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Health Hazards in Rental Housing: An Overview of Clark County, Nevada

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HEALTH HAZARDS IN RENTAL HOUSING:
AN OVERVIEW OF
CLARK COUNTY,
NEVADA

by

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Bachelor of Arts in Community Health Education
Portland State University
2005

A thesis submitted in partial fulfillment
of the requirements for the

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May 2014

ABSTRACT

Health Hazards in Rental Housing: An Overview of Clark County, Nevada

by

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A wide range of health conditions are associated with housing conditions, including asthma, respiratory infections, injuries, mental health issues, and lead poisoning. People in modern societies spend more than 90% of their time indoors, the vast majority of which is spent at home. Therefore, any new information on housing related health hazards in a population provides an opportunity for a new prevention program. Reports have shown that rental properties have more health related hazards than owner occupied housing, and rental properties are frequently occupied by low-income and minority individuals. This descriptive study intended to provide an overview of housing related health hazards in Clark County, NV rental housing, as no published data exists regarding conditions in that subset of housing. Information gathered as part of the operation of a landlord/tenant hotline, managed by the Southern Nevada Health District, was analyzed to determine: 1) the geographical distribution of reported housing related health hazards in rental properties, 2) if an association exists between either income or type of housing and the frequency of reported housing related health hazards in rental properties, and 3) the prevalence of specific categories of hazards in rental housing. Frequency distributions showed that reports of housing related health hazards in rental properties (N=3,523) are not equally distributed throughout the county even after

adjusting for differences in the number of occupied housing units in an area. A Spearman's Rank Order correlation revealed a statistically significant inverse relationship ($n = 21$, $r = -.877$, $p < .01$) between median income of a zip code and reported housing related health hazards in that zip code. A Mann-Whitney U test indicated that the distribution of complaints is the same ($n = 21$, $p > .05$) across zip codes regardless of the predominant type of housing in that zip code. Frequency distributions of hazard category showed that mold, bed bugs, general maintenance, and cockroaches are the most frequently reported health hazards in Clark County rental housing. Reports of health hazards that are known asthma triggers made up 36.7% of the total reported health hazards in renter occupied housing, although this is thought to be a gross underestimate of the true prevalence due to reporting limitations. The results of this study contributed to narrowing the knowledge gap regarding housing conditions in renter occupied units in Clark County, NV and to the possibility of further analyses of the SNHD landlord/tenant hotline.

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CHAPTER 1

INTRODUCTION

Clark County, NV undoubtedly experiences a wide variety of housing-related health hazards. However, a significant knowledge gap exists with respect to housing conditions in the area, and particularly in a specific subset of housing, renter occupied units (ROUs). Currently there are no estimates of the prevalence of deficiencies that have been shown to negatively impact health in ROUs in Clark County. The purpose of this study is to provide an overview of the health hazards present in ROUs; what they are, who they affect, and how they are distributed, thereby narrowing the knowledge gap.

Information collected by the Southern Nevada Health District (SNHD) through the operation of a landlord/tenant hotline, as well as literature on the social inequities related to housing and health, provided the basis for this study's research questions, which are:

- 1) Are housing related health hazards in ROUs equally distributed across Clark County, NV?
- 2) Does median income, or type of housing, correlate to the frequency of housing related health hazards in ROUs?
- 3) How prevalent are hazards that are known asthma triggers?

Significance

This study is significant in that it is the first in the area to present data regarding health hazards in Clark County ROUs. Additionally, the Centers for Disease Control and Prevention (CDC) launched its most recent 10-year agenda for improving the nation's health, Healthy People 2020. One of the themes within the EH (Environmental Health) objectives is homes and communities. Furthermore, objective EH-19 is to reduce the number of occupied housing units with moderate or severe physical problems (U.S. Department of Health and Human Services [DHHS], 2010). While this study's findings will not be used as a measurement of meeting objectives, it will provide some information about physical problems in occupied housing units locally, specifically in ROUs. Information gained as a result of this study also provides support for further research into the efficacy of interventions aimed at renters, the possible need for new programs and interventions, and examination of social justice issues in the Clark County area.

Clark County, Nevada is an ideal location for this study for several reasons. First, published statistics or information regarding health hazards in ROUs in the county do not exist at present. Second, data is easily accessible due to the creation of the landlord/tenant hotline. Clark County also contains more than 70% of Nevada's 2.8 million residents and includes approximately 339,735 renter-occupied housing units (ROUs), which account for more than 47% of all occupied housing units in the county. Data from 2008-2012 shows that median household income in Clark County was similar to that in the rest of the state as well as the nation, as well as the percentage of the population living below poverty level (14.2% in the county versus 14.9% nationally)

(U.S. Census Bureau, 2013a). These socioeconomic similarities may allow for some generalization of results of this study to the larger population of the country, adding to the significance of the study.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Health and Housing

Housing is an extremely important determinant of health. For most people, the place we live represents comfort, safety, and security. However, circumstances in the home can be quite dangerous to the health of its inhabitants. Housing can influence health in many ways, and while housing affordability and the neighborhoods surrounding a home certainly affect health and the ability to make healthy choices; this study will focus on the physical conditions within the home environment and/or property. People in modern societies spend about 90% of their time indoors, including homes, workplaces, and schools. Approximately 66% of that time is spent in homes (Leech, Nelson, Burnett, Aaron, & Raizenne, 2002). Additionally, certain subpopulations such as infants, the elderly and those with chronic illnesses spend an even greater proportion of time indoors (American Lung Association [ALA], Environmental Protection Agency [EPA], Consumer Products Safety Commission [CPSC], & American Medical Association [AMA], 1994).

The importance of the connection between health and housing has been understood for centuries. The relationship between overcrowding or poor hygiene/sanitation and diseases like tuberculosis and the plague were researched many years ago. While poor sanitation and high population density are still enormous problems in the developing world, first-world countries face many other challenges related to health and housing.

The 2009 *Surgeon General's Call to Action to Promote Healthy Homes* states that “residents of homes with significant upkeep problems and structural and safety defects, such as lack of specific safety devices, deferred maintenance, moisture, and pest infestation, are also at increased risk for housing-related illness, injury, and disability” (DHHS, 2009). A wide range of health conditions are associated with housing conditions, including asthma, respiratory infections, injuries, mental health, and lead poisoning (Krieger & Higgins, 2002). Water leaks, poor ventilation, dirty carpets, and pest infestations can lead to an increase in mold, mites, and other allergens, which play an important role in the development and exacerbation of respiratory illnesses including asthma (Robert Wood Johnson Foundation, 2008). Exposure to various air pollutants, such as radon, environmental tobacco smoke, pollutants from heating and cooking with gas, volatile organic compounds, and asbestos, have been linked with respiratory illnesses and some types of cancer (Bonney, 2007). Injuries that occur in the home result in an estimated 4 million emergency department visits and 70,000 hospital admissions each year for children in the U.S. (Phelan, Khoury, Kalkwarf, & Lanphear, 2005). Lead is a known developmental toxicant and is often found within homes built before 1978; lead poisoning can cause learning disabilities, behavioral problems, seizures, coma, and even death (Centers for Disease Control and Prevention [CDC], 2009). Studies have shown that mental health may be adversely affected by housing conditions as well. According to Bonney (2007), “poor quality housing, providing insufficient protection from the outside, from noise, from scrutiny, and intrusion can be the source of major suffering” and “may generate pathological manifestations such as anxiety, depression, insomnia, paranoid feelings, and social dysfunction”. Additionally, lack of safe drinking water,

absence of hot water for washing, inadequate waste disposal, and intrusion by disease vectors such as rats and insects, and inadequate food storage contribute to the spread of infectious diseases (Krieger & Higgins, 2002).

Renters and Health

Social and economic circumstances dictate that housing quality varies greatly, and substandard housing is clearly much more of a risk for select subpopulations. Physical housing-related problems such as structural defects and environmental hazards are more likely to be occupied by low-income, minority individuals (U.S. Department of Housing and Urban Development [HUD] Office of Healthy Homes and Lead Hazard Control, 2012). Rental properties often are associated with these sensitive and underserved populations. Indeed, it is estimated from the American Housing Survey (AHS) that 29% of families in rental units across the nation are living below the poverty level. The survey also shows that the average median household income for OOUs is \$58,919 while that of ROUs is \$28,000 (U.S. Census Bureau, 2013b). In 2010, approximately 70% of renter occupied homes had incomes below the national median and 40% had incomes in the bottom quartile (Joint Center for Housing Studies of Harvard University, 2011).

Table 1 displays the prevalence of some specific health related hazards in both OOUs and ROUs as reported in the 2011 AHS. Renters reported more deficiencies in nearly every category. According to the *FY 2010-2014 HUD Consolidated Plan: Clark County, North Las Vegas, Boulder City, Mesquite*, in unincorporated Clark County alone, nearly 900 renters live in severely substandard households (lacking complete plumbing or kitchen facilities), compared to only 178 homeowners (HUD, 2010).

Characteristic	All Occupied Units		Owner Occupied		Renter Occupied	
	# of units	%	# of units	%	# of units	%
TOTAL (N)	114,907	100	76,091	100	38,816	100
Severe or Moderate Problems w/:						
Heating	1643	1.43	855	1.12	789	2.03
Plumbing	1650	1.44	716	0.94	935	2.41
Broken plaster or peeling paint (interior)	2370	2.1	1156	1.5	1214	3.1
Exposed wiring	1820	1.6	998	1.3	822	2.1
Holes in floors	1173	1.0	566	0.7	608	1.6
Open cracks or holes (interior)	5949	5.2	3180	4.2	2769	7.1
Water leakage in last 12 months						
From inside	9686	8.4	5385	7.1	4301	11.1
From outside	12461	10.8	8676	11.4	3785	9.8
Mold in last 12 months	4023	3.5	2015	2.6	2008	5.2
Households with children 6-17 years of age						
Diagnosed with asthma	5517	4.8	3263	4.3	2255	5.8
Visited ER in past 12 months due to asthma	625	0.5	277	0.4	348	0.9
Secondhand smoke entering home daily	1753	1.5	598	0.8	1155	3.0

Table 1. Selected Housing Deficiencies/Health and Safety Characteristics in Occupied Housing in the U.S. (Source: U.S. Census Bureau, 2013b)

The same AHS also showed that of ROUs with severe physical problems, 47% were Black or Hispanic households, 12% were occupied by elderly and 36% were occupied by tenants living below the poverty level. From a health standpoint, for renters specifically, families that spend half of their incomes or more for rent must budget wisely for all other necessities, including food and healthcare (Proscio, 2004).

The link between health and housing is undeniable and exists regardless of a property being occupied by its owners or by renters. However, there are additional

associations between health and housing tenure. Epidemiological research in several countries has repeatedly shown that owner-occupiers live longer and are healthier than renters (Hiscock, Macintyre, Kearns, & Ellaway, 2003). The reasons for these inequalities are debatable and are the subject of continuing research. Demographic differences between renters and owners, such as age, marital and socioeconomic status, and race may explain these varying health outcomes. Not only do homeowners tend to have larger incomes than renters, “Blacks and Hispanics are less likely to be homeowners on any socioeconomic level” (Eddy & Jones, 2011). Various characteristics of housing itself are another explanation. In truth, these explanations are inextricably linked and it can be argued that “people with particular personal characteristics reside inside housing with particular characteristics” (Hiscock et al., 2003). Regardless of demographic or other differences, tenants have little or no decision-making power to fix the variety of structural and environmental problems that may present health hazards (Rauh, Landrigan, & Claudio, 2008).

Again, these housing characteristics play an enormous role in the health of the people that live there. From the exacerbation of asthma, to injuries, to poor mental health, exposure to hazards within homes places a great burden, both physically and financially, on individuals, families, and society as a whole. Some of the most frequently reported housing related health hazards are reviewed here.

Asthma

The relationship between asthma and some of the more commonly reported problems in homes cannot be denied. Mold, some general maintenance issues, cockroaches, rodents, and environmental tobacco smoke (ETS) are all associated with asthma.

The National Institutes of Health (NIH) defines asthma as a common chronic disorder of the airways involving a complex interaction of “airflow obstruction, bronchial hyper responsiveness, and an underlying inflammation” (NIH National Heart, Lung, and Blood Institute, 2007). Asthma causes the airways of the lungs to swell and narrow, leading to wheezing, shortness of breath, chest tightening, and coughing (NIH, 2012). Asthma has emerged as a major public health problem in the United States in recent years, as the number of cases has more than doubled since 1980 (Redd, 2002). In 2011, approximately 25.9 million Americans had asthma (ALA, 2012). The financial burden associated with asthma in terms of direct health care costs and lost productivity in school and work settings continues to grow as well, to about \$56 billion in 2007 (CDC, 2011a). A recent study of students in Clark County, NV schools showed that children with asthma have a significantly greater risk of absenteeism at a level that puts them at risk of repeating a grade (Moonie, Cross, Guillermo, & Gupta, 2010).

According to the 2011 Behavioral Risk Factor Surveillance System (BRFSS), lifetime and current asthma prevalence rates in the state closely resemble the national prevalence rates. In Nevada, the percentage of adults that had ever been told by a doctor, nurse, or other health professional that they had asthma was 13.8, compared with 13.4 in

the U.S. When asked if they still have asthma, 8.1% of adult Nevadans said yes, compared with 9.1% in the U.S. (CDC, 2011b). In Clark County specifically, 13.7% of respondents reported that they had, at some point, been told by a health professional that they have asthma and 7.4% reported that they currently have asthma (Nevada DHHS, 2013a). These are likely underestimates, however, due to the fact that many people do not have a telephone landline enabling them to participate in the survey. Additionally, there are areas of Clark County with much higher rates. While the national 2012 current asthma prevalence rate in children was 9.3% (CDC, 2013a), individual schools within Clark County have reported rates as high as 16% (Clark County School District Office of Research Accountability, 2008).

Asthma disproportionately affects those with family income below the poverty level and certain minority groups (Akinbami et al., 2012). For example, in 2011, the prevalence rate in blacks was 36.9% higher than the rate in whites (ALA, 2012). Black children are twice as likely to be hospitalized and four times as likely to die from asthma as white children (EPA, 2013), and in Nevada specifically, non-Hispanic blacks have a current asthma rate (16.2%) twice that of the state average (8.1%) (Nevada DHHS, 2013a). Several studies have also suggested that the more severe forms of asthma are related to poverty (Rauh et al., 2008). Table 2 below shows the percentage of respondents to the 2011 Nevada BRFSS, broken down by income, that reported either currently having asthma or ever having been told by a medical professional that they had asthma.

Income	Current asthma	Lifetime asthma
< 15,000	12.0%	17.5%
\$15,000 to \$24,999	8.0%	15.9%
\$25,000 to \$34,999	9.9%	15.2%
\$35,000 to \$49,999	9.0%	16.4%
\$50,000 to \$74,999	6.1%	12.2%
\$75,000 +	6.0%	8.8%

Table 2. Asthma Prevalence by Income, Nevada BRFSS 2011 (Source: Nevada DHHS, 2013a)

While asthma rates do not differ significantly between renters and owners, a study of people with asthma found that renters were less likely (63%) than homeowners (91%) to make changes to minimize exposures to asthma triggers in their homes (American College of Allergy, Asthma & Immunology, 2012). Additionally, living in a unit with shared walls can affect the level of control people have over asthma triggers in their home (Milet, 2013).

One of the major components of effective asthma management is controlling exposure to factors that trigger asthma episodes. The Institute of Medicine (IOM) has reported that asthma and allergic conditions are believed to be associated primarily with exposure to contaminants in indoor rather than outdoor environments (IOM, 2000). Residential exposures have been repeatedly shown to be strong risk factors for the development and exacerbation of asthma. Children can develop asthma from contact with

indoor allergens and these allergens exacerbate existing asthma (Wu & Takaro, 2007). One study showed that 39% of doctor-diagnosed asthma cases in US children under the age of 6 could be prevented by eliminating exposures to indoor pollutants and allergens in housing, therefore having a huge impact on hospitalization rates, school absences, ER visits, medical costs, and the overall health and functioning of children (Lanphear, Aligne, Auinger, Weitzman, & Byrd, 2001). These indoor contaminants include mold, cockroach and rodent allergens, pet dander, dust mites, environmental tobacco smoke, and nitrogen oxides from gas stoves (HUD, Office of Healthy Homes and Lead Hazard Control, 2012). The American Housing Survey showed that about 12% of renters reported signs of rodents in their homes in the last 12 months, nearly 18% reported signs of cockroaches, 5% reported mold, and more than 19% reported either having a smoker that lives in the home or has visitors that smoke (U.S. Census Bureau, 2013b).

Further examination of the relationships between asthma and mold, asthma and cockroaches, and asthma and general maintenance can be found in later sections. The role of rodents, however, is discussed below.

Rodents and Asthma

Rodent allergens are a significant cause of asthma and allergic disease. Exposure in occupational settings such as laboratory workers has been noted for many years, but rodent allergens in home environments have only more recently been studied. Rodent allergens are likely from rodent urine, feces, saliva, and skin. While many of the rodent allergens have been identified, including rabbits, guinea pigs, and hamsters, the most studied and characterized are mouse and rat allergens. The development of rodent allergy

is related to both individual susceptibility and exposure. While individual susceptibility is not related to housing, exposure most certainly is. Exposure appears to be the most important risk factor for development of sensitization to rodent allergens (Phipatanakul, 2002). In a major asthma study on inner-city children, almost 20% of asthmatic children were found to have been sensitized to rats and 15% to mice. Rodents are a major concern, as other research suggests that mouse allergen exists in 82% of U.S. homes (National Center for Healthy Housing [NCHH], 2008).

In addition to acting as a trigger and a cause for asthma and allergies, rodents spread many diseases and disease-causing agents around the world both directly and indirectly, including hantavirus, leptospirosis, Lyme disease, and Plague (CDC, 2011c).

Mold

Mold is another known allergen found in the home and a frequently reported issue in rental housing. Molds are fungi that are found both indoors and outdoors. They are part of the natural environment outdoors, where they break down dead organic matter like dead trees and fallen leaves. Indoors, however, mold has the potential to cause health problems (described below) and should be avoided (EPA, 2010). Molds grow best in warm, damp, and humid conditions. They spread and reproduce by making spores that can survive harsh environmental conditions that do not support normal mold growth, such as dry conditions (CDC, 2012a). Normally the types and concentrations of mold indoors are similar to those found outdoors. However, indoor mold concentrations may increase whenever water accumulates in buildings, such as after flooding or due to leaks or air conditioning related condensation. Once water accumulates, it takes less than 72

hours for mold to begin growing on dampened surfaces (American Society for Microbiology, 2004).

Molds produce allergens, irritants, and in some cases, potentially toxic substances called mycotoxins (EPA, 2010). At least 60 species of molds have spores that are thought to be allergenic and 30% of patients with respiratory allergies seem to be particularly sensitive to molds, with children being the most sensitive population (Etzel, 2003). Epidemiological studies have shown associations between damp and moldy housing and recurrent headaches, nausea and vomiting, fever, and sore throats (Krieger & Higgins, 2002). The American Society for Microbiology also refers to an Institute of Medicine (IOM) report that states that “there is sufficient evidence of an association between the presence of mold and bacteria in damp indoor environments and hypersensitivity pneumonitis” in sensitized individuals, as well as an increased risk of lower respiratory tract illnesses in otherwise healthy children. Several studies have indicated that indoor mold exposure can alter brain blood flow, autonomic nerve function, and brain waves, and worsen balance, memory, concentration, and attention (Curtis, Lieberman, Stark, Rea, & Vetter, 2004). There is plenty of evidence indicating that children have a significantly higher chance of developing asthma if they are exposed to indoor air mold in the first years of their lives (Wu & Takaro, 2007). More than half of those with asthma have respiratory allergies, often to mold. Therefore, molds can actually trigger an asthma attack in sensitive asthmatics (EPA, 2012).

Bed bugs

Bed bug (*Cimex lectularius*) infestations are rapidly increasing worldwide. These insects have been known as human parasites for thousands of years, although populations dropped dramatically during the mid-20th century. In recent years, however, an alarming resurgence in the United States and many other countries has overwhelmed public health agencies with complaints about infestations. For example, reports of bed bug infestations in San Francisco doubled between 2004-2006 and in Australia, bed bug samples submitted to a government public health agency increased by 400% during the period of 2001-2004 compared with the previous three-year period (Goddard & deShazo, 2009). International travel, immigration, changes in pest control practices, insecticide resistance, and a lack of public awareness of bed bugs and the ease with which they are spread may have contributed to the recent population explosion in developed countries. Bed bugs are recognized as both an important environmental and public health issue, so much so that federal agencies issued a joint statement declaring them to be “a pest of significant public health importance” (EPA & CDC, 2010).

Bed bugs are small, flat, oval-shaped insects that feed on the blood of sleeping people and animals. Adults are reddish-brown in color while juveniles are much smaller and may be light yellow. Bed bugs range from 1 to 7 millimeters in length and resemble unfed ticks or small cockroaches. After a blood meal, they may increase in length by 30% to 50% and in weight by 150% to 200%. Adults can survive for up to a year without feeding, one of the reasons eradication is so difficult (Goddard & deShazo, 2009). Infestations usually occur near areas where people sleep or spend a significant amount of time, including apartments, shelters, dorms, hospitals, and hotels. Bed bugs hide during

the day in nearly every place imaginable: seams of mattresses, box springs, bed frames, headboards, night stands, picture frames, light switches, behind wallpaper, and in cracks or crevices, among other places (EPA & CDC, 2010). Bed bugs are mobile and spread quickly among residences in multi-unit buildings, traveling through voids in walls, along utility lines and heating ducts, and via elevator shafts, and laundry and mail chutes (Eddy & Jones, 2011). Dispersal of the insects also occurs by way of furniture, clothing, suitcases, used mattresses, and other personal possessions (Goddard & deShazo, 2009).

Bed bugs have become an epidemic in some towns and cities, causing an array of adverse health effects in humans. While a bite itself is normally painless at the time of feeding, symptoms after being bitten vary from person to person, from mild to, in rare cases, anaphylaxis. Some 70% of humans have allergic reactions to bed bug bites, experiencing inflamed swollen welts and itching that can last for hours to days (Eddy & Jones, 2011). The bites can also lead to secondary infections of the skin such as impetigo, ecthyma, and lymphangitis (EPA & CDC, 2010). Asthma attacks have also been attributed to large numbers of bed bugs becoming airborne (American College of Allergy, Asthma, & Immunology, 2010). Also concerning is the fact that bed bugs have been found to be infected with at least 24 disease organisms, including *Staphylococcus aureus*, *Trypanosoma cruzi*, and hepatitis B (Eddy & Jones, 2011). Although bed bugs are known to harbor pathogens, evidence for transmission to humans is uncertain (Goddard & deShazo, 2009). However, bed bugs can reduce quality of life by causing discomfort, embarrassment, sleeplessness, and anxiety. This added stress can then have a substantial effect on the emotional health and well-being of some people (Potter, 1996), and may even make a person more susceptible to common diseases. In fact, while

evidence for disease transmission is lacking, “issues of vector competence, reactions to insect bites, embarrassment, and mental anguish have been the basis for lawsuits against landlords and lodging corporations” (Goddard & deShazo, 2009).

Bed bug infestations are a burden to society economically as well. The combined losses from health care costs, wages, revenue for apartments, hotels, businesses, etc., and reduced productivity can be significant. In addition, the cost of effectively eliminating bed bugs may be much higher compared with the control of other pests for several reasons. Bed bug control usually requires multiple visits by a pest control operator as well as tenant cooperation with respect to preparing for pesticide application processes, removing clutter permanently, and diligence in monitoring for the presence of bed bugs (EPA & CDC, 2010). Effective control may also mean that mattresses, box springs, carpets, and other items be discarded, which can clearly be a financial burden for those incurring the costs (Goddard & deShazo, 2009). Bed bug control is obviously more difficult in multi-unit structures such as apartments because of the ease with which the insects move from unit to unit via belongings, voids in walls, pipes, and virtually any other place they can crawl through.

Pesticide misuse is another concern associated with bed bugs as residents may resort to trying to eradicate the insects themselves. Over-the-counter or homemade preparations may perpetuate pesticide resistance in bed bugs, may not be intended for indoor use, and may expose the tenant to unsafe levels of the product (EPA & CDC, 2010).

Cockroaches

Cockroaches are among the most common pests in many homes and other buildings. Not only are they offensive and leave behind an unpleasant odor, cockroaches in the home environment are a health hazard for several reasons. The manner in which cockroaches behave dictates that they have the potential to spread disease. For example, multiple roach species live in sewers and can easily travel via pipes or drains, possibly ending up on food or food preparation surfaces and utensils. They may feed on sewage, rotting food, or garbage, meaning they can transfer pathogens from these sources to people (Miller & Peters, 2004). Cockroaches are proven or suspected carriers of the organisms causing diarrhea, dysentery, cholera, leprosy, Salmonella, and many others (World Health Organization [WHO], 1997). Additionally, cockroaches are considered to be an allergen and an asthma trigger. Allergic sensitization to cockroaches has been related to the level of bedroom allergen exposure in children (Rauh et al., 2008) and exposure to cockroach allergens early in life has been found to be a predictor for the development of asthma (Miller & Peters, 2004). Debris such as saliva, droppings, and body parts carry proteins that trigger asthma attacks in sensitized individuals (NCHH, 2008). Based on positive skin tests, it has been estimated that 26.1% of the U.S. population exhibits allergic sensitization to the German cockroach (Arbes, 2005). In one nationally representative study assessing 831 homes, 13% were found to have cockroach allergen levels on kitchen floors that exceed the limit for allergic sensitization and 10% were found to have levels associated with asthma morbidity. Elevated concentrations of allergens were observed in high-rise apartments, urban settings, pre-1940's construction,

and households with annual incomes below \$20,000 (Cohn, Arbes, Jaramillo, Reid, & Zeldin, 2006).

Cockroaches may be the result of clutter and/or a lack of cleanliness, an infestation in adjoining units, cracks and crevices throughout the home, or, like dust mites and mold, may be the result of excess moisture in the home, which can be due to plumbing leaks, leaky roofs, or issues with HVAC systems. Integrated Pest Management techniques including general maintenance are recommended to prevent and/or control infestations (NCHH, 2008).

General Maintenance

General maintenance issues are common complaints from renters, and can prove to be the cause of many additional issues in the home, several of which were discussed previously. Proper maintenance of the structural components of a building or home is imperative in order to avoid poor health outcomes. According to the American Housing Survey, almost 5.8 million homes have severe or moderate hazards such as unsafe wiring, presence of rats, inadequate plumbing, failed heating systems and other physical problems. Of these, about 3.3 million are renter occupied units (DHHS, 2009).

Housing conditions such as plumbing leaks, roof leaks, and inadequate ventilation often contribute to mold formation, especially in older and poorly maintained buildings (Rauh et al., 2008). Occupants of damp buildings have reported a variety of symptoms, including headaches, nasal congestion, runny nose, watery, burning eyes, dry cough, tight chest, wheezing, nosebleeds, rashes, memory and cognitive problems, joint and muscle pain, and gastrointestinal problems (American Society for Microbiology, 2004). In

addition to encouraging mold growth, damp housing provides a perfect environment for mites, roaches, and respiratory viruses (Krieger & Higgins, 2002). Solutions to addressing interior and exterior sources of excess moisture include repairing and redirecting downspouts, fixing leaks, exhausting vents in kitchens and bathrooms to the outside and adequate ventilation (HUD, Office of Healthy Homes and Lead Hazard Control, 2012).

Landlords cannot be held responsible for much of the basic cleanliness of a home. However, the age and condition of carpeting can be partially controlled by a landlord. Exposure to dust, allergens, and toxic chemicals that collect in old, dirty carpeting can result in allergic, respiratory, neurological, and hematologic illnesses (Roberts & Dickey, 1995). Sensitization to house dust mites is an important risk factor for both the development and exacerbation of asthma. Household interventions including steam cleaning of carpets can decrease exposure to house dust mite allergens (Etzel, 2003).

Structural defects such as cracks and holes allow pests like cockroaches and rodents to enter homes, leaking pipes and other water sources provide them with water to drink, and inadequate disposal facilities can help them get food (Krieger & Higgins, 2002). These pests are not only annoying, but pose real health risks. IPM techniques such as replacing window screens and repairing leaks are recommended by the U.S. Environmental Protection Agency (EPA) for both the management of pest problems and to limit human exposure to pesticides, as pesticides may increase the risk of developing asthma, exacerbate existing asthma conditions, or trigger an asthma attack (Hernandez,

Parron, & Alarcon, 2011). Therefore, maintenance and timely repairs are imperative in order to safely avoid pest infestations.

Lead

Another important health concern related to the general maintenance of a home is lead exposure. Lead is a widely used metal that can be found nearly everywhere in the environment, including our homes. Lead and lead compounds have been used in a variety of products that are found in homes such as paint, pipes, plumbing materials, and gasoline. Although lead is a useful, functional element that serves many purposes, it is also highly toxic and has been shown to produce a number of adverse health outcomes.

Lead can affect almost every organ and system in the body, most severely the brain and central nervous system (National Conference of State Legislatures [NCSL], 2013). In adults lead exposure can result in cardiovascular effects, increased blood pressure and incidence of hypertension, nervous system effects, decreased kidney function, and reproductive problems in both men and women (EPA, 2012b). Pregnant women and women of child-bearing age are at increased risk because lead that accumulates in the body over time can cross the placenta and affect the unborn fetus and can result in miscarriage, premature birth, reduced growth of the fetus, problems with the baby's brain, kidneys, and nervous system, and learning and/or behavioral issues in the child (CDC, 2010). While everyone is susceptible to the damaging effects of lead exposure, children six years old and younger are especially at risk for lead poisoning due to frequent hand-to-mouth activity and lead is more readily absorbed by their rapidly growing bodies (EPA, 2013). Even at low levels of exposure, lead causes measurable

changes in children's mental development and behavior, including hyperactivity; deficits in fine motor function, hand-eye coordination, and reaction time; and lowered performance on intelligence tests (National Institute of Environmental Health Sciences [NIEHS], 2012), as well as insomnia, hearing loss, and impaired growth (NCHH, 2008). At very high levels of exposure lead poisoning can cause vomiting, staggering walk, muscle weakness, seizures, coma, and even death (U.S. National Library of Medicine [NLM], 2013). While all children living in older housing where lead paint is more prevalent are at risk for exposure to lead hazards, minority and low-income children are disproportionately affected (CDC, 2000).

While the use and production of lead has been greatly reduced, it remains a threat because of its persistence in the environment (NCSL, 2013). The major source of lead exposure for American children is ingestion of lead-contaminated dust that forms inside homes from the flaking and chipping of lead-based paint in housing built before 1978 (Rauh et al., 2008). Children are frequently poisoned when homes are poorly maintained with respect to deteriorating paint or when repainting and remodeling projects disrupt old painted surfaces (NCHH, 2008). Moisture, a contributing factor for multiple health issues discussed here, can also cause paint to break down faster or peel (Maine Center for Disease Control and Prevention, 2011).

Injury

Also related to the basic maintenance of a home or building is unintentional injury. In Nevada, as in the United States, unintentional injuries are the leading cause of death among people between the ages of 1 and 44 (CDC, 2013c). Both the state of

Nevada and Clark County specifically averaged more than twice the Healthy People 2010 goal of 17.1 deaths per 100,000 people (Nevada DHHS, 2013b). Non-fatal unintentional injuries are much more prevalent, with more than 300 million such injuries reported in the United States from 2000 – 2011 (CDC, 2013c). Based on National Health Interview Survey (NHIS) injury estimates, unintentional home injuries in the U.S. cost society at least \$217 billion (including medical and indirect costs as well as the value of lost quality of life) in 1998 (Zaloshnja, Miller, Lawrence, & Romano, 2005). That same year, based on NHIS and other survey data, there were more than 12 million unintentional home injuries requiring some form of medical attention (Runyan, Perkins, Marshall, Johnson, Coyne-Beasley, Waller, Black & Baccaglini, 2005). Injury rates were highest among the oldest and youngest age groups. In a study utilizing data from the National Vital Statistics System (NVSS), older adults (≥ 70 years) had higher rates of unintentional home injury deaths than all other age groups, with falls as the leading cause of death (Runyan, Casteel, Perkins, Black, Marshall, Johnson, Coyne-Beasley, Waller, & Viswanathan, 2005). The United States has one of the highest rates of child injury deaths with rates more than twice that of the highest-ranking countries. Each year in the U.S., more than 9,000 children die, more than 225,000 are hospitalized, and nearly 9 million are treated in hospital ER's due to unintentional injuries (CDC, 2012b).

As is the case with asthma and lead exposure, minority and socioeconomic status seem to have an impact on vulnerability to unintentional injury. In children, injury-related death and disability are more likely to occur among males, children of lower SES, those living in specific geographic regions, and in certain racial/ethnic groups (CDC, 2012b). Native American/Alaskan Native children have the highest fatality rate from

unintentional injuries. Black children have the second highest, with fatality rates nearly 1.5 times that of white children (Safe Kids Worldwide, 2008). An inverse relationship between SES and childhood injury morbidity and mortality has been shown in multiple studies from various locations around the world (Birken & Macarthur, 2004).

Data and statistics regarding unintentional injury in general are plentiful. However, such information regarding unintentional injury **in the home** is somewhat convoluted. One study mentioned previously found that 20% of all fatal unintentional injuries where information on the location of injury was available occurred in the home. Falls, poisonings, and fire and burn injuries were the leading causes of injury death in the home, accounting for nearly 80% of all fatal unintentional home injuries (Runyan et al., 2005).

There are many ways that substandard, poorly maintained housing can cause or increase the risk of injury. Exposed heating sources, unprotected upper-story windows, low sill heights, slippery surfaces (Krieger & Higgins, 2002), lack of stair railings and smoke and carbon monoxide alarms are but a few examples that can result in injury, illness, or poor health.

While the health hazards related to housing discussed here are prevalent and can be quite devastating, it is important to note that there are many other housing conditions that are associated with a wide range of health problems. The health hazards previously described in detail were the most frequently reported to the SNHD landlord/tenant hotline during the time period of this study based on preliminary review of the hotline database.

CHAPTER 3

METHODOLOGY

In May 2011, SNHD began receiving calls from Clark County, NV residents via a new telephone hotline. This hotline was created to assist and guide both property landlords and tenants with respect to any number of health related problems at a rental property. SNHD involvement with a specific caller ranged from basic advice, an explanation of Nevada law regarding habitability problems, referrals to more appropriate agencies or resources, visits to properties and documentation of findings by SNHD Environmental Health Specialists, and court appearances by SNHD personnel. Incoming calls were logged since May 1, 2011, with important information being tracked including the zip code of the property and the health issue(s) being reported, enabling statistical analysis of key parameters.

IRB and Data Management

The University of Nevada, Las Vegas (UNLV) Institutional Review Board (IRB) granted approval for the use of human subjects in a larger, related study of the landlord/tenant hotline (The Clark County Landlord Tenant Hotline Study) on 2/14/2014 (Appendix A). The Collaborative Institutional Training Initiative (CITI) course on Human Subjects Research (HSR) was completed as well.

A copy of the SNHD landlord/tenant hotline log, in the form of Excel spreadsheets, was used to arrive at the final data set. A sample can be found in Appendix B. All spreadsheets and related data sets were stored on password protected computers.

Study Design

A simple descriptive study design used quantitative measures to describe the current state of rental housing with respect to health hazards in Clark County as reported to SNHD via the landlord/tenant hotline. Retrospective data review of hotline logs was used to determine prevalence, types, and distribution of health hazards in Clark County area ROUs as reported to SNHD, as well as to assess the presence of asthma-related issues in ROUs. Demographic data was used to examine socioeconomic conditions of the zip codes that were determined to have the most health hazards in ROUs, after accounting for differences in the quantities of housing, as well as the predominant type of housing that comprises each of those zip codes. Study hypotheses, below, were analyzed using data from the landlord/tenant hotline over the 2-year period of 5/1/11 through 4/30/13.

Hypotheses

H_{a1}: Total complaints to the hotline are not equally distributed among Clark County city council wards and unincorporated areas of Clark County.

H_{a2}: After adjusting for differences in the quantity of housing units, there is an inverse relationship between the total number of complaints to the hotline from a zip code and median household income of that zip code.

H_{a3}: After adjusting for differences in the quantity of housing units, there is a difference in the number of complaints to the hotline between zip codes based on the type of housing in that zip code.

H_{a4}: There is a difference between the frequency of complaints to the hotline regarding known asthma triggers and complaints regarding all other issues (not asthma triggers).

Study Inclusion Criteria

The hotline received 4,483 complaints from a total of 3,314 calls between 5/1/2011 and 4/30/2013; the difference is due to the fact that many callers have multiple complaints about the same property. Complaints were logged into 15 categories including: Mold, General Maintenance, Bedbugs, Roaches, Insects, HVAC Outage, Malodor, Water Outage, Sewage, Electrical/Gas Outage, Rodents, Domestic Animals, Pigeons, Other, and Hoarder. The most prevalent complaints to the hotline were those issues that were previously discussed: mold, general maintenance, bedbugs, and roaches. However, inclusion and exclusion criteria (defined below) dictate that not all of the 4,483 complaints were included in this study.

In order to arrive at the final data set of calls and complaints to be included in this study, all of the SNHD landlord/tenant logs were combined into one Excel spreadsheet and each call entry was examined to determine eligibility for inclusion in the study. Entries that were not eligible based on the criteria below were deleted from the spreadsheet.

Inclusion Criteria

- Calls to the CCLTH from tenants, landlords, or someone calling on behalf of a tenant, of ROUs (single family homes, apartments, condominiums, duplexes, 3- or 4-plexes, or mobile homes) within Clark County

- Calls to the CCLTH in which both a zip code and a specific health-related complaint were entered into the database
- Calls made to the hotline between 5/1/2011 and 4/30/2013

Exclusion Criteria

- Calls to the CCLTH regarding OOU's
- Calls to the CCLTH from occupants/owners/management of dwellings that hold a Public Accommodation permit
- Calls to the CCLTH regarding ROUs outside of Clark County, NV
- Calls to the CCLTH regarding housing units in Mesquite, NV or Boulder City, NV *see below
- Calls to the CCLTH in which both a zip code and a specific complaint were not entered into the Excel database
- Repeat complaints regarding the same issue at the same ROU
- Calls regarding commercial properties
- Calls that did not identify a complaint at a specific property (i.e., caller wanted general information on the manner in which bed bugs are spread)
- Calls regarding buildings not intended for living quarters (i.e., caller renting a small room in a church)
- Calls regarding non-health hazard complaints (i.e., shower not hot enough, wanted information on breaking a lease)

- Calls in which the SNHD staff person that spoke with the caller included comments in the log questioning the validity of the complaint based on the callers mental health status (i.e., delusional parasitosis)

Multiple calls and the associated complaints were excluded from the study based on comments entered into the original SNHD log by the hotline staff.

*Due to the extremely low call volume from both cities, combined with the fact that both have their own city council wards and would therefore be an additional two regions that would be compared to much larger and more heavily populated areas, Mesquite and Boulder City, NV zip codes were not included in statistical analyses. A total of four complaints were made to the hotline regarding ROUs in these cities; those four complaints were also excluded from this study.

Public housing

Originally, complaints regarding publically assisted housing were not going to be included in this study. While any landlord or tenant of an ROU in Clark County, NV is free to call the hotline, some are referred to a different department or organization. Residents of publically assisted housing are referred to the Southern Nevada Regional Housing Authority (SNRHA), as they are designated to handle complaints regarding these properties. Publicly assisted housing, however, is utilized by residents of Clark County who are, in fact, paying rent. While SNRHA is involved in a variety of housing programs in the area, the recipients of these services are still considered tenants, the homes they live in are included in the housing inventory of Clark County, and they meet all of the eligibility criteria for this study. Therefore, although this subset of tenants was

referred to SNRHA, their calls and complaints were still entered into the SNHD database and were included in this study.

Methods of Analyses

After applying the criteria above, the final data set consisted of 3,523 complaints from 2,361 callers to the hotline. The information captured by those calls was used to test the study hypotheses as described below.

H_{01} : Complaints to the hotline originate equally from all Clark County city council wards and unincorporated areas of Clark County.

H_{a1} : Complaints to the hotline are not equally distributed among Clark County city council wards and unincorporated areas of Clark County.

In order to test this hypothesis I used the final data set to determine the number of complaints originating from each zip code. Zip codes were then lumped together into political subdivisions, specifically city council wards and unincorporated Clark County, which does not have city council wards. Because ward boundaries do not follow zip code boundaries exactly, zip codes that cross ward boundaries were assigned to the ward in which the geographical majority lies. A list of each political subdivision and its associated zip codes can be found in Appendix C. All Clark County zip codes that have a population according to 2013 estimates (Clark County Department of Comprehensive Planning, 2013) were included, although no complaints came in from some of them. Zip codes with no complaints attributed to them were included in order to accurately adjust for differences in the number of housing units between areas. A map of Clark County

with zip code boundaries can be seen in Figure 1 below. Additionally maps of each of the wards can be seen in Appendix D.

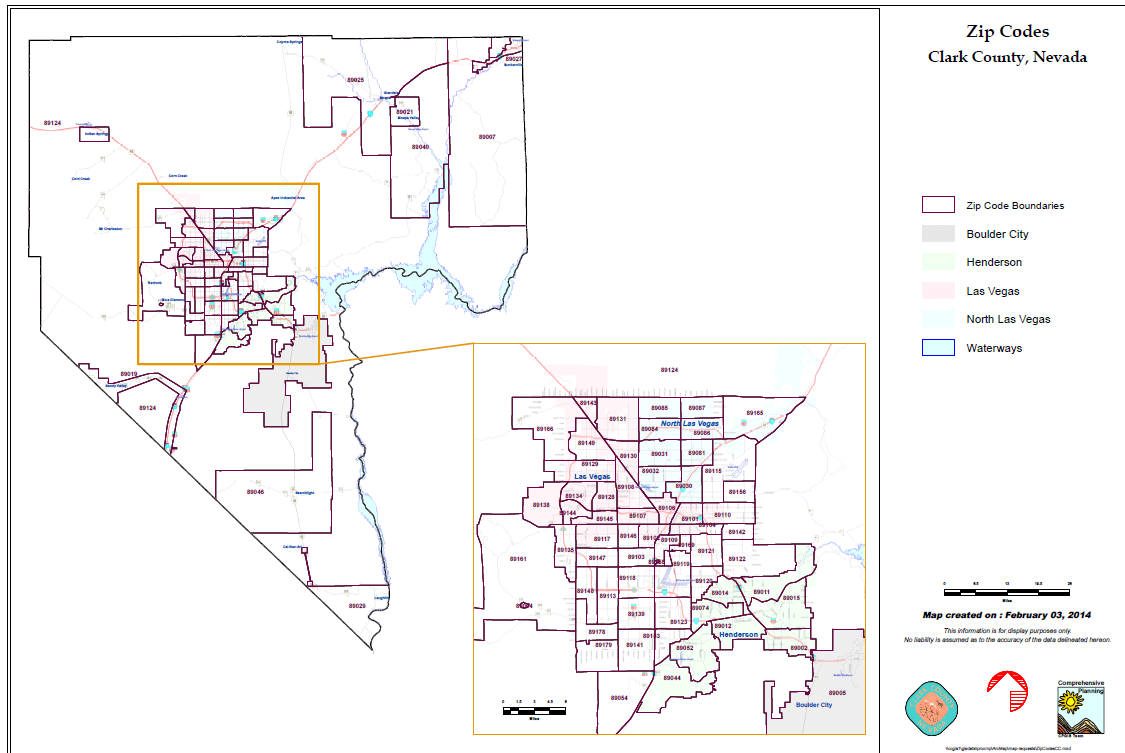


Figure 1. Map of Clark County, NV with Zip Code Boundaries (Source: Clark County Department of Comprehensive Planning)

Frequencies of complaints from each subdivision (city council ward or unincorporated) are reported as a percentage of total complaints to the hotline. Additionally, an adjusted rate of complaints from each subdivision is reported as the number of complaints per 1000 occupied housing units in that area. There are substantial differences between zip codes and political subdivisions with respect to the amount of housing units within them. Comparing the number of complaints in relation to the number of occupied housing units in particular provides a more revealing picture of the differences between the geographical groups. Occupied housing estimates from 2013

(Clark County Department of Comprehensive Planning, 2013), which are listed by zip code, were used in order to adjust for differences in housing quantities between zip codes, and therefore wards/unincorporated areas.

H₀₂: There is no correlation between the rate of complaints to the hotline from a zip code and the median household income of that zip code.

H_{a2}: There is an inverse relationship between the rate of complaints to the hotline from a zip code and median household income of that zip code.

After adjusting for differences in the number of occupied housing units, the 21 zip codes with the highest rate of complaints to the hotline were analyzed to determine if there is, indeed, an association between income and frequency of complaints. Zip code 89161 was excluded from analysis of this hypothesis. Although it ended up having an adjusted rate of 5.49 complaints/1000 occupied units, only 1 call came into the hotline regarding this zip code. Due to the extremely low number of units (182) within 89161, that 1 call led to very high adjusted rate which would have put this zip code in 16th place. The obvious disconnectedness from what this study intends to show, which is a bigger picture of housing related health hazards in ROUs in Clark County, led to the removal of this zip code from the top 21 zip codes that were analyzed.

Originally, the 20 zip codes with the highest rate of complaints were to be analyzed. However, upon calculating the adjusted rate of complaints, the three zip codes between 19th and 21st place had rates within 0.05 complaints per 1000 occupied housing units of each other. Therefore, the 21 zip codes with the highest number of complaints were included in the analysis.

IBM SPSS Version 22 was used to perform statistical analysis. Spearman's Rank correlation ($n=21$, $p < .01$) was performed to determine if a correlation exists between complaint rate and income. Median household income of each zip code was acquired from American Community Survey 5-year estimates (U.S. Census Bureau, 2012a).

H_{03} : There is no difference in the rate of complaints to the hotline between zip codes based on the type of housing in that zip code.

H_{a3} : There is a difference in the rate of complaints to the hotline between zip codes based on the type of housing in that zip code.

After adjusting for differences in the number of occupied housing units between zip codes, the 21 zip codes with the highest rate of complaints to the hotline were analyzed to determine if there is a difference between zip codes and the rate of complaints to the hotline, based on the predominant type of housing within each zip code. Again, 89161 was not included in the analysis for reasons described previously. Data on housing types by zip code came from the Clark County Government's housing unit estimates (Clark County Department of Comprehensive Planning, 2013), which breaks down housing type into six categories: Single Family, Duplex and 3- or 4-Plex, Mobile Home, Apartments, Townhomes, and Condominiums. For this study, those categories were lumped into two larger categories: Single-family and Multi-family. Definitions of single- and multifamily housing vary by organization. For example, the National Association of Home Builders defines a multifamily home as a building containing two or more units while Congress defines it as "any project with four or more units that includes condominiums, apartments, and single-story" (Zietz, 2003). Census statistics on

single-family housing include fully detached, semidetached, row houses and townhouses but further specifies that the attached units must be separated from the adjacent unit by a ground-to-roof wall and must not share heating/air-conditioning systems, utilities, or have common facilities such as an attic or basement. This definition would imply that manufactured (or mobile) homes are considered single-family housing. However, they are not included in the New Residential Construction statistics (U.S. Census Bureau, 2012b). Because of the differing definitions, inclusion criteria for each of the categories in this study (single-family or multi-family) are as follows:

Single-family (Category 0) includes all fully detached homes and manufactured homes. Manufactured homes are included in this category because they are designed as single-family residences.

Multi-family (Category 1) includes duplexes, 3- and 4- plexes, apartments, townhomes, and condominiums. Although townhomes and condominiums could conceivably meet the U.S. Census Bureau definition of single-family housing, it is impossible to determine if those included in the Clark County Department of Comprehensive Planning's estimates do so.

If more than half of the housing units in a zip code fall into one of those categories, the zip code was assigned to that category. If any zip codes were determined to have equal single-family and multi-family units, that zip code was not to be included in the statistical analyses. Although there were zip codes with close to equivalent numbers of single- and multi-family units, none were exactly equivalent.

IBM SPSS Version 22 was used to perform statistical tests. First, tests for normal distribution were performed. Based on the results of those tests, the Mann-Whitney U test ($n=21$, $p<.05$) was performed in order to determine if there is a statistically significant difference between the rates of complaints from zip codes with respect to housing type in those zip codes.

H_{04} : There is no difference between the number of complaints to the hotline regarding known asthma triggers (see criteria below) and the number of complaints regarding all other issues (not asthma triggers).

H_{a1-4} : Complaints to the hotline regarding known asthma triggers are more prevalent than complaints regarding all other issues (not asthma triggers).

H_{a2-4} : Complaints to the hotline regarding known asthma triggers are less prevalent than complaints regarding all other issues (not asthma triggers).

Asthma Trigger Criteria In addition to the categories used for the landlord/tenant hotline log that are known asthma triggers, there are a number of other known asthma triggers. In order to accurately assess the presence of any of the many asthma triggers in ROUs in Clark County we would need data on all of them. However, the limited number of complaint categories and lack of investigation or confirmation by SNHD staff dictates that only a few of the known asthma triggers could be included in this study and statistical analysis. Therefore, only cockroach allergen, mold, rodents, and complaints in the “Other” category that specified ETS in the notes/comments section of the original SNHD log were included as asthma triggers. Asthma triggers that may be present within a home that were **not** included in this study are pets, dust mites, and volatile organic

compounds (VOCs). It is very important to note that just because these triggers were not included in this study because they were not categories in the landlord/tenant hotline log, they are very common in homes and quite serious threats for people living with asthma.

A frequency distribution was developed for cockroaches, mold, rodents, and ETS. Furthermore, all complaints regarding the presence of cockroaches, mold, rodents, or ETS were added together to find the total number of asthma-trigger related complaints. This number is then reported as a percentage of total complaints to the hotline.

CHAPTER 4

RESULTS

The original sample size of 4,483 complaints to the landlord tenant hotline between 5/1/11 and 4/30/13 decreased to 3,523 complaints from 2,361 unique calls to the hotline after applying inclusion/exclusion criteria. As stated previously, the difference is due to the fact that each caller may have more than one complaint. Calls from tenants of ROUs or someone calling on behalf of a tenant of an ROU greatly outnumbered calls from landlords, with 2,355 (99.75%) calls coming from tenants and 6 (.25%) from landlords.

After excluding the 3 populated zip codes in Clark County that are in Mesquite or Boulder City, a total of 70 populated zip codes remain. Of these 70 zip codes, 14 did not have a call to the landlord/tenant hotline, leaving a total of 56 zip codes represented by at least one call to the landlord/tenant hotline.

Statistical Analyses of Research Hypotheses

Hypothesis1 – Physical distribution of complaints

This hypothesis examines the geographical distribution of complaints to the hotline to determine if there are differences between areas of Clark County. A total of 15 areas, or zip code groupings, were created and analyzed based on political boundaries: 4 North Las Vegas City Council Wards, 6 City of Las Vegas Council Wards, 4 Henderson Council Wards, and the unincorporated areas of Clark County.

All 70 populated zip codes were included in the analysis of H_1 in order to correctly account for overall complaints per 1000 occupied housing units within each of the 15 areas. Each of these 70 zip codes was assigned to one of the 15 larger areas mentioned. Again, ward boundaries do not necessarily align with zip code boundaries, so multiple zip codes lay partly in two different wards or unincorporated Clark County. However, each zip code was assigned to only one area, based on where the physical majority of the zip code lies. A list of each area and the zip codes assigned to them can be seen in Appendix C.

The actual number of complaints before adjusting for differences in the number of occupied housing units for each area as well as Clark County as a whole can be seen in Appendix E.

Figure 2 below also depicts the total number of complaints by individual ward and the unincorporated areas of Clark County.

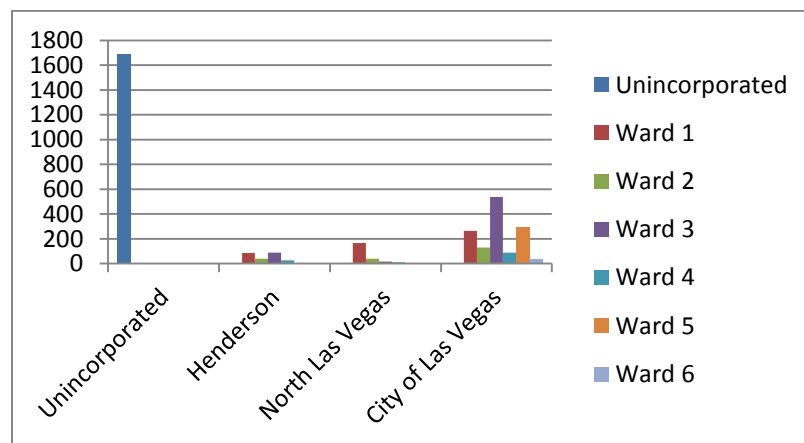


Figure 2. Total Numbers of Complaints to the SNHD Landlord/Tenant Hotline, By Political Subdivision, 5/1/11- 4/30/13, N=3523

After adjusting for differences in the number of occupied units within groups, however, the results were much different. Figure 3 illustrates the differences in the adjusted rates between areas.

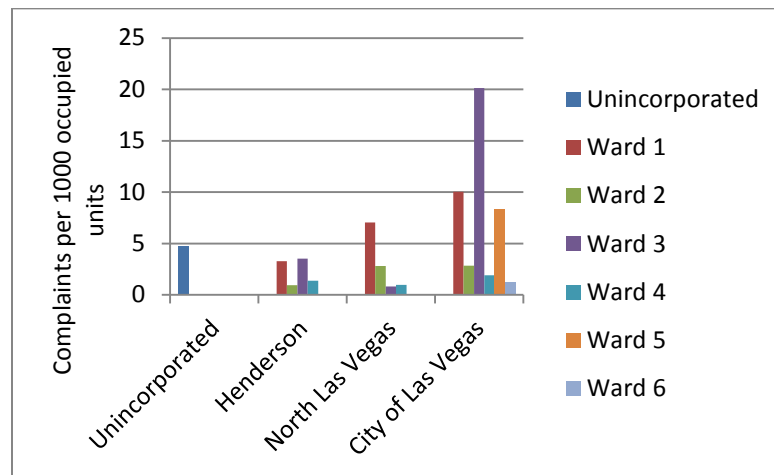


Figure 3. Adjusted Rates of Complaints to the SNHD Landlord/Tenant Hotline, By Political Subdivision, 5/1/11 - 4/30/13, N=3523

Appendix F provides the occupied housing unit adjusted complaint rate for each of the 15 areas and for Clark County as a whole.

City of Las Vegas had the highest overall rate as well as the 3 highest individual ward rates. Unincorporated Clark County had the next highest rate, followed by North Las Vegas, and then Henderson. It is clear that complaints are not equally distributed among areas. In fact, the adjusted rate of complaints varies greatly between cities/unincorporated Clark County, and even between wards within the same city.

Hypothesis 2 – Complaints by median household income

This hypothesis examines the relationship between the number of complaints from a zip code and the median household income of that zip code. The 21 zip codes

with the highest number of complaints/1000 occupied housing units, after the removal of the 89161 zip code as described previously, were analyzed. Figure 4 shows the distribution of the 21 zip codes with the highest adjusted complaint rates and the corresponding median household income of those zip codes.

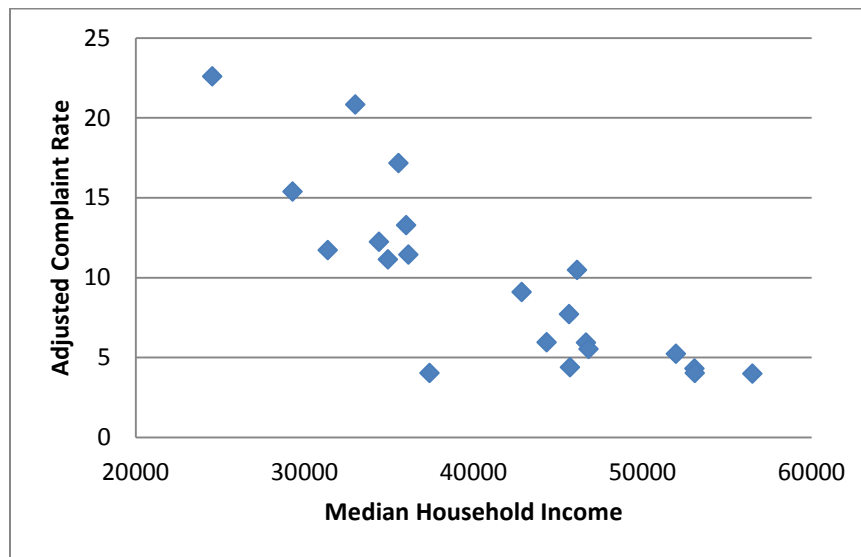


Figure 4. Distribution of Adjusted Complaint Rates to the SNHD Landlord/Tenant Hotline and Median Household Income, By Zip Code, 5/1/11 - 4/30/13, n=21

A Spearman's Rank Order correlation was run to measure the strength of association between median household income of a zip code and the adjusted number of complaints from that zip code. This test revealed a statistically significant relationship ($p < .01$) between the median household income and the number of complaints to the landlord/tenant hotline from a zip code ($r_s[21] = -.877, p = .000$). The analysis shows a fairly strong inverse correlation between the two variables, meaning that as income increases, the rate of complaints decreases.

Hypothesis 3 – Complaints and housing type

This hypothesis examines the relationship between the adjusted number of complaints from a zip code and the dominant type of housing in that zip code. The 21 zip codes with the highest number of complaints/1000 occupied housing units, after the removal of the 89161 zip code as described previously, were analyzed. Initially, tests of normality were performed to determine the distribution of the data. These tests showed that the single-family housing data set is not normally distributed ($p = .010$), while the multi-family housing data set is normally distributed ($p = .305$), based on the Shapiro-Wilk test. Because one of the data sets is not normal, a non-parametric test for independent samples was used, specifically the Mann-Whitney U Test, in order to evaluate the difference in medians. The results of that test are summarized in Table 3 below.

	N	Mean Rank
Single-family housing	9	8.89
Multi-family housing	12	12.58
Total	21	
Statistics: U: 35.0 α: 0.05 Exact significance: $p = .193$		

Table 3. Mann-Whitney U Test Results for Complaint Rates By Housing Type

These results indicate that the distribution of the adjusted complaint rate is the same ($p > .05$) across zip codes regardless of the predominant type of housing (single-family or multi-family) and the null hypothesis is retained.

Hypothesis 4 – Frequency of asthma trigger complaints

This hypothesis compares the frequency of complaints to the hotline regarding known asthma triggers with the frequency of all other complaints to the hotline (non-asthma triggers). Table 4 shows the overall frequency of every complaint category, both asthma triggers and all others. The SNHD logs recorded complaints regarding ETS in the “other” category. For the analysis of this hypothesis, the 5 ETS complaints were removed from the “other” category and considered to be their own categories in order to include them in the total number of asthma trigger related complaints.

Complaint Category	Frequency	Percent of Total
Mold	849	24.1
General Maintenance	814	23.1
Bed Bugs	445	12.6
Cockroaches	367	10.4
HVAC Outage	272	7.7
Other Insect	148	4.2
Malodor	139	3.9
Water Outage	137	3.9
Sewage	95	2.7
Electrical/Gas Outage	23	0.7
Rodent	72	2.0
Domestic Animal	31	0.9
Pigeon	32	0.9
Other		
ETS	5	0.1
Non-ETS	85	2.4
Hoarder	9	0.3

Table 4. Frequency of Complaints, By Category, to the SNHD Landlord/Tenant Hotline, 5/1/11-4/30/13, N=3523 (Asthma Trigger Related Complaints in Red)

Figure 5 compares all asthma trigger complaints with all remaining (non-asthma trigger) complaint categories.

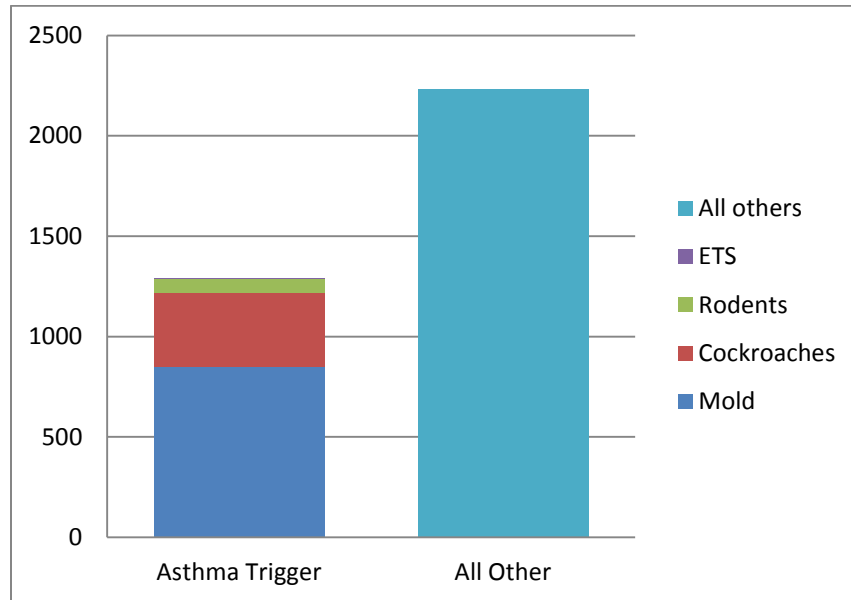


Figure 5. Complaint Frequencies, By Type (Asthma Triggers Vs Remaining Categories), to the SNHD Landlord/Tenant Hotline, 5/1/11 - 4/30/13, N = 3523

The total number of complaints to the hotline that are asthma triggers was 1,293, or 36.7% of the total complaints, while the total number of all other categories of complaints was 2,230, or 63.3%, of the total complaints.

CHAPTER 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion of Results

A wide variety of housing related health hazards exist in ROUs throughout Clark County, NV. The most frequently reported hazards to the SNHD landlord/tenant hotline were mold, general maintenance issues, bed bugs, and cockroaches. These four issues combined made up 70% of the complaints included in this study. Health hazards in ROUs are not equally distributed across the county, either by zip code or political boundaries. Income was shown to be inversely related with the complaint frequency of a zip code, while housing type did not appear to be associated. Complaints regarding asthma triggers were significant, with nearly 37% of total complaints falling into that category.

Through the dates of the study, a total of 4,483 complaints were entered into the SNHD landlord/tenant hotline database from 3,314 calls. A copy of the SNHD call logs, in the form of Excel spreadsheets, was analyzed entry by entry to determine each call's eligibility for this study. After applying inclusion and exclusion criteria, the data set for this study decreased to 3,523 complaints from 2,361 unique calls. This final data set of entries was then condensed to include only the zip code of the rental property and the complaint category/categories.

The data was analyzed in a number of ways in order to provide an overall portrayal of the housing related health hazards present in ROUs in Clark County, NV, as represented by complaints to the landlord/tenant hotline. The frequency of each

complaint category and the geographical distribution of complaints allowed for further examination of relationships between income and complaints, housing type and complaints, and asthma trigger complaints compared to all other types of complaints.

Analysis showed that complaints regarding housing related health hazards were not equally distributed throughout zip codes or political subdivisions of the county. Overall complaints per 1,000 occupied housing units ranged from 0 to 22.59 in zip codes and from 0.82 to 20.12 in political subdivisions. The overall rate for Clark County was 4.68 per 1,000 occupied housing units. The 6 wards that make up the City of Las Vegas averaged 6.37 complaints/1000 occupied units. The city includes the 3 highest individual ward complaint rates, at 20.12, 10.03, and 8.30 for Wards 3, 1, and 5, respectively. The unincorporated areas of Clark County had the next highest complaint rate of 4.73 per 1000 occupied units, followed by North Las Vegas (ward average of 3.36). Henderson wards averaged 2.13 complaints/1000 occupied units, and in fact no single ward in Henderson had a rate as high as the Clark County average.

The fact that complaints are not equally distributed among all areas of the county is not surprising. There are most certainly multiple factors that contribute to this distribution, what those factors are, however, aren't clear. The distribution could be a function of the rate of renter occupied housing versus owner occupied housing within an area. When calculating the adjusted rates of complaints from each zip code, the denominator used was the total number of occupied housing units within each zip code. Using only occupied rental housing units, as opposed to all occupied housing units, within each zip code would provide more information with respect to the true distribution of hazards in rental housing alone.

Age of buildings may also play a role in the uneven distribution of health hazard related complaints to the landlord/tenant hotline. A neighborhood is generally developed all at once, meaning its buildings are often very similar in age and may share the same physical characteristics. Therefore, deterioration of buildings within a neighborhood usually occurs around the same time, and one might expect more concurrent housing issues from older areas. Another contributing factor to the inequitable distribution of health hazards in ROUs, as reported to the landlord/tenant hotline, is the race/ethnicity of their inhabitants. As described in the literature review, physical housing-related problems are more likely to be occupied by low-income, minority individuals (HUD, Office of Healthy Homes and Lead Hazard Control, 2012). In fact, a survey showed that of ROUs with severe physical problems, 47% were Black or Hispanic households (U.S. Census Bureau, 2013b).

This study did not examine a relationship between either the ages of buildings or minority status of residents and complaint frequency to the landlord/tenant hotline, but both are likely to be contributing factors to the clearly unequal distribution of housing-related health hazards in rental units. Further research into the importance of these factors in predicting the presence of hazards is needed.

This study did, however, examine income and type of housing as they relate to the rate of complaints to the landlord/tenant hotline.

There was a fairly strong inverse correlation between the median household income of a zip code and the adjusted rate of complaints to the hotline from that zip code ($r [21] = -.877, p = .000$). This result is consistent with literature on the subject, which

repeatedly shows that exposure to substandard housing, such as housing with structural defects and environmental hazards, disproportionately affects people of color and people considered low-income (Krieger & Higgins, 2002). So, not only is the median household income for ROUs in general less than half that of OOUs (\$28,000 and \$58,919, respectively), ROUs with deficiencies are inequitably occupied by low-income tenants. The 2011 American Housing survey found that of ROUs with severe physical problems, 36% were occupied by tenants living below poverty level (U.S. Census Bureau, 2013b).

It may seem obvious that more multi-family or multi-unit structures would mean more renters, which would lead to more complaints to the hotline from zip codes with more of those types of structures. In fact, according to estimates from the American Housing Survey, about 40% of ROUs nationally are either single-family homes or manufactured/mobile homes/trailers, while 60% of ROUs are units in multi-family structures (2013), supporting the idea above. Additionally, the design of multi-unit housing allows an issue that may have started in one unit to move to others, seeming to contribute to the idea that multi-unit housing would have more health hazards. Specific hazards (particularly cockroaches, bed bugs, rodents and ETS) spread easily within multi-unit structures. Plumbing and mold problems in one unit can have an effect on other units (such as a flood in upstairs unit causing mold in the unit below), and structural defects generally impact multiple units, if not the entire structure.

The results, however, did not indicate that this is true. Census data provided the information needed to categorize each zip code as either single-family or multi-family housing, based on which was more prevalent in that zip code (Clark County Department of Comprehensive Planning, 2013). Complaint rates of zip codes were then compared to

determine if a relationship exists between dominant housing type and health hazards in ROUs. There was no difference shown ($n = 21$, $p=.193$) between complaint rate and which type of housing is the most prevalent. After analyzing this hypothesis, these zip codes were examined further to see if the zip codes designated in this study as single-family do, in fact, have more OOU's than ROUs and if those designated in this study as multi-family have more ROUs than OOU's. The majority of the 21 zip codes that were analyzed in hypotheses 2 and 3 do generally follow this seemingly intuitive pattern. However, for 4 of these zip codes the opposite was true; 3 of them are comprised of more single-family units than multi-family, yet have more ROUs than OOU's, and 1 zip code is comprised of more multi-family units yet contains more OOU's than ROUs.

The limited amount of information collected by the SNHD landlord/tenant hotline database made it impossible to know which type of housing a complaint pertained to. Some of the original entries included an apartment complex name, indicating a multi-unit structure. However, most entries did not contain this type of information or any other reference to the type of housing, making it impossible to analyze individual complaints based on housing type. Therefore, overall prevalence of housing type in each zip code was used for this study. Further data collection of actual housing type of each caller and subsequent analysis of the relationship between housing type and frequency of complaints is needed.

The analysis of hypothesis 4 shows that nearly 37% of the complaints to the hotline are related to known asthma triggers. This is consistent with published survey data, which showed that about 12% of renters reported signs of rodents in their

homes in the last 12 months, nearly 18% reported signs of cockroaches, and 5% reported mold (U.S. Census Bureau, 2013b).

However, the results in this study are likely an underestimate of the true prevalence of asthma triggers in ROUs in Clark County, due to the fact that only three categories of complaint and the few complaints from the “other” category that specified ETS were included in the analysis. There were also multiple complaints that were not included that may have, in fact, been related to asthma triggers. Complaints denoted as “other” or “malodor” in the SNHD log sometimes included comments, written by the SNHD staff that took the call, indicating possible VOC exposure. Many more complaints relate to the proliferation of asthma triggers: hot water outages make it difficult to rid laundry of dust mites and HVAC outages can lead to increased humidity levels, which, in turn, promote mold growth. While general maintenance complaints were tracked as their own category, the relationship between maintenance and other complaint categories is very important. In fact, it can be argued that thorough general maintenance could have helped to avoid the majority of all other complaints. Complaints categorized as “general maintenance” covered a wide array of issues, but some of them related to cracks, holes, or broken windows, allowing for the entrance of pests such as rodents and cockroaches. Others involved leaking pipes or plumbing, which can provide a source of water for pests as well as an opportunity for mold growth. Therefore, exposure to VOCs, dust mites, mold, cockroaches and rodents (all asthma triggers) was likely much higher in ROUs than this study indicates. Many of the complaints that were not categorized as asthma trigger related were, in reality, indirectly related.

Study Limitations

With any study, there are limitations as to the information that can be gained and the inferences that can be made for any number of reasons. This study is no different, and in fact has multiple limitations that are presented here.

Reporting/Data Entry Errors

This study examines complaints that were made to the SNHD landlord/tenant hotline between 5/1/11 and 4/30/13. There are, undoubtedly, numerous housing related health hazards present in ROUs in Clark County that were not reported to the hotline for any of a number of reasons. Many residents are unaware of the hotline or are unwilling to report issues for fear of retaliation, making it impossible to know that data are truly representative of Clark County. Additionally, the outgoing message to callers of the hotline outlines the steps necessary to legally notify the offending party (landlord or tenant), of the issues at hand. It is likely that some callers listened to this information detailing how to go about getting their issue resolved and never actually reported these issues to SNHD.

Issues associated with self-reporting are another limitation with respect to the accuracy of the data from the hotline log. Over reporting may have occurred due to the fact that not all complaints are investigated and confirmed to be accurate by SNHD EHS's but are recorded in the hotline log and are therefore included in this study.

Possible data entry errors into the hotline log by SNHD staff may also have some impact on results, as incorrect zip codes or complaint categories could ultimately alter the statistics. With respect to determining which calls were included in the final data set,

every attempt was made to use only accurate information while retaining as much original data as entered by SNHD staff. Unfortunately, upon analyzing each entry it was determined that there were errors in the SNHD log. While not every entry included a whole street address, some did contain that information and it was determined that several of those cases contained the wrong zip code; in those cases the zip code was corrected for the study data set. Additionally, some entries were found to have been entered twice; repeat entries were omitted from this study.

Public Accommodations

Complaints regarding public accommodations (PAs) were discovered in the SNHD log as well, although they are not considered to be rental properties under the landlord-tenant laws of Nevada. These entries were excluded from this study because including them in the data set would dictate that all PAs be included, such as casino hotels and resorts which are generally not used as housing for Clark County residents. This may be considered a limitation to the study due to the use of some PAs as long-term housing for residents of the county. “Flexible” or “extended” stay types of PAs are common in Clark County, but unfortunately are not differentiated from larger, resort style hotels in Clark County with respect to not being considered a ROU. However, many of them function like multi-unit housing for their residents. In fact, some PAs have multiple locations and only some of them hold a PA permit; the others are treated as rental units inhabited by tenants, just like an apartment. Those specific locations that do not hold a PA permit were included in this study, while the PAs were not. However, in reality, health hazards that are present in these facilities are negatively affecting residents that rent there but could not be included in this study.

Grouping Limitations

Assigning zip codes to wards (hypothesis 1) presented problems at times due to ward boundaries not following zip boundaries in many cases. Zip codes were assigned to only one ward or unincorporated Clark County based on in which one the physical majority of the zip code lies. In reality, some zip codes are split between wards, meaning one ward was not credited with a zip code that is partially within its boundaries. It is also possible that the physical majority does not indicate population or housing stock majority.

Grouping zip codes into council wards and unincorporated areas in this manner may have had an effect on results, in that complaints that were assigned to a ward due to the zip code it is in may actually be within another ward's boundary. However, grouping by political boundaries can be beneficial in other ways such as garnering support for future research and/or projects.

The initial sample size of 3,523 complaints (after applying inclusion criteria) appeared to be very large. However, the manner in which complaints were grouped and the hypotheses were analyzed dictated that this original sample size of total complaints did not remain the sample size for several of the analyses. Rather, the 21 zip codes with the highest adjusted rate of complaints became the sample for hypotheses 2 (income) and 3 (housing type).

Grouping manufactured (or mobile) homes together with fully detached homes to comprise the "single-family" category of housing may present a limitation as well. Although manufactured homes are designed as single-family residences, in some cases

the health and safety risks associated with them differ from site-built structures. Because manufactured homes are built in a plant and then transported (sometimes multiple times), the structural integrity is not the same as that of a detached home. Not only does the structural integrity affect utility costs, durability, and reliability; it protects occupants from injury and helps to control pests and moisture (HUD & CDC, 2011). However, there appeared to be no difference in the adjusted rate of complaints to the hotline from a zip code based on the predominant type of housing there based on statistical analysis.

Other limitations

Ecological fallacy is another limitation of this study, as inferences are made about individuals based on aggregate group data about the zip code in which they live. The median income and type of housing most prevalent in a specific zip code do not indicate that the callers from that zip code to the hotline share those group characteristics. However, lack of income or housing data for each individual caller made it impossible to analyze the respective hypotheses in another way.

This study does not take into consideration the percentage of ROUs in zip codes or other geographical/political subdivisions. Rather, the total percentage of occupied housing units was used. It seems likely that if the frequency of complaints were adjusted for the number of ROUs the resultant analysis would provide more information with respect to the true distribution of hazards in rental housing alone. This information is available from the U.S. Census Bureau's American Community Survey (2008 – 2012) and would be helpful to gain further understanding of the distribution of housing related health hazards in ROUs in Clark County. While not used for the statistical analyses of

this study's hypotheses, adjusted rates using these data (only ROUs as opposed to total occupied units) in the denominator were calculated. The newly adjusted complaint rates for the 56 zip codes that had at least 1 complaint attributed to them can be seen in Appendix G.

Study Contributions

Overall, the most significant finding of the study is the insight provided into which specific housing related health hazards are present in Clark County, NV ROUs and the frequency of occurrence. The percentage of ROUs in Clark County is higher than the national average, at 44.3% vs 34.5% for the United States as a whole (U.S. Census Bureau, 2013a). ROUs are home to many of Clark County's residents, many of whom are low-income, minority individuals and families. This subset of housing needs to be understood in order to assure that it is allocated its share of resources.

Previously, there were no estimates of housing related health hazards in ROUs in this area. While the limited data captured via the landlord/tenant hotline leaves many important questions unanswered, a preliminary review of this data has provided basic knowledge of which hazards occur in Clark County and to what extent.

Conclusions and Recommendations

The relationship between housing and health is undeniable, and based on the results of this study; housing related health hazards affect thousands of Clark County ROUs and many more individuals. Some of the more common complaints should be addressed utilizing IPM, briefly discussed below. Solutions to the overall issue of poor conditions in rental housing are explored in this section as well.

IPM and General Maintenance

While IPM may be intended to deal with pests such as rodents and bed bugs, the benefits of its use can be observed with respect to other housing issues. Techniques that control one hazard can help to minimize exposure to other hazards. Maintenance is actually a part of IPM, and the importance of general maintenance as both a preventative measure and a solution for many of the other complaints to the hotline cannot be stressed enough. There are seven principles of healthy homes according to the National Center for Healthy Housing: Keep it Maintained, Keep it Dry, Keep it Ventilated, Keep it Safe, Keep it Contaminant Free, Keep it Pest Free, and Keep it Clean (National Center for Healthy Housing, 2008). In reality, keeping a home maintained aids in following most, if not all, of the other principles. For example, controlling moisture by fixing leaks and cleaning up/drying wet areas can not only aid in pest control, but also helps to prevent exposure to lead and mold. Maintaining HVAC systems help with proper ventilation and keeping humidity levels (which can result in mold, dust mite proliferation, and flaking paint) in the proper range. Well maintained smoke and CO detectors obviously promote safety. Repairing cracks and/or holes help to avoid pest infestations as well as contaminant and water intrusion. Promoting IPM techniques to both tenants and landlords should be a priority, perhaps via educational materials distributed through area multi-unit complexes. Landlords, in particular, should be made aware of the financial benefits of prevention, rather than repeat “quick fixes”. Tax credits could be available for landlords or property owners that show that preventative measures, including IPM and regular maintenance, were taken in the previous year at their rental housing units.

Possible Solutions

Beyond the best manner in which to solve specific housing related health hazards, a bigger problem exists. As discussed previously, ROUs are often inhabited by sensitive populations such as low-income, minorities, and the elderly. Furthermore, ROUs are frequently reported to have more deficiencies that can negatively affect health. Unfortunately, renters often have very little control over housing conditions, and little power to change them. This is evident in Clark County, where landlord-tenant laws are almost unenforceable. SNHD has no jurisdiction over rental housing, and cannot even assess a fine to a landlord or tenant that is found to be in violation of the landlord-tenant laws, even when the violation is health related. Public accommodations, however, are regulated by SNHD. Those facilities can incur fines and even be closed due to health and safety violations. Food establishments, of course, are heavily regulated and face similar penalties for violations.

In order for renters to be guaranteed a healthy place to live, one that is maintained and safe, landlords must be held accountable for the conditions of their properties. Conversely, tenants should be, and in fact already are, held accountable for their violations of the landlord – tenant laws.

First, SNHD, or some other regulatory agency, must have jurisdiction over rental properties and the power to assess fines and possibly take further action to repeat/egregious violations. Another possible solution is for the regulatory agency to evaluate a property based on healthy homes criteria, publish the resulting “grade”, and require that it be posted on the property, much like food establishments do currently.

Properties that receive an “A” rating could be “Healthy Homes Certified” and permitted to advertise as such. It would also be incredibly powerful for providing incentive to landlords, as well as extremely beneficial for residents, if HUD required a passing grade, or a healthy homes certification, for all of its rental assistance programs.

While none of the above is an immediate solution to a historical pattern of dilapidated conditions in rental housing, they can be achieved. The research performed as part of this study, and further research, may provide information necessary to advance a solution.

Future Research

Future research that could be conducted via the landlord/tenant hotline may involve the exploration of factors of ROUs such as the age of the units or whether a common landlord or management company has multiple properties with health hazards. Data collection regarding asthma diagnoses within the home would be very useful, as would asking questions about the presence of asthma triggers in the home (such as dogs/cats or tobacco smoke). This information would be beneficial in determining who would be better served by an educational outreach program, etc. Determining what specific type of housing are most affected by housing related health hazards would be useful and could be accomplished by asking callers which type of housing they live in, beyond single-family or multi-family. Additionally, the collection of socioeconomic information about the individual callers may demonstrate a need for more research into social justice issues related to health and housing.

Analyses of the landlord/tenant hotline itself is needed in order to determine if it is effective at helping both landlords and tenants to find solutions to health related housing issues. Additionally, a cost-benefit analysis should be conducted to evaluate whether it is viable to continue the service in the future. This analysis should compare the costs of operating the hotline with the benefits, measured in dollars spent by the offending party to alleviate the health hazard, reaped by the non-offending party. In fact, the current Clark County Landlord Tenant Hotline Study is in the process of collecting the needed data and intends to perform these analyses.

It is hoped that the knowledge gained with this study, and with the study mentioned above, will inform future housing policy that could give SNHD or another agency the ability to enforce statutes regarding the conditions in ROUs.

APPENDIX A
IRB APPROVAL



**Biomedical IRB – Expedited Review
Approval Notice**

NOTICE TO ALL RESEARCHERS:

Please be aware that a protocol violation (e.g., failure to submit a modification for any change) of an IRB approved protocol may result in mandatory remedial education, additional audits, re-consenting subjects, researcher probation, suspension of any research protocol at issue, suspension of additional existing research protocols, invalidation of all research conducted under the research protocol at issue, and further appropriate consequences as determined by the IRB and the Institutional Officer.

DATE: February 14, 2014

TO: **Dr. Shawn Gerstenberger**, Environmental & Occupational Health

FROM: Office of Research Integrity - Human Subjects

RE: Notification of IRB Action
Protocol Title: **Clark County Landlord-Tenant Hotline Study (CCLTHS)**
Protocol #: 1312-4664
Expiration Date: February 13, 2015

This memorandum is notification that the project referenced above has been reviewed and approved by the UNLV Biomedical Institutional Review Board (IRB) as indicated in Federal regulatory statutes 45 CFR 46 and UNLV Human Research Policies and Procedures.

The protocol is approved for a period of one year and expires February 13, 2015. If the above-referenced project has not been completed by this date you must request renewal by submitting a Continuing Review Request form 30 days before the expiration date.

PLEASE NOTE:

Upon approval, the research team is responsible for conducting the research as stated in the protocol most recently reviewed and approved by the IRB, which shall include using the most recently submitted Informed Consent/Assent forms and recruitment materials. The official versions of these forms are indicated by footer which contains approval and expiration dates.

Should there be *any* change to the protocol, it will be necessary to submit a **Modification Form** through ORI - Human Subjects. No changes may be made to the existing protocol until modifications have been approved by the IRB. Modified versions of protocol materials must be used upon review and approval. Unanticipated problems, deviations to protocols, and adverse events must be reported to the ORI – HS within 10 days of occurrence.

If you have questions or require any assistance, please contact the Office of Research Integrity - Human Subjects at IRB@unlv.edu or call 895-2794.

Office of Research Integrity - Human Subjects
4505 Maryland Parkway • Box 451047 • Las Vegas, Nevada 89154-1047
(702) 895-2794 • FAX: (702) 895-0805

APPENDIX B

LANDLORD/TENANT HOTLINE LOG EXAMPLE

[illegible]

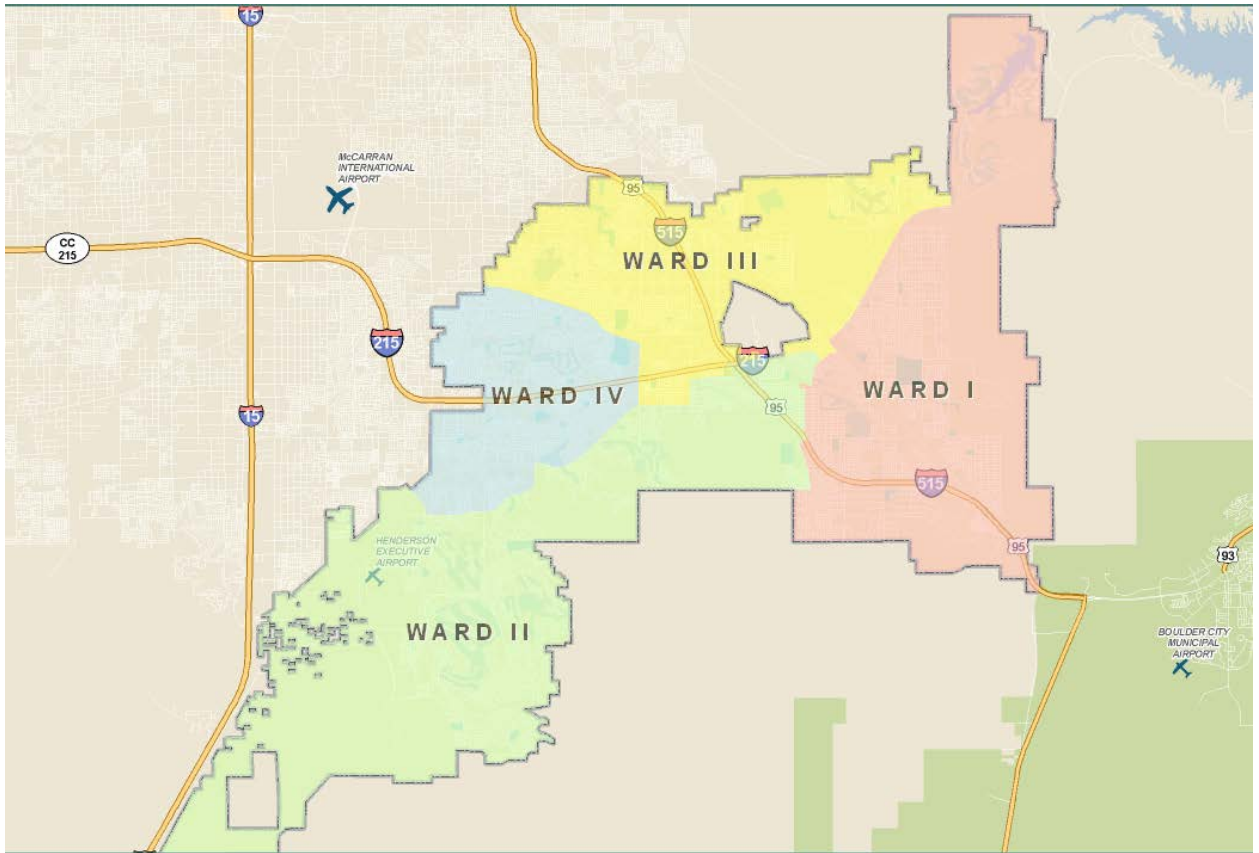
APPENDIX C

WARD/AREA AND ASSOCIATED ZIP CODES

Ward or Unincorporated Clark County	Zip Codes Included
City of Las Vegas (LV)	
LV Ward 1	89102, 89107
LV Ward 2	89145, 89117, 89138, 89144
LV Ward 3	89101, 89104
LV Ward 4	89128, 89129, 89134
LV Ward 5	89108, 89106
LV Ward 6	89130, 89131, 89143
City of Henderson	
Henderson Ward 1	89002, 89015
Henderson Ward 2	89012, 89044, 89052
Henderson Ward 3	89011, 89014
Henderson Ward 4	89074
City of North Las Vegas (NLV)	
NLV Ward 1	89030, 89081
NLV Ward 2	89032
NLV Ward 3	89031
NLV Ward 4	89084, 89085, 89086
Unincorporated Clark County	89004, 89007, 89018, 89019, 89021, 89025, 89029, 89039, 89040, 89046, 89054, 89103, 89109, 89110, 89113, 89115, 89118, 89119, 89120, 89121, 89122, 89123, 89124, 89135, 89139, 89141, 89142, 89146, 89147, 89148, 89149, 89156, 89158, 89161, 89166, 89169, 89178, 89179, 89183

APPENDIX D

CITY COUNCIL WARD MAPS

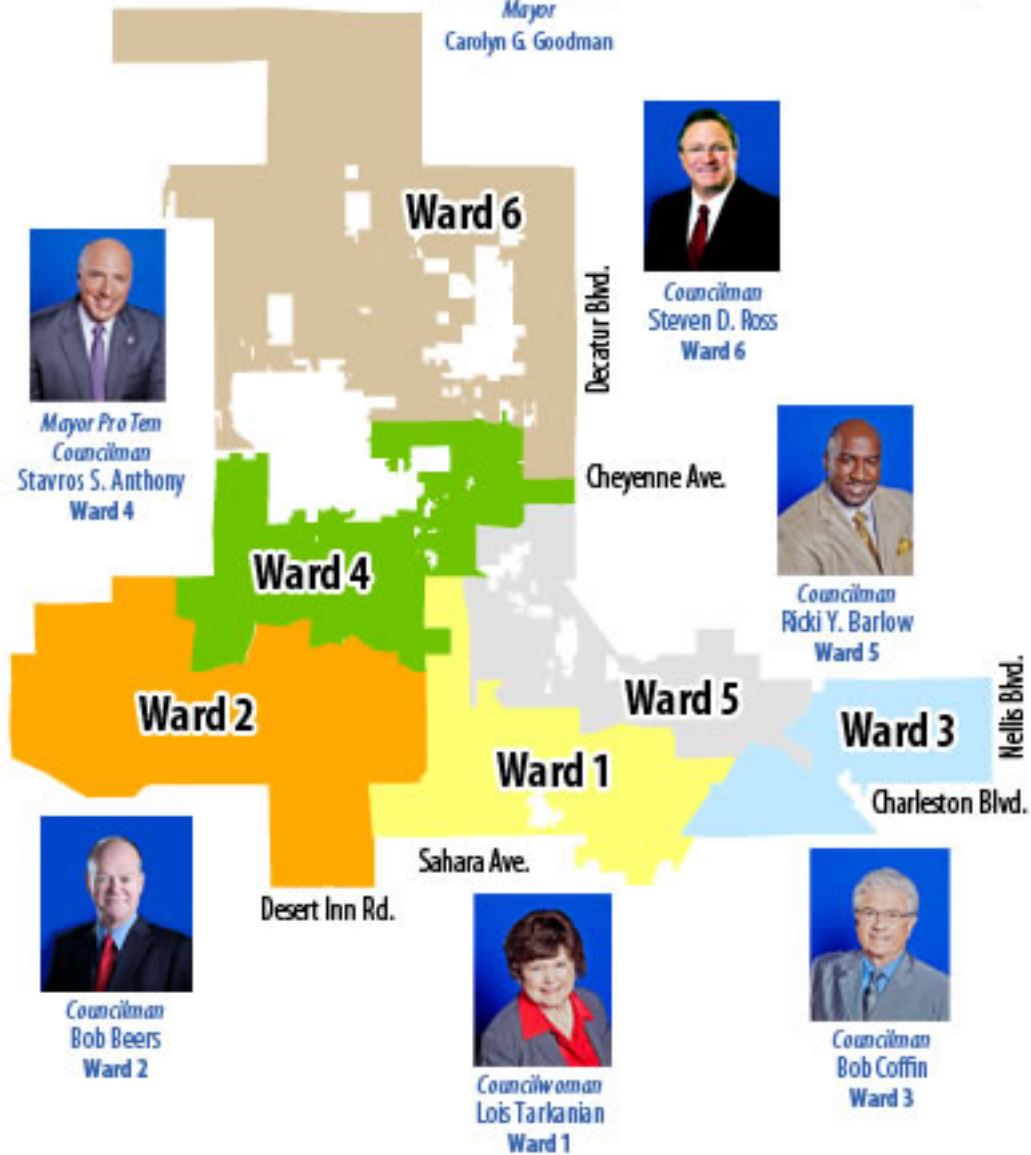


City of Henderson

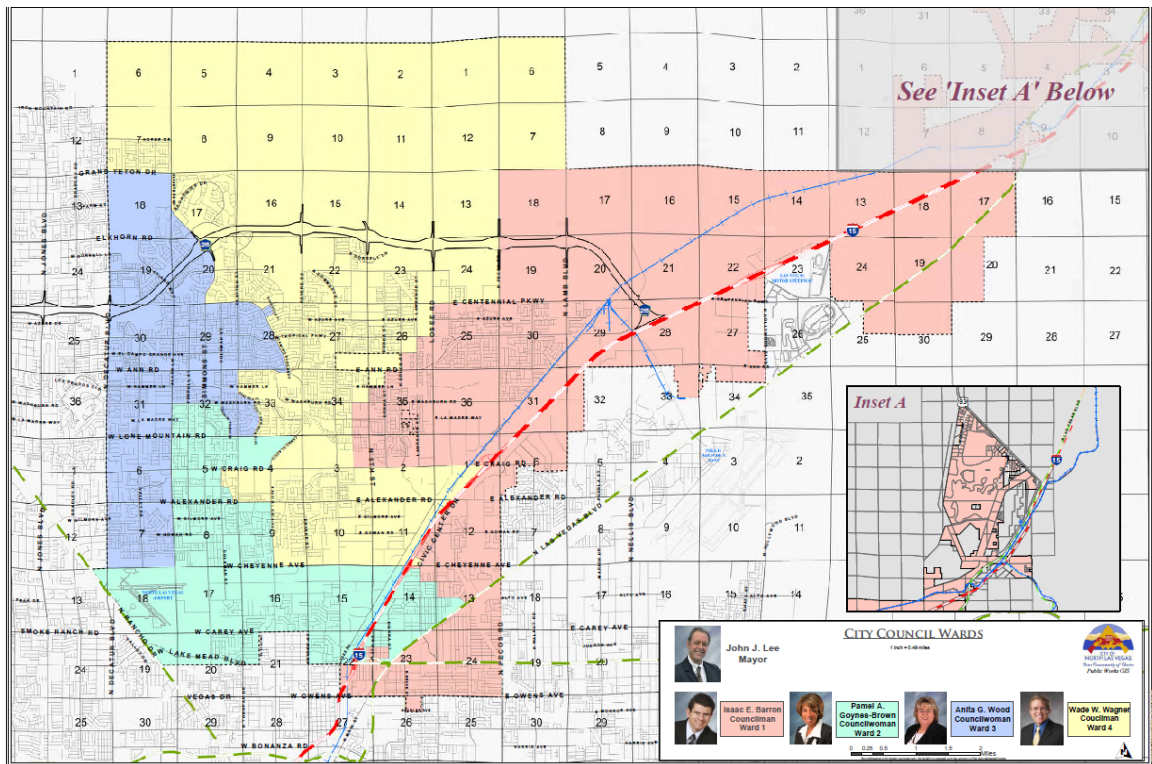


Mayor
Carolyn G. Goodman

City of Las Vegas Mayor and Council Ward Map



City of Las Vegas



North Las Vegas

APPENDIX E

COMPLAINTS BY POLITICAL SUBDIVISION

Ward/Area	Total # of complaints	Percentage of total complaints
City of Las Vegas	1356	38.5
Ward 1	264	7.5
Ward 2	130	3.7
Ward 3	537	15.2
Ward 4	90	2.6
Ward 5	295	8.4
Ward 6	40	1.1
Henderson	241	6.8
Ward 1	87	2.5
Ward 2	39	1.1
Ward 3	88	2.5
Ward 4	27	0.8
North Las Vegas	234	6.6
Ward 1	166	4.7
Ward 2	40	1.1
Ward 3	17	0.5
Ward 4	11	0.3
Unincorporated	1692	48.0
Total Clark County	3523	100%

Total Numbers of Complaints to the SNHD Landlord/Tenant Hotline, By Political Subdivision,
5/1/11 – 4/30/13

APPENDIX F

ADJUSTED COMPLAINT RATES BY POLITICAL SUBDIVISION

Ward or Area	Number of complaints per 1000 occupied units
City of Las Vegas	6.37
Ward 1	10.03
Ward 2	2.84
Ward 3	20.12
Ward 4	1.92
Ward 5	8.30
Ward 6	1.26
Henderson	2.13
Ward 1	3.28
Ward 2	0.94
Ward 3	3.52
Ward 4	1.37
North Las Vegas	3.36
Ward 1	7.06
Ward 2	2.82
Ward 3	0.82
Ward 4	0.97
Unincorporated	4.73
OVERALL CLARK COUNTY	4.68

Adjusted Rates of Complaints to the SNHD
Landlord/Tenant Hotline, By Political Subdivision,
5/1/11-4/30/13, N=3523

APPENDIX G

ADUSTED COMPLAINT RATES BY ZIP CODE

Zip Code	Adjusted rate using total occupied housing units	Adjusted rate using only ROUs
89101	22.59	29.04
89169	20.83	30.53
89104	17.18	27.73
89106	15.40	25.20
89109	13.29	18.76
89102	12.24	17.33
89030	11.73	19.02
89119	11.44	15.67
89115	11.14	18.57
89146	10.49	20.04
89121	9.11	21.39
89107	7.73	18.33
89108	5.97	13.55
89156	5.94	15.97
89110	5.53	13.55
89015	5.23	14.89
89122	4.39	13.18
89086	4.32	5.95
89103	4.04	5.88
89014	4.03	7.81
89117	3.99	7.82
89142	3.73	10.91
89128	3.33	7.22
89120	2.88	7.01
89032	2.82	8.26
89118	2.82	6.72
89011	2.63	9.36
89147	2.53	6.29
89145	2.51	8.75
89130	2.11	8.15
89019	1.79	5.81
89012	1.60	4.68
89129	1.42	4.39
89074	1.37	4.24
89161	5.49	0 (no ROUs per census)
89029	1.36	3.07
89144	1.36	3.71
89113	1.29	3.27
89123	1.24	3.16
89149	1.22	4.06
89148	1.19	3.14
89081	1.07	2.76
89183	1.06	2.13
89135	1.04	3.51
89134	.98	5.70
89141	.98	2.96
89166	.92	2.62
89052	.88	3.43
89131	.84	3.76
89031	.82	3.04
89002	.70	3.73
89139	.59	1.59
89084	.47	1.71
89143	.46	4.13
89178	.30	1.29
89138	.21	.68

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