely due in part to the fact that there are no longer enough social housing buildings in the analysis to support a comparison, See Appendix B) however, the type of building and problems-with-safety remain significant. Nevertheless, problems-with-safety becomes insignificant when problems-with-drugs is included in the model (Model 4; Table 8). Clearly problems-with-safety and problems-with-drugs are related, however further research is needed to determine the extent to which problems-with-drugs mediates problems-with-safety and
a larger sample is required to determine whether these findings remain significant when more representative sampling is used.

This analysis has several limitations. The first set of limitations is related to the distinction between unstable and stable tenants. First, the use of stratified random-sampling contributed to the lack of representation of unstable tenants, especially within Social-housing. Further research needs to explore how new residents to social housing navigate health. Second, the measure of stability - based on the time that a resident reported living at their current address - did not account for alternative living situations. The possibility that survey participants spent the majority of their time in another living space or moved within their current building was not considered. The practice of moving tenants to different rooms within the same building is one method that has been documented in the DTES to avoid street-homelessness for “hard-to-house” tenants that may have habits that contribute to unsafe living conditions (e.g. fire hazards, general disrepair of sinks/lighting etc.). The effects of this type of “inter”-building instability have not been well documented and were not accounted for within the survey. Although these factors were not accounted for in the measure of stability, people who experience “inter”-building instability are likely the minority furthermore there is no reason to believe that they would overly affect the distinction between unstable and stable tenants. Finally, the extent of the instability that people had experienced was unclear from this study. Future research should consider using a longitudinal survey in order to better understand the extent and effects of instability within SRO and Social-housing buildings.
The second set of limitations in this study are related to the different demographic composition of building residents which was not accounted for when variables were aggregated to the building level. Future analyses should take a hierarchical modeling approach to this data, as this would allow gender, ethnicity and age to be more accurately accounted for. Furthermore, taking a building level approach to the analysis made variables such as age and ethnicity difficult to incorporate. The absence of these variables from the analyses is problematic, and it is important to recall gendered differences in the experience of health and home as discussed in the literature review (Robertson and Culhane 2005; VANDU Women’s Care Team 2009). Finally, building’s range in size within the DTES from 6 units to 200, while analytic weights were used to account for the different sample sizes taken from each building the overall building size was not accounted for. Using proportional weights would be another method of testing the robustness of the models summarized above.
Chapter 7: Conclusion

To conclude, I analyzed stable and unstable residents, and their average change in health compared to 1 year ago at the building level and found that a different set of factors contributed to health for these two groups. Nevertheless, both populations benefited from living in social housing and reported significantly better health. Stable residents health declined as they aged, and buildings with older populations had significantly poorer health than buildings with younger populations, however living in social housing and/or having good management contributed to significantly better health. Future research is needed to determine what good management entails and the steps necessary to facilitate good management. Management was not a significant determinant of health outcomes for unstable residents, likely due to the fact that these relationships take time to develop. Despite this, poor management likely contributes to problems with safety within buildings and problems-with-safety significantly affected unstable residents health, especially within SRO buildings. Furthermore, problems-with-safety appear to be related to problems-with-drugs.

While this is being written the City of Vancouver has a number of new social-housing buildings that are in process, or recently completed. Clearly both unstable and stable low-income people benefit from social-housing and there is hope that these measures will address longstanding structural and systematic processes that have contributed to the poor-health outcomes among low-income people, especially in Vancouver’s DTES. Housing instability is a driving force of these disparities. With a better understanding of the factors that most-likely impede health for unstable residents, such as problems-with-safety, there is the opportunity to
focus resources on these factors to facilitate the transition from inadequate housing, to environments that contribute to the health and stability of residents. For people who live in poverty in Vancouver, SRO and Social Housing continue to be the housing options that are most accessible, however these two types of housing show substantively different levels of stability. To decrease health inequalities, there is a need to further invest in social housing and the safety and security of SRO housing.
References


57


King, D. November 22, 2011. “This national housing day we’re taking a slumlord to court” [Internet]. Pivot Legal Society. Retrieved from: [http://pivotlegal.org/pivot-points/blog/this-national-housing-day-were-taking-a-slumlord-to-court](http://pivotlegal.org/pivot-points/blog/this-national-housing-day-were-taking-a-slumlord-to-court)


VANDU Women’s Care Team. 2009. “Me, I’m Living it: The Primary Health Care Experiences of Women who use Drugs in Vancouver’s Downtown Eastside.” Summary of Findings from the VANDU WOMEN’S CLINIC ACIONT RESEARCH FOR EMPOWERMENT Study.


INTRODUCTION AND CONSENT

Hello, my name is ________________________________. I’m conducting a study for the City of Vancouver and BC Housing which looks at the lives of residents in the Downtown Eastside of Vancouver.

This survey asks questions about you and your housing situation. Our goal is to understand the living situation of Downtown Eastside residents.

The questions will take approximately 20 minutes.

Your participation is up to you. You do not have to give your name and your privacy will be protected.

Are you interested in being part of this study and do you have any questions before we start?

Thank you.

Administrative Data (for researcher use only)

<table>
<thead>
<tr>
<th>Researcher name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of day</td>
</tr>
<tr>
<td>Day of week</td>
</tr>
<tr>
<td>Name of hotel or residence of respondent</td>
</tr>
<tr>
<td>Room # (Primary residence of respondent)</td>
</tr>
<tr>
<td>Live alone ☐</td>
</tr>
<tr>
<td>English as primary language</td>
</tr>
<tr>
<td>First language (if not English)</td>
</tr>
<tr>
<td>Place survey administered (if different from above)</td>
</tr>
<tr>
<td>Other comments</td>
</tr>
</tbody>
</table>
### CURRENT HOUSING SITUATION

**Q1. How long have you lived at this address?**

- [ ] Less than 6 months
- [ ] 6 months to 1 year
- [ ] Between 1 and 2 years (12 months to 24 months)
- [ ] Between 2 and 5 years (24 months to 60 months)
- [ ] More than 5 years
- [ ] Unsure
- [ ] No response

**Q2. How long have you lived in the Downtown Eastside?**

- [ ] Less than 6 months
- [ ] 6 months to 1 year
- [ ] Between 1 and 2 years (12 months to 24 months)
- [ ] Between 2 and 5 years (24 months to 60 months)
- [ ] More than 5 years
- [ ] Unsure
- [ ] No response

**Q3. How much rent do you pay? $________/month**

**Q4. How would you rate your current housing compared to your previous housing?**

- [ ] It is a lot better
- [ ] It is somewhat better
- [ ] It is about the same
- [ ] It is somewhat worse
- [ ] It is a lot worse
- [ ] Unsure
- [ ] No response
### CURRENT HOUSING SITUATION

**Q1. How long have you lived at this address?**
- [ ] Less than 6 months
- [ ] 6 months to 1 year
- [ ] Between 1 and 2 years (12 months to 24 months)
- [ ] Between 2 and 5 years (24 months to 60 months)
- [ ] More than 5 years
- [ ] Unsure
- [ ] No response

**Q2. How long have you lived in the Downtown Eastside?**
- [ ] Less than 6 months
- [ ] 6 months to 1 year
- [ ] Between 1 and 2 years (12 months to 24 months)
- [ ] Between 2 and 5 years (24 months to 60 months)
- [ ] More than 5 years
- [ ] Unsure
- [ ] No response

**Q3. How much rent do you pay? $________/month**

**Q4. How would you rate your current housing compared to your previous housing?**
- [ ] It is a lot better
- [ ] It is somewhat better
- [ ] It is about the same
- [ ] It is somewhat worse
- [ ] It is a lot worse
- [ ] Unsure
- [ ] No response
Q5. How would you rate the following aspects of your current housing?

<table>
<thead>
<tr>
<th></th>
<th>Very Good</th>
<th>Good</th>
<th>OK</th>
<th>Poor</th>
<th>Very Poor</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Neighbourhood</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Safety and security in the building</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Building management</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Maintenance</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Ability to have guests</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Overall satisfaction</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Q6. Compared to others you know, how would you rate your current housing?

- □ A lot better
- □ Somewhat better
- □ About the same
- □ Somewhat worse
- □ A lot worse
- □ No response

Q7. How big a problem are each of the following in this building?

<table>
<thead>
<tr>
<th></th>
<th>Big problem</th>
<th>Small problem</th>
<th>Not a problem</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pests (mice/rats, roaches, bedbugs)</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Noise</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Concerns for personal safety</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Drug related activity in building</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Strangers in the building</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Guest fees ($________/visit)</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Q8 (a) What is the best thing about living i) in this housing and ii) in the DTES?

i) __________________________________________ ii) __________________________________________

Q8 (b) What is the worst thing about living i) in this housing and ii) in the DTES?

i) __________________________________________ ii) __________________________________________
### Q9. If you could afford to live outside the DTES, would you move? (If no, please go to Q. 10)

- Yes, I would move  (Where? __________________________________________)
- No, I would stay in the Downtown Eastside
- Unsure
- No response

**Q9(a). If you said you would move, please say why?**

### Q10. How much longer do you see yourself living in the Downtown Eastside?

- Less than 1 year
- 1 to 2 years (13 to 24 months)
- 2 to 5 years (25 to 60 months)
- More than 5 years (61+ months)
- Unsure
- No response

### PREVIOUS HOUSING SITUATION

### Q11. What type of housing did you live in **immediately** before (the day before) moving in here?

- SRO hotel/rooming house (Name _______________________________________)  
- A private suite in a house (garden, basement or other)
- A room in a place shared with others
- Private apartment (low rise/high rise building)
- Lived or stayed with friends or family members (including parent/s)
- Emergency shelter
- Homeless/on the street
- An entire house you rented or owned
- Subsidized housing (non-profit, co-op or public housing)
- Housing with on-site staff to help you (Supported housing)
- Jail
- Hospital
- Recovery house
- Other (Please explain __________________________________________________)
Q12. **What was your main reason for moving from your previous housing?**

Q13. **Where was your previous housing located?**

- Downtown Eastside (where ________________)
- City of Vancouver--not DTES (where ________________)
- Lower Mainland—not City of Vancouver (where ________________)
- Elsewhere in B.C.—not Lower Mainland (where ________________)
- Outside of B.C. (where ________________)

Q14. **Have you experienced any changes in your life in the past year that affected your housing? (eg. relationship breakdown, fight with roommate, loss of job, health issues, eviction)**

- Yes (Please describe ________________)
- No
- Unsure
- No response

Q15. **How many times have you moved in the last year? (____________________ times)**

Q16. **Have you been evicted in the past year?**

- Yes (Please describe ________________)
- No
- No response

**HISTORY OF HOMELESSNESS**

Q17. **Have you ever used an emergency shelter?**

- Yes
- No
- No response

Q17(a). **If yes, how many times did this happen in the past year? (____________________ times)**
Q18. Have you ever stayed with family or friends because you did not have your own place (‘sofa surfed’)?
- Yes
- No
- No response

Q18 (a) If yes, how many times did this happen in the past year? (_____________________ times)

Q19. Have you ever slept on the street, in a park, in a vehicle (‘slept rough’)?
- Yes
- No
- No response

Q19 (a) If yes, how many times did this happen in the past year? (_____________________ times)

Q20. Have you ever lived in subsidized (social) housing? (ASK ONLY SRO RESIDENTS)
- Yes (If yes, why did you leave? ________________________________)
- No
- Unsure

Q20(a). Have you ever applied to live in subsidized (social) housing? (ASK ONLY SRO RESIDENTS)
- Yes (If yes, how long ago? ________________________________)
- No
- Unsure

**ABOUT YOU**

Q21. What gender do you identify as?
- Male
- Female
- Transgendered

Q22 (a). Where were you born? ________________________________
Q22 (b). What is your age? __________________
Q22 (c). In what town or city did you go to Elementary School? ________________________________
Q22 (d). If you went to High School, in what town or city? ________________________________
Q22 (e). What was your age when you first left home? __________________
Q23  Why did you first move to the DTES and where did you move from? (Please try to reply in terms of major life events like jobs, relationships, family issues, health issues).

Why? ____________________________________________________________

Where from? ______________________________________________________

Q24. Have you ever been in public care such as a foster home, group home, prison, or long-term mental health institution like Riverview?

- [ ] Yes __________________________________________________________
- [ ] No
- [ ] No response

Q25. Please indicate your ethnic background.

- [ ] Asian ______________________________
- [ ] Black ______________________________
- [ ] Caucasian/White ____________________________
- [ ] First Nations _____________________________
- [ ] Hispanic ______________________________
- [ ] Other _______________________________
- [ ] No response

Q26. Are you a new immigrant or a refugee?

- [ ] New immigrant (how long have you lived in Canada __________ yrs)
- [ ] Refugee (how long have you lived in Canada __________ yrs)
- [ ] Not applicable
- [ ] No response

Q27. Which best describes your household?

- [ ] Single person
- [ ] Two or more unrelated persons sharing accommodation
- [ ] Couple without children
- [ ] Couple with children
- [ ] Single parent family with children
- [ ] Other (Please specify) ________________________________
Q28. Have you previously been married?
- [ ] Yes
- [ ] No
- [ ] No response

Q28 (a). Do you have any children?
- [ ] Yes  (Please specify how many children 18 or younger ________________)
- [ ] No
- [ ] No response

Q28 (b). Are you in contact with your child/ren?
- [ ] Yes, regularly
- [ ] Only sometimes/some of them
- [ ] No

Q29. Where do you mostly get or buy your food? ___________________________________

Q29 (a). Where do you mostly get or buy your clothes? _______________________________

ABOUT YOUR EDUCATION, INCOME AND EMPLOYMENT

Q30. What is the highest educational level you have completed?
- [ ] Elementary school (Grade completed ____________________)
- [ ] High school (Grade completed ________________________)
- [ ] Trade or vocational school
- [ ] College/University
- [ ] Have not completed any schooling
- [ ] No response

Q31. Over the past year, what was the main source of income for your household?
- [ ] Employment
- [ ] Employment insurance
- [ ] Income Assistance
- [ ] Federal Pension (Senior or Disability)
- [ ] Retirement income and private pensions
- [ ] Grey economy (sex trade, drugs, under the table employment, binning, etc.)
- [ ] Student loans
- [ ] Other  (Please specify) _____________________________________
Q 32. Are you able to work?
- Yes
- No
- Unsure
- No response

Q 32 (a). Do you work?
- Yes
- No
- Unsure
- No response

Q32 (b). If yes, please describe how you earn your income?
- Full time regular employment
- Part time regular employment
- Through ‘labour ready’/temp agencies
- Squeeging, panhandling, binning, collecting bottles/cans
- Sex trade work
- Volunteer
- Other

Q33. Approximately what was your total income for last year from all sources? $__________

GENERAL HEALTH STATUS

Q34. How would you rate your health?
- Excellent
- Very good
- Average
- Poor
- Terrible
- No response
Q35. How is your health compared to one year ago?

- Much better
- Somewhat better
- About the same
- Somewhat worse
- Much worse
- Unsure
- No response

Q36. Do you face any of the following health challenges? (Check all that apply)

- Physical limitations (e.g. chronic pain, mobility challenges)
- Mental health challenges
- Alcohol addiction (if yes, at what age did you begin? ________________)
- Drug use/addiction (if yes, at what age did you begin? ________________)
- T.B., Hep C or HIV/AIDS
- Diabetes
- Fetal Alcohol Syndrome
- Brain injury
- I have no health challenges
- No response

Q37(a). Do you smoke?

- Yes, a lot/regularly
- Yes, only a bit/occasionally
- No
- No response

Q37(b). Do you use drugs?

- Yes, a lot/regularly
- Yes, only a bit/occasionally
- No
- No response

Q38. If you are a drug user, which drug do you use the most? ____________________________

Q38(a). If yes, how much does your drug use cost per day? $________________
Q 39. Have you been to Emergency in the past year?
- Yes (# of times____________)
- No
- Unsure

Q40. Have you been hospitalized overnight in the past year?
- Yes (# of times____________)
- No
- Unsure

Q41. Do you believe your health has been negatively affected by living in the Downtown Core?
- Yes (Please describe how _______________________________________________)
- No
- Unsure
- No response

PATTERNS OF SERVICE USE AND COMMUNITY SUPPORTS

Q42. Please indicate which of the following government support programs you have used in the past year, and how often. Please also provide us with comments on the programs you use.

<table>
<thead>
<tr>
<th>A. USE</th>
<th>B. FREQUENCY</th>
<th>C. COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Often</td>
</tr>
<tr>
<td>Income support (Benefits, Disability)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Job training, skills development</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Food bank or meal program</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Safe injection site</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Mental health or addiction services</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Health Clinic</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Hospital</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Community centres (eg. Carnegie)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>On site (in bldg) services/supports</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other _________________________</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Q43. *(ONLY FOR THOSE NOT ON IA)* Have you tried to get Income Assistance in the past year?

- ☐ Yes
- ☐ No
- ☐ Unsure
- ☐ No response

Q43(a). If not, why not? If yes, please explain what happened.

<table>
<thead>
<tr>
<th>1.</th>
<th>Is help available?</th>
<th>☐ Yes</th>
<th>☐ No</th>
<th>☐ Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Is help available?</td>
<td>☐ Yes</td>
<td>☐ No</td>
<td>☐ Unsure</td>
</tr>
<tr>
<td>3.</td>
<td>Is help available?</td>
<td>☐ Yes</td>
<td>☐ No</td>
<td>☐ Unsure</td>
</tr>
</tbody>
</table>

Q44. What are the things you most need help with right now? *(PROBE: USE PROMPTS SUCH AS ACCESS TO INCOME SUPPORT, HEALTH CARE, EMOTIONAL SUPPORT, FINDING A JOB, SKILLS TRAINING, HOUSING…)*

Q45. Thank you for taking the time to complete the survey. Do you have any other thoughts or observations that you would like to share with us?
APPENDIX B

Tests for Normality and Adjustments for Table 4: Model 3

Table 9: Model 3 Prior to Adjustments

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>4.22463873</td>
<td>3</td>
<td>1.40821291</td>
</tr>
<tr>
<td>Residual</td>
<td>20.6629689</td>
<td>122</td>
<td>0.169368598</td>
</tr>
<tr>
<td>Total</td>
<td>24.8876076</td>
<td>125</td>
<td>0.199100861</td>
</tr>
</tbody>
</table>

Number of obs = 126
F( 3, 122) = 8.31
Prob > F = 0
R-squared = 0.1697
Adj R-squared = 0.1493
Root MSE = 0.41154

<table>
<thead>
<tr>
<th>Healthcompar–1</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;t</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.016392</td>
<td>0.0036884</td>
<td>-4.44</td>
<td>0</td>
<td>-0.0236936 -0.0090904</td>
</tr>
<tr>
<td>Privatesocial</td>
<td>0.2009118</td>
<td>0.0876365</td>
<td>2.29</td>
<td>0.024</td>
<td>0.0274265 0.3743971</td>
</tr>
<tr>
<td>Ratemanagement</td>
<td>0.1391959</td>
<td>0.0525983</td>
<td>2.65</td>
<td>0.009</td>
<td>0.0350723 0.2433194</td>
</tr>
<tr>
<td>_cons</td>
<td>3.05156</td>
<td>0.2390764</td>
<td>12.76</td>
<td>0</td>
<td>2.578284 3.524836</td>
</tr>
</tbody>
</table>

Outliers and Leverage
First of all, I want to look at outliers and leverage points:

Figure 7: Model 3, Outliers and Leverage Points
High leverage: Building 1
Outliers: Building 2, Building 3 and Building 4

The problematic cases appear to be Building 2, 3 and 4. It appears that the Building 3 represents a case where the one person’s change in health over the last year is not represented by the building level measures that are highly influenced by the majority of unstable tenants. Buildings 2 and 4 both represent cases with n=1.

Building 1 represents one of the few buildings with only female respondents (n=4) these respondents rated their building very poorly and their case has high leverage. I will leave it in the analysis at first to see how it affects the model.

Table 10: Model 3 After Outliers Removed from the Analysis

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>4.54434683</td>
<td>3</td>
<td>1.51478228</td>
</tr>
<tr>
<td>Residual</td>
<td>17.4918489</td>
<td>119</td>
<td>0.146990327</td>
</tr>
<tr>
<td>Total</td>
<td>22.0361957</td>
<td>122</td>
<td>0.180624555</td>
</tr>
</tbody>
</table>

k
- Number of obs = 123
- F(3, 119) = 10.31
- Prob > F = 0
- R-squared = 0.2062
- Adj R-squared = 0.1862
- Root MSE = 0.38339

<table>
<thead>
<tr>
<th>Healthcompar~1</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;t</th>
<th>95% Conf.</th>
<th>Int</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.0167149</td>
<td>0.0034769</td>
<td>-4.81</td>
<td>0</td>
<td>-0.0235995</td>
<td>0</td>
</tr>
<tr>
<td>Privatesocial</td>
<td>0.183835</td>
<td>0.0826502</td>
<td>2.22</td>
<td>0.02</td>
<td>0.0201794</td>
<td>0.3474906</td>
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<tr>
<td>Ratemanagement</td>
<td>0.1621363</td>
<td>0.0498248</td>
<td>3.25</td>
<td>0.001</td>
<td>0.0634783</td>
<td>0.2607944</td>
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<tr>
<td>_cons</td>
<td>3.004049</td>
<td>0.2254351</td>
<td>13.33</td>
<td>0</td>
<td>2.557665</td>
<td></td>
</tr>
</tbody>
</table>

Normality of Residuals

This greatly improves the fit of the model and the error terms are now relatively normally distributed as can be seen in the k-density plots, qnorm and pnorm plots.

---

7 Buildings are numbered from left to right with Building 1 representing the outlier case at the top left of the graph. Hotel names were originally used in the analysis but have been removed to ensure building confidentiality.
Figure 8: Kernel Density Estimate

Kernel = epanechnikov, bandwidth = 0.1371

Figure 9: Quantile Plot of Residuals for Model 3

Empirical P[i] = i/(N+1)
“The `pnorm` command graphs a standardized normal probability (P-P) plot while `qnorm` plots the quantiles of a variable against the quantiles of a normal distribution. `pnorm` is sensitive to non-normality in the middle range of data and `qnorm` is sensitive to non-normality near the tails.” (Stata Web Book 2012) As can be see above, the results from `pnorm` show some indications of non-normality, while the `qnorm` of Model 3’s residuals shows a slight deviation from normal at the upper and lower tail. To ensure that these results are normal I also looked at the inter-quartile range of the residuals as well as the Shapiro-Wilkes W test for normality.

### Table 11: Inter-quantile Range of Residuals for Model 3

<table>
<thead>
<tr>
<th></th>
<th>low</th>
<th>high</th>
<th>mean=</th>
<th>std.dev.=</th>
<th>median=</th>
<th>pseudo std.dev.=</th>
<th>n= 123</th>
<th>IQR= .5429</th>
</tr>
</thead>
<tbody>
<tr>
<td>inner fences</td>
<td>-1.02</td>
<td>1.152</td>
<td>0.0614</td>
<td>0.4764</td>
<td>0.0322</td>
<td>0.4025</td>
<td></td>
<td></td>
</tr>
<tr>
<td># mild outliers</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% mild outliers</td>
<td>1.63%</td>
<td>2.44%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>outer fences</td>
<td></td>
<td></td>
<td>0.0686</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># severe outliers</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% severe outliers</td>
<td></td>
<td></td>
<td>0.00%</td>
<td>0.00%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Severe outliers would be evidence that the residuals are not normally distributed. Since there are no severe outliers we can accept that the residuals are normally distributed.

### Table 12: Shapiro-Wilk W Test for Normal Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>W</th>
<th>V</th>
<th>z</th>
<th>Prob&gt;z</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>123</td>
<td>0.9845</td>
<td>1.523</td>
<td>0.943</td>
<td>0.17274</td>
</tr>
</tbody>
</table>

The Shapiro-Wilk test supports this as we cannot reject the null hypothesis that the error is normally distribute (Prob>z = 0.17).

**Heteroscedasticity**

**Figure 11: Homoscedasticity in Model 3**

Within Model 3 the error variance is relatively homogenous as reflected by the Breush-Pagan Test for Heteroskedasticity. The Breush-Pagan tests the null hypothesis that the error variance is equal across difference in the dependent variable (y hat), against the alternative hypothesis that it is not. With a chi2(1)=0.66 and prob>chi2=0.3179 we can accept the null hypothesis that the error variance is not significant.

Of interest the point at the far left of the graph that seems to be separate from other residuals is the “Chinese United Church” hotel that was identified earlier in the analysis as a point with high
leverage. Despite this building clearly falling more to the right of the other points it does not appear to fall outside of the range of the other data and when it is removed there is a minimal affect on the heteroscedasticity (\(\text{chi2}(1)=0.97\); \(\text{prob}>\text{chi2}=0.3252\))

**Multicollinearity**

Multicollinearity within this model is very low as can be observed from the variance inflation factors below:

**Table 13: VIFs for Model 3**

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Privatesoc~l</td>
<td>1.37</td>
<td>0.727312</td>
</tr>
<tr>
<td>Age</td>
<td>1.36</td>
<td>0.736162</td>
</tr>
<tr>
<td>Ratemanage~t</td>
<td>1.08</td>
<td>0.929829</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>1.27</td>
<td></td>
</tr>
</tbody>
</table>

Points of concern were identified as those that had a 1/VIF of .1 or lower and would need to be explored as a linear combination of a fundamental concept. Clearly none of the points above measure similar conceptual constructs that would be better explored as a single variable.

I’ve also included the vif’s for **Table4: Model 4** to demonstrate the low collinearity between the variables:

**Table 14: VIFs for Model 4**

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeataddr~s</td>
<td>2.95</td>
<td>0.339178</td>
</tr>
<tr>
<td>Privatesoc~l</td>
<td>2.33</td>
<td>0.429158</td>
</tr>
<tr>
<td>Problempests</td>
<td>2.19</td>
<td>0.457414</td>
</tr>
<tr>
<td>Age</td>
<td>2.05</td>
<td>0.487384</td>
</tr>
<tr>
<td>Problemsaf~y</td>
<td>1.84</td>
<td>0.544862</td>
</tr>
<tr>
<td>Ratemanage~t</td>
<td>1.62</td>
<td>0.618972</td>
</tr>
<tr>
<td>CrimeCount</td>
<td>1.57</td>
<td>0.637711</td>
</tr>
<tr>
<td>Rateneighb~d</td>
<td>1.55</td>
<td>0.645554</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>2.01</td>
<td></td>
</tr>
</tbody>
</table>

**Model Specification**

Clearly with an Adjusted \(R^2\) of 18.63 Model 3 there are a number of other important variables necessary for predicting health compared to 1 year ago that are not being included in this model however within the social sciences and when exploring determinants of health such as the housing environment these findings are still significant.
Tests for Normality and Adjustments for Table 6: Model 6

Model 6 prior to adjustments:

**Table 15: Model 6 Prior to Adjustments**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>9.64963539</td>
<td>5</td>
<td>1.92992708</td>
</tr>
<tr>
<td>Residual</td>
<td>30.0456854</td>
<td>101</td>
<td>0.297482033</td>
</tr>
<tr>
<td>Total</td>
<td>39.6953208</td>
<td>106</td>
<td>0.374484158</td>
</tr>
</tbody>
</table>

Number of obs = 107
F( 5, 101) = 6.49
Prob > F = 0
R-squared = 0.2431
Adj R-squared = 0.2056
Root MSE = 0.54542

<table>
<thead>
<tr>
<th>Healthcompa~0</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;t</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.011325</td>
<td>0.0078144</td>
<td>-1.45</td>
<td>0.15</td>
<td>-0.026826t</td>
</tr>
<tr>
<td>Social (vs. SRO)</td>
<td>-1.249222</td>
<td>0.7325751</td>
<td>-1.71</td>
<td>0.091</td>
<td>-2.70245t</td>
</tr>
<tr>
<td>Problemsafety</td>
<td>-0.3962761</td>
<td>0.202608</td>
<td>-1.96</td>
<td>0.053</td>
<td>-0.798195t</td>
</tr>
<tr>
<td>_IPriXProbl_1</td>
<td>1.33414</td>
<td>0.5527749</td>
<td>2.41</td>
<td>0.018</td>
<td>0.237583t</td>
</tr>
<tr>
<td>Problemsdrugs</td>
<td>-0.1901357</td>
<td>0.1794724</td>
<td>-1.06</td>
<td>0.292</td>
<td>-0.546160t</td>
</tr>
<tr>
<td>_cons</td>
<td>4.136792</td>
<td>0.4324759</td>
<td>9.57</td>
<td>0</td>
<td>3.27887t</td>
</tr>
</tbody>
</table>

**Outliers and Leverage**

First of all, I want to look at outliers and leverage points:

**Figure 12: Model 6 Outliers and Leverage Points**
Leverage: Building 1
Both: Building 2
Outliers: Building 3 and 4

It appears that Building 1 is a case where the new residents report much better health than the population at large (13 residents 2 “unstable”, lived there for less than 1 year) and may not be representative of the wider building.

Building 3 is also a case where a “new” resident has rated their health very high (4 residents, 1 “unstable”)

Building 2– which has high leverage and is an outlier is a case where the new resident is also not representative of the building more generally (n=9, 1 “unstable residents”)

Building 4 follows the pattern of Building 2 where the 1 “new” unstable resident has experienced a significant decrease in health that does not align with more stable residents experiences and the building environment more generally.

Since all of these cases seem to be extreme compared to the more stable residents in their building who are the majority I will not include them in the analysis.

Once these cases have been dropped the model fit improves significantly:

**Table 16: Model 6 After Outliers Removed from the Analysis**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>9.51689483</td>
<td>5</td>
<td>1.90337897</td>
</tr>
<tr>
<td>Residual</td>
<td>25.471482</td>
<td>97</td>
<td>0.262592598</td>
</tr>
<tr>
<td>Total</td>
<td>34.9883768</td>
<td>102</td>
<td>0.343023302</td>
</tr>
</tbody>
</table>

Number of obs = 103
F( 5, 97) = 7.25
Prob > F = 0
R-squared = 0.272
Adj R-squared = 0.2345
Root MSE = 0.51244

<table>
<thead>
<tr>
<th>Healthcomp−0</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;t</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.0054208</td>
<td>0.0077995</td>
<td>-0.7</td>
<td>0.489</td>
<td>-0.0209006, 0.0100591</td>
</tr>
<tr>
<td>Social (vs. SRO)</td>
<td>-1.599442</td>
<td>0.8477309</td>
<td>-1.89</td>
<td>0.062</td>
<td>-3.281953, 0.0830691</td>
</tr>
<tr>
<td>Problem with safety</td>
<td>-0.3535721</td>
<td>0.193238</td>
<td>-1.83</td>
<td>0.07</td>
<td>-0.7370959, 0.0299518</td>
</tr>
</tbody>
</table>

---

8 Buildings numbered from top left to bottom right. Building names were used in original analysis but removed to ensure building confidentiality.
<table>
<thead>
<tr>
<th></th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;t</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction</td>
<td>1.604337</td>
<td>0.6505652</td>
<td>2.47</td>
<td>0.015</td>
<td>0.3131452 2.895529</td>
</tr>
<tr>
<td>Problem with drugs</td>
<td>-0.2465068</td>
<td>0.1718688</td>
<td>-1.43</td>
<td>0.155</td>
<td>-0.5876188 0.0946052</td>
</tr>
<tr>
<td>Intercepts</td>
<td>3.89303</td>
<td>0.4252286</td>
<td>9.16</td>
<td>0</td>
<td>3.049069 4.736991</td>
</tr>
</tbody>
</table>

As can be seen from the model above the difference between SROs and Social housing becomes moderately significant once outliers and leverage points are minimized.

**Normality of Residuals**

This greatly improves the fit of the model and the error terms are now relatively normally distributed as can be seen in the k-density plots, qnorm and pnorm plots.

**Figure 13:**

Kernel Density Estimate

Kernel density estimate

Normal density

kernel = epanechnikov, bandwidth = 0.1790
Figure 14: Quantile Plot of Residuals for Model 6

Figure 15: Normal Probability Plot for Model 6
From the above graphs the distribution looks relatively normal with no points of concern however to double check will also look at Shapiro-Wilk W test for normality:

| Variable | Obs | W      | V   | z   | Prob>|z|
|----------|-----|--------|-----|-----|-----|
| r        | 103 | 0.99136| 0.731 | -0.695 | 0.75642 |

This test strongly supports the position that we cannot reject the null hypothesis that the residuals are normally distributed.

Heteroscedasticity

Figure 16: Homoscedasticity in Model 6

As can be observed from the graph above there is a fairly significant pattern of heteroscedasticity with error variance most problematic around the middle value (3), meaning that the model does a poorer job of predicting health when the change in health at the building level averaged to “the same”. The Breush-Pagan Test for Heteroskedasticity (chi2(1)= 6.95 and prob>|chi2|=0.0084) supports this primary analysis demonstrating that we cannot reject the alternative hypothesis that the error is not normally distributed. Returning to an exploration of the dependent variable (Healthcompared-at the building level for unstable residents) as earlier when looking at the normality of the dependent variable and independent variables it was noticed that the dependent variable was not normally distributed (see graphs below)
Figure 17: Distribution of Dependent Variable for Analysis of Buildings with Unstable Tenants

The graph above includes cases where only one resident at the building level was identified as unstable. From this graph it is clear that there is a better representation of buildings with poorer health, and the distribution is not normal which contributes to the case of heteroscedasticity. When buildings with only 1 respondent are dropped the distribution approaches normal:

Figure 18: Distribution of Dependent Variable for Analysis of Buildings with Unstable Tenants when Buildings with Low-Response Rate Dropped
While dropping cases with low n does seem to improve the normality of the distribution for Healthcompared0 there is no longer enough cases of social housing buildings to support a comparison between SRO and Social housing.

**Table 18: Descriptive Statistics of Dependent Variable when Buildings with Low-Response Rate Dropped (n≤1)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Compared Unstable (SRO)</td>
<td>59</td>
<td>2.707085</td>
<td>0.5897821</td>
<td>1.5</td>
<td>4</td>
</tr>
<tr>
<td>Health Compared Unstable (Social)</td>
<td>20</td>
<td>3.340173</td>
<td>0.6304361</td>
<td>2.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Within the model using Healthcompared0_nolow (buildings with n=1 dropped) heteroscedasticity remains a problem, however it is less severe: chi2(1) = 6.13 Prob> chi2 = 0.0133. (The full analysis can be seen in Table 7 where the robustness of Table 6: Model4 is summarized). While dropping cases with low n does appear to decrease the heteroscedasticity I use Model 6 in this analysis because without including buildings with low n there are not enough buildings to explore an interaction term however Table 8 summarizes the findings without the inclusion of an interaction when cases with low n are excluded.

**Figure 19: Homoscedasticity in Model 3**

![Residuals vs Fitted values](image)

**Multicollinearity**

From Table 6: Model 6; which is Model 6 without the interaction term the variance inflation frequencies were calculated:
Table: VIFs for Model 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem safety</td>
<td>2.02</td>
<td>0.494918</td>
</tr>
<tr>
<td>Problem drugs</td>
<td>1.94</td>
<td>0.515935</td>
</tr>
<tr>
<td>Private social</td>
<td>1.27</td>
<td>0.788261</td>
</tr>
<tr>
<td>Age</td>
<td>1.22</td>
<td>0.822846</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>1.61</td>
<td></td>
</tr>
</tbody>
</table>

From the terms set out above (1/VIF<0.10 potential case of multicollinearity) there is a very low chance that multicollinearity is present in this analysis. Nevertheless the fact that problem with safety drops from significance when problem with drugs is included suggests that they are related as can be observed in Table 8.

Model Specifications

Clearly with an Adjusted R\(^2\) of 0.2345 for Table6: Model 6 there are a number of other important variables necessary for predicting health compared to 1 year ago for unstable residents that are not being included in this model however within the social sciences and when exploring determinants of health such as the housing environment these findings are still significant.