Determinants of Maternal Perceptions of Child Health in the Informal Urban Settlement of Kibera in Nairobi, Kenya: a Quantitative Study

by

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B.Sc., University of Victoria, 2009

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Supervisory Committee

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As populations in informal urban settlements continue to grow, an increasing number of people are exposed to unsafe living conditions. Children are particularly vulnerable to the environmental risks associated with this settlement type. While much is known about child morbidity and mortality in informal urban settlements, little is known about maternal perceptions of child health. This thesis explores the determinants of maternal perceptions of child health in the informal urban settlement of Kibera in Nairobi, Kenya. Data utilized in this thesis come from *A Kenya Free of AIDS* (KeFA), a research-based, National Institute of Health-funded project. Through Respondent Driven Sampling (RDS), 320 women in Kibera were recruited for interviews. Of these, 277 reported having children in their care and were accordingly selected for analysis. Questions selected for analysis were divided into four categories: child health, maternal background, social and economic support, child characteristics and maternal health. Data were analysed using Student's t-tests, chi-squares, and multiple regression methodology. Two different response variables were used in the regressions: general child illness rating and infrequency of child illness. Analysis indicated that women in the sample were

significantly more likely to report poor child health if they: had more children in their care, had younger children in their care, were involved in an intimate relationship, and had experienced a recent barrier to medical treatment for a child. Exploring maternal perceptions of child health is critical because these perceptions are the precursor to healthcare-seeking behaviour.

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Acronyms

ARI: acute respiratory infection

AIDS: acquired immune-deficiency syndrome

H-HANES: Hispanic Health and Nutrition Examination Survey

HICs: higher income countries

HIV: human immunodeficiency virus

HRQL: health-related quality of life

IPV: interpersonal violence

KeFA: *A Kenya Free of AIDS*

KES: Kenyan shillings

LICs: lower income countries

MANOVA: multiple analysis of variance

MSM: men who have sex with men

NUDSS: Nairobi Urban Demographic Surveillance System

PWUIDs: people who use injection drugs

R^2: coefficient of determination

RDS: respondent-driven sampling

SAS: Statistical Analysis Software

TB: tuberculosis

UN: United Nations

VIF: variance inflation factor

WESW: women engaged in sex work

WHO: World Health Organisation

WNESW: women never engaged in sex work

YLL: years of life lost

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Chapter 1: Introduction and Literature Review

1-1 Introduction

This thesis examines the determinants of maternal perceptions of child health in the informal urban settlement of Kibera in Nairobi, Kenya. Data for this study come from interviews conducted in Kibera with women engaged in sex work (WESW; n=139) and women never engaged in sex work (WNESW; n=138). These interviews were a component of *A Kenya Free of AIDS (KeFA): Exploration of Kenyan Female Commercial Sex Workers and Their Male Partners—Life Course Harm Reduction Approaches*, an interdisciplinary project with lead investigators from the Universities of Nairobi (Kenya), Washington (USA) and Victoria (Canada). The primary goal of KeFA is to encourage and enable research on HIV/AIDS in Kenya and to ultimately reduce its transmission. Select data from KeFA were analyzed using multiple regression methodology to address the following question: What are the determinants of maternal perceptions of child health in Kibera?

The remainder of this chapter is a literature review covering the following topics: health in informal urban settlements, urban versus rural health, and access to healthcare in urban areas; WESW in informal urban settlements and the unique vulnerabilities faced by their children; and perceptions of health, particularly maternal perceptions of child health. Following the literature review, Chapter 2 includes a more thorough description of the study area, pertinent data and selected analytical approach. Chapter 3 presents the results of the analyses outlined in the previous chapter. Finally, Chapter 4 includes a discussion of the results, making connections to pertinent literature, describing potential

limitations of this study and suggesting future research on the topic.

To understand parental perceptions of child health is to understand motives behind treatment-seeking within the context of a particular social, familial and economic environment. Identifying the determinants of maternal perceptions of child health has the potential to inform future harm-reducing, family-based interventions in comparable contexts throughout the world.

1-2 Urban Health

In 2009, for the first time in human history, our world became more urban than rural, indicating a shift in not only our physical environments, but the distribution of resources such as social networks, healthcare and social services (Galea and Vlahov 2005; UN Department of Economics and Social Affairs 2009). Living in cities is not intrinsically bad for human health; however, if urban areas are developed too rapidly with little regulation or city planning, then population growth may outpace infrastructure development, exposing large urban populations to environmental hazards such as untreated sewage and unsafe drinking water (Kyobutungi et al. 2008). Worldwide, approximately one third of urban populations live in unplanned, informal settlements (UN-Habitat 2003), a housing type characterized by illegal tenancy and few or nonexistent public services (UN-Habitat 1996). This form of urbanization is especially prevalent in sub-Saharan Africa where, in 2003, 166 million people lived in informal urban settlements—a population that made up a staggering 72% of all urban populations in the region (UN-Habitat 2003). This is significantly higher than any other region of the world, the next highest being south-central Asia at 58% (UN-Habitat 2003). In contrast,

roughly 6% of populations in the global north reside in these types of communities (UN-Habitat 2003).

According to the United Nations Department of Economics and Social Affairs (2009), the least industrialized countries are expected to experience the fastest rates of urbanization. It is predicted that by 2030 the urban population of sub-Saharan Africa will more than double—adding 300 million people to urban areas in one of the most impoverished regions of the world (UN Department of Economics and Social Affairs 2009). Not only are rates of urbanization in lower-income countries (LICs) exceeding those of higher-income countries (HICs), but much of this growth takes place in informal urban settlements (Montgomery and Ezeh 2005a). In Nairobi, Kenya, for example, 75% of population growth is absorbed by informal settlements (UN-Habitat n.d.). The United Nations' 2003 *Report on Human Settlements* indicates that compared to other urban areas, informal settlements have higher levels of poverty, poorer access to clean water and sanitation, more barriers to work opportunities resulting from stigma and geographic isolation, more frequent exposure to environmental hazards and a far greater disease load (UN-Habitat 2003; also see Kyobutungi et al. 2008). The health risks associated with informal settlements paired with their rapidly growing populations make urban health an increasingly important field of research.

1-2-1 Urban versus rural health: a fruitless debate

Much of urban health research in the less industrialized world has focused on the dichotomy between rural and urban living. Demographic data, however, often ignore variation that exists within a city (Montgomery and Ezeh 2005a). Montgomery and Ezeh

(2005b) and Kyobutungi et al. (2008) stress that adequate data are not always available from informal settlements, making the "urban versus rural" debate difficult and often inaccurate. Although much research suggests an "urban advantage" and indicates improved health in urban over rural populations (Panel on Urban Population Dynamics 2003), the conditions in informal urban settlements are far poorer than most rural communities (African Population and Health Research Center 2002).

For example, urban areas have a significantly higher rate of HIV/AIDS—one clear exception to the urban advantage (Montgomery and Ezeh 2005a). After conducting a review of community-based studies, UNAIDS (2004) estimated the worldwide prevalence of HIV in cities to be about twice that found in rural areas. In Kenya, the rate of HIV is estimated at 5 to 7% of the population, yet rates in Kibera are twice the national average at 10 to 12% (Kenya Ministry of Health 2005; Unge et al. 2009). In fact, HIV and Tuberculosis (TB, a common opportunistic infection) are the leading causes of premature mortality in Nairobi's informal settlements, accounting for nearly 50% of all Years of Life Lost (YLL) among individuals five years and older, followed by interpersonal violence at approximately 12%. Under-five mortality is most commonly a result of pneumonia and diarrheal diseases, accounting for 23% and 20% of all YLL, respectively (Kyobutungi et al. 2008).

Child mortality is often used as a marker of population health when examining relative health in informal urban settlements. The African Population and Health Research Center (2002) found that child and infant mortality is much higher in the informal settlements of Nairobi than both the rest of the city *and* Kenya's rural areas. In Kibera, the probability of dying before the age of five is 150.6 per 1000 births, compared

to 113.0 and 61.5 in rural Kenya and Nairobi, respectively (African Population and Health Research Center 2002). Kyobutungi et al. (2008) examined representative areas of two informal settlements in Nairobi (Korogocho and Viwandani) between 2003 and 2005 and found the under-five mortality ratios were 121.4 to 139.1 per 1000 live births—greater than rural regions as reported by the African Population and Health Research Center (above). Reasons for these higher probabilities of child and infant mortality are linked to unsanitary delivery conditions, environmental hazards, malnutrition and a lack of social services leading to increased prevalence of pneumonia and diarrheal diseases (African Population and Health Research Center 2002; Kyobutungi et al. 2008; WHO 2009a). Furthermore, child mortality is directly linked to the social gradient in health; premature death is much more likely in LICs, and within those countries, lower-income households (WHO 2009a).

Thus, while urban populations as a whole may indeed have superior health, there are subpopulations that do not. As we become increasingly urbanized, the need to understand the social and environmental determinants of health prevalent in urban settlements becomes imperative (Galea and Vlahov 2005).

1-2-2 Access to healthcare in urban settings

Unequal access to healthcare may be a factor in the inequitable health experiences in urban and rural populations. Although there are more resources potentially available to urban residents worldwide—by way of a greater number of hospitals and other clinics—the privatization of healthcare common in cities makes it impossible for some, especially those in informal settlements with little financial means, to access these services

(Montgomery and Ezeh 2005a). In rural areas, although cost is sometimes an issue, care is more likely to be free or cheap (Montgomery and Ezeh 2005a). Furthermore, the informal, and often illegal, nature of informal settlements allows governments to justify withholding resources commonplace in other parts of a city, like water and sewer infrastructure that would promote sanitary conditions and good health (Zulu et al. 2004). Therefore, while informal urban settlements are a manifestation of urban poverty they are also a symptom of poor housing policy which is rooted in the stigmatization of the urban poor and a lack of political will (UN-Habitat 2003).

Living in urban areas within LICs allows individuals to access healthcare and advice from many different types of specialists such as local chemists, traditional healers, clinic staff or medical doctors trained within a western paradigm (Montgomery and Ezeh 2005b). For example, in Kibera there are three government health facilities in addition to non-profit and private organizations offering health services (E. Ngugi, personal communication, January 22, 2013). Unfortunately, the urban poor are not always able to take full advantage of the resources theoretically available to them, not only because of a paucity of funds, but because they are less likely to have the "urban literacy" needed to understand the complex environments of hospitals and other healthcare facilities (Barua and Singh 2003 in Montgomery and Ezeh 2005b). Correspondingly, prejudice in healthcare may affect a patient's treatment when healthcare providers act on a bias they hold against a patient based on a perceived trait (Aday 2001). Those most vulnerable to discrimination are individuals with multiple "high-risk" traits such as a specific minority, gender, marital status, occupation or socioeconomic status (Aday 2001). It would seem that those living in informal settlements are at a particularly high risk of prejudice in

healthcare settings because of their relative location on the "fringe" of society and lack of social and financial resources. Despite these challenges, many people in informal urban settlements do regularly access health services; after all, a clinic would relocate from an informal community if it was not being used by its residents (Ngugi, personal communication, January 22, 2013).

1-3 Women and Children in Informal Urban Settlements: Sex work and child health

A social gradient of health exists at every level of society; those living in low income countries, neighbourhoods and households have diminished access to healthcare and higher rates of mortality than their higher income counterparts (WHO 2009b). Child health is also closely tied to many maternal factors including health, access to education, and occupational activities (WHO 2009b). There is evidence that, compared to men, women have additional disadvantages in LICs because of biological differences and gendered norms (WHO 2009b). Women are more likely to be employed in the informal sector or to engage in unpaid work, increasing their risk of poverty (World Bank 2008 in WHO 2009b). Because much available work is gender specific, such as manual labour, they tend to have a harder time finding regular paid work (Zulu et al. 2004). Not only do women have fewer opportunities for income (Kyobutungi et al. 2008), but childcare is often a responsibility they bear alone (Zulu et al. 2004). Female-headed households, which according to some research are becoming increasingly common in LICs (Bongaarts 2001), are more susceptible to poverty than those that are male-headed (Mukuria et al. 2005). Finally, a woman's education is associated with her children's

health; lower educational achievements are negatively correlated with under-five mortality across all regions of the world (WHO 2009c; WHO 2011).

Girls are not, on average, more or less advantaged than boys worldwide, although regional differences in health outcomes do exist (WHO 2009b). In Kenya, for instance, the 2008-09 Demographic and Health Survey found that boys were more likely to experience symptoms and be treated for both fever and diarrhea (Kenya National Bureau of Statistics 2010). Boys were also more likely to exhibit symptoms of acute respiratory infection (ARI), although girls were more likely to receive antibiotics for their ARI symptoms. Additionally, girls were more likely to receive vaccinations for every infectious disease surveyed. Finally, in a study on the determinants of health-seeking behaviours in Nairobi informal urban settlements, gender was not a significant variable influencing whether or not treatment for a sick child was sought by parents (Taffa and Chepngeno 2005).

Women engaged in sex work (WESW) are considered one of the "most at risk populations" of HIV infection because of their frequent exposure to the virus from multiple partners (Akeroyd 2004). Social Anthropologist Ann Akeroyd (2004) places sex work in an occupational category, "…in which the risk of HIV transmission is inherent/integral". Many women, especially young women, may be powerless to demand the use of condoms from either intimate partners or clients (Akeroyd 2004). This is a problem when, as Akeroyd claims, the "weaker partner" is given the responsibility of practicing safe sex. WESW have often been described as a *core* population in the HIV epidemic, acting as a reservoir for the virus, which their clients then transmit to other lower risk populations (Lowndes et al. 2002; Thomas and Tucker 1996; Voeten et al.

2002; van Viliet et al. 1998). However, more recently, the idea of "risk behaviors" rather than "risk groups" has been suggested as a means of avoiding discrimination and *othering* when examining the social and epidemiological impact of HIV (Akeroyd 2004). In interviews in Nairobi informal settlements, Zulu et al. (2004) explored social networking and reproductive health, concluding that sex work in these environments is mainly a "last resort" as a means to pay for basic necessities like food and housing. Thus, women with little social capital have fewer options for employment and may see sex work as the only viable possibility.

Researchers have rarely addressed a completely different responsibility that WESW shoulder—that of parenthood (Beard et al. 2010). Recent research indicates that WESW in Kibera have a comparable number of children to women in other occupations. In a sample of mothers engaged in sex work interviewed by Chege et al. (2002), the average number of children per woman was 3.4. This is congruent with the findings of Ngugi et al. (2012); WESW interviewed in Kibera reported an average of 3.2 children whereas WNESW reported 3.3. In spite of these findings, little consideration has been given to the special vulnerabilities the children of WESW face and how their unique circumstance may affect physical and psychological health.

Although it is nearly impossible to determine the exact number of people engaged in sex work in any given area, Vandepitte et al. (2006) conducted a meta-analysis of sex-worker population studies and determined approximations for different regions of the world. Estimates ranged from 0.1% (Turkmenistan) to 8.7% (Nigeria) of the population but the authors note that methodology varied widely. In Kenya, they estimate that 4.3 to 6.6% of the population is engaged in sex work. While these astronomical numbers may

be an overestimation, they underscore the extent and relative importance of this occupation (Vandepitte et al. 2006).

Considering the ubiquity of sex work worldwide and the potential for ending cycles of risk, there is surprisingly little research on the children of WESW. Beard et al. (2010) conducted an extensive literature review on the children of both people who use injection drugs (PWUID) and WESW and determined a need for further research in the latter group. The authors stress the importance of understanding these children's unique needs, experiences and vulnerabilities when developing appropriate family-based interventions. Although limited, research does exist from: Nairobi (Chege et al., 2002), a Midwestern US city (Sloss and Harper 2004) and a city in India (Pardeshi and Bhattacharya 2006). These studies consistently conclude that the children of WESW are more vulnerable than the children of WNESW because they are more likely to suffer separation from their mothers, experience sexual abuse, enter sex work, witness their mothers with clients, experience an earlier age of sexual debut and miss school. While not all directly related to health, these factors may lead to greater levels of stress, negatively impacting a child's health over his or her life-course (Thoits 2010).

The only research investigating the children of WESW in sub-Saharan Africa was conducted by researchers in Kibera in 2000 and included structured questionnaires administered to WESW and community focus group discussions (Chege et al. 2002). Results indicated that the women spent little time interacting with their children other than the physical responsibilities of a parent—like food preparation and clothes washing—and that their children were more likely to drop out of school than other children in Kenya. Additionally, most women lived with their children and also

entertained clients at home. As a result, girls were more likely to enter sex work themselves since they were "socialized" into it from a young age. Finally, children were sometimes locked up at night while their mothers sought clients.

It should be noted that all 385 women interviewed by Chege et al. (2002) were single parents, a group that generally must spend more time generating income than mothers with financial input from a partner, and thus have less time to spend with their children (Mclanahan 1999). Additionally, as Chege et al. (2002) indicate, the stigma and financial burden of divorce, by way of a smaller social network and reduced financial support from the father, may facilitate entry into sex work for some mothers in Kibera, leading to children with increased vulnerabilities. However, because this project did not have a comparable cohort of women engaged in other avenues of work, it is difficult to determine if the children's vulnerabilities were a direct result of mothers engaging in sex work or purely a function of single-parent households and poverty.

1-4 Perceptions of Child Health

There is much research on child health in informal urban settlements but with a heavy focus on child mortality and determinants of health (Tekçe and Shorter 1984; Hussain et al. 1999; African Population and Health Research Centre 2002; Garenne 2003; Amouzou and Hill 2004; Kyobutungi et al. 2008; Ziraba et al. 2009). There is very little research, however, on parents' perceptions of child health in these environments (eg. Taffa and Chepngeno 2005) even though it is these perceptions that lead a parent to potentially seek treatment for a child in need of medical care. Self-reported health-related quality of life (HRQL) is usually considered the standard in health research and for

diagnostic purposes (Hays et al. 1995). In pediatrics, parental report of health status is often used as a proxy for child health although there is still debate over the validity of this approach (Theunissen et al. 1998; Parsons et al. 1999; Waters et al. 2003; Panepinto et al. 2005; Varni et al. 2007). In the following discussion perceptions of health will be examined from three perspectives: community versus physician assessments of health, determinants of health perceptions, and parent perception of child health. Variables influencing health perceptions will be highlighted, including: community perceptions, recent illness and treatment, personality, marital status, age, gender, socio-economic status, and immersion in the dominant culture.

1-4-1 Community versus physician assessments of health

Understanding community-wide health perceptions can help to explain and frame individual health perceptions. A longitudinal study in Tanzania took a unique approach to examining community health and illustrates the differences often seen between internal and external health perceptions (Degrémont et al. 1987). The authors compared community perceptions of health (household interviews of individuals six years and older) with local clinic registers (what was actually treated), standardized questionnaires of children (or parent proxies) and physician examinations of children (one month to 15 years old). Household interviews, clinic registers and standardized questionnaires identified significantly different health concerns than physician examinations. The former three approaches found that fever/malaria, headache and abdominal problems were the most common medical problems described or treated. In contrast to this, physician

examinations diagnosed splenomegaly (enlarged spleen), teeth caries and skin infections more than any other health problem.

The authors hypothesize that differences in health perceptions were partly a result of the community's past and current access to treatment and differing interpretations of health and disease. For example, when there was community-wide treatment for Giardia (an intestinal protozoan) in conjunction with a water sanitation project, household surveys and clinic registers recorded improvements in perceived health that did not necessarily correlate with a long-term decrease in intestinal infections. Furthermore, the authors note that members of the community were more likely to rank health problems as more serious if they were not being adequately resolved by the available medical facilities. As an example, "wounds" was not in the top five most common health problems for household interviews or child surveys even though wounds were commonly treated at the local clinics. This is likely because most wounds could be adequately attended to at the local clinics and were therefore not viewed as problematic. Additionally, some conditions may not have been reported if they were usually self-treated or treated using traditional methods. For example, joint pain, psychiatric disturbances and diarrhea were usually treated using "alternative" approaches and therefore not considered in interviews since the community may not have perceived these ailments as a "biomedical" or "western medical" concern. Finally, when some conditions are particularly pervasive they may not be identified as a health problem at all, rather accepted as a "natural state of being" (Sen 2002).

What should be noted from this study is that individuals may have different perceptions of what is important to their community's health compared to what is

actually treated or diagnosed by health practitioners. These differing views carry unique and important validity that paint a more complete picture of community health. For the study at hand, mothers' perceptions of their children's health may be affected by recent access to health services, personal and cultural definitions of health and illness, access to "home" or "traditional" remedies and the relative ubiquity of specific illnesses.

1-4-2 Determinants of health perceptions

What determines an individual's perception of health and how might these factors impact perceptions of child health? The following section outlines research examining factors associated with poor self-reported health.

Waters et al. (2000) explored the effect of self-reported HRQL and other factors, such as gender, on parental perceptions of child health. Data were collected from 4,595 mothers and 745 fathers as part of the Health of Young Victorians Study in Australia. These two groups had similar rates of self-reported illness, overall health, marital status, household income and child living arrangements but varying education and countries of birth. Data were analyzed using logistic regression models adjusted for potential confounding variables including child age and gender, and parental education and country of birth. The authors found that mothers were much more likely to rate their children's health as poor if they also rated their own health as poor. Fathers with poor health, however, were no more likely to report poor child health. The study was unable to determine if there was a causal relationship between poor parental health perceptions and child health since it was not longitudinal in nature. Furthermore, with only one parent responding from each family there was no way to compare responses between mothers

and fathers. However, if a mother's perception of child health is more likely to be associated with personal health perceptions, then parent gender and self-reported HRQL are important factors when considering parent proxy health reports for children and determining any subsequent interventions.

Goodwin and Engstrom (2002) took the exploration of personal affect and its impact on health perceptions a step beyond Waters et al. (2000). Data from the Midlife Development in the United States Survey were examined using Multiple Analysis of Variance (MANOVA) to determine the relationship between self-perceived health and personality for adults (n=3606) with and without self-reported medical problems. In the former group, low scores of neuroticism and high scores of agreeableness, extraversion and conscientiousness were associated with good health perceptions. In the latter group, high scores of neuroticism were associated with poor health perceptions while high scores of openness, extraversion and conscientiousness were associated with good health perceptions. Even when the above data were adjusted for age, gender, race, marital status and education the results remained statistically significant. The authors hypothesized that neuroticism affects perceptions by the perpetuation of a negative attitude towards all facets of life. Conversely, it is possible that an independent factor leads to both neuroticism and poor health perception; however, the authors did not conjecture further. Either way, if personality affects personal health perceptions, it seems likely that it would also affect parent perception of child health.

In addition to gender and personality, marital status can impact an individual's perception of their health status. The effects of marital status on self-reported health and actual health outcomes have long been documented (Kiecolt-Glaser & Newton 2001).

Married individuals have, on average, less depression, better cardiovascular health, and longer life expectancies than the unmarried. However, marriage as a protective factor is much more pronounced for men than women (Kiecolt-Glaser & Newton 2001) and the quality of the marriage greatly impacts self-reported health (Ren 1997). One study found that married or cohabiting individuals reporting unhappy relationships had poorer self-perceived health than happily married/cohabiting couples *and* both separated and divorced individuals (Ren 1997). It is possible then that the presence of a happy relationship (either through marriage or cohabitation) indirectly improves perceptions of child health and conversely an unhappy partnership negatively alters these perceptions.

1-4-3 Parent perceptions of child health

Although self-report of HRQL is always ideal for research and treatment purposes, when a child is very young, sick or has developmental conditions affecting his or her cognition it may be necessary for a parent or caregiver to give a health report instead. It has been found that proxy health reports (parent or other caregiver) are correlated to child health perceptions but agreement tends to be stronger for more observable symptoms, and less so for internal symptoms such as depression (Upton et al. 2008). In a review of parent-child agreement on HRQL, Upton et al. (2008) found that parents consistently report more extreme child HRQL scores than their children. In nonclinical samples parents tend to report relatively higher (better) child HRQL scores, whereas in clinical samples parents are more likely to report relatively lower child HRQL than their children.

Theunissen et al. (1998) illustrate the complexity of parent-child perceptions of health, highlighting some of the factors that alter this relationship. Questionnaires were administered to 1105 children in the Netherlands, aged 8 to 11, and one or both of each child's parents. The purpose of this study was to determine agreement between child and parent perceptions of child HRQL. The questionnaire included seven sections: physical complaints, motor functioning, autonomy, cognitive functioning, social functioning, positive emotions and negative emotions. Responses were quantified using Student's t-tests, Pearson correlations and interclass correlations, and analyzed further using multitrait-multimethod analysis and stepwise linear regression. In general, the authors found a statistically significant relationship between child-parent agreement and a number of variables including child age and gender, parent age, child visits to a physician and recent child illness. These relationships were never straightforward, however, and were mediated by any number of personality scores.

For instance, children in the older age group (10 and 11 years) were more likely to report similar HRQL to their parents but only when they also scored high in autonomy on the questionnaire. Gender added another layer of complexity. When high autonomy scores were reported, boys were more likely to agree with their parents on HRQL; however, if autonomy scores were low, girls were more likely to agree. A similarly convoluted pattern emerged for parent age. Younger parents were more likely to agree with their children on HRQL when the child had low social functioning scores; but when social functioning scores were higher for the child then older parents were in greater agreement. Children with temporary illnesses were more likely to be in agreement with their parents if they also had lower social functioning and physical complaint scores; yet

when social functioning scores were high, sick children were less likely to agree with their parents. Finally, more regular doctor visits were associated with agreement if the child had low autonomy and motor functioning scores. On the other hand, for those children regularly visiting a doctor but with high reported autonomy and motor functioning scores, this pattern was reversed.

Although the results of Theunissen et al. (1998) are rather complex, the overarching trend is a correlation between child and parent perceptions but with parents reporting more extreme HRQL scores than children. On average, when the child reported poorer HRQL scores, parents reported an even lower score for the child. A similar pattern was seen for high HRQL.

Some research on parent-child health perceptions has focused on clinical populations; that is, children receiving treatment for health problems. One such study (Parsons et al. 1999) compared HRQL assessments of children, aged 5 to 12, receiving post-bone marrow transplant treatment, with proxy assessments from a parent and physician. Using Pearson's correlation coefficients, Student's t-tests and the Kruskal-Wallis test, the authors found that the children reported a statistically significantly correlated health status to the physicians' ratings of disease severity. In contrast, the children's parents' ratings were not significantly correlated with the physicians' ratings. In general, the authors found better agreement between parents and children for observable symptoms and use of healthcare services. Non-observable symptoms, such as those related to mental health and quality of life, were not correlated with the parental report.

Similarly, Panepinto et al. (2005) examined child and parent perception of HRQL for children, aged 5 to 18, with sickle cell disease in the United States. Participating in the study were 98 parents or caretakers and 63 children. The authors utilized one-sample and independent t-tests and Pearson correlation coefficients in their analysis. Overall, parents and caretakers tended to rate their children's HRQL as worse than the children. This was particularly pronounced in more internally experienced (non-observable) symptoms; children consistently rated their psychological quality of life as better than their parents' ratings. Consequently, the authors concluded that proxy HRQL measures from parents are only reasonable when dealing with more physical symptoms like pain and its impact on physical functioning.

Much research on parental proxy for child health has focused on young children (Parsons et al. 1999; Theunissen et al. 1998) or included larger age ranges incorporating both young children and adolescents (Panepinto et al. 2005; Varni et al. 2007), but rarely has research focused solely on an adolescent age group. Waters et al. (2003) is an exception to this trend. Using data from the Health of Young Victorians Study (Australia) the authors examined parent-adolescent agreement on a number of health factors including: physical, emotional, mental and social health and well-being. The objective of the study was to determine the association between parent and adolescent (12 to 18 years) health ratings for a non-clinical population. Through analysis of variance and two-sample t-tests it was found that, although correlated overall, adolescents tended to report their health as worse than their parents did for all factors except physical health. For those adolescents with an illness, this relationship was even more extreme. This discrepancy is significant for those adolescents with severe illnesses or certain cognitive or

developmental disorders that prevent them from reporting their own health status. The authors stress that, unlike younger age groups, adolescents may experience pain and mental health problems more severely than a proxy reporter may conclude.

Using a slightly different approach, Varni et al. (2007) tested the validity and reliability of parent ratings of child HRQL, aged 2 to 16 years. Data used in their analysis came from a subset of the PedsQL™ Database℠, a system developed by Dr. James W. Varni at Texas A&M University to "measure the core dimensions of health as delineated by the World Health Organization" (www.pedsql.org). PedsQL™ utilizes four scales including physical, emotional, school and social functioning to measure HRQL. For the purposes of their 2007 study, Varni et al. utilized data from parents of 13,878 children from the PedsQL™ 4.0 Generic Core Scales Database℠. This database is composed of parent and child data from a general, rather than clinical, population. The two sets of data were collected using similar means—questionnaires administered over the phone, in-person or self-administered and mailed in—and using parallel questions and formats. Parental proxy reports were compared to child self-reports using percentage of missing values of parent responses and the known-groups method. Through their analysis the authors concluded that parental proxy is feasible, reliable and valid for children aged 2 to 16 years, although they note that when possible child self-report is still preferred.

1-4-3 Relevance to perceptions of child health in Kibera, Nairobi

Why examine a mother's perception of her children's health and what meaning can be taken from it? Regardless of how accurate maternal perceptions of child health are, these perceptions determine whether or not treatment is sought for any medical

concerns. In informal urban settlements, where female-headed households are increasingly common (Bongaarts 2001), this decision and responsibility will often fall on the mother.

Given the importance of parental perceptions of child health, it is critical to understand what the determinants of these perceptions are. Arcia (1998) examined data from H-HANES (the Hispanic Health and Nutrition examination survey), focusing on Mexican American and Puerto Rican mothers of children, 6 months to 11 years. After running multiple regression models, both groups rated their children's health lower than the general American population. Those variables significantly (and independently) associated with poorer reports of child health included: functional limitations of the child, both current and resolved medical problems (including developmental) for the child, lower levels of acculturation of the parent, low educational achievement of the head of household, and low family income.

To explore the determinants of healthcare seeking for child illness, Taffa and Chepngeno (2005) analyzed data from the Nairobi Urban Demographic Surveillance System (NUDSS) collected from two informal urban settlements in Nairobi, Kenya: Korogocho and Viwandani. Data came from mothers (or other caretakers) from 15,174 households that included 3,015 children less than five years of age. In the two weeks before the survey was conducted, 33.1% (n=999) of children were reported to have experienced health problems. The most commonly reported symptoms were coughing (58.1%), fever (50.8%), diarrhea (36.4%) and vomiting (33.0%). Of those children with reported illness, parents sought treatment for them outside the home 60.5% of the time. Parents not seeking treatment for a sick child indicated a lack of finances (49.6%) as the

primary reason, followed by the perception that the illness was not serious enough to warrant outside treatment (28.1%). Through chi-squares, odds ratios and logistic regression analysis, other factors were found to affect treatment-seeking as well. Mothers were significantly more likely to seek treatment for younger children, and younger mothers were more likely to seek treatment than older mothers. Mothers with at least secondary education were also more likely to seek treatment than those with less schooling. Surprisingly, involvement in income-generating activities was not found to be a direct determinant of treatment-seeking, however, household expenditure was. Households with the lowest expenditures sought treatment for sick children significantly less than households with both average and high expenditures. The latter two groups, however, were not significantly different with regards to healthcare seeking. This study outlines an important fact—that money is the primary barrier to healthcare seeking for children in informal urban settlements in the Nairobi area. If a mother (or parent) is able to afford treatment it is still their perception that dictates whether or not it will be pursued. Thus, understanding perception of child health is paramount for children accessing healthcare services.

One potential limitation of the Taffa and Chepngeno study, above, is how "seeking treatment" was quantified. Only biomedical healthcare providers were considered as treatment, a definition that disregards any attempts the mother may have made to seek treatment either through more traditional means or home remedies. Angel and Worobey (1988) examined the effect of acculturation on maternal child health reports to determine if the relationship between maternal and physician reports on child health is altered by acculturation. Using data collected from approximately 12,000 Mexican

Americans, Puerto Ricans and Cuban Americans for H-HANES, the authors evaluated the impact of acculturation on perceptions of health with multivariate analyses. To measure acculturation, language preference and use, ethnic identity and preferred language for the interview were used. It was found that as acculturation increased, so did agreement between mothers and (biomedical) physicians. This is an important consideration since it indicates different interpretations of health and illness depending on an individual's socio-cultural perspective. Although Angel and Worobey (1988) predates Taffa and Chepngeno (2005) by nearly two decades, the message is still relevant today: one must be very cautious when taking meaning from interviews or questionnaires since how something is asked may be interpreted differently depending on cultural background and personal attitudes towards health, illness and treatment.

1-5 Overview of Literature Review

From the above review some basic trends emerge. It is often difficult to be healthy in an informal urban settlement and this challenge is possibly even greater for women and children. Women with few job opportunities and little financial support may be driven to engage in sex work which can increase their risk of harm and create unique vulnerabilities for their children. Although self-reported HRQL is preferred for diagnostic and research purposes, parent proxy is sometimes necessary for very young children. Parent and child health reports tend to be correlated overall, although factors such as child age, gender and past and present disease states may alter this relationship, as well as parent gender, personality, marital status and self-perceived health. Mothers in Kibera are most likely the adult responsible for evaluating a child's disease state and, if possible,

connecting them with any needed treatment, whether it is using a home remedy, community-based healer or biomedical practitioner. It is this fact that makes understanding maternal perceptions of child health in Kibera valuable when examining healthcare-seeking behaviour and child health in this environment.

Chapter 2: Materials and Methods

2-1 *A Kenya Free of AIDS*

A Kenya Free of AIDS: Harnessing interdisciplinary science for HIV prevention (KeFA) is a National Institute of Health-funded project with lead investigators collaborating from three different institutions—the University of Nairobi (Dr. Elizabeth Ngugi), the University of Washington (Dr. Martina Morris) and the University of Victoria (Dr. Eric Roth). KeFA includes four field-based projects, one of which (Project Four) is entitled *Exploration of Kenyan Female Commercial Sex Workers and Their Male Partners—Life Course Harm Reduction Approaches*. Project Four is led by Dr. Ngugi with Drs. Cecilia Benoit, Mikael Jansson, Eric Roth and Helga Halgrimsdottir from the University of Victoria. The objective of this project is to increase understanding of WESW in Kenya with the ultimate goal of examining the role these women play in HIV transmission in Kibera. Data collected in Kibera for Phase One of Project Four were utilized for this thesis.

2-1-1 Study area

Kibera is one of the largest informal urban settlements, or slums, in sub-Saharan Africa (Davis 2007). Situated in Nairobi, Kenya (Figure 1), its origins date back to the years immediately after World War I when the land was bestowed to returning Sudanese Nubian soldiers by the British Colonial government (Bendiksen 2008). Unfortunately, since corresponding land titles were never granted, the residents' rights to the land were not nationally recognized and the area was overlooked when Nairobi received "post-

independence" upgrades. As a result, Kibera lacks much basic infrastructure such as roads, public water systems and sewage disposal, and many of Kibera's residents today still have no legal land rights, making their occupancy tenuous at best.

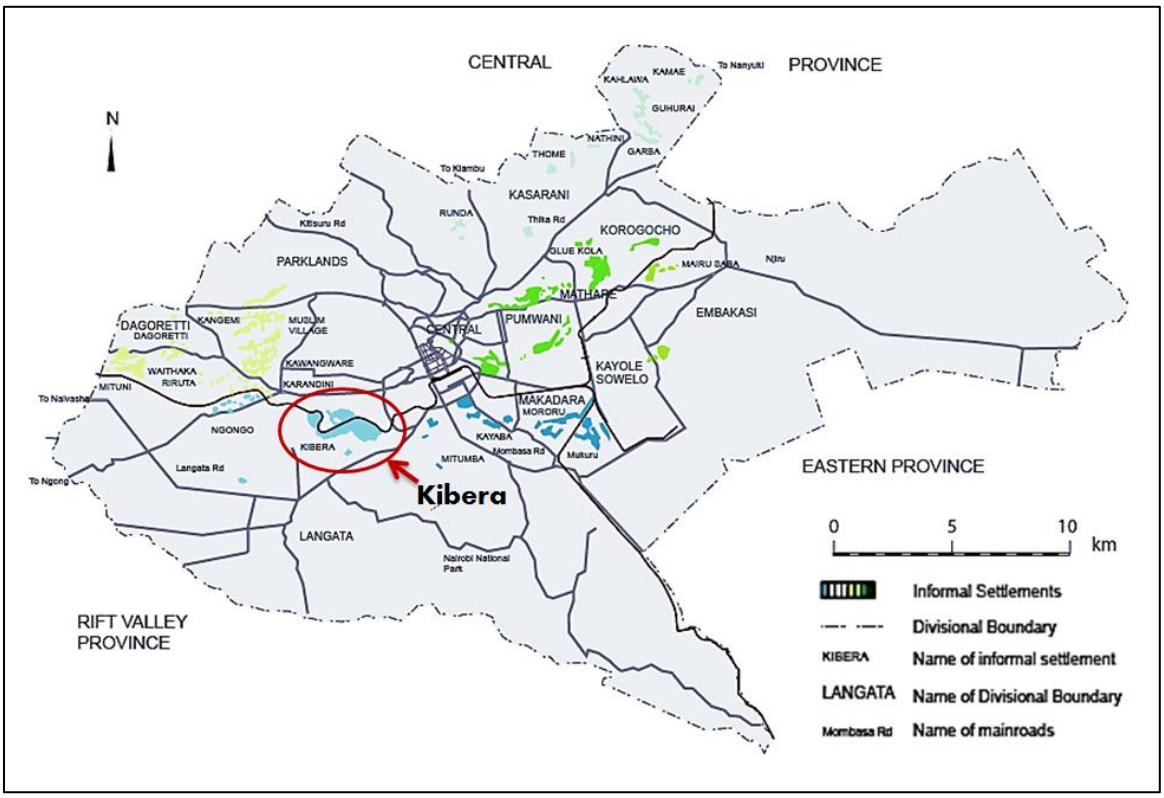

Figure 1. *Locations of informal urban settlements in Nairobi, Kenya (Source: Contemporary City Institute, 2013)*

Since the 1920s, Kibera's population has grown rapidly, absorbing the majority of Nairobi's growth, along with the city's other informal settlements (UN-Habitat n.d). Today it is estimated to have as many as one million people with a population density of 50 000 to 130 000 people per square kilometre (Davis, 2007; Desgrouppes and Taupin 2011) (Figure 2). Despite overcrowding, the residents of Kibera are roughly organized into at least ten large communities, or villages, with distinct ethnic identities (Ngugi et al. 2012). Most people reside in housing composed of mud, thatched roofs and iron sheets

(Davis 2007; Kyobutungi et al. 2008; Ngugi et al. 2012; Vasagar 2004). For employment men often work as casual labourers in neighbouring industrial areas while women are more likely find work in the informal sector cooking, cleaning, tailoring, selling food or second hand clothing, hairdressing, working in bars, or in sex work (Ngugi et al. 2012). However, high levels of poverty, which initially lead many people to informal settlements (Zulu et al. 2004), are exacerbated and maintained by irregular income and unemployment resulting from a lack of secure occupational opportunities (Kyubutungi et al. 2008).

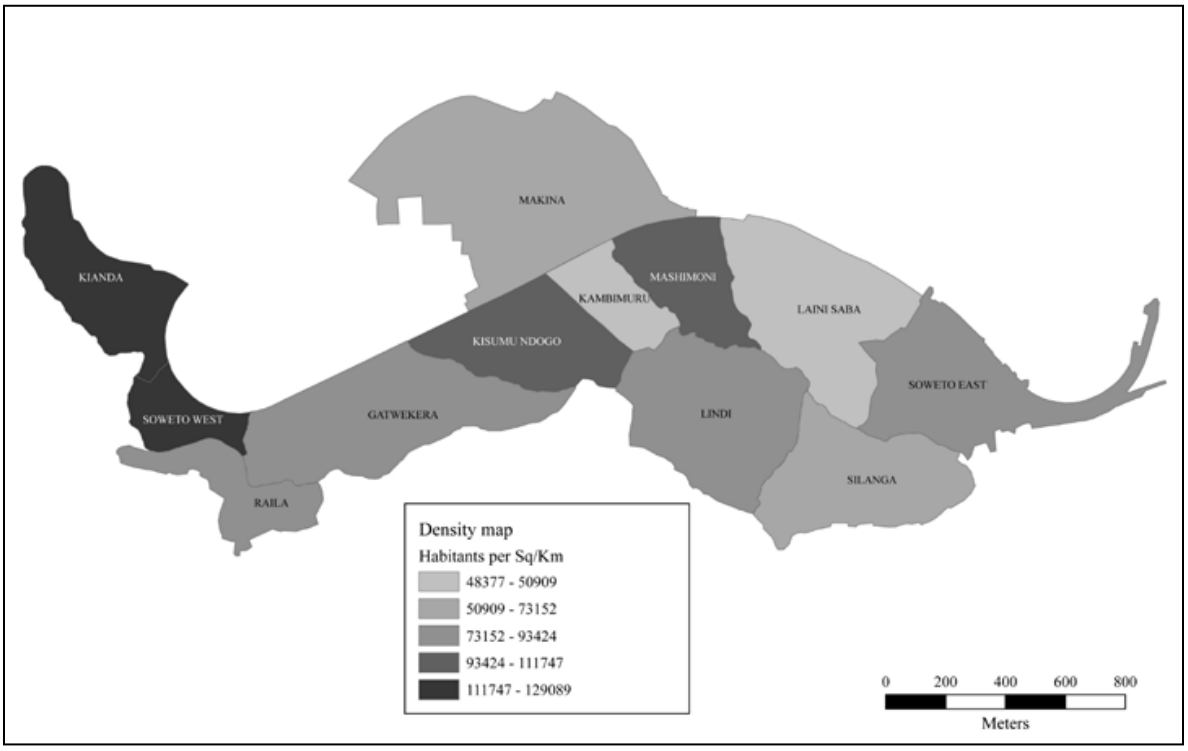

Figure 2. *Map of Kibera neighbourhoods with estimated population densities (source: Desgrouppes and Taupin 2011)*

2-2 Materials

Data were collected in 2009 in Kibera through questionnaire-based interviews developed by the lead investigators and with input from research assistants at the

University of Nairobi. Each interview was conducted by a female research assistant from the University of Nairobi, assisted by a female researcher from the University of Victoria. Interviews were held in Kiswahili or translated into English by the research assistant, depending on the respondent's preference.

Women were recruited for the study through respondent-driven sampling (RDS), a method developed by Douglas Heckathorn (1997) as an approach to working with hidden and at-risk populations. RDS increases researchers' access to the indicated populations while reducing bias implicit in chain-referred methods (Heckathorn 1997). It has successfully been employed in other low-income urban studies to identify and study WESW (Johnston et al. 2006; Yeka et al. 2006). The KeFA investigators attempted to locate a representative sample by selecting eight women from each of ten identified ethnic communities in Kibera: four WESW and four women never engaged in sex work (WNESW) (Ngugi et al., 2012). These eight women, or "seeds", were proportionately selected from four different age classes (18-24, 25-34, 35-44, 45+). Each seed was then asked to select three additional recruits from their same age class, occupational category (WESW or WNESW) and community. Seeds in Project Four were identified by Dr. Ngugi because of her vast experience and familiarity with Kenyan WESW (Ngugi et al. 1988; Moses et al. 1991; Ngugi et al. 1996; Ngugi et al. 1999; Ngugi et al. 2007; Ngugi et al. 2012). All women who took part in KeFA Project Four, Phase One interviews were compensated with 500 Kenyan shillings (KES) for the interview with an additional 200 KES for each successful recruit; combined; an amount comparable to two to four days' wages for a woman in Kibera.

A total of 320 women participated in interviews, representing WESW and WNESW equally. In this thesis, these women are variously referred to as the participants, mothers or respondents. The sub-sample of WNESW is extremely important as no known studies on the children of WESW have employed a control population of other working women (Chege et al. 2002; Pardeshi and Bhattacharya 2006). The use of such a sample allows for control of the ubiquitous risk factors in Kibera associated with poverty (Pearce 2011). Through the interview process, one woman, initially grouped with WNESW was determined to have past experience in sex work and was subsequently moved to WESW; therefore the final sample consisted of 161 WESW and 159 WNESW.

The sample of women reported a total of 750 living biological children (WESW=391, WNESW=359). However, this research will focus only on those children (biological or adopted; zero to 18 years) currently in the respondents' care at least part of the time. Of the 320 participants interviewed, 278 reported having a total of 680 children in their care at the time of the interview. One WESW did not respond to a number of questions relating to her one child (age, gender, relationship to mother) so she was excluded from the analysis; therefore, the sample used in all analyses for this thesis is composed of 277 women (139 WESW and 138 WNESW) with a total of 679 children.

2-2-1 Description of variables

Questions were selected from the KeFA Project Four, Phase One questionnaire for analysis based on relevancy to health or health perceptions and a strong theoretical underpinning in the scientific literature (Appendix A). Selected questions were grouped into five categories: perceptions of child health (response variables), maternal

background, social and economic support, child characteristics and maternal health. Initially, 24 variables were selected but after examining Pearson's coefficients some independent variables were excluded or combined because of moderate to strong correlations (Appendix B, Tables 11 and 12). After evaluating the variables in this manner, 17 were deemed suitable for analysis, including the two response variables. Tables 1 to 5 include descriptions of each variable, including a justification for their use or exclusion in the analysis.

Response variables, collectively measuring maternal perceptions of child health, came from two questions relating to: child illness rating and infrequency of child illness (Table 1). These variables are continuous and follow a normal curve (Figures 3 and 4). For both of these variables, the child with the poorest rating (highest illness rating, highest illness frequency) was used because it represents the child with the greatest potential for vulnerability, and therefore the most likely to be affected by the independent variables. This coding approach was compared with four other approaches—proportion of children in the household below the mean health rating, proportion of children in the household about the mean health rating, average child health rating and best child health rating (results not shown)—and was found to have the highest coefficient of determination (R^2) for each response variable when run through multiple regression models with the independent variables. Thus, the explanatory variables were best able to predict maternal perceptions of child health when the poorest child health rating was used for each woman.

Figure 3. *Distribution of child illness ratings reported by each participant (n=277) for their child with the highest rating (poorest health)*

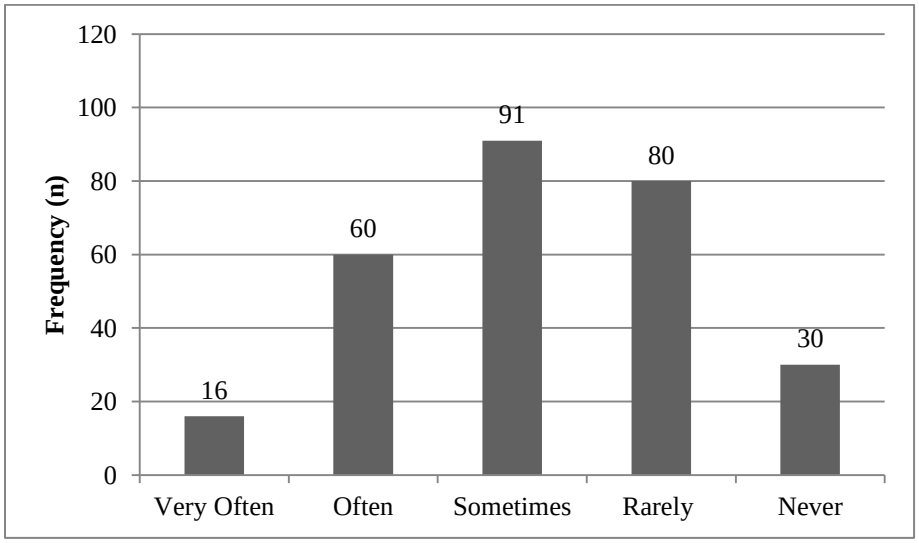

Figure 4. *Distribution of child illness infrequency reported by each participant (n=277) for their child with the lowest rating (highest illness frequency)*

Table 1. *Response variables: maternal perceptions of child health*

Variable	Question(s) from interview	Type of measure	Comments	Justification
Child illness rating	In general, how would you rate the children's health? [in the past four months]	1=excellent 2=very good 3=good 4=fair 5=poor	A rating was given for each child. The poorest rating was used for the purpose of analysis.	There is little research on determinants of maternal perceptions of child health, particularly in informal urban settlements.
Infrequency of child illness	Looking back over the past four months, how often has/have the children been ill? [in the past four months]	1=very often 2=often 3=sometimes 4=rarely 5=never	A frequency was given for each child. The highest frequency was used for the purpose of analysis.	There is little research on determinants of maternal perceptions of child health, particularly in informal urban settlements.

Years living in Nairobi, education, and occupation were selected to illustrate maternal background (Table 2). The number of years each woman had been living in Nairobi exemplifies exposure to a particular urban environment over time. Maternal age, which from previous research (Ngugi et al. 2012) is known to be the same for WESW and WNESW in this sample, was correlated with years living in Nairobi (Pearson's coefficient = 0.34) and was thus excluded from the analysis to avoid multi-collinearity. Maternal education was selected because of the strong relationship between a mother's education and child mortality (WHO 2009c). About one third of the women interviewed with children had schooling beyond primary school.

Table 2. *Distal variables: maternal background*

Variable	Question(s) from interview	Type of measure	Comments	Included in analysis?	Justification
Maternal age	When were you born (month/year)?	n=age (years) at time of interview	-	no	This variable was excluded from the analysis because it is

					correlated with "years in Nairobi" (Pearson's coefficient = 0.34) and the latter more likely represents the participants' time spent living in an informal urban environment.
Years in Nairobi	How many years have you lived in Nairobi?	n=number of years	-	yes	Represents the minimum time spent in an urban environment, an important component of this investigation.
Maternal education	What is the highest level of education you ever attained?	0=none 1=primary 2=post-primary or vocational 3=secondary or A level 4=college, middle level 5=university 6=other	No women reported education as >4.	yes	Maternal education is related to under-five child mortality. Lower levels of education are associated with higher rates of child mortality, worldwide (WHO 2009c).
Maternal occupation	What are your current work titles? Please list in order of work earnings and tell me if the work is full-time or part-time.	0=engaged in sex work 1=never engaged in sex work	Any individual who listed sex work at any point in their occupational history was grouped with WESW.	yes	Although this variable was moderately correlated with alcohol consumption (Pearson's coefficient = -0.49) it was included in the analysis because the dataset is divided between two occupational categories and is an interest of this thesis.

To illustrate the household environment income, presence of an intimate partner, family connections and access to healthcare were selected for analysis (Table 3). Household income includes both the study participants' personal income along with any contributions from family members, partners or friends as this value best represents the

funds potentially available to the participant and her children. Since KES have low value (1 KES = 0.01 CND), income was adjusted by a factor of 100 so that a one unit increase represents a meaningful difference in economic resources for the purposes of interpretation.

For all questions relating to an intimate partner, only those partners that had been in a relationship with the participant for at least four months were included because all questions relating to both child and maternal health are specific to the four months prior to the date of the interview. Moreover, it is assumed that any protective elements of a partnership take some time to form. The number of family members seen at least weekly (family connections) was selected to measure social support, an important variable since it is well-established that more social relationships are associated with lower mortality rates and better health outcomes (Berkman and Syme 1979; Seeman 1996; Uchino 2006). Finally, access to healthcare was represented by the ability of a respondent with a child needing access to medical treatment in the last four months to successfully access those services.

Table 3. *Distal variables: social and economic support*

Variable	Question(s) from interview	Type of measure	Comments	Included in analysis?	Justification
Household income	In an average week, what is your income in shillings from each work activity? Does anyone in addition to you often contribute to your	Kenyan Shillings (KES)/100 per month (personal income was adjusted from week to month)	Personal income from all occupations and contributions were combined. Because KES have low value (1 KES = 0.01 CND) total income was adjusted by a factor of 100 so	yes	A social gradient of health exists at all levels of society. Mortality rates are higher among countries, cities, neighborhoods and families that earn less (WHO 2009b). Parents in low income households are more likely to rate their

	household needs per month in shillings (yes or no)? If yes, how much do they contribute in an average month in shillings?		that one unit increase in income was economically meaningful in the analysis.		children's health as poor (Arcia 1998).
Problems paying	How often do you have problems paying for basic necessities (like food, clothing or rent)? How often do you have problems paying for things you need for work, for example, clothes, transportation, and tools? How often do you have problems paying for things you like to do?	1=never 2=rarely 3=some-times 4=often	Responses from these three questions were averaged for each woman because they were found to be positively correlated.	no	This variable was excluded from the multiple regression models because it was strongly correlated with "lack of food" (Pearson's coefficient = 0.69) and this latter variable was deemed to more accurately represent problems paying.
Partner	Are you currently in an intimate/love relationship? How many months have you been in this relationship?	0=no 1=yes	This includes both husbands and other romantic partners. Only partners that had been present for at least four months prior to the interview were included in the analysis. Many questions in the	yes	Intimate partners of WESW may have a protective health factor in that women with a partner report fewer clients and fewer clients that do not use condoms (Ngugi et al. 2011). In general, people with partners (husband/wife) have better health outcomes

			interview were specific to the previous four months so partners that were not present for this entire time period were excluded from the analysis.		than single people (Kiecolt-Glaser & Newton 2001).
Relationship unhappiness	How would you describe your level of happiness in this relationship?	1=very happy 2=mostly happy 3=some-times happy/ sometimes unhappy 4=mostly unhappy 5=very unhappy	Does not include <4 month relationships.	no	Ren (1997) found that people who reported happy relationships (marriage/co-inhabiting couples) were more likely to perceive their health as better than people who reported unhappy relationships. However, because not all women reported having an intimate partner (n=142 had a partnership of at least four months), this variable was excluded from the analysis to avoid reducing the total sample size and consequently the statistical strength of the analysis.
Partner education	What is the highest level of schooling that your partner attained?	0=none 1=primary 2=post-primary or vocational 3=secondary or A level 4=college, middle level 5=university 6=other	No women reported partner education as 6; does not include <4 month relationships.	no	Homes where the head of household has a lower level of education are associated with poorer perceptions of child health (Arcia 1998). But, as with "relationship unhappiness" this variable was excluded from the analysis to avoid reducing the total sample size.

Partner work	Is your partner currently working to earn money?	0=no 1=yes	Does not include <4 month relationships.	no	Excluded from the analysis to avoid reducing the sample size. Additionally, any potential financial contributions from a partner are already included in "household income".
Family connections	How many family members, including parents, aunts, uncles, siblings do you see on a weekly basis now?	n=family members/ week	-	yes	Social relationships are linked to better health outcomes and lower mortality rates (Berkman and Syme 1979; Seeman 1996; Uchino 2006).
Adults in household	How many other adults presently live in your household with you?	n=number of adults	Does not include adult children or intimate partners.	no	This variable was excluded from the analysis since there was no way of determining if these individuals are dependents or contributing financially to the household. Additionally, the number of adults in the home was correlated with "family connections" (Pearson's coefficient = 0.24) which is already included in the regression models.
Access to healthcare	In the past four months have any of the children had a medical problem for which they did not receive treatment?	0=yes 1=no	-	yes	Measures access to healthcare, a common concern among low income families and individuals, particularly in low income settlements (Montgomery and Ezeh 2005a).

Child characteristics are delineated by three variables: number of children currently in the participant's care, the average age of these children and the proportion of female children in the household (Table 4). Some children lived with the participant for only part of the time and some were adopted (usually blood relatives). However, children were not differentiated on these terms since it was assumed that any child in a woman's care requires at least some financial and familial responsibility.

Table 4. *Proximal variables: child characteristics*

Variable	Question(s) from interview	Type of measure	Comments	Included in analysis	Justification
Number of children	How many children currently live in your household?	n=number of children	Includes both adopted and biological children and those living in the household at least part-time.	yes	Number of children indicates how many children a woman is potentially caring and providing for financially.
Age of children	Please complete the table below for children who lived with you in the past week: - month of birth - year of birth	n=average age of children in household at least part-time	-	yes	Parents are more likely to seek treatment for younger children (Taffa and Chepngeno 2005) and younger children have a greater risk of all-cause mortality than older children (United Nations Department of Economic and Social Affairs 2012).
Gender of children	Please complete the table below for children who lived with you in the past week: - gender	0=no girls 1=all girls	Proportion of girl children in the household.	yes	Although there are not worldwide disparities in health outcomes between boy and girl children, there are regional differences between genders (WHO 2009b). In Kenya, girls are more likely to receive vaccinations than boys and boys are more likely to be diagnosed and treated for

	diarrheal diseases and fever (Kenya National Bureau of Statistics 2010)

Maternal health variables selected for analysis include alcohol consumption, frequency of a lack of food, HIV status, physical illness and emotional stress (Table 5). A conservative estimate of alcohol consumption was used for analysis. Women were asked how many times a month they drank both beer and alcohol but they gave no indication of how much was consumed during one drinking occasion and if beer and alcohol were consumed during the same event (and consequently counted twice). Because of this limitation the highest value of the two was used—either number of beer drinks or number of alcohol drinks—for the analysis.

To represent spending power, the frequency of having inadequate quantities of food was used. There were other questions on this same topic such as worry about not having enough to eat, and problems paying for necessities. However, all of these responses were correlated and actual frequency of inadequate quantities of food was determined to best represent each woman's spending ability (Tables 3 and 5).

Health-related questions were also grouped together because of positive correlations. Maternal physical illness is the average of three questions relating to physical health and illness—overall rating, bodily pain and frequency of illness. Similarly, emotional stress is the average of three questions on the topic—mental health, stress and fatigue. Physical illness and emotional stress were not, however, combined to form one health value because they were found to have different correlations with other variables.

Table 5. *Proximal variables: maternal health*

Variable	Question(s) from interview	Type of measure	Comments	Included in analysis	Justification
Alcohol consumption	For each substance I will ask you how old you were when you first tried it and how often you have used it in the last four months: - beer - alcohol	n=number of beer or alcohol drinks per month	Used the highest value of either beer or alcohol drinks per month since there is no way to know the quantity of consumption or if both drink types were being consumed at once.	yes	Alcohol consumption has the potential to affect both spending power and maternal health.
Worry about food	How often did you worry that there will not be enough to eat for you and/or your children because of lack of money? [in the last four months]	1=never 2=rarely 3=sometimes 4=often	-	no	This variable was excluded from the analysis because it was strongly correlated with "lack of food" (Pearson's coefficient = 0.77).
Lack of food	How often did you or your children not have enough to eat because of lack of money? [in the last four months]	1=never 2=rarely 3=sometimes 4=often	This variables was used to represent difficulty in paying for necessities; that is, the participants' spending power.	yes	This variable was deemed to most accurately represents spending ability which is related to the social gradient of health (WHO 2009b).

Seronegative HIV status	Were you ever tested for the following sexually transmitted infections [results of last test]: - HIV	0=positive status 1=negative status/don't know	-	yes	HIV status represents lifelong treatment and potentially ill health. It was included in the regression models because maternal health is tied to child health (WHO 2009b).
Physical illness	How would you rate your physical health? [in the last four months] How often did you feel unwell physically? [in the last four months] How often have you been in bodily pain? [in the last four months]	1=excellent/ never 2=very good/rarely 3=good/ sometimes 4=fair/often 5=poor/very often	Responses from these three questions were averaged for each woman because they were found to be positively correlated.	yes	Maternal health is closely related to child health (WHO 2009b). “Physical illness” and “emotional stress” were kept separate since they were not always correlated with the same variables. For example, emotional stress is correlated with “partner education” (Pearson’s coefficient = 0.21) and “access to healthcare (Pearson’s coefficient = 0.20) while “physical illness” is correlated with “seronegative HIV status” (Pearson’s coefficient = 0.21) and “number of children” (Pearson’s coefficient = 0.25).
Emotional stress	How often did you feel unwell mentally or emotionally? [in the last four months] How often did you feel tired or fatigued? [in the last four months]	1=never/not at all stressful 2=rarely/not very stressful 3=sometimes/ a bit stressful 4=often/quite a bit stressful 5=very often/ extremely stressful	Responses from these three questions were averaged for each woman because they were found to be positively correlated.	yes	See “physical illness”.

	Thinking about the amount of stress in your life would you say most days were… [in the last four months]

2-2-2 Methods

All analyses were conducted using Statistical Analysis Software (SAS), Version 9.3. Initially, descriptive statistics were calculated for the entire sample including means, standard deviations and ranges (Table 6). To compare WESW with WNESW, Student's t-tests were employed for all selected variables. Data were then analysed with multiple regression methodology (Der and Everitt 2002). Before running the regressions, variance inflation factors (VIF) of the explanatory variables were calculated to determine the presence of multi-collinearity (Appendix B, Table 13). As per Der and Everitt (2002) a VIF of greater than ten is considered problematic. Since all the variables had a VIF of less than two it was assumed that multi-collinearity was not a significant factor. To predict maternal child health perceptions, a stepwise regression approach was used. A regression was run with each response variable: 1) child illness rating and 2) child illness infrequency as perceived by the respondent in the past four months. Independent variables were forced into each regression in a number of models, or batches, beginning with distal variables and concluding with proximal variables. Variables were identified as either distal or proximal by their approximate distance (chronological or spatial) to the participant. Variables that directly related to the participants' bodily state, such as alcohol consumption and reported health rating, were labelled as proximal. Conversely, those

variables that only indirectly impact the participants, such as income and education, were identified as distal and organized in the model from most to least distal based on how long-standing their influence on the participants was judged to be. In this manner, all variables were included in the results in a cumulative fashion, so that the relationship between variables could be tracked as each successive model was run (Figure 5).

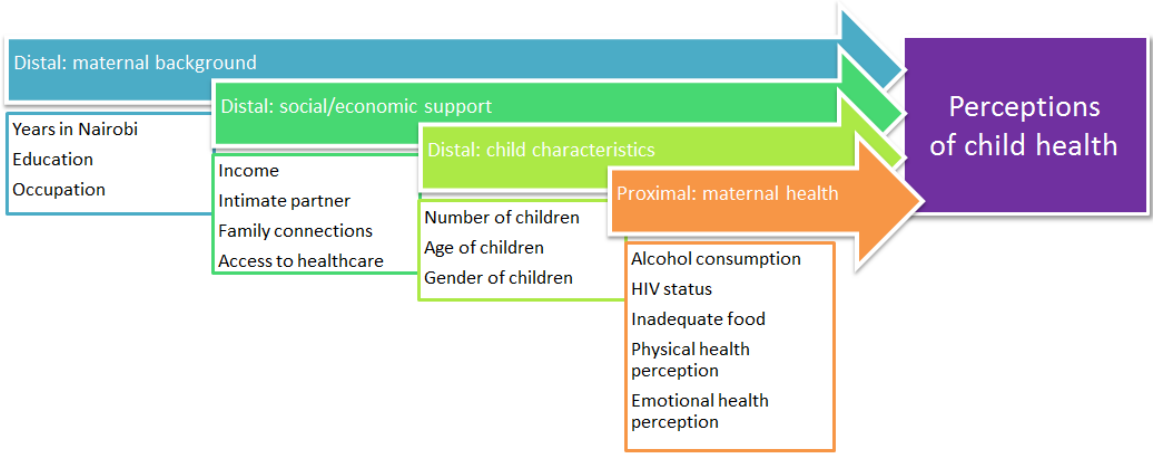

Figure 5. *Cumulative effect of distal and proximal variables on maternal perceptions of child health*

2-2-3 Ethics

The data collection described above was approved by the ethics boards of the University of Nairobi, the University of Washington and the University of Victoria (Ngugi et al., 2012). This thesis, while giving the researcher no direct contact with the aforementioned populations, was conducted with the guiding principle most stressed in any public health pursuit—"first, do no harm" (UNAIDS/FHI 2003). It is clearly understood that the attainment of data to further epidemiological and cultural awareness of public health takes a backseat to the safety of the populations being studied, especially those populations considered vulnerable such as WESW.

Chapter 3: Results

Descriptive statistics were calculated for the entire sample (Table 6). The average woman included in the analysis had been in Nairobi a little over 14 years and had completed primary education. She earned approximately 10,494 KES in the past month, including contributions from others, and was in contact with three or four family members each week. She had between two and three children at an average age of 7.3 years, 46% of which were girls. She drank at least 11 times in the past month and did not have adequate quantities of food for her or her children "sometimes" in the past four months. However, she reported feeling physically unwell only "sometimes" and her emotional state as "a bit stressful" in the same time period. Of the 277 women, just over half reported having an intimate partner for at least four months. Eighteen percent knew they were HIV positive at the time of the interview and 12% reported not being able to access treatment for a sick or injured child in the past four months. These averages, however, obscure some of the variation seen in the sample. Occupational differences will be explored in the following section.

Table 6. *Description of sample (n=277)*

Variable	**Mean**	**Standard Deviation**	**Range (frequency)**	
Child illness rating	3.011	0.976	1	5
Child illness infrequency	3.173	1.069	1	5
Years in Nairobi	14.278	9.709	0	44
Maternal education	1.657	0.975	0	4
Maternal occupation	0.498	0.501	0	1

Household income (/100)	104.947	120.125	10	1226
Partner	0.542	0.499	(yes = 150; no = 127)	
Family connections	3.332	4.129	0	48
Access to healthcare	0.881	0.325	(yes = 33; no = 244)	
Number of children	2.415	1.361	1	8
Age of children	7.280	4.297	0	18
Gender of children (proportion girls)	0.464	0.377	(girls = 324; boys = 356)	
Lack of food	2.628	1.044	1	4
Alcohol consumption	11.014	20.586	0	60
Seronegative HIV status	0.823	0.382	(positive = 49; negative/don't know = 228)	
Physical illness	2.840	0.739	1	4.67
Emotional stress	2.977	0.718	1	4.67

3-1 WESW and WNESW

Results from the Student's t-tests comparing statistics between WESW and WNESW are presented in Table 7. WESW and WNESW showed many similarities, particularly with regards to child characteristics, but also showed statistically significant differences ($p < 0.05$), such as in self-reports of health. For perceptions of child health, WESW were more likely to report poorer child health yet there was no significant difference between WESW and WNESW in their report on frequency of recent child illness.

Table 7. *Comparison of WESW and WNESW*

Variable	**WESW** *Mean/SD*	**WESW** *Range*	**WNESW** *Mean/SD*	**WNESW** *Range*	**Probability***
Child illness rating	3.137 0.987	1 – 5	2.884 0.952	1 – 5	***0.031***
Child illness infrequency	3.072 1.033	1 – 5	3.275 1.099	1 – 5	0.1136
Years in Nairobi	16.871 9.457	2 – 44	11.667 9.280	0 – 39	***<0.0001***
Maternal Education	1.468 0.854	0 – 3	1.848 1.053	0 – 4	***0.0011***
Household income	136.200 156.200	10 – 1226	73.429 49.997	12 – 332	***<0.0001***
Partner	0.403 0.492	No = 83 Yes = 56	0.681 0.468	No = 44 Yes = 94	***<0.0001***
Family connections	2.655 2.886	0 – 15	4.015 5.002	0 – 48	***0.0059***
Access to healthcare	0.871 0.337	No = 121 Yes = 18	0.891 0.312	No = 123 Yes = 15	0.5931
Number of children	2.460 1.410	1 – 8	2.370 1.313	1 – 6	0.5794
Age of children	7.114 4.289	0 – 18	7.447 4.313	0 – 18	0.5203
Gender of children	0.497 0.371	Girls = 170 Boys = 174	0.432 0.381	Girls = 154 Boys = 182	0.8223
Lack of food	2.705 1.066	1 – 4	2.551 1.019	1 – 4	0.2192
Alcohol consumption	21.079 25.069	0 – 60	0.877 3.795	0 – 30	***<0.0001***
Seronegative HIV status	0.763 0.427	Negative/ don't know = 106 Positive = 33	0.884 0.321	Negative/ don't know = 122 Positive = 16	***0.0081***
Physical illness	2.988 0.751	1.33 – 4.67	2.691 0.697	1 – 4.67	***0.0008***
Emotional stress	3.175 0.712	1 – 4.67	2.778 0.670	1 – 4.33	***<0.0001***

*Student's t-tests were used for continuous variables; chi-squares were used for categorical variables (partner, access to healthcare, child gender and seronegative HIV status)

Background and social and economic support were significantly different between the two occupational groups. WESW were more likely to report lower educational achievement and they had lived in Nairobi for a greater number of years. Results also showed WESW monthly incomes nearly twice as high as WNESW, with a very high level of significance. However, when income is broken down into personal income and contributions (income from family, partners or friends), WNESW actually receive statistically significantly larger contributions than WESW (Table 8). Not only are WNESW more likely to receive more financial contributions, they are also more likely to have an intimate partner. Despite the fact that the two samples reported significantly different levels of financial support, they reported no difference in difficulty accessing medical treatment for their children in the past four months.

Table 8. *Income of WESW and WNESW (KES/month)*

Income	WESW	WNESW	Probability
Total household income	13,623	7,343	***<0.0001***
Personal income from all work activities	12,436	5,231	***<0.0001***
Contributions	1,187	2,112	***0.0002***

In contrast to social and economic support, the two occupational groups reported similar numbers of children in their care, with no significant differences for child age or gender. Yet, self-perceptions of health were significantly worse for WESW compared to WNESW for nearly every variable. WESW reported poorer physical and emotional health, a much higher rate of HIV, and alcohol consumption at frequencies of more than 25 times greater than WNESW. Nevertheless, both groups of women, despite reporting different incomes, levels of social support and health statuses, reported no significant

difference in the frequency with which adequate food was not attainable for them or their children due to a lack of financial resources.

3-2 Determinants of Maternal Child Health Perceptions

3-2-1 Multiple Regression One: child illness rating

The results of the two multiple regressions are shown in Tables 9 and 10. Regression One (Table 9) used each mother's highest child illness rating (poorest health) as the response variable. The 15 independent variables are used to explain this health perception. The final model has a R^2 value of 0.2523 indicating that 25% variability in child illness ratings can be explained by the independent variables. Three variables resulted in statistically significant probabilities (p-value of less than 0.05). Mothers were more likely to report a poorer child illness rating if they: had an intimate partner (parameter estimate = 0.29663; F value = 7.12; Pr > F = 0.0081), experienced potential barriers to healthcare for a child in the past four months (parameter estimate = -0.50551; F value = 9.17; Pr > F = 0.0027) and had more children in their care (parameter estimate = 0.20583; F value = 23.238; Pr > F = <0.0001). In Model Two maternal occupation became statistically significant (Pr > F = 0.0179). Its probability became even greater in Model Three (child characteristics) (Pr > F = 0.0065), however, once maternal health variables were added to the regression (Model Four), it became non-significant with a Pr > F = 0.4019. Age of children and alcohol consumption were not significant but had probabilities of less than 0.1.

3-2-2 Multiple Regression Two: infrequency of child illness

Regression Two (Table 10) used the lowest value for child illness infrequency (most frequent illness) as reported by each mother in the past four months. The R^2 for this regression in the final model is 0.2333; 23% of the reported child illness infrequency can be explained by the selected variables. Three variables are statistically significant with probabilities of less than 0.05: access to healthcare, number of children and child age. Mothers were more likely to report more frequent child illness if they: had experienced a barrier to child medical treatment in the past four months (parameter estimate = 0.49869; F value = 7.25; Pr > F = 0.0075), had more children in their care (parameter estimate = -0.22338; F value = 22.37; Pr > F = <0.0001), and had younger children in their care (parameter estimate = 0.03194; F value = 4.65; Pr > F = 0.032). These three variables also remained significant throughout the models as other variables were added. When first added in Model Two, household income was not significant. This changed with the addition of the child characteristics in Model Three and it became statistically significant. However, this pattern reversed again with the addition of maternal health variables and in Model Four household income is no longer significant. Alcohol consumption and maternal physical illness are non-significant yet still resulted in probabilities of less than 0.1.

Table 9. *Results of forced, stepwise multiple regression models using poorest child illness rating as response variable*

	Model 1			*Model 2*			*Model 3*			*Model 4*		
Variable	**Parameter Estimate**	**F Value**	**Pr > F**	**Parameter Estimate**	**F Value**	**Pr > F**	**Parameter Estimate**	**F Value**	**Pr > F**	**Parameter Estimate**	**F Value**	**Pr > F**
Intercept	2.90845	341.51	<.0001	3.43215	241.19	<.0001	3.03036	159.28	<.0001	1.9157	20.71	<.0001
Years in Nairobi	0.00818	1.72	0.1911	0.00969	2.32	0.1288	0.00435	0.46	0.4986	0.00368	0.34	0.5602
Maternal education	0.0615	1.02	0.3145	0.04423	0.55	0.4586	0.06757	1.43	0.2322	0.07925	2.03	0.1554
Maternal occupation	-0.23346	3.58	0.0594	-0.3114	5.68	***0.0179***	-0.33904	7.52	***0.0065***	-0.11797	0.71	0.4019
Household income				-0.0003545	0.52	0.473	-0.0006152	1.72	0.1915	-0.0002306	0.23	0.6349
Partner				0.30964	6.82	***0.0095***	0.30386	7.22	***0.0077***	0.29663	7.12	***0.0081***
Family connections				-0.00131	0.01	0.9278	-0.00128	0.01	0.9262	-0.00125	0.01	0.9274
Access to healthcare				-0.68564	15.41	***0.0001***	-0.57469	11.98	***0.0006***	-0.50551	9.17	***0.0027***
Number of children							0.24662	35.07	***<.0001***	0.20583	23.38	***<.0001***
Age of children							-0.02452	3.35	0.0682	-0.02211	2.74	0.099
Gender of children							-0.06732	0.22	0.6426	-0.07037	0.24	0.6276
Lack of food										0.07272	1.59	0.2082
Alcohol consumption										0.00513	3.03	0.0829
Seronegative HIV status										-0.02805	0.04	0.8467
Physical illness										0.12291	1.89	0.1708
Emotional stress										0.13633	2.14	0.1443
	$R^2 = 0.0271$			$R^2 = 0.1019$			$R^2 = 0.2085$			$R^2 = 0.2523$		

Table 10. *Results of forced, stepwise multiple regression models using lowest child illness infrequency rating as response variable*

	Model 1			*Model 2*			*Model 3*			*Model 4*		
Variable	**Parameter Estimate**	**F Value**	**Pr > F**	**Parameter Estimate**	**F Value**	**Pr > F**	**Parameter Estimate**	**F Value**	**Pr > F**	**Parameter Estimate**	**F Value**	**Pr > F**
Intercept	3.08593	316.09	<.0001	2.44978	99.4	<.0001	2.89862	117.76	<.0001	4.35019	86.74	<.0001
Years in Nairobi	-0.00598	0.76	0.3855	-0.00954	1.82	0.1785	-0.00377	0.28	0.5978	-0.0026	0.14	0.7107
Maternal education	0.05924	0.77	0.3796	0.06587	0.99	0.3212	0.03848	0.38	0.5405	0.02553	0.17	0.6794
Maternal occupation	0.14977	1.21	0.2719	0.21364	2.16	0.1427	0.2384	3.01	0.0841	0.00513	0	0.9738
Household income				0.000935	2.9	0.0895	0.00122	5.47	***0.0201***	0.0008529	2.51	0.1143
Partner				-0.18261	1.92	0.1672	-0.18806	2.24	0.1361	-0.18019	2.13	0.1453
Family connections				0.00733	0.21	0.6492	0.0057	0.14	0.7098	0.00652	0.18	0.6686
Access to healthcare				0.7044	13.16	***0.0003***	0.58438	10.01	***0.0017***	0.49869	7.25	***0.0075***
Number of children							-0.26863	33.62	***<.0001***	-0.22338	22.37	***<.0001***
Age of children							0.0358	5.78	***0.0169***	0.03194	4.65	***0.032***
Gender of children							-0.05625	0.12	0.7274	-0.06792	0.18	0.673
Lack of food										-0.07446	1.36	0.2453
Alcohol consumption										-0.00563	2.96	0.0863
Seronegative HIV status										-0.11164	0.48	0.488
Physical illness										-0.17332	3.05	0.0821
Emotional stress										-0.15356	2.21	0.1383
	$R^2 = 0.0143$			$R^2 = 0.0751$			$R^2 = 0.1840$			$R^2 = 0.2333$		

Chapter 4: Discussion and Conclusion

Parental perceptions of child health represent a vital precursor to behaviour. Whether a parent seeks treatment for a sick child or determines that it is not warranted, this decision stems from how they perceive that child's health. Regardless of whether treatment is successfully accessed, parental perception opens or closes the door to the medical treatment of children. Although the data collected during KeFA Project Four, Phase One were focused on the social epidemiology of WESW, they included many valuable questions relating to child health. These data allowed for the innovative exploration of the determinants of maternal perceptions of child health displayed in this thesis.

The analyses outlined in Chapters Two and Three indicate that women in Kibera are more likely to report poor child health or high frequency of child illness if they are responsible for more children—particularly if they are younger children—have an intimate partner and have recently experienced a barrier to child healthcare. The following section will discuss and postulate on these significant variables.

4-1 Significant Variables

4-1-1 Child characteristics

It is not surprising that child variables are significant in both regressions considering perceptions of child health would be directly related to child characteristics. The number of children in a woman's care was highly significant with a large F-value in both regressions. This makes intuitive sense since a greater number of children spread an

income thinner in addition to taking more time for care (e.g. feeding, washing clothes, etc.). Not only do parents with more children need to devote more time to parenting tasks, they need to spend more time in income-generating activities. This is particularly pronounced among single parents (Mclanahan 1999)—nearly half of the participants in this study. It should be noted that because the poorest child health rating was used in both regressions, women with more children would have been more likely to have a child with poor health compared to women with fewer children, potentially skewing the results. Also, because all children in a participants' care were treated equally in the analysis, there is no way of differentiating between children living in the participants' care full-time and those only in their care for part of the time. Similarly, adopted children were not distinguished from biological children.

Perceiving younger children's health as worse than that of older children is consistent with child mortality statistics (United Nations Department of Economics and Social Affairs 2012). Children under 5 years of age have the highest risk of all-cause mortality of any age group except adults over the age of 60, worldwide. Within this age group younger children are even more at risk—over 70% of under-five deaths occur within the first year of life (WHO 2011). Poorer perceptions of younger children's health are also consistent with research on treatment-seeking in Nairobi. Taffa and Chepngeno (2005) found that mothers of children underfive were most likely to pursue treatment for children at the lower end of this age range.

4-1-2 Intimate partners

Other research from the KeFA project suggests that the presence of an intimate partner offers some level of protection for the health of WESW (Ngugi et al. 2011). Those with partners had fewer clients and proportionally fewer clients who did not use condoms than WESW without partners. In a recent qualitative study using KeFA Project Four, Phase Three data, however, more details surface. Thirty WESW participated in interviews related to intimate partners, clients and condom use. Many of the women viewed having a partner as a financial drawback because it interfered with their ability to work and earn money (Sharpé n.d.). What's more, many kept their occupation a secret from their partner in the fear that he or she would end the relationship if they were to disclose. In the current sample, women from both occupational groups with a partner did not earn significantly more or less than women without a partner. However, contributions were significantly higher for those women with an intimate partner, and WESW were significantly less likely to report having an intimate partner.

The above research seems contradictory to the results of Regression One (general child illness rating), which indicate that women in intimate partnerships are more likely to rate their children's health as poor. Other factors not accounted for in the data may be influencing the results. It is not known if the partner was the biological parent to any or all of the children in the participants' care; therefore, their investment in the children's wellbeing is also unknown. It is also not known if the partner had children living in a different household that he or she contributed to financially, removing potential finances from the participant's household. Additionally, partnerships lasting four months were not differentiated from partnerships lasting much longer which could partially account for the

negative impact of a partner on maternal perceptions of child health. Finally, the quality of the relationship was not accounted for. Violence is often associated with intimate partnerships (WHO 2012). Violence against women is most often perpetrated by their intimate partners and interpersonal violence (IPV) affects the health of both the victim and her children. The children of women who experience IPV have poorer health outcomes than other children and are more likely to experience abuse themselves (WHO 2012).

4-1-3 Access to healthcare

In informal urban areas, difficulty accessing health services may be juxtaposed by a large number of services available (Montgomery and Ezeh 2005a; Montgomery and Ezeh 2005b). In Kibera, for instance, there are three government health facilities, in addition to both non-governmental and private organizations offering health services (E. Ngugi, personal communication, January 22, 2013). Clearly, these services are being used by at least some of Kibera's residents for them to remain open. In one study, however, parents in informal urban settlements in Nairobi listed financial barriers as the primary reason for not being able to access treatment for a sick child (Taff and Chepngeno 2005). In the present analysis, WESW and WNESW reported similar levels of access to healthcare for their children, indicating that other factors, such as environmental hazards, in Kibera are greater than, or outweigh, occupational factors influencing access to health services.

An inability to access needed medical care for a child may be the direct cause of poor or worsening health but it also may have indirect effects on parents' perceptions of

child health. In Degrémont et al. (1987), it was found that health perceptions improved after community-wide treatment for Giardia, even after the actual effects of the treatment had subsided. Similarly, those ailments receiving adequate care, such as wounds, were not viewed as problematic in the community, even though they were common. Thus, there may be a psychological component that coincides with access to treatment, giving the patient (or patient's parent) improved health perceptions, in addition to physically treating the illness or injury.

4-2 Non-Significant Variables

Perhaps just as important in this study are those variables that did not result in significant probabilities. Years in Nairobi, maternal education and occupation, household income, family connections, gender of children, lack of food, HIV status and emotional stress were non-significant in both multiple regressions with probabilities of less than 90%. Some of these variables may be ubiquitous factors that are prevalent in the informal urban context. For instance, similar frequencies of inadequate food were reported across occupations even though WESW had a significantly higher income. Maternal education, occupation and household income are of particular interest because they are strongly backed in the literature as being related to child health. These three variables are discussed in the remainder of this section.

Given its strong association with child mortality, it is surprising that maternal education was not a significant variable in either regression (WHO 2011). The measures of child health used in the analyses are not, however, biomedical measures and are not necessarily directly associated with child mortality. It is possible that women with a

higher level of education are better able to recognize illness which increases proportionally lower child health ratings. It is also possible that environmental factors in informal settings, such as poor sanitation, outweigh the protective influence of maternal education.

In the two occupational samples (WESW and WNESW) there was a significant difference in alcohol consumption. Alcohol was strongly associated with engagement in sex work and is related to occupational activities. In a sample of 30 WESW in Kibera interviewed during KeFA Project Four, Phase Three, most reported drinking regularly with prospective clients yet rarely outside of work (Sharpé n.d.). Even so, the two variables were preserved and both were included in the present analysis since occupation was also correlated with many other variables, independent of alcohol (e.g. years in Nairobi, income, partner, physical illness and emotional stress; all with Pearson's coefficients of ± 0.2). Interestingly, when occupation was removed from both regressions alcohol became highly significant. However, with the addition or substitution of occupation, both variables became non-significant. This implies a complex relationship between occupation and alcohol with a potential degree of multi-collinearity or multiplicative interaction. For instance, it is possible that WESW who also drink alcohol above a certain threshold report poorer child health, on average. To explore this relationship further an interaction term would need to be calculated and incorporated into the regressions. This is an excellent consideration for future investigation. Nonetheless, in the present analysis, both alcohol consumption and occupation were included in the analysis since they represent considerably different measures.

Another concern with the alcohol variable is that it is highly skewed (for the entire sample: average=11.01/month, SD=20.59/month); many women reported little to no consumption while a few (usually WESW) reported very high consumption. The values used for alcohol in the analysis are already a conservative estimate since only beer *or* alcohol drinks were counted. Even so, as an extra precaution alcohol consumption was re-coded so that 30 drinks per month was the maximum value, rather than 60. This did not have a significant impact on the results of either regression so the variable was reverted to its original state to retain the participants' responses.

Finally, it is somewhat unexpected that income was not found to be a determinant of child health perceptions in either of the final regressions considering the well-established social gradient of health which exists at all levels of society (WHO 2009b). The value used for income included all sources of household income but it did not take the number of people residing in the household into account. This may be why, in Regression Two (child illness infrequency), income is only significant after the third batch of variables are added (child characteristics). It is reasonable to assume that with more children to care for, income becomes a more important factor in health and health perceptions.

4-3 Limitations and Future Research

This study has a number of limitations related to its diversion from the original purpose of KeFA, Project Four. Data available for this study came from a questionnaire that was not structured with child health or health perceptions as a major point of investigation. As such, questions relating to child morbidities were general and there

were no open-ended questions on the matter. A more detailed discussion of health in the interview would have allowed for the participants' personal definitions of health and illness to be considered in the analysis. Additionally, physician evaluations would have allowed for comparisons between maternal and physician perceptions of health to determine how much diagnosable child morbidities influence maternal perceptions of child health.

There are also limitations regarding the generalizability of the sample used in the analysis. Respondent driven sampling, while giving researchers access to hard to reach populations, has implicit in its approach a bias from both researchers and respondents who are in part responsible for recruitment. Accordingly, one may wonder if the resulting sample is truly representative of the population since it is not random. While this is certainly an important consideration to make when interpreting the results it is equally important to recognize that a truly random sample would be extremely difficult in an informal urban settlement since there are few roads and even fewer street addresses. The respondent driven sample used in this thesis equally represented the ten major neighbourhoods of Kibera and also equally represented different age groups. Although half of the respondents identified as having being involved in sex work at some time in their lives, most of these women also reported other income generating activities. It is for these reasons that the results of these analyses can be tentatively generalized to populations of women in other informal urban settlements in sub-Saharan Africa.

In future research on maternal perceptions of child health, the collection of data relating to objective and quantifiable child morbidities should be included in study designs. This data could be collected through any number of approaches: maternal reports

on specific child morbidities or symptoms within a particular time period; child anthropometrics to gauge growth and development; or assessment by a physician or other health professional. These additional health measures would allow for the comparison between maternal perceptions and objective morbidity data to further understand health perceptions. Additionally, future endeavors should explore factors that lead to specific health perceptions so that healthcare providers and health organizations may understand what the barriers to child healthcare are in specific urban contexts. A qualitative component to future research could help explicate the meaning behind health perceptions.

4-4 Conclusion

Growing urban areas, especially in sub-Saharan Africa, mean that an increasing number of people will be living in informal urban settlements, dealing with an increased disease load, and faced with a shortage of social and medical resources (Galea and Vlahov 2005). Children in these environments are at particular risk of malnutrition and infectious disease (United Nations Department of Economics and Social Affairs 2012). While financial barriers may be the primary reason why children in informal urban settlements are not connected with needed medical care, it is still parental perceptions of child health that determine whether or not treatment is initially sought. In sub-Saharan Africa, where female-headed households are increasing in number (Bongaarts 2001), it is likely mothers' perceptions that influence treatment-seeking. Thus, understanding what influences maternal perceptions of child health, how these perceptions are translated into action and what prevents treatment from being accessed are all important questions when trying to improve the health of children in informal urban settlements around the world.

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Appendix

Appendix A: Selected Questions from KeFA, Project Four Questionnaire

The following questions were selected from the KeFA, Project Four questionnaire, administered in Kibera in 2009, for use in the analysis for this thesis (original numbering and order of questions has been changed in places but wording is as it was administered):

1) When were you born (month/year)?

2) How many years have you lived in Nairobi?

3) How many family members, including parents, aunts, uncles, siblings do you see on a weekly basis now?

4) What is the highest level of education you ever attained?
   a) None
   b) Primary
   c) Post-Primary/Vocational
   d) Secondary /A Level
   e) College Middle Level
   f) University
   g) Other (Specify)

5) What are your current work titles? Please list in order of work earnings and tell me if the work is full-time or part-time.

6) In an average week, what is your income in shillings from each work activity?

7) How many biological/adopted children have you ever had?

8) How many children currently live in your household?

9) Please complete the table below for children who lived with you in the past week.

Child	Gender	Month of Birth	Year of Birth	Relationship to you	Live with you all year long (yes or no)	Other place they live
1						
2						
3						
4						
5						
6						

10) Are you currently in an intimate/love relationship? (If "no" skip to question 16, other household members) [*includes both marriage and other partners*]

11) How many months have you been in this relationship?

12) How would you describe your level of happiness in this relationship?
    a) Very happy
    b) Mostly happy
    c) Sometimes happy/Sometimes unhappy
    d) Mostly unhappy
    e) Very unhappy

13) What is the highest level of schooling that your partner attained?
    a) None

b) Primary
c) Post-Primary/Vocational
d) Secondary /A Level
e) College Middle Level
f) University
g) Other (Specify)

14) Is your partner currently working to earn money?

15) How many other adults presently live in your household with you (other than children and intimate partner already listed)

16) How often do you have problems paying for basic necessities (like food, clothing or rent)?
a) Never
b) Rarely
c) Sometimes
d) Often

17) How often do you have problems paying for things you need for work, for example, clothes, transportation, and tools?
a) Never
b) Rarely
c) Sometimes
d) Often

18) How often do you have problems paying for things you like to do?
a) Never
b) Rarely
c) Sometimes
d) Often

19) How often did you worry that there will not be enough to eat for you and/or your children because of lack of money?
    a) Never
    b) Rarely
    c) Sometimes
    d) Often

20) How often did you or your children not have enough to eat because of lack of money?
    a) Never
    b) Rarely
    c) Sometimes
    d) Often

21) Does anyone in addition to you often contribute to your household needs per month in shillings (yes or no)?

22) If yes, how much do they contribute in an average month in shillings?

23) How would you rate your physical health [*in the past 4 months*]?
    a) Excellent
    b) Very good
    c) Good
    d) Fair
    e) Poor

24) How often did you feel unwell physically [*in the past 4 months*]?
    a) Never
    b) Not often
    c) Sometimes
    d) Very often

e) Always/Chronically

25) How often did you feel unwell mentally or emotionally [*in the past 4 months*]?

a) Never
b) Not often
c) Sometimes
d) Very often
e) Always/Chronically

26) How often have you been in bodily pain [*in the past 4 months*]?

a) Never
b) Not often
c) Sometimes
d) Very often
e) Always/Chronically

27) How often did you feel tired or fatigued [*in the past 4 months*]?

a) Never
b) Not often
c) Sometimes
d) Very often
e) Always/Chronically

28) Thinking about the amount of stress in your life would you say most days were [*in the past 4 months*]:

a) Not at all stressful
b) Not very stressful
c) A bit stressful
d) Quite a bit stressful
e) Extremely stressful

29) In general, how would you rate the children's health [*in the past 4 months*]? (Please provide information based on oldest to youngest child. Child 1 should be the oldest.)

Child/Age	Excellent	Very Good	Good	Fair	Poor
1					
2					
3					
4					
5					
6					

30) Looking back over the past four months, how often has/have the children been ill? (Please provide information based on the oldest to youngest child. Child 1 should be the oldest child.)

Child/Age	Very Often	Often	Sometimes	Rarely	Never
1					
2					
3					
4					
5					
6					

31) In the past four months have any of the children had a medical problem for which they did not receive treatment (yes or no)?

32) If yes, please tell me about the things that made it difficult, or discouraged you from seeking treatment:_____

33) Were you ever tested for HIV/AIDS?

	Tested (yes or no)	How many times tested	Date last tested Month/Year	Where tested*	Result of lab test
HIV/AIDS					

*Choose from: hospital, STI clinic, VCT, public health clinic, private health clinic, other

**Choose from: positive, negative, don't know

34) Finally I would like to ask you some questions about your use of legal and illegal substances. I would like to remind you that all these data are confidential and that you have not given your name. For each substance I will ask you how old you were when you first tried it and how often you have used it in the last four months.

a) Beer
   i) How often:
      (1) Never
      (2) Once a month
      (3) Twice a month
      (4) Once a week
      (5) Twice a week
      (6) Once a day
      (7) Several times a day

b) Alcohol
   i) How often:
      (1) Never
      (2) Once a month
      (3) Twice a month
      (4) Once a week
      (5) Twice a week
      (6) Once a day
      (7) Several times a day

Appendix B: Correlations and Variance Inflation Factors

Table 11. *Correlations for all selected variables (table 1 of 2)*

Pearson Correlation Coefficients Prob > |r| under H0: Rho=0 Number of Observations	Child illness rating	Child illness infrequency	Maternal age	Years in Nairobi	Maternal education	Maternal occupation	Household income	Problems paying-basics	Problems paying-work	Problems paying-like	Partner	Relation-ship un-happiness	Partner education	Partner work	Family connect-ions	Adults in household	Access to healthcare	Number of children	Age of children	Gender of children	Alcohol consump-tion	Worry about food	Lack of food	Seroneg-ative HIV status	Physical ill-ness-health rating	Physical illness-unwell	Physical illness-pain	Emotional stress-mental	Emotional stress-fatigue	Emotional stress-frequency
Child illness rating	1	-0.644	0.119	0.114	0.038	-0.130	0.018	0.162	0.311	0.199	0.114	-0.046	0.110	-0.086	-0.005	-0.007	-0.225	0.002	0.006	0.001	0.135	0.245	0.192	-0.092	0.266	0.212	0.170	0.275	0.236	0.215
		<.0001	0.0484	0.059	0.5269	0.031	0.761	0.007	<.0001	0.0009	0.0574	0.5829	0.1943	0.295	0.9288	0.9033	0.0002	0.9728	0.9161	0.9808	0.0242	<.0001	0.0013	0.1269	<.0001	0.0004	0.0045	<.0001	<.0001	0.0003
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Child illness infrequency	-0.644	1	-0.074	-0.090	0.068	0.095	0.061	-0.215	-0.293	-0.232	-0.047	0.039	-0.052	0.121	0.033	0.050	0.206	-0.045	0.016	-0.044	-0.127	-0.218	-0.211	0.049	-0.169	-0.248	-0.223	-0.285	-0.149	-0.202
	<.0001		0.2199	0.136	0.262	0.1136	0.3157	0.0003	<.0001	<.0001	0.4314	0.645	0.5362	0.1375	0.586	0.4117	0.0006	0.4595	0.7853	0.4685	0.0353	0.0003	0.0004	0.4198	0.0047	<.0001	0.0002	<.0001	0.0133	0.0007
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Maternal age	0.119	-0.074	1	0.339	0.013	-0.057	-0.054	0.120	0.148	0.047	0.084	0.179	-0.063	0.091	-0.007	-0.180	0.094	-0.020	0.633	0.189	-0.032	0.075	0.104	-0.281	0.133	0.099	0.085	0.064	0.152	0.091
	0.0484	0.2199		<.0001	0.8239	0.3412	0.3692	0.0463	0.0137	0.4361	0.1636	0.0328	0.4586	0.2683	0.9138	0.0026	0.1203	0.7367	<.0001	0.0016	0.5975	0.2134	0.0827	<.0001	0.0272	0.1012	0.158	0.2896	0.0114	0.1329
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Years in Nairobi	0.114	-0.090	0.339	1	0.014	-0.268	0.180	0.068	0.112	0.049	-0.021	0.127	0.162	-0.019	0.211	0.133	0.066	-0.041	0.260	0.179	0.116	0.068	0.045	-0.017	0.099	0.064	0.122	0.098	0.103	0.012
	0.059	0.136	<.0001		0.8174	<.0001	0.0027	0.2614	0.0632	0.4187	0.7222	0.1292	0.0548	0.8146	0.0004	0.0274	0.2755	0.4926	<.0001	0.0027	0.0539	0.2573	0.4601	0.7786	0.0994	0.2873	0.0429	0.1035	0.0882	0.8426
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Maternal education	0.038	0.068	0.013	0.014	1	0.195	0.027	-0.062	-0.024	-0.031	0.115	-0.168	0.207	0.043	0.109	-0.077	-0.038	0.012	0.066	-0.040	-0.157	-0.075	-0.094	0.041	-0.115	-0.016	0.036	-0.022	-0.020	-0.093
	0.5269	0.262	0.8239	0.8174		0.0011	0.6488	0.3017	0.6901	0.6123	0.056	0.0451	0.0136	0.5977	0.0691	0.203	0.529	0.8408	0.2756	0.5043	0.0088	0.215	0.1197	0.4991	0.0569	0.7927	0.5511	0.7171	0.7382	0.1239
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Maternal occupation	-0.130	0.095	-0.057	-0.268	0.195	1	-0.262	0.000	-0.063	0.060	0.279	-0.203	-0.172	-0.089	0.165	-0.080	0.032	0.052	0.039	-0.087	-0.492	-0.068	-0.074	0.159	-0.189	-0.116	-0.178	-0.207	-0.160	-0.144
	0.031	0.1136	0.3412	<.0001	0.0011		<.0001	0.9947	0.2963	0.3238	<.0001	0.0149	0.0412	0.2771	0.0059	0.1862	0.5947	0.3924	0.5203	0.1506	<.0001	0.2581	0.2192	0.008	0.0016	0.0532	0.003	0.0005	0.0076	0.0165
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Household income	0.018	0.061	-0.054	0.180	0.027	-0.262	1	-0.270	-0.208	-0.241	-0.021	-0.082	0.243	0.100	-0.069	0.065	-0.017	0.058	-0.062	-0.011	0.107	-0.223	-0.226	0.078	0.083	0.011	-0.024	0.003	-0.097	-0.138
	0.761	0.3157	0.3692	0.0027	0.6488	<.0001		<.0001	0.0005	<.0001	0.7329	0.3319	0.0036	0.2238	0.2559	0.2802	0.7778	0.3382	0.3065	0.8557	0.0766	0.0002	0.0002	0.1956	0.1697	0.8613	0.6936	0.9609	0.1055	0.0211
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Problems paying-basics	0.162	-0.215	0.120	0.068	-0.062	0.000	-0.270	1	0.658	0.597	-0.028	0.200	-0.090	-0.195	0.068	0.027	-0.007	0.034	0.025	0.027	-0.061	0.624	0.671	-0.169	0.296	0.286	0.217	0.154	0.345	0.425
	0.007	0.0003	0.0463	0.2614	0.3017	0.9947	<.0001		<.0001	<.0001	0.6422	0.0164	0.2872	0.0162	0.2616	0.6591	0.913	0.5718	0.683	0.6536	0.3122	<.0001	<.0001	0.0049	<.0001	<.0001	0.0003	0.0101	<.0001	<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Problems paying-work	0.311	-0.293	0.148	0.112	-0.024	-0.063	-0.208	0.658	1	0.606	-0.088	0.097	0.073	-0.214	-0.004	0.048	-0.087	0.011	0.113	0.015	0.033	0.627	0.559	-0.115	0.292	0.322	0.225	0.210	0.362	0.397
	<.0001	<.0001	0.0137	0.0632	0.6901	0.2963	0.0005	<.0001		<.0001	0.1459	0.25	0.387	0.0084	0.9523	0.4253	0.1501	0.851	0.0594	0.7976	0.5886	<.0001	<.0001	0.0569	<.0001	<.0001	0.0002	0.0004	<.0001	<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Problems paying-like	0.199	-0.232	0.047	0.049	-0.031	0.060	-0.241	0.597	0.606	1	0.039	0.199	-0.041	-0.080	0.055	-0.019	-0.092	0.006	0.034	0.023	-0.051	0.626	0.517	-0.107	0.264	0.269	0.210	0.230	0.347	0.427
	0.0009	<.0001	0.4361	0.4187	0.6123	0.3238	<.0001	<.0001	<.0001		0.5224	0.0172	0.626	0.3305	0.3653	0.7508	0.1281	0.9219	0.5717	0.7068	0.3948	<.0001	<.0001	0.0757	<.0001	<.0001	0.0004	0.0001	<.0001	<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Partner	0.114	-0.047	0.084	-0.021	0.115	0.279	-0.021	-0.028	-0.088	0.039	1	.	.	0.266	0.007	-0.174	0.019	0.073	0.132	-0.022	-0.139	-0.004	-0.071	0.010	0.001	-0.045	0.004	0.010	-0.032	-0.028
	0.0574	0.4314	0.1636	0.7222	0.056	<.0001	0.7329	0.6422	0.1459	0.5224		.	.	0.001	0.9031	0.0037	0.7471	0.2246	0.0284	0.721	0.021	0.9496	0.2382	0.8665	0.9851	0.4571	0.9497	0.8721	0.5942	0.6411
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Relationship unhappiness	-0.046	0.039	0.179	0.127	-0.168	-0.203	-0.082	0.200	0.097	0.199	.	1	0.098	-0.237	0.016	0.107	-0.087	-0.041	0.245	0.018	0.063	0.186	0.271	-0.014	0.257	0.176	0.186	0.075	0.315	0.209
	0.5829	0.645	0.0328	0.1292	0.0451	0.0149	0.3319	0.0164	0.25	0.0172	.		0.2561	0.0043	0.8464	0.202	0.3032	0.6304	0.0031	0.8305	0.4519	0.0259	0.0011	0.8728	0.002	0.0353	0.0263	0.3722	0.0001	0.0121
	143	143	143	143	143	143	143	143	143	143	143	143	135	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143
Partner education	0.110	-0.052	-0.063	0.162	0.207	-0.172	0.243	-0.090	0.073	-0.041	.	0.098	1	-0.081	0.128	0.022	-0.043	0.057	0.038	-0.037	0.065	-0.102	-0.029	-0.009	0.039	0.141	0.209	0.258	0.182	0.043
	0.1943	0.5362	0.4586	0.0548	0.0136	0.0412	0.0036	0.2872	0.387	0.626	.	0.2561		0.3405	0.129	0.7917	0.6095	0.4988	0.6546	0.6637	0.4401	0.2257	0.7303	0.9112	0.6457	0.0931	0.0128	0.002	0.0303	0.6134
	142	142	142	142	142	142	142	142	142	142	142	135	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
Partner work	-0.086	0.121	0.091	-0.019	0.043	-0.089	0.100	-0.195	-0.214	-0.080	0.266	-0.237	-0.081	1	-0.070	-0.150	-0.035	-0.006	-0.028	-0.050	0.023	-0.224	-0.215	0.042	-0.098	-0.134	-0.014	-0.086	-0.084	-0.100
	0.295	0.1375	0.2683	0.8146	0.5977	0.2771	0.2238	0.0162	0.0084	0.3305	0.001	0.0043	0.3405		0.3909	0.0663	0.673	0.9377	0.7284	0.5435	0.7837	0.0056	0.0081	0.6119	0.2306	0.1018	0.8685	0.291	0.3073	0.2202
	151	151	151	151	151	151	151	151	151	151	151	143	142	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151	151
Family connections	-0.005	0.033	-0.007	0.211	0.109	0.165	-0.069	0.068	-0.004	0.055	0.007	0.016	0.128	-0.070	1	0.238	0.011	0.026	0.150	-0.029	-0.072	0.069	0.103	0.099	-0.020	-0.023	0.006	-0.100	-0.024	-0.069
	0.9288	0.586	0.9138	0.0004	0.0691	0.0059	0.2559	0.2616	0.9523	0.3653	0.9031	0.8464	0.129	0.3909		<.0001	0.8592	0.6629	0.0126	0.6297	0.232	0.2503	0.0879	0.099	0.7356	0.7008	0.9169	0.0964	0.6928	0.2557
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277

Table 12. *Correlations for all selected variables (table 2 of 2)*

Pearson Correlation Coefficients Prob > |r| under H0: Rho=0 Number of Observations	Child illness rating	Child illness infrequency	Maternal age	Years in Nairobi	Maternal education	Maternal occupation	Household income	Problems paying-basics	Problems paying-work	Problems paying- like	Partner	Relation-ship un-happiness	Partner education	Partner work	Family connect-ions	Adults in household	Access to healthcare	Number of children	Age of children	Gender of children	Alcohol consump-tion	Worry about food	Lack of food	Seroneg-ative HIV status	Physical ill-ness-health rating	Physical illness-unwell	Physical illness-pain	Emotional stress-mental	Emotional stress-fatigue	Emotional stress-frequency
Adults in household	-0.007	0.050	-0.180	0.133	-0.077	-0.080	0.065	0.027	0.048	-0.019	-0.174	0.107	0.022	-0.150	0.238	1	0.027	-0.002	-0.059	0.079	0.026	-0.037	0.028	0.051	0.030	0.050	-0.009	-0.079	0.007	-0.029
	0.9033	0.4117	0.0026	0.0274	0.203	0.1862	0.2802	0.6591	0.4253	0.7508	0.0037	0.202	0.7917	0.0663	<.0001		0.6576	0.9678	0.3249	0.1895	0.6701	0.536	0.6396	0.3992	0.6237	0.4113	0.88	0.1899	0.904	0.6317
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Access to healthcare	-0.225	0.206	0.094	0.066	-0.038	0.032	-0.017	-0.007	-0.087	-0.092	0.019	-0.087	-0.043	-0.035	0.011	0.027	1	0.088	0.005	0.005	-0.018	-0.073	0.008	0.005	-0.029	-0.050	-0.128	-0.187	-0.091	-0.141
	0.0002	0.0006	0.1203	0.2755	0.529	0.5947	0.7778	0.913	0.1501	0.1281	0.7471	0.3032	0.6095	0.673	0.8592	0.6576		0.1451	0.9333	0.9381	0.7632	0.2259	0.8972	0.9373	0.6339	0.4079	0.0328	0.0018	0.1312	0.0192
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Number of children	0.002	-0.045	-0.020	-0.041	0.012	0.052	0.058	0.034	0.011	0.006	0.073	-0.041	0.057	-0.006	0.026	-0.002	0.088	1	-0.069	0.067	-0.055	0.022	0.086	-0.005	0.063	-0.027	0.027	-0.016	0.000	0.000
	0.9728	0.4595	0.7367	0.4926	0.8408	0.3924	0.3382	0.5718	0.851	0.9219	0.2246	0.6304	0.4988	0.9377	0.6629	0.9678	0.1451		0.25	0.2699	0.358	0.7155	0.1529	0.9396	0.2955	0.6498	0.6523	0.7888	0.9946	0.9953
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Age of children	0.006	0.016	0.633	0.260	0.066	0.039	-0.062	0.025	0.113	0.034	0.132	0.245	0.038	-0.028	0.150	-0.059	0.005	-0.069	1	0.076	-0.071	0.018	0.012	-0.123	0.087	0.090	0.061	-0.026	0.122	0.052
	0.9161	0.7853	<.0001	<.0001	0.2756	0.5203	0.3065	0.683	0.0594	0.5717	0.0284	0.0031	0.6546	0.7284	0.0126	0.3249	0.9333	0.25		0.2055	0.2402	0.7671	0.8487	0.0404	0.1487	0.1373	0.3121	0.6716	0.0422	0.3866
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Gender of children	0.001	-0.044	0.189	0.179	-0.040	-0.087	-0.011	0.027	0.015	0.023	-0.022	0.018	-0.037	-0.050	-0.029	0.079	0.005	0.067	0.076	1	0.072	0.041	0.023	-0.078	-0.061	-0.081	-0.018	0.056	0.085	0.083
	0.9808	0.4685	0.0016	0.0027	0.5043	0.1506	0.8557	0.6536	0.7976	0.7068	0.721	0.8305	0.6637	0.5435	0.6297	0.1895	0.9381	0.2699	0.2055		0.2344	0.4923	0.7092	0.1932	0.3128	0.1789	0.7627	0.3528	0.1586	0.1688
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Alcohol consumption	0.135	-0.127	-0.032	0.116	-0.157	-0.492	0.107	-0.061	0.033	-0.051	-0.139	0.063	0.065	0.023	-0.072	0.026	-0.018	-0.055	-0.071	0.072	1	0.004	-0.002	-0.110	0.025	-0.007	0.059	0.107	0.048	-0.008
	0.0242	0.0353	0.5975	0.0539	0.0088	<.0001	0.0766	0.3122	0.5886	0.3948	0.021	0.4519	0.4401	0.7837	0.232	0.6701	0.7632	0.358	0.2402	0.2344		0.948	0.9721	0.0683	0.6755	0.9093	0.3303	0.0767	0.4235	0.8992
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Worry about food	0.245	-0.218	0.075	0.068	-0.075	-0.068	-0.223	0.624	0.627	0.626	-0.004	0.186	-0.102	-0.224	0.069	-0.037	-0.073	0.022	0.018	0.041	0.004	1	0.771	-0.132	0.296	0.280	0.181	0.205	0.325	0.463
	<.0001	0.0003	0.2134	0.2573	0.215	0.2581	0.0002	<.0001	<.0001	<.0001	0.9496	0.0259	0.2257	0.0056	0.2503	0.536	0.2259	0.7155	0.7671	0.4923	0.948		<.0001	0.0284	<.0001	<.0001	0.0025	0.0006	<.0001	<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Lack of food	0.192	-0.211	0.104	0.045	-0.094	-0.074	-0.226	0.671	0.559	0.517	-0.071	0.271	-0.029	-0.215	0.103	0.028	0.008	0.086	0.012	0.023	-0.002	0.771	1	-0.165	0.324	0.234	0.262	0.196	0.312	0.414
	0.0013	0.0004	0.0827	0.4601	0.1197	0.2192	0.0002	<.0001	<.0001	<.0001	0.2382	0.0011	0.7303	0.0081	0.0879	0.6396	0.8972	0.1529	0.8487	0.7092	0.9721	<.0001		0.0058	<.0001	<.0001	<.0001	0.001	<.0001	<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Seronegative HIV status	-0.092	0.049	-0.281	-0.017	0.041	0.159	0.078	-0.169	-0.115	-0.107	0.010	-0.014	-0.009	0.042	0.099	0.051	0.005	-0.005	-0.123	-0.078	-0.110	-0.132	-0.165	1	-0.165	-0.181	-0.152	-0.168	-0.190	-0.121
	0.1269	0.4198	<.0001	0.7786	0.4991	0.008	0.1956	0.0049	0.0569	0.0757	0.8665	0.8728	0.9112	0.6119	0.099	0.3992	0.9373	0.9396	0.0404	0.1932	0.0683	0.0284	0.0058		0.006	0.0025	0.0111	0.0051	0.0015	0.0435
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Physical illness-health rating	0.266	-0.169	0.133	0.099	-0.115	-0.189	0.083	0.296	0.292	0.264	0.001	0.257	0.039	-0.098	-0.020	0.030	-0.029	0.063	0.087	-0.061	0.025	0.296	0.324	-0.165	1	0.588	0.336	0.333	0.345	0.478
	<.0001	0.0047	0.0272	0.0994	0.0569	0.0016	0.1697	<.0001	<.0001	<.0001	0.9851	0.002	0.6457	0.2306	0.7356	0.6237	0.6339	0.2955	0.1487	0.3128	0.6755	<.0001	<.0001	0.006		<.0001	<.0001	<.0001	<.0001	<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Physical illness-unwell	0.212	-0.248	0.099	0.064	-0.016	-0.116	0.011	0.286	0.322	0.269	-0.045	0.176	0.141	-0.134	-0.023	0.050	-0.050	-0.027	0.090	-0.081	-0.007	0.280	0.234	-0.181	0.588	1	0.452	0.344	0.293	0.445
	0.0004	<.0001	0.1012	0.2873	0.7927	0.0532	0.8613	<.0001	<.0001	<.0001	0.4571	0.0353	0.0931	0.1018	0.7008	0.4113	0.4079	0.6498	0.1373	0.1789	0.9093	<.0001	<.0001	0.0025	<.0001		<.0001	<.0001	<.0001	<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Physical illness-pain	0.170	-0.223	0.085	0.122	0.036	-0.178	-0.024	0.217	0.225	0.210	0.004	0.186	0.209	-0.014	0.006	-0.009	-0.128	0.027	0.061	-0.018	0.059	0.181	0.262	-0.152	0.336	0.452	1	0.466	0.399	0.365
	0.0045	0.0002	0.158	0.0429	0.5511	0.003	0.6936	0.0003	0.0002	0.0004	0.9497	0.0263	0.0128	0.8685	0.9169	0.88	0.0328	0.6523	0.3121	0.7627	0.3303	0.0025	<.0001	0.0111	<.0001	<.0001		<.0001	<.0001	<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Emotional stress-mental	0.275	-0.285	0.064	0.098	-0.022	-0.207	0.003	0.154	0.210	0.230	0.010	0.075	0.258	-0.086	-0.100	-0.079	-0.187	-0.016	-0.026	0.056	0.107	0.205	0.196	-0.168	0.333	0.344	0.466	1	0.351	0.356
	<.0001	<.0001	0.2896	0.1035	0.7171	0.0005	0.9609	0.0101	0.0004	0.0001	0.8721	0.3722	0.002	0.291	0.0964	0.1899	0.0018	0.7888	0.6716	0.3528	0.0767	0.0006	0.001	0.0051	<.0001	<.0001	<.0001		<.0001	<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Emotional stress-fatigue	0.236	-0.149	0.152	0.103	-0.020	-0.160	-0.097	0.345	0.362	0.347	-0.032	0.315	0.182	-0.084	-0.024	0.007	-0.091	0.000	0.122	0.085	0.048	0.325	0.312	-0.190	0.345	0.293	0.399	0.351	1	0.480
	<.0001	0.0133	0.0114	0.0882	0.7382	0.0076	0.1055	<.0001	<.0001	<.0001	0.5942	0.0001	0.0303	0.3073	0.6928	0.904	0.1312	0.9946	0.0422	0.1586	0.4235	<.0001	<.0001	0.0015	<.0001	<.0001	<.0001	<.0001		<.0001
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277
Emotional stress-frequency	0.215	-0.202	0.091	0.012	-0.093	-0.144	-0.138	0.425	0.397	0.427	-0.028	0.209	0.043	-0.100	-0.069	-0.029	-0.141	0.000	0.052	0.083	-0.008	0.463	0.414	-0.121	0.478	0.445	0.365	0.356	0.480	1
	0.0003	0.0007	0.1329	0.8426	0.1239	0.0165	0.0211	<.0001	<.0001	<.0001	0.6411	0.0121	0.6134	0.2202	0.2557	0.6317	0.0192	0.9953	0.3866	0.1688	0.8992	<.0001	<.0001	0.0435	<.0001	<.0001	<.0001	<.0001	<.0001	
	277	277	277	277	277	277	277	277	277	277	277	143	142	151	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277	277

Table 13. *Variance inflation factors for variables used in the multiple regression models*

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	1.9157	0.421	4.55	<.0001	0
Years in Nairobi	1	0.00368	0.00631	0.58	0.5602	1.37587
Maternal education	1	0.07925	0.05562	1.42	0.1554	1.07776
Maternal occupation	1	-0.11797	0.1405	-0.84	0.4019	1.8145
Household income	1	-0.000231	0.0004852	-0.48	0.6349	1.24432
Partner	1	0.29663	0.11119	2.67	0.0081	1.12866
Family connections	1	-0.00125	0.01372	-0.09	0.9274	1.17594
Access to healthcare	1	-0.50551	0.16691	-3.03	0.0027	1.07498
Number of children	1	0.20583	0.04257	4.84	<.0001	1.22981
Age of children	1	-0.02211	0.01335	-1.66	0.099	1.20596
Gender of children	1	-0.07037	0.14488	-0.49	0.6276	1.09027
Lack of food	1	0.07272	0.05764	1.26	0.2082	1.32602
Alcohol consumption	1	0.00513	0.00295	1.74	0.0829	1.34995
Seronegative HIV status	1	-0.02805	0.14489	-0.19	0.8467	1.12394
Physical illness	1	0.12291	0.0895	1.37	0.1708	1.6014
Emotional stress	1	0.13633	0.09309	1.46	0.1443	1.63756