

# Healthy Housing in Nicaragua:

## An Intersectoral Approach to Improving Livelihoods

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**WCCN**  
WISCONSIN COORDINATING  
COUNCIL ON NICARAGUA



Working Paper Series No. 2

Fall 2004

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## **Introduction**

### *The issue of housing in Nicaragua*

As Nicaragua strives to improve the quality of life for its citizens, it has faced a major hurdle in providing access to adequate housing. As of 2000, Nicaragua had a deficit of 378,627 housing units—over 52 percent of this deficit was comprised of irreparable units that proved unfit for human habitation, while the remaining deficit was comprised of homes that had varying levels of qualitative deficiencies (Gómez 2000, 3). The difficulty of providing adequate housing in Nicaragua stems from various sources; these include extreme levels of poverty and the insecurity of land tenure. Land titling has long been unsystematic in Nicaragua, thereby leaving many residents without official title. In 1995, only 32.3 percent of home owners in urban areas had deeds to their land, while 40 percent of rural home owners held deeds (Gómez, 10). The issue of titling has been complicated further by legal actions brought against the current government from former landowners whose property had been seized during the Sandinista era. The factors of poverty and insecure land titling have conspired to limit the access of many citizens to the housing market—without a title to prove ownership of their land, residents' access to credit is effectively cut off, and poverty prevents the purchase of new or upgrading of current housing without credit. Other causes of the housing deficit include the need to find permanent residences for former combatants in the civil war during the 1980s and, more recently, the displacement of citizens as a result of Hurricane Mitch in October 1998 (Gómez 2000; COHRE, CENIDH, and WCCN 2004).

### *A focus on health and housing*

This paper focuses on the negative impacts Nicaragua's substandard housing can have on the health—physical, mental, and social—of its population. It examines resources from the World Health Organization, the Pan-American Health Organization, and the Inter-American Healthy Housing Network to establish a framework for understanding the many relationships between housing quality and health status. Further, by using these resources, this paper offers suggestions to urban planners, non-governmental organizations, and others looking to implement housing programs as a component of public health initiatives.

### *Development, health, and housing: An overview of concepts*

Three interconnected concepts—development, health, and housing—figure prominently throughout this paper. What these terms mean, however, can vary depending on the specific interests and goals of the writer. As a result, this paper begins with an overview of these three terms, and what they signify in the context of this paper.

*Development* in its broadest sense is best defined by Nobel laureate Amartya Sen as a state where society's members having the means, capabilities, or "freedoms" to achieve the "ends that [one has] a reason to pursue" (1999, 90). His emphasis on the means to achieve goals resonates with other literature that suggests development is the process of enabling individuals to meet their needs through access to education; community, religious, and medical services; as well as employment opportunities (PAHO 2000). The United Nations' eight Millennium Development Goals for 2015 further confirm the importance of education, health, and poverty alleviation in the development

process; that four of the UN Millennium Development Goals focus explicitly on health issues underscores the particularly vital role health plays in development (UNDP 2004).

*Health* has been defined as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (CDC [n.d.]). Moreover, *optimal health* includes not only the three elements of physical, mental, and social wellness, but incorporates notions of “...spiritual and intellectual health” (Barceló, Guzmán, and Gómez 2001, 20). The many components of health are intertwined and affected by a multitude of factors, including environmental, economic, sociocultural, and political influences.

*Housing* fulfills a variety of roles. Most basically, housing is a structure that provides shelter from environmental stressors such as climatic extremes, environmental toxins, disease vectors, and excess noise. The physical space has two aspects: technical—the structure, furnishings, and the building’s connection to networks such as sewage, piped water, electricity, and communications—and natural—its geographical location and the surrounding environment. Housing also has a social aspect comprised of “people and their activities” that, together with its technical and natural aspects, dictates the form housing takes. In its psychosocial role, housing fulfills peoples’ need for a “place” and provides a refuge from psychological stressors, where people can rest, eat, study, work, and socialize. Housing, finally, is also an economic resource, both as a place of productive labor and as an asset to be sold or used as collateral (PAHO 2000, 6; WHO 1990, viii).

Because of its multiple roles, housing clearly serves as the realm where the economic, environmental, and social factors that affect health converge. Moreover, the

role of housing as a shelter for the regenerative activities of sleep, digestion, and rest—times when individuals’ immunological defenses are particularly low—make residents less resistant to all kinds of stressors and reinforces the importance of healthy housing. High quality housing protects residents from communicable and chronic disease, injuries and accidents, promotes healthy social interaction, limits psychological stress, and ensures robust good health. Poor quality housing, conversely, exposes residents to continuous health threats (PAHO 2000). The impact of housing quality on health is so significant that housing deprivation at any point in the life cycle can result in negative health consequences in the future (Marsh et al. 2000, 411).

### **Attributes of housing and its surrounding environment in Nicaragua**

The quality of housing in Nicaragua can vary greatly by region and socio-economic status. Housing in the Central and Atlantic Coast zones prove to be of poorer quality, and rural residences often exhibit greater health risks than urban housing units. Even so, type of housing is perhaps most dictated by economic class. In Nicaragua, housing developments for the upper classes are generally undertaken by commercial construction enterprises, while the middle classes often employ individual carpenters and masons to avoid the higher costs of commercially produced housing. Finally, among poor families, the tendency is toward self-built housing (Gómez, 14; Hussein et al. 1999, 759; WHO 1989).

As of 2001, roughly 2.8 million Nicaraguans (45.8 percent of the population) lived below the poverty line, while 783,300 (15.1 percent) of these lived in extreme poverty (INEC 2002, 4). This fact also confirms the concentration of substandard housing

in the Central and Atlantic zones: these zones, compared to Managua and the Pacific coast, face much higher rates of poverty (59.9 and 61.3 percent, respectively). Likewise, poor housing is concentrated in rural areas—61.7 percent of the poor live in Nicaragua’s countryside. Due to this high rate of poverty, Gómez estimates that 83 percent of the country’s housing is self-constructed (2000, 23). While rural residents comprise the largest part of Nicaragua’s poor, population growth coupled with heavy rural to urban migration has also resulted in increased peri-urban or urban settlements where access to employment in both the formal and informal sectors is greatest (Gómez 2000; McMichael 2000). The extreme poor are likely to squat on empty public land, parks, and along river banks.

Among self-constructed homes in Nicaragua, the most common materials include wood, clay, cloth or cardboard for interior walls, thatch or zinc roofs and, frequently, earthen floors. Though homes among low-income residents in major cities of the Pacific region may have access to water connections and sewage, residents elsewhere must access water through public taps or wells and use latrines or, in some cases, open areas for defecation. The most current national-level statistics on basic housing indicators are listed in Table 1.

<b>Table 1: Nicaragua—Basic Housing Indicators, 1998 and 2001</b>		
<b>Predominant Housing Materials</b>		
Percent of housing with ...	1998	2001
Earthen floor	47.8	43.5
Zinc roof	64.4	67.7
Cement or concrete walls	29.4	31.9
<b>Type of Housing</b>		
Percent of housing categorized as ...	1998	2001
House	91.7	92.1
<i>Rancho or choza</i>	4.3	2.0
Improvised dwelling	2.6	4.9
Other type of housing	1.4	1.1
<b>Basic Services</b>		

Percent of housing with ...	1998	2001
Piped water (in or near the home)	61.0	60.5
Toilet/sewerage	22.9	22.6
Electricity	68.9	71.0
<b>Solid Waste Disposal</b>		
Percent of housing units using the following methods ...	1998	2001
Trash collection	31.3	32.9
Burning trash	46.4	44.5
Burying trash	3.9	2.9
Toss into field, river, etc.	15.7	17.6
Deliver to authorized collection site	2.6	1.5
<b>Housing Tenancy</b>		
Percent of residents who ...	1998	2001
Own home (with or without deed)	77.9	81.4
Borrowed	7.9	3.5
Rent	4.2	3.0
Other	13.6	11.9
<b>Percent of Social Projects Directed Toward ...</b>		
Improvement/construction of schools	25.7	17.6
Improvement/construction of health centers	15.7	13.7
Installation of basic services	27.2	18.7
Health campaigns	42.2	38.3

Data from Nicaragua's National Institute of Statistics and the Census, Encuesta Nacional de Hogares sobre Medición del Nivel de Vida, 1998 and 2001. Accessed online at <http://www.inec.gob.ni/estadisticas/indicadoresemnv.htm>.

## **Housing, environment, and health**

The type of housing prevalent among Nicaragua's poor makes residents more vulnerable to communicable diseases, chronic illnesses, poisoning, accidents and injuries. It also presents a range of psychosocial risks such as stress, anxiety, and deterioration of social networks, and a general worsening of physical health. Though the causes are often the same, each category of ailments is considered separately below.

### *Communicable diseases*

Communicable diseases include illnesses that can be transmitted by vectors, water, food, and human contact. The communicable diseases most related to substandard housing include vector-borne illnesses such as malaria, dengue, Chagas', typhus, and

yellow fever (see Appendix 2 for more information on vector-borne diseases and their symptoms), water- and food-borne illness that include typhoid, cholera, amoebiasis, dysentery, and schistosomiasis (see Appendix 3), and aerially transmitted respiratory infections such as tuberculosis and pneumonia.

In the peri-domestic environment, certain characteristics encourage the presence of disease vectors that are key components in the spread of communicable disease. Standing water and open sewage prompt the breeding of malaria- and dengue-carrying mosquitoes and contribute to the contamination of ground water with microbes that transmit typhoid, cholera, and dysentery. Rotting garbage encourages rodent and insect vectors that transmit a collection of viruses and disease including hepatitis and shigellosis. Non-biodegradable trash, such as old tires and plastic containers, also become ideal breeding sites for mosquitoes. The presence of livestock or pets and small garden plots correlate to increased vector presence; vectors are drawn to the area by the opportunity to feed on animal hosts or waste, or by irrigation channels ideal for breeding (McMichael 2000, 1121; Schofield 1990, 203).

Not only does degradation of the peri-domestic environment lead to increased opportunities of disease transmission by vectors, but so does the structure of the house itself. Unfinished walls, floors, and ceilings—especially those of clay or thatch—provide ideal hiding places for insect vectors. When there is little natural light in the home, nocturnal vectors are further encouraged to hide within the dwelling. When ventilation is poor, residents often do not screen their windows or doors, and insects have free entry. Unsanitary conditions in the home, due to inadequate solid waste disposal and lack of a nearby water source, and poor food storage also encourage vector presence. Insects that

frequently infest a home include mosquitoes, fleas (with rodents), lice, and triatomine insects. These vectors can transmit malaria, dengue, plague, typhus, and Chagas' disease.

Daily habits of hygiene and food storage and preparation can also be a source of disease. While personal and domestic cleanliness—which are contingent on easy access to water—are important for restricting disease vectors, they are also important to limit food- and water-borne illnesses. Only 60.5 percent of Nicaraguans had access to piped water in 2001; the remaining 35.5 percent relied on wells, municipal taps, and other sources of water (INEC 2001a). Regardless of the source, water in Nicaragua is often untreated or insufficiently treated. Contamination typically occurs due to sullage, badly maintained or constructed latrines, and other sources of pollution. As a result of quantitative and qualitative water deficiencies, residents can develop typhoid, cholera, and dysentery. In its 2001 survey of basic indicators, INEC found that 13.1 percent of children under 5 years of age in Nicaragua suffered from diarrhea as a result of unpotable water and a degraded peri-domestic environment (INEC 2001b).

### *Chronic illnesses*

A common cause of chronic illness at the household level is indoor air pollution (IAP). Globally, IAP is responsible for “1.5 million to 2 million deaths, ... This accounts for approximately 4 to 5 percent of total mortality worldwide” (Ezzati and Kammen 2002, 1057). IAP results from the burning of wood, fossil fuels, and animal waste for heating and cooking purposes. Ezzati and Kammen's research establishes a direct causal link between IAP and acute respiratory infections, middle ear infections, and chronic pulmonary disease. Other possible illnesses arising from IAP include cancer, asthma,

tuberculosis, cataracts, and blindness; IAP can also contribute to low birth weight, which also leads to long-term health risks. Poor ventilation coupled with overcrowding (> 2 persons per room) exacerbates the effects of indoor air pollution, and leads to increased risk of respiratory infection (Ezzati and Kammen 2002; Marsh et al. 2000). As of 2001, 30.9 percent of children under five in Nicaragua were found to suffer from acute respiratory infections (INEC 2001b). Furthermore, respiratory problems—averaged across age cohorts—represented 36.7 percent of the ailments for which individuals sought treatment (INEC 2001b, 5). Other chronic ailments that result from housing quality can include dermatitis, rhinitis, and conjunctivitis; arteriosclerosis; and cardiac arrhythmia. These ailments depend on the insufficiency of the home to protect residents from drastic climatic conditions; carbon monoxide poisoning from burning biomass fuels or trash; and poor ventilation.

### *Injuries, accidents, and poisoning*

Substandard housing can also make residents more susceptible to injuries, accidents, and chemical poisoning because of structural inadequacies as well as lack of space and storage (PAHO 2001; Stillwaggon 1998). According to the Pan American Health Organization, “accidental injuries are the leading cause of death worldwide. . . . Traumatic injuries cause 3 million deaths per year and are responsible for one-third of hospital admissions” (PAHO 2000, 10). Though incidences of seeking health care for injuries and accidents is quite low in Nicaragua, averaging only 3.25 percent of ailments for which health care was sought, PAHO asserts that accidental injuries are greater in developing countries (INEC 2001b, PAHO 2000). Furthermore, notes PAHO, “the home

is the scene of many accidents” (2000, 10). Accidents can include cuts, contusions, burns, respiratory obstruction, poisonings, and suffocation. The risk of injuries and poisoning in the home are greater when, as is common among the poor, the home is also converted into a work site. In Nicaragua, residents often run informal stores or *pulperías* out of their homes; in other instances, men and women may do construction, garment piece-work, or other activities in the home that introduce tools, chemicals, or other potentially dangerous materials (Briceño-León et al 2001; Gómez 2000; PAHO 2000). In rural areas, pesticides and chemical fertilizers used for agriculture can prove poisonous to residents if they are not properly stored.

### *Psychosocial effects of housing*

Characteristics of substandard housing, not surprisingly, affect physical health in many ways; they also, however, have a strong impact on mental health and social networks. Insecure tenure or ownership status, crowding and insufficient space, the degraded condition of the home and surrounding area, lack of security and safety in housing construction, and excessive noise can all result in mental health problems. The effect of degraded housing is further complicated by the home’s placement within the larger community. A lack of access to employment opportunities and recreational or community activities also contributes to psychological strain.

The psychological impact of low-quality housing manifests itself in stress, depression, hopelessness, and “loss of moral values” categorized by recreational drug use. Among people with history of psychological disorders, housing can prompt an increase in instances of psychosis, mania, neurosis, and depression (PAHO 2000). In

Nicaragua, the use of drugs and alcohol are a common coping mechanism to deal with the strain of poverty. Alcoholism is particularly pronounced among men in Nicaragua, especially in rural or peri-urban areas; in rural areas, young men often begin drinking as young as 14 years of age. Though drug and alcohol abuse in many cases develop as coping mechanisms, they ironically serve to maintain the cycle of poverty and ill health. Among men who consume excessive alcohol, doctors have noted increased psychiatric problems, as well as increased neurologic, liver, pancreatic, and skin disease (Gómez 2000, 12–13). Finally, psychological illness and substance abuse resulting from insecure living conditions can also promote social breakdown and domestic violence, especially against women and children. Abuse can take the form of verbal, emotional, or physical violence.

### *Vulnerable populations*

While everyone is subject to the health effects of housing, certain populations are more vulnerable to risks posed by substandard housing. As suggested throughout this paper, the poor are highly vulnerable to the risks of low-quality housing. They are both more likely to live in unhealthy housing, and less likely to have the education or resources to remedy qualitative deficits in the housing environment (Briceño-León et al. 1990; Barceló, Guzmán, and Gómez 2001). The poor are also susceptible to health risks from housing due to the location of housing structures. Unlike expensive, high-quality constructions, the housing of the poor are most often located in areas vulnerable to natural and man-made disasters (WHO 1989; PAHO 2000). In Nicaragua, this threat is particularly strong; from 1992 to 1998, natural disasters have destroyed over 100,000

homes and killed 13,000 residents (Gómez 2000, 16). Not surprisingly, the poor shouldered the greatest burden from this loss of life and homes.

Other populations are also more vulnerable to health risks. Due to the additional time they spend in the home, the health of the following groups proves particularly sensitive to housing characteristics: women, children, the elderly, and the disabled or infirm (Barceló, Guzmán, and Gómez 2001; Ezzati and Kammen 2002; PAHO 2000; WHO 1989). According to the 2001 survey of Nicaraguan demography and health, many of the identified illnesses for which health care was sought had a “u-shaped” curve, in which professional care was sought in greater proportion for children and the elderly, while the ailments did not affect young adults enough to warrant medical assistance (INEC 2001b).

### **Approaches to healthy housing**

#### *Inter-American Healthy Housing Network (VIVSALUD)*

By examining the health effects of substandard housing, the goal of this paper is to throw into relief the negative effects of Nicaragua’s housing shortage on the country’s citizens, and further to emphasize that the burden of disease resulting from this shortage has fallen most heavily on the country’s poorest residents. A prime resource for public health officials, planners, and others looking to address Nicaragua’s housing deficits is the Inter-American Healthy Housing Network.

The Pan-American Health Organization and World Health Organization created the Inter-American Healthy Housing Network in 1995 in order to coordinate a regional healthy housing initiative in the Latin American-Caribbean region. The Inter-American

Healthy Housing Network (also called VIVSALUD) supports National Networks of Healthy Housing that undertake country-specific projects and initiatives to improve public health through housing. National Networks are essential for successful projects because, despite the commonalities among the health risks posed by housing quality in LAC countries, each National Network must consider the “physiographic, climatic, demographic, socioeconomic, cultural, political, and historical conditions, as well as tangible education and idiosyncrasies proper to their area of action” (VIVSALUD 2003). VIVSALUD promotes the goals of the individual National Networks by facilitating the sharing of relevant knowledge and experience, as well as working with individual countries to find viable solutions to qualitative and quantitative housing deficits. Countries associated with VIVSALUD include Argentina, Bolivia, Brazil, Chile, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Haiti, Mexico, Nicaragua, Peru, the United States, and Venezuela. The following countries are in the process of developing National Networks as part of VIVSALUD: Colombia, Costa Rica, the Dominican Republic, Guyana, Honduras, Jamaica, and Paraguay (VIVSALUD 2003).

While healthy housing can be considered from a variety of frameworks, including economic, political, and social rubrics, VIVSALUD and PAHO, according to their “Guías Metodológicas para las Iniciativa de Vivienda Saludable,” place the issue of healthy housing squarely in the realm of public and environmental health (Barceló, Guzmán, and Gómez 2001, 16). Their rubric, however, clearly incorporates political, economic, and social concerns, so the framework provides a comprehensive view of housing and health issues. At the local level, healthy housing is affected by the placement of settlements (including environmental risks of the peri-domestic environment),

characteristics of the housing structure, and basic service provision, which are in turn affected by the political, economic, and social realities of the settlements. To put it another way, well-being and quality of life result from the local level convergence of political leadership and action, one's economic and social-cultural resources, and environmental characteristics (Barceló, Guzmán, and Gómez, 31). Because the home serves as a point convergence for all these factors, a multidisciplinary, inter-sectoral approach is best situated to address health issues related to housing. Health education can do little without credit availability, legislation that appropriately dictates housing standards, or improved urban planning that prevents the creation of precarious settlements that are difficult or impossible to service (WHO 1989).

The first step required to address health and housing issues is an initial evaluation of health indicators and housing status. Studies may include evaluation of environmental risks to health, impact of housing on environment, and the epidemiologic impact of housing (Barceló, Guzmán, and Gómez 2001, 19). Depending on context, data from previous censuses, agricultural data, and health surveys may prove helpful; however, researchers will need to decide on necessary data and investigate cost-effective methods of gathering information that provide a clear image of both the quality of housing in their locality, the dominant health concerns, and how those two intersect (WHO 1989, 35). Gómez (2000), in conjunction with the Pan American Health Organization and VIVSALUD, has already prepared a national level evaluation of health and housing status in Nicaragua, but local level data is often better suited for local, community-driven initiatives. This analysis should also identify potential collaborators in health initiatives, including:

- Householders, including homeowners, landlords, and tenants;
- Related government offices (planning, interior, sanitary services);
- Civic, religious, and social community organizations;
- Professional and trade groups, including architects, builders, and civil engineers;
- Local leaders, both political and informal;
- Schools; and
- Media outlets (WHO 1989, 24-25).

When considering the scope of public health intervention, WHO, PAHO, and VIVSALUD recommend “local actions to achieve global goals” (Barceló, Guzmán, and Gómez 2001, 31). This emphasis on a local approach stems from the fact that housing is frequently built by householders themselves and that only by building on local citizens’ interests and desires can initiatives be effective (WHO 1989, 18). To this end, the World Health Organization also recommends decentralization in the allocation of resources, decision-making, and taxation so that local issues can be effectively addressed by local communities (1989, 28). Nevertheless, parallel actions may be necessary at broader levels, such as improved housing legislation and public health funding at a provincial or national level (27).

After assessment, VIVSALUD and WHO identify the following as key areas for action: health services; employment services; the housing sector; urban planning, law, and policy development; and credit assistance. Because their framework recognizes the inherent links among these sectors, one can see in the following examples how actions in one sector rely on compliance in another (see Table 2 for a bulleted list of suggestions).

The health sector plays a crucial role in protecting the health of residents from a variety of risks. Priorities include preventative and primary health services, as well as health advocacy, including dissemination of information about hygiene, food preparation, and communicable diseases in general. As part of health advocacy campaigns, the health

care workers—who themselves need to be aware of the health risks posed by housing—can inform patients about housing characteristics that encourage disease, and provide suggestions on how to protect themselves against those risks. Curative care, though not the focus of a healthy housing campaign, is also crucial in a context of poverty, where individuals are subject to a greater likelihood of disease and injury. For the health sector to contribute to such a healthy housing initiative, however, local residents—regardless of income level—must have access to health services. Ways to ensure that health services reach the individuals who need them most include providing publicly funded clinics, offering sliding scale fees, and improving employment opportunities in the labor market.

Not surprisingly, the provision of economic opportunity is vital to improving health and housing quality. Though economic development can be a daunting task, actions such as reducing barriers to credit, coordinating the provision of housing materials at lower rates from local distributors, offering sliding-scale fees for health services and education opportunities, and job training programs can all be effectively implemented at the local level.

The role of education, not only of individual residents but of health care workers, architects, engineers, policymakers, and formal and informal community leaders, is also significant in healthy housing campaigns. All players in the fields of health and housing need to know the particular health risks of substandard housing and how those risks can be avoided. Both horizontal and vertical information flows, however, tend to be poor in developing countries. For this reason, identifying key players early on in a healthy

housing campaign and deciding how information on health risks, building codes, and other issues is disseminated is extremely important.

Finally, legal and policy tools can also be established to support the goal of healthy housing. Laws protecting the rights of landholders and tenants, realistic building codes that support incremental upgrading, and establishment of tenure for non-legal landholders can all contribute to housing improvements. In the arena of planning, it is important that local planners give standing to all settlements, including informal housing developments. Issues of capacity can make this particularly difficult; some *barrios* may already be located in areas that are extremely difficult to service. However, ignoring the health and social risks new urban developments pose to informal settlements will only serve to worsen housing deficits.

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• **Table 2: Suggestions for Healthy Housing Initiatives**

- Health advocacy, both general and housing-related, including provision of primary-care health services;
  - Create social and economic development initiatives designed to address disparities in income and access to credit, health services, and basic services;
  - Develop legal frameworks to protect the rights of householders and tenants, including increasing the security of land tenure;
  - Develop realistic building codes and housing standards that are clear, consistent, and supportive of affordable, incremental improvements in housing quality;
  - Communicate housing standards to all stakeholders, including architects, builders, producers of housing materials, and householders;
  - Analyze current locality for possible risks from man-made and natural disasters; if risks are significant, look for ways to mitigate potential damages from disasters and develop protocol for temporary housing
  - Incorporate health and social criteria in the planning and management of development—regardless if a settlement is informal or legal, local governments must consider the impact of public and private developments on the neighborhood and individual dwellings;
  - Provide health and hygiene education campaigns with the assistance of social, civic, and religious organizations, community leaders, schools, and mass media outlets.
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Though these recommendations are deliberately general in order to suit a variety of contexts, the importance of providing clear, context-relevant information to householders

on domestic hygiene and environmental health, as well as concrete options regarding credit, housing upgrades, and other forms of assistance cannot be overstated. According to research from the Universidad Central de Venezuela, psychosocial and situational factors can prevent householders from implementing housing upgrades or lifestyle changes (Briceño-León et al. 1990). In their study of rural homeowners, Briceño-León et al. found householders who lacked a sense of control over their own lives, and had imperfect knowledge of disease transmission, were more likely not to participate in housing upgrades. However, a direct education program about transmission of Chagas' disease, coupled with a simple, transparent credit program for roofing and flooring materials, led almost 70 percent of families in the study to upgrade their homes (1990, 115). Prior to the study, all the families' had had unfinished homes, some of which had been left uncompleted for almost 10 years. The findings of Briceño-León complement what researchers have learned about the mental health effects of substandard housing, and suggest ways to overcome the inertia among the poor that result from feelings of disenfranchisement and powerlessness.

## **Conclusion**

This paper has sought to review the ways in which health is affected by housing and, in outlining a framework for intervention, suggest local-level activities to promote healthy housing, with special reference to Nicaragua. How to approach housing issues, however, varies greatly by local context, even within countries. Even so, much can be learned from housing initiatives in other Latin American-Caribbean countries and, indeed, from other countries outside the LAC region. The Inter-American Network on

Healthy Housing (VIVSALUD), moreover, serves as an excellent clearinghouse of research and other resources on housing in LAC countries; used with other resources referenced in this document, we hope this paper will serve as a useful starting point for healthy housing programs in Nicaragua.

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## Appendix 1: Poor housing, degraded environment, and health

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Housing characteristic	Environmental outcome	Health risks	Specific illnesses and diseases
Lack of drainage for sewage and sillage	1. Standing water 2. Contaminated ground water	1. Vector breeding, esp. mosquitoes 2. Pathogens in drinking water	1. Malaria, dengue fever, yellow fever, typhus, Chagas' disease, leishmaniasis, plague 2. Typhoid fever, cholera, ameobiasis, dysentery, schistosomiasis
Lack of/insufficient garbage collection and solid waste removal	1. Increase environmental pollution, including Rotting garbage Non-biodegradable rubbish, such as plastic containers, old tires 2. Air pollution from burning rubbish	1a. Increased spread of disease 1b. Increased vector breeding 2. Greater risk of respiratory infections, asthma, and other breathing problems	1. Malaria, ameobiasis, dysentery, diarrhea (undefined), intestinal worms, dengue fever, yellow fever, typhus, Chagas' disease, leishmaniasis, plague
Crowding, lack of household space	Less sanitary conditions	Easier transmission of infectious diseases Increased psycho-social stress	
Sharing household space with livestock and pets	Increased disease vector presence in/around home		Malaria, dengue fever, yellow fever, typhus, Chagas' disease, leishmaniasis, plague
Open burning of biomass fuel for cooking and heating	Indoor air pollution	Increased acute respiratory infections, asthma, pulmonary disease, cancer, and cataracts Greater risk of burn injuries	
Low quality housing materials, poor quality housing structure	Increased disease vector presence in home Greater risk of accidents, vulnerability to disasters (e.g. flooding, earthquakes)		
Lack of quality in-home or local water supply	Reduced hygiene and sanitation efforts	Increase in skin, eye, ear infections and disease Illnesses related to contaminated food or water	
Lack of well-maintained latrines or bathroom facilities	Contaminated ground water	Pathogens in drinking water	Typhoid fever, cholera, ameobiasis, dysentery, schistosomiasis

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## Appendix 2: Vector-borne diseases

Disease	Vector	Symptoms of infection	Additional notes
Malaria: 4 types 1. Plasmodium falciparum 2. P. vivax 3. P. ovale 4. P. malariae	Anopheline and culex mosquitoes both carry the parasites that cause malaria	Fever, flu-like illness. Shaking, chills, headache, muscle aches, tiredness. Sometimes nausea, vomiting, or diarrhea. May also cause anemia and jaundice. Infection with type 1 may cause kidney failure, seizures, confusion, coma, and death.	Types 2 and 3 can relapse.
Dengue fever/dengue hemorrhagic fever	Female <i>Aedes aegypti</i> mosquito	Severe, flu-like illness. Symptoms vary with age, but include rash, weakness, high fever, headache, muscle and joint pain. Dengue hemorrhagic fever is deadly, characterized by high fever, hemorrhagic phenomena, enlargement of liver and in some cases circulatory failure.	Once infected with dengue fever, a person becomes more susceptible to subsequent infections.
Leishmaniasis: 4 types 1. Cutaneous 2. Diffuse cutaneous 3. Mucocutaneous 4. Visceral	Sandflies carrying parasitic leishmaniasis	Disabling and sometimes highly mutilating lesions. Type 4 is most severe and attacks the spleen, liver, and lymph nodes	Increase in this disease is due to environmental changes, including deforestation, dam-building, new irrigation schemes, urbanization, and migration of non-immune populations to endemic areas.
Plague: 3 types 1. Bubonic 2. Septicemic 3. Pneumonic	Rodents carry infected fleas	Symptoms vary by type	Types 2 and 3 have high case/fatality ratios
Chagas' disease	Transmitted by triatomine insects carrying parasite <i>Trypanosoma</i>	2 stages of infection: (1) Acute stage, (2) chronic stage. The chronic stage appears after a dormant period that may last several years. The lesions of the chronic phase irreversibly damage internal organs including the heart, esophagus, colon, and peripheral nervous system.	
Louse-borne typhus	Human body louse carrying <i>Rickettsia prowazekii</i>	Sudden onset of high fever, chills, headache, general pain, and severe exhaustion alternating with agitation, followed by a macular eruption.	People are infected by rubbing louse fecal matter or crushed lice into a bite wound or through scratching. Problems are magnified in crowded housing; however,

Yellow fever	<i>Aedes</i> and <i>Haemogogus</i> mosquitoes	2 stages: (1) Acute and (2) chronic. The acute phase includes fever, muscle pain, headache, shivers, loss of appetite, nausea, and/or vomiting. Most patients improve after 3 to 4 days and symptoms disappear; however 15% enter a toxic phase within 24 hours. Fever reappears and several body systems are affected. Symptoms include jaundice and abdominal pain with vomiting. Bleeding can occur from the mouth, nose, eyes, and/or stomach. Blood also appears in vomit and feces. Kidney function deteriorates. Fatality rate is 50% for patients who reach the toxic stage.	disease is not transmitted through person-to-person contact. One attack usually confers long-lasting immunity. There are 3 different transmission cycles for yellow fever: 1. Sylvatic (or jungle) 2. Intermediate 3. Urban Type 3 is most common in urban areas; it can cause a large-scale epidemic when migrants introduce the virus into a high-density population.
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### Appendix 3: Water- and food-borne diseases

Disease	Mode of transmission	Symptoms	Additional notes
Typhoid fever	Consuming food or drink contaminated with <i>Salmonella typhi</i> —the pathogen is found in feces and urine of patients and carriers.	Sudden onset of sustained fever, severe headache, nausea, and loss of appetite. Sometimes accompanied by a hoarse cough and constipation or diarrhea.	People can transmit the disease long as the bacterium is in their system. 2 to 5% will become permanent carriers.
Cholera	Drinking water infected with bacterium <i>Vibrio cholerae</i> ; bacterium is typically found in feces from an infected person	Infection is often mild, without symptoms, but can be severe. Severe disease is characterized by profuse watery diarrhea, vomiting, and leg cramps. Rapid loss of body fluid can lead to dehydration, shock, and possibly death.	Disease spreads rapidly in areas with inadequate treatment of sewage and drinking water.
Amoebiasis <i>Amoebic dysentery is a severe form of this disease</i>	Consuming food or drink infected with <i>Entamoeba histolytica</i> . <i>E. histolytica</i> is generally found in the feces of an infected person.	Symptoms can include loose stools, stomach pain, and cramping. Amoebic dysentery includes stomach pain, bloody stools, and fever. Rarely, the parasite invades the liver and forms an abscess.	
Dysentery (epidemic)	Transmission is usually through person-to-person contact or by consuming contaminated food or drink. Can be caused by several organisms, but significant is <i>Shigella dysenteriae</i> type 1 (Sd1).	Bloody diarrhea, abdominal cramps, fever, and rectal pain. Less common symptoms include sepsis, seizures, renal failure, and hemolytic uremic syndrome.	Epidemics of Sd1 usually occur in impoverished areas. 5 to 15% of cases are fatal.
Schistosomiasis: 2 types 1. Intestinal 2. Urinary	Transmitted by (1) <i>Schistosoma mansoni</i> , <i>S. intercalatum</i> , <i>S. japonicum</i> , and <i>S. mekongi</i> or (2) <i>S. haematobium</i> . All are usually transmitted through infected water.	(1) Intermittent (bloody) diarrhea that can lead to serious complications of the liver and spleen. (2) Blood in urine, leading eventually to bladder cancer or kidney problems.	In both types of the disease, the infected are seriously weakened. It has severe consequences on the socioeconomic development of tropical and subtropical regions.

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