The Relationship between Maternal Health Risk Behaviors and Child Health in South Africa

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DECLARATION

I declare that this research report is my original and unaided intellectual work. It is being submitted for the award of the degree of Masters of Arts from the University of the Witwatersrand, Johannesburg, South Africa. It has not been submitted before for any degree or examination in any other university here in South Africa or anywhere else in the world.

Candidate:

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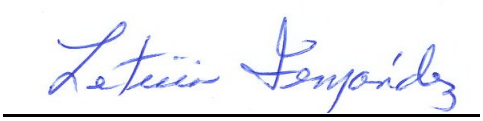
Signature



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3 May, 2011

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LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome.
BCG	Bacillus Calmette-Guérin (Tuberculosis) Vaccine
DTP	Diphtheria, Tetanus, Pertussis (Whooping Cough) Vaccine
DHS	Demographic and Health Survey
HATiP	HIV & AIDS Treatment in Practice
HIV	Human Immunodeficiency Virus
HSRC	Human Sciences Research Council
MRC	Medical Research Council
SADHS	South Africa Demographic and Health Survey
TB	Tuberculosis
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WHO	World Health Organization

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ABSTRACT

Over 50,000 children under age five die in South Africa every year due to acute respiratory infections, diarrhea, malnutrition and HIV/AIDS. Many of these deaths are preventable with timely immunization and better domestic sanitation and hygiene. Mothers are usually the main caregivers for young children, and they are the first to notice when their child is sick. Moreover, research across many developing countries reports a strong relationship between maternal childcare practices and child health. This study interrogates whether there is an association between mothers who adopt health risk behaviors for themselves and the health outcomes of their children, as evidenced by timing of child immunizations and maternal reports of incidence of diarrhea and cough in the two weeks prior to data collection. The study is anchored on the theoretical debate about the extent to which individual agency versus social structure determine the choice of healthy or risky lifestyles and the implications this may have on an individual's dependent children. The theoretical framework is based on Cockerham's (2005) proposed Health Lifestyle Paradigm, which conceptualizes a person's dispositions or preferences (Bourdieu's *habitus*) as shaped by the interplay of choices and chances, and ultimately resulting in the adoption of healthy or risky lifestyles. The framework has been extended to include maternal health-related practices on behalf of their children that may impact their health outcomes. Maternal health risk behaviors are proxied by smoking, alcohol consumption, risky sexual practices and whether she is following treatment for a diagnosed condition, all relevant factors in the South African context. The data come from the 1998 South African Demographic and Health Survey (SADHS). This study is limited to the subsample of 2,440 children under age five that are matched with a mother in the same household. Logistic regression models are used to ascertain the existence and nature of the association between maternal health behaviors and child outcomes net of other socioeconomic and demographic variables. The main findings are that there are significant associations between maternal health risk behaviors and her child's health outcomes. Maternal alcohol consumption is associated with delays in immunization, and children of mothers who do not take medications for a diagnosed condition are significantly more likely to have had diarrhea or respiratory infections in the last two weeks. Data limitations prevent disentangling whether these findings are due to internalized maternal practices or overwhelming constraining structures that limit access to healthcare for both mother and child. Policy ramifications and needs for future research are discussed.

INTRODUCTION

The virtue in most request is conformity. Self-reliance is its aversion.
It loves not realities and creators, but names and customs.
R. W. Emerson

This study examines the relationship between a mother's health behaviors for herself and whether these may impact the health of her child/ren. Some individuals practice a cluster of health risk behaviors that become a risky lifestyle in the sense that their behaviors increase their own risks of disease or injury (Baban and Craciun, 2007). There are several paths through which individuals who practice such health risk lifestyles may affect negatively not only their own health, but also the health of their dependent children. For example, in South Africa, historical socioeconomic disparities have created significant racial inequalities in health and in patterns of risky behaviors, such as high-risk sexual practices which have potentially negative consequences not only for adults, but also for their children as evidenced by maternal transmission of HIV/AIDS to newborns (Coovadia et al., 2009). Another mechanism by which parents who practice health risk behaviors affect the health of their children is by 'parental modeling' of frameworks that children will emulate as they grow older, and these health risk behaviors may eventually lead to adverse health effects for the next generation (Wickrama et al., 1999). This is a problematic issue in the context of public health programs and health promotion because eradicating negative behaviors learned at home has proven to be very challenging and costly (Baban and Craciun, 2007).

This research focuses on an alternative, and so far understudied, path through which maternal health behaviors may have a significant impact on the health of her children. It interrogates the implications of certain maternal health risk behaviors adopted for herself but that may be extended to similar treatment in her children; thus, affecting timing of immunizations, risks of diarrhea or risks of respiratory infections. In South Africa, the latter two are potentially serious diseases accounting for a high proportion of deaths among children under age 5.

The focus on maternal behaviors is justified by the fact that mothers are usually the main caregivers for young children, and because research across many countries in the developing world have reported a strong relationship between child morbidity and mortality on the one hand, and maternal childcare practices on the other (Cleland and van Ginneken, 1988; Caldwell and Caldwell, 1993). Child illnesses are more likely to be prevented or their

severity reduced when mothers understand and implement health messages, practice good hygiene and sanitation in the household, provide nutritional meals to children, keep their immunizations on track, and seek medical care for their children in the early stages of an illness (Cleland and van Ginneken, 1988; Das Gupta, 1990; Desai and Alva, 1998; Caldwell and Caldwell, 1993). These behaviors have been associated with maternal education and socioeconomic status. Therefore, one of the problems that needs to be tackled is understanding whether maternal health risk behaviors are themselves a reflection of low levels of education and poverty (structure), or whether risky lifestyles are to some extent independent of these factors.

While individual-level behaviors are frequently the focus of health behavior studies, previous research consistently finds that those who share the same social class or other stratification variable tend to also adopt similar health risk behaviors, which is attributed to individuals' similar socialization and experiences within a particular class (Blaxter, 1990; Cockerham, 2000b; Ross and Wu, 1995; Lindbladh and Lyttkens, 2002). South Africa has been historically characterized by large racial socioeconomic differences reinforced by institutionalized discrimination and oppression of Black populations (Coovadia et al., 2009). Social structural theory argues that under these circumstances, people adopt patterns of risky health lifestyles because they learn these behaviors within social structures that show them a limited range of options; therefore, these behaviors are replicated even if individuals are aware of the negative long-term negative consequences (Williams, 1995; Cockerham, 2000a, 2005).

Another layer in the complexity of health behaviors is that household composition may have a mediating role in the relationship between maternal health risk behaviors and treatment of child illness within a given social class. This is particularly relevant in the South African context since widespread migration for labor, reduced rates of marriage, and marital instability contribute to diversity in household composition. It is estimated that about 40 percent of Black households are headed by a lone mother, and three-generation households as well as polygynous households are also relatively common (Coovadia et al., 2009; Walker et al., 2004; South Africa Department of Health et al., 2002). Thus, intra-household allocation of power, access to household resources, and maternal decision-making abilities are likely to vary by household composition as well as by maternal education and her social class membership.

In terms of the specific child health outcomes that may be affected by maternal health risk behaviors, this study focuses on three measures that are relevant in the South African

context because of their high incidence, severity, and impact on child health: Respiratory infections, diarrhea and immunizations. Pneumonia and diarrhea are the top two main causes of morbidity and mortality among children under age five in developing countries according to the Global Burden of Disease Study (Lopez, 2005; WHO, 2004). Child immunizations are included as a health outcome because they are a preventive measure to protect child health, and because they require planning and execution on the part of the mother, such as keeping calendars in mind and dealing with the side effects of the immunizations, and can demonstrate her commitment or lack thereof to maintaining or promoting her child's health (Das Gupta, 1990).

Maternal health risk behaviors, the explanatory variables in this study, include behaviors that reflect the social realities affecting women in South Africa, and that may compromise future health outcomes: not following treatment for a chronic condition of her own, smoking, alcohol abuse, and risky sexual practices. These are behaviors linked to the onset or exacerbation of chronic conditions (WHO, 2006); they are also the results of limited access to quality health care services that have been experienced historically by Black South African populations (Coovadia et al., 2009).

The research questions therefore focused on:

- Quantifying the proportion of mothers who display the health risk behaviors selected for study, and examining their prevalence by maternal education, race, and socioeconomic status;
- Assessing whether there is an association between children's timing of immunization and their mother's health risk behaviors;
- Comparing the incidence of diarrhea and/or respiratory diseases in the last two weeks between children of mothers who practice health risk behaviors and children of other mothers;
- And, studying whether household composition mediates the effect of the relationship between maternal health risk behaviors and child health.

Rationale

This study has the potential to contribute to the literature that gives a more nuanced understanding on how the health risk behaviors of mothers may influence the way they treat their own children's illnesses, particularly in the South African context, where child morbidity and mortality remain high, and where social inequalities associated with race are large (Coovadia et al., 2009; Chopra et al., 2009). The focus of this study is on maternal behavior because the mother is the most likely household member to first recognize that the child is ill, and because mothers' responses to their child's illnesses may be critical in reducing the impact of socioeconomic adversity on child health (Chopra et al., 2009). It is acknowledged that structural barriers prevent the poorest groups in South Africa from accessing critical health information and healthcare. Poor environmental conditions, lack of reliable transportation systems, fragmented health systems, a shortage of skilled health workers, low quality of clinical care, and perceived patient mistreatment are all part of the social realities of the indigent in South Africa, and are likely to result in delays in seeking medical care for an ill child, which will impact on the child's health (WHO, 2006; Wigton, 2008; Chopra et al., 2009).

This research also provides an additional perspective on the concept of agency. Important sociological theorists tell us that our preferences are social products because we learn them within specific stratifying structures, and in those structures our preferences match what is considered appropriate, desirable, and obtainable (Weber, [1922] 1947; Bourdieu, 1984; Williams, 1995; Cockerham, 2005). Thus, even the choices we make, and not only the options from which we choose, are strongly influenced by our circumstances. In this regard, this research sheds light on an understudied path through which patterns of maternal health behaviors may have inter-generational health impacts that are different from the biological mother-to-child transmission of a disease, and that predate the socialization of children in terms of health behaviors.

Basically, the central question is whether mothers who "don't take good care of themselves" can take good care of their children. If so, then this is evidence of stronger agency than much structural theory seems to accept. In contrast, a similar neglect of her own and her children's health will be consistent with a weak view of agency as a structure-specific product (Blaxter, 1990; Cockerham, 2005).

In this study, I find that within structural limitations there are variations in maternal agency and behaviors regarding her own and her child's health. In particular, not all the health risk behaviors identified in this research are associated with negative child health

outcomes. Thus, identifying the links between maternal health risk behaviors and her child's illness increases knowledge of pathways through which to reduce child morbidity and mortality.

In this respect, interventions that successfully reduce health risk behaviors in adults are already viewed as cost effective because they avert the much larger costs associated with severe and disabling chronic conditions down the road. If the same interventions have the potential to identify children most at risk and offer opportunities to target prevention and treatment of child illnesses, these interventions become even more valuable.

LITERATURE REVIEW

Theoretical Considerations

This chapter discusses central theoretical frameworks that can help us conceptualize the adoption of patterns of health behaviors by individuals according to their position in society. It also discusses previous research findings about the relative roles of individual agency, and the impact of structural conditions on health. Combined, theory and research findings contribute to the conceptual framework that guides the analysis of the data.

Health risk behaviors can be seen as the absence of healthy behaviors. Researchers find that in most cases, individual adopt some of both, and only in rare cases are health behaviors at the extremes of all healthy or all harmful (Blaxter, 1990). Sociologists theorize that health behaviors (healthy or harmful) are the observable outcomes of complex interactions between individual choices (agency) and social structure. Social structure refers to patterns of stratification in society that rank groups of individuals and provide or restrict resources to them. These structures include social class, age, gender, race/ethnicity and other ascribed characteristics that situate individuals in different relative positions (Cockerham, 2005).

Agency is the capacity of individuals to choose behavior based on preferences. Agency is viewed as shaped or influenced by structure because when individuals must choose from among options available to them, their choices are guided by internalized rankings instilled through socialization within the group to which they belong (Bauman, 1999; Bourdieu, 1977, 1984; Cockerham, 2005). Thus, agency can never be free from structure, as even preferences are a social product.

Theoretical debate on the relative dominance of individual agency versus social structure in determining the choice of healthy or risky lifestyles has benefited from contributions by Giddens, Weber and Bourdieu, among others (Cockerham, 2000a). Giddens argues that individuals have considerable agency within their assigned position in a social structure; moreover, social structures and individual agency influence each other in the sense that individual choices and lifestyles are embedded in social structures, but at the same time these structures are perpetuated or changed through the actions and lifestyles adopted by individuals (Cockerham, 2000a; Giddens, 1991). Under Giddens' perspective, social structures are flexible and changeable, and individuals have substantial agency to adopt lifestyles that are consistent with or become part of their self-identity (Giddens, 1991).

To a lesser extent, Weber also viewed individuals as having agency, but not as able to influence social structures. That is, Weber's "life chances," the extent to which individuals have access to important resources in society, are constrained by social structures linked to their status in society; individuals do have some agency so that their "life choices" may reflects the balance between individual preferences and structural constraints, and in this context individuals may adopt either healthy or risky lifestyles (Weber, [1922] 1947). That is, for Weber, through socialization individuals develop context-specific capacity to interpret their situation, evaluate their constraints and options, and choose a course of action that has subjective meaning (Cockerham, 2005; Emirbayer and Mische, 1998). Moreover, the patterns of behavior that emerge from the interplay of choices and chances (agency and structure) become a person's lifestyle. An important contribution from Weber is the concept that these lifestyles reconcile what individuals desire with what they are able to achieve given their social position; thus, successful socialization shapes individuals' perception of needs and desires to match their structure (Weber, [1922] 1947; Swarts, 1997; Cockerham, 2000a).

There are similarities between Weber's concept that there must be a match between life chances and life choices, and Bourdieu's concept of *habitus*. Bourdieu (1977) viewed the interaction of agency and structure as a process that inscribes individuals with class-specific inclinations or dispositions, which he referred to as habitus. He saw this as the mechanism by which objective conditions associated with a particular social class became subjective preferences (Bourdieu, 1984, 1990). That is, Bourdieu believed that socialization and experiences within particular social classes become internalized as perceptions, dispositions, preferences and appreciations for the adoption of certain behaviors *consistent* with that class. These dispositions guide people's understanding of "how things are done" in a broad range of dimensions, including behaviors that impact health (Kontos, 2006). To be sure, class habitus defines at an *unconscious* level preference for food, sports, desired physical appearance, behaviors that impact health, and even what it feels like to be "healthy" (Bourdieu 1977, 1984; Bourdieu and Wacquant, 1992; Williams, 1995; Cockerham, 2005; Kontos, 2006).

Moreover, some researchers suggest that other cognitive characteristics that promote or hinder the adoption and continuation of health risk behaviors are also imprinted through habitus, such as time perspective orientation and locus of control (Illsley, 1980 in Williams, 1995). Time perspective refers to a construct in social psychology that ranks an individual's orientation as either toward the present or the future. Those high in future time perspective are more likely to defer gratification and less likely to engage in risky health behavior compared to those high in present time perspective. Not surprisingly, future time perspective

has been associated with membership in higher social classes and present time perspective with membership in lower social class (Boyd and Zimbardo, 2005). The locus of control is another construct from the field of social psychology that measures whether an individual believes events that affect her are primarily the result of her own behaviors (internal locus of control) or mostly the result of powerful others, or due to luck or fate (external locus of control) (Wallston et al., 1978 in Williams, 1995). Sociological theory would suggest that the perceived control over one's life is shaped in ways consistent with the social class where one is socialized.

In addition, and related to the extent to which individuals believe they can control their lives, studies find different narratives about experiences with disease (Frank, 1995). Four typical narratives are: the *restitution narrative* in which individuals refer to positive outcomes after coping successfully with an illness; *the chaos narrative,* which reflects impotence or powerlessness to deal with a disease; the *quest narrative,* which refers to a relentless search for either a cure or meaning throughout an illness; and the *testimony* which reflects the tendency to extract "learned experiences" from illness episodes (Frank, 1995). Although the author does not link any of these narratives with a particular social class, race, gender or culture, it is easy to see that this is yet another way in which an individual's perception may reflect the structure that shaped it.

Thus, sociological theory provides a powerful framework to study how social stratification is critical in the development of agency as well as in the adoption of health behaviors. That is, agency is central to individual decisions, but these decisions reflect preferences and inclinations that are strongly influenced by structural conditions. Individuals are not even aware of these preferences or dispositions because they have internalized them as norms and values, and view them as the way things are "supposed to be." The end product of socialization is non-reflexive behaviors and the ability to make choices (agency) that are consistent with the corresponding social structure (Cockerham, 2005). In particular, Bourdieu viewed agency as influenced to a much greater extent by social structure, and this implies that health lifestyles may not really be a matter of individual choice (Williams, 1995; Jenkins, 1992). Health related behaviors or, more specifically, health risk behaviors might become routine that is carried out without thinking, but they are in no way randomly distributed (Lindbladh and Lyttkens, 2002).

With respect to this research, sociological theory suggests that mothers who adopt health risk behaviors are not aware of them because these are part of a normal set of behaviors that take place within their particular circumstances. In addition, even if

individuals from different groups adopt the same behavior their meanings differ by social position. While cigarette smoking and alcohol consumption, for example, may be considered glamorous or sophisticated in higher social classes, individuals in lower social classes may use them to help cope with the challenges of daily life. In this regard, studies find that for some mothers, cigarettes are perceived as a way of dealing with stress, and that in their cost/benefit analysis they view the known negative impact of cigarettes as more than compensated by the benefits to their mental health (Williams, 1995). These calculations, again, are subjective and denote time perspectives that are largely influenced by the particular social class to which these individuals belong.

Would the reason for not taking medication also vary by social class? It is possible to imagine that mothers in the poorest groups do not follow treatment because they lack the resources (transportation, money, etc.) to ensure a continuous supply of medication, or that they may perceive to have little control over their disease anyway. In contrast, mothers in wealthier groups may also reject medical treatment but for an entirely different reason. For example, they may believe that through alternative herbal or other treatments they are able to reverse their condition instead of taking the prescribed medication. These are speculations derived from what theory tells us are the ways in which health risk behaviors, and their meanings, vary by the position of individuals in society. Qualitative research would help further understand how women from different social groups may interpret the same health risk behaviors in a different light.

Findings from Previous Research

What are the empirical research findings with respect to the association between structure and health risk behaviors? Previous studies consistently find differences in health (or risk) behaviors by stratification variables, most commonly social class, gender and race. Individuals in higher social classes are more likely to adopt behaviors that promote or maintain their health such as balanced diets, preventive checkups, relaxing activities and exercising or playing a physical sport during their leisure time. In fact, they may find it easier to adopt healthy lifestyles because their social conditions include higher levels of education, more leisure time and greater resources to invest on their health (Blaxter, 1990; Cockerham, 2000b; Ross and Wu, 1995; Lindbladh and Lyttkens, 2002). Note that individuals in higher social classes may also adopt negative health behaviors. However, the consequences seem to be less detrimental to their health because the social conditions that interact with health risk behaviors to exacerbate their impact are not present, such as poverty,

isolation, malnutrition and poor housing (Marmot and Wilkinson, 1999). Members of wealthier classes, in general, also are faster to adopt health practices in response to new knowledge, such as diets that reduce risks of heart disease or cholesterol (Cockerham, 2005; Lindbladh and Lyttkens, 2002).

In contrast, individuals in lower social classes tend to be slower in changing their health behaviors and are more likely to rely on established habits, some learned from parental behavior during childhood (Lindbladh and Lyttkens, 2002). In terms of prevalence, they are more likely to report smoking, alcohol abuse, poor dietary habits, non-adherence to medical treatments, and lack of exercise compared to the rates found among wealthier groups (Blaxter, 1990). Moreover, studies find that individuals in poor socioeconomic circumstances tend to have relatively more illnesses and, therefore, they have internalized a different standard of what it means to be "healthy" compared to the norms adopted by wealthier social groups where the density of diseases tends to be lower (Blaxter, 1990; Blaxter and Patterson, 1982). This finding comes back to reinforce theoretical arguments about class-specific concepts and standards regarding health status and health behaviors.

Although some health risk behaviors—smoking and alcohol abuse—cost money, these expenditures may be justified among the poor by frequent interactions with others in similar social groups for whom these behaviors may have become a way to cope with a sense of lack of control of one's own life and limited opportunities for advancement (Blaxter, 1990; Mirowsky and Ross, 1989).

Moreover, adopting a healthy lifestyle may be difficult and ineffective for members of low socioeconomic groups because they live in adverse environments that are likely to reduce the expected benefits derived from a more positive lifestyle (Blaxer, 1990). And since health risk behaviors take years to impact health in noticeable ways, in the absence of negative symptoms, structural barriers are more likely to result in the adoption or continuation of a risky lifestyle (Kagee et al., 2007).

The discussion so far has focused on health risk behaviors adopted by individuals. However, there is need to emphasize that even without practicing health risk behaviors, groups at the bottom of a stratification system—whether class, race or gender—tend to see their health deteriorate faster because they are exposed to constant stress, anxiety, and feelings of impotence, which are likely to have psychological and physical impacts in the long run (Marmot and Wilkinson, 1999). For example, some studies find that Blacks who encounter persistent (structural) racism tend to have poorer health outcomes than their counterparts (Karlsen and Nazroo, 2002). In addition, there are direct adverse consequences

from being at the bottom of a stratification system, such as living in poverty, lack of sanitation, malnutrition, job insecurity and unemployment, transportation barriers, and social exclusion or lack of social support (Marmot and Wilkinson, 1999). Clearly, the longer people are subjected to a life in poverty, the more health risks they face (Baxter, 2004; Bartley, 2003). If individuals in these circumstances also adopt health risk behaviors, severe impacts on their health are likely because they are already in vulnerable physical and mental conditions.

In South Africa, the most noticeable stratification systems are social class, race and gender. Due to historical institutionalized racism, social class and race hierarchies are confounded so that addressing one involves the other dimension as well. That is, the vast majority of the Black population lives in extreme poverty, so these two stratification systems work in tandem. The Black populations that live in the worse forms of poverty are chronically subjected to attacks on their health by the determinants mentioned above from the time of conception, and many live in poverty from birth to death. These structural conditions perpetuate health disparities that have existed since the colonial period (Myer et al., 2004). Labor migration, in particular, has been associated with the spread of HIV/AIDS because migrant men tend to have multiple high-risk sexual partners and then transmit HIV infection to women in rural areas that would otherwise be at low risks of infection (Myer et al., 2004).

Not surprisingly, those living in poor housing with limited or no access to basic utilities (electricity, piped water, heating source, etc.) have more diseases and more often than those in better conditions. Disadvantaged neighborhoods are linked to poorer health because of the stress and physical impact of overcrowded living conditions that facilitate the spread of communicable diseases, compounded by lack of public services and sanitation, higher crime rates, and lack of facilities for exercising and promoting community social capital (parks, safe streets, etc.) (Blaxter, 1990; Browning and Cagney, 2002; Cockerham, 2005).

For the indigent Black in South Africa, conditions are such that in recent years an emerging "triple burden" of diseases has been identified (Bradshaw et al., 2001; Myer et al., 2004). This syndrome affecting disproportionately the Black poor population refers to the combination of diseases associated with poverty, such as TB and diarrhea; concurrent with increasing rates of chronic conditions, such as HIV/AIDS, heart disease and stroke; and a high rate of injuries (intentional or unintentional violence, accidents and suicide) (Bradshaw et al., 2001; Myer et al., 2004). Under these conditions, it is difficult to separate what may be considered an individual's willful adoption of health risk behaviors from what is considered normative daily life. Thus, this is a strong argument for Bourdieu's view that structure plays

the dominant role in the formation of habitus, those routine ways of life enacted on a daily basis without consciously thinking about them.

In terms of research findings regarding gender differences in health risk behaviors, women in general tend to have healthier lifestyles than men; still, social class is a key factor favoring women in wealthier classes compared to women in lower-income groups (Blaxter, 1990; Cockerham, 2000a, 2000b; Wickrama et al., 1999). Research specific to South Africa reports that the intersection of race, class and gender places Black women at higher risks of poverty and greater disadvantage in every dimension compared to any other group. In particular, African women in low social classes have a very low status in their households, communities and society (Gilbert and Walker, 2002). They have higher rates of poverty and unemployment, and lower income and education than African men. Because of their low status, which is enforced by fear of violence and economic dependence on men, women lack relational power to negotiate concessions from men in terms of reducing health risks to themselves or their children, such as the use of condom in the presence of high rates of HIV/AIDS prevalence (Gilbert and Walker, 2002; Jewkes et al., 2010). Moreover, frequent sexual and physical assaults on women have reportedly become normative in some communities (Leclerc-Madlala, 2004; Mane and Aggleton, 2001). And the dimensions of violence and sexual violence against women are staggering by most comparisons. One quarter of South African men in a 2006 survey admitted to having raped someone (Gilbert and Selikow, 2010).

Under these bleak circumstances, adoption of health risk behaviors is likely to be in the realm of habitus and not at any level of individual awareness. Moreover, from this perspective, sexual risky behaviors in women are likely to be outside their control, since coerced risky sexual intercourse negates any agency on the part of women. Another dimension to risky sexual practices involves transactional sex in exchange for goods and money. This practices is said to be widespread in some groups, and not only among indigent Black women. Women may have more than one male partner supporting their material needs. However, this strategy increases the risk of HIV/AIDS infection since older men who may have more resources to exchange for sex, may also be more likely to be infected (Leclerc-Madlala, 2006; Gilbert and Selikow, 2010; Bodibe, 2010).

Against this background my research project seeks to throw some light on whether there is an association between maternal health risk behaviors and child health outcomes. Are children at additional risks of disease, beyond those already faced due to their living

conditions, when mothers practice health risk behaviors? And would social class and household composition play a mediating role?

Child Morbidity and Mortality in Africa

Guendelman et al. (1995) studied the relationships between maternal smoking and alcohol consumption on the one hand, and infant immunization status on the other. Their findings were that maternal alcohol consumption and ever being a smoker were associated with children not receiving age-appropriate immunizations, net of socioeconomic factors. However, the authors did not consider other child health outcomes. Looking at additional outcomes matters because the value of timely immunizations as protective of child health may be perceived as low given that its benefits are far in the future, and they may be delayed in the presence of more urgent demands for maternal time. For this reason, this study examined, in addition to age-appropriate child immunizations, the incidence of recent episodes of two childhood illnesses with potentially serious short-term consequences, diarrhea and respiratory infections.

The data for this study is limited to children under five years of age in 1998. This means that the oldest children in the sample were born in 1993, around the dismantling of the apartheid system. Under apartheid, race designation determined an individual's lifetime experiences and opportunities, including access to basic resources, such as health care and education. The apartheid government forcibly moved Blacks into rural tribal sites designated as "homelands" (Bantustans). Lacking natural resources, these homelands were not self-sufficient. Therefore, only the unemployed, disabled, children and elderly lived there, while working adults were allowed to live in poor urban informal settlements ("townships") (Coovadia et al., 2009). The majority of Black working mothers was in domestic jobs, which meant that their children were raised by extended families in the Bantustans (Coovadia et al., 2009). Although each Bantustan had its own health department, these were severely underfunded and immunizations were not likely to have been easily available (Coovadia et al., 2009; Harrison, 2009).

There is limited data about the coverage rates of immunization campaigns in the early 1990s, but it is reported that rates varied substantially by province and racial group (Cooper et al., 1994; Harrison, 2009). The rates of immunizations among children under age one living *outside* the homelands have been estimated at around 60 to 66 percent (WHO, 2010; Harrison, 1995, 2009). However, these rates masked great variations between provinces, from as low as 45 to 50 percent among children in Free State and the Eastern Cape to rates of

85 percent or higher coverage among children in Western Cape and Gauteng (Harrison, 1995, 2009; South Africa Department of Health, 2005). Moreover, children living *inside* the Bantustans had much lower immunization coverage, with only about 30 percent of children between ages 1 and 2 recorded as fully immunized (Cooper et al., 1994).

Not surprisingly, in the years prior to the dismantling of apartheid, and despite South Africa's relatively high per capita income, very poor child health indicators were documented. These indicators reflected the inefficient fragmentation of health services and the racial disparities in access to curative and preventive health care (Cooper et al., 1994). The under-five mortality rates for Blacks was around 72 per 1,000 live births, which at the time was about ten times higher than the rates among White South African children (Bradshaw et al., 1992; Cooper et al., 1994). In addition, over half of the children between ages 2 and 5 present stunted growth due to malnutrition, compared to rates of 39 percent in the rest of Africa (Cooper et al., 1994).

After the change in dispensation in 1994, immunization schedules were updated to meet internationally accepted practices and immunization coverage was expanded substantially. Since 1995, it is estimated that 95 percent of infants received the BCG (tuberculosis) vaccine, and that coverage rates have increased every year for other vaccines (WHO, 2010). In addition, resources for health care provision were distributed more equitably than before, and hospital equipment and facilities were replaced or repaired (Harrison, 2009; Coovadia et al., 2009).

While there is no doubt that there have been improvements in the provision of health care in South Africa since the end of apartheid, many challenges still remained as of 1998, when the data for this study were collected. The fragmented health systems had not been integrated, there were shortages of staff and medical professionals, the quality of clinical care remained low and overwhelmed by the demands of patients, and low staff morale resulted in pervasive patient mistreatment (WHO, 2006; Wigton, 2008; Chopra et al., 2009).

Under this scenario, over 50,000 children under age five die every year in South Africa due to acute respiratory infections, diarrhea, malnutrition and HIV/AIDS (WHO, 2006; Chopra et al., 2009). Globally, each year 2.4 million children under age five die due to pneumonia, and another 1.5 million die due to diarrhea (HATiP, 2010; HATiP, 2008). It is estimated that fifty percent of the annual child deaths due to pneumonia and 40 percent of those due to diarrhea take place in African countries (HATiP, 2010; HATiP, 2008).

No doubt, the number of child deaths due to pneumonia and diarrhea are a reflection of the South African environment of extreme poverty and continued limited access to health

care. However, with activities that may be under the control of caregivers, such as immunizing children, boiling drinking water and improving domestic sanitation and hygiene, many of these child deaths may be prevented (Lin et al., 2002; Rahman, 2007).

Pneumonia refers to an acute bacterial or viral infection in the lungs that obstructs oxygen absorption. Its symptoms include coughing and fast or difficult breathing (HATiP, 2008). Although this disease may be prevented in children by timely immunizations and antibiotics, many children die at home without medical attention (Qazi et al., 2008). Recognizing pneumonia may be difficult because the symptoms are similar to those of malaria; therefore, some children may receive antimalarials at home as a first response, thus delaying medical treatment for a few days and risking fatal consequences (HATiP, 2008).

Diarrhea, the other major cause of death among children under age five, is defined as "abnormally frequent stools or unformed watery stools" (HATiP, 2010, pp. 2). Severe cases include cholera and may lead to rapid dehydration if it lasts for several days. In the case of diarrhea, sanitation and hygiene are important because it is spread through water or food contaminated with fecal matter. Many diarrhea cases may resolve by themselves, but it is recommended that zinc supplements, fluids and food be given to the child continuously because of the danger of rapid dehydration, especially if the child is malnourished and susceptible to faster dehydration; in this negative cycle, persistent diarrhea itself leads to malnutrition and wasting (UNICEF, 2009).

In general, it is recommended that a child presenting symptoms of pneumonia or diarrhea be taken early on for medical assessment. In countries with a high prevalence of HIV/AIDS as is the case in South Africa, this becomes critical because children infected with HIV have higher incidence, severity and risks of death due to these infections; indeed, antibiotics are not effective for treating pneumonia in HIV-infected children, who should be hospitalized in the early stages of disease (Kotloff et al., 1994; Marsh et al., 2008; Dawson et al., 2008; Jeena, 2008; HATiP, 2008, 2010; van Eijk et al., 2010). Although complications due to HIV-infection can accelerate health deterioration of children, this study does not include child HIV/AIDS status as a factor in the analysis due to data constraints.

In the presence of the adverse social and disease environments, and the challenges to the health care infrastructure described above, maternal health behaviors on behalf of her children may reduce the frequency or severity of these diseases (Chopra et al., 2009). The central question is whether structural barriers preventing mothers from adopting healthy lifestyles will be associated with higher risks of disease for their children, or whether there is evidence that regardless of their own health risk behaviors, mothers are able to circumvent

structural obstacles to access and adopt critical health information and preventive measures for their children.

Maternal Health Risk Behaviors

In addition to the conventional health risk behaviors — smoking, alcohol abuse, poor dietary habits, lack of exercise, no preventive health screenings, and risky sexual behavior — the rise of chronic conditions gives way to another type of health risk behavior; namely, poor management of one's own illnesses (Gray, 1993; Wickrama et al., 1999; Baban and Craciun, 2007). Individuals who are diagnosed with a chronic condition but do not follow the recommended treatments are likely to see their health deteriorate faster, and may have a lower quality of life and higher risks of death than they would if they had followed the recommended management plan for their conditions (Kagee et al., 2007).

Although in general women are less likely than men to smoke or abuse alcohol, and more likely to follow a balanced diet and to seek healthcare services, this varies by social class and the status accorded to women in societies (Dean, 1989; Dean et al., 1995). In developing countries, chronic diseases account for more than half of the total disease burden for both men and women, and this trend is likely to continue as the importance of infectious diseases decline (WHO, 2004).

In countries where the status of women is low, women may be at higher risks of health complications than men. As described above, in South Africa, women's low status in society and within the family has been associated with higher rates of physical violence at the hands of their male partners, higher rates of poverty, and higher rates of HIV/AIDS infection (Gilbert and Walker, 2002; Gilbert and Selikow, 2010; Seedat et al., 2009). Women who head single-parent households also have worse socioeconomic circumstances and higher morbidity than men in similar living arrangements (Nettleton, 2006).

South African women tend to have high risks for hypertension, diabetes, mental health problems and breast and cervical cancers (Doyal and Hoffman, 2009). Some of these risks are associated with poverty, and with women's higher prevalence of overweight and obesity relative to men. But also, these risks reflect the paucity of health information and programs to both offer and educate women about the need for preventive and monitoring care (Mayosi, et al., 2009; Bradshaw et al., 2001; Nettleton, 2006; Doyal and Hoffman, 2009). Finally, because women are expected to put others' wellbeing ahead of theirs, they are also at high risks of malnutrition and more susceptible to diseases than men (Gilbert and Walker, 2002). In this study I examine the extent to which women practice various health risks

behaviors by race, education, and socioeconomic status, in addition to assessing whether there is a relationship between these behaviors and their children's health outcomes as evidenced by recent episodes of diarrhea, respiratory infections and timing of immunizations.

Household Composition

Previous research finds that household composition has an important role on health behaviors in general (Knodel et al., 2009; Omariba, 2007). In the case of child wellbeing, the absence of a mother, due to death or migration has been associated with risks of child malnutrition which are twice to four-fold higher than the risks among children whose mother is present in the household (Madhavan and Townsend, 2007). When the mother is present, child health continues to be influenced by household composition. The presence of others may influence maternal decision making abilities and even impact her access to household resources. In particular, in extended households several individuals in addition to (or instead of) the mother may be involved in decisions that affect child health outcomes, such as the mother-in-law, sisters-in-law or co-wives (Madhavan, 2001).

Children living in polygynous households have higher morbidity and mortality rates than children raised by monogamous parents (Omariba, 2007; Madhavan, 2001; Sellen, 1999). Part of the explanation for these findings seems to be that the women who enter into polygynous marriages, compared to those in monogamous unions, tend to be less educated, less likely to be employed in the formal economy, and less likely to relate to their husbands on an equal footing when it comes to decisions about household resources that affect child health—all these are factors associated with maternal economic dependence, and ultimately with child morbidity and mortality (Omariba, 2007; Agadjanian and Ezeh, 2000; Ware, 1984). Although earlier studies had suggested that cooperation for childcare among co-wives might have a positive impact on child caring and child health, more recent studies find that the stress associated with competition among wives may be a risk factor for child mortality (Madhavan, 2001; Strassmann, 1997; Issac and Feinberg, 1982). In particular, the presence of more children means fewer resources per child, and first wives may have control of financial resources and be unwilling to pay for medication or treatment for the children of higher-order wives (Gibson and Mace, 2007; Brown, 2004; Alam, 2000; Strassmann, 1997). In addition, larger households also may mean higher likelihood of diseases being transmitted between children (Madhavan, 2001; Aaby et al., 1983).

In monogamous households, the death of one of the parents may lead to increases in three-generational household as the surviving parent may co-reside with elder kin for

emotional, instrumental and perhaps financial support (Schatz, 2007). Alternatively, widows may find themselves as mother-only households though their long-term viability is not always assured (Madhavan and Schatz, 2007; Schatz, 2007). In this study, I take into account the household composition to separate its impact on child health from that of maternal health risk behaviors. This is relevant for the study because maternal health risk behaviors may be outside her control (or even her awareness), and a spurious association between her health behaviors and her children's health outcomes could result from having limited access to resources due to her living arrangements, rather than from her extending her own health risk behaviors to how she treats her children's health needs.

CONCEPTUAL FRAMEWORK

The main hypothesis in this study is that mothers who practice health risk behaviors, whether consciously or unconsciously, may also treat their children's health in a similar way with negative health consequences (**Path A** in Fig. 1, page 29). That is, *if* there is an association, this would mean that knowing that a mother practices certain health risk behaviors could signal that her children are at higher risks of disease than other children in similar circumstances. Therefore, these children may be less likely to have full age-appropriate immunizations and more likely to present diarrhea and/or respiratory diseases at any given time.

The alternative hypothesis is that maternal behaviors regarding their own health are independent of how they treat their children's health (**Path B** in Fig. 1). A lack of association between a mother's health risk behaviors and her child health outcomes is consistent with this alternative view.

Starting from the top of Fig. 1 in page 29, the conceptual framework is based on Cockerham's (2005) proposed Health Lifestyles Paradigm and has been expanded to include child health outcomes. Maternal health behaviors are conceptualized as resulting from the interaction between life chances (structure) and life choices (agency) (Weber, [1922] 1947).

Maternal life chances are derived from her position in society, and the access to resources afforded in such position. In South Africa, the specific **stratification structures** that constrain access to health and health services are social class (proxied by education and wealth), race, and substandard housing conditions that have a negative impact on health beyond that of social class (Coovadia et al., 2009). Therefore I included these variables as measures of social structure on maternal life chances. Note that an arrow also goes from the stratification box to the child health outcomes box at the bottom of Fig. 1. This indicates that social structure has an effect on child health independent from that resulting in maternal behaviors toward the child. This refers, for example, to the impact of poor housing conditions on child health, such as lack of piped water or increased exposure to infectious diseases from sharing a communal latrine.

Maternal life choices refer to her ability to choose behavior based on her particular preferences and valuations. These preferences are influenced by her position in the social structure and by daily routine experiences that serve to fine-tune and confirm these preferences (Weber, [1922] 1947; Bauman, 1999; Bourdieu, 1977, 1984; Cockerham, 2005).

Life chances and life choices interact and result in **habitus**, a set of dispositions and preferences that unconsciously guide health and other behaviors (Bourdieu 1977, 1984). Through habitus, women may adopt healthy or health risk behaviors for themselves that become their lifestyles. These behaviors escape self-scrutiny because they are derived from preferences that not only are consistent with their social class, but also are embedded or internalized as "the way things are done" (Bourdieu, 1977, 1984; Williams, 1995; Kontos, 2006).

In this research, I do find some variation in behaviors *within* socioeconomic class, race, and educational level and this is consistent with the theoretical view that no two individuals have the exact same combination of socialization and experiences (Cockerham, 2005). In addition, household composition will influence or modify a woman's health behaviors, although the impact may depend on the particular relationships.

In the South African context, historical disruptions in family life have resulted in high proportion of mother-only households, and cultural practices also accommodate multi-generational as well as polygynous households. The intra-household distribution of power in each type of household, as well as the availability of resources, is likely to impact both maternal behaviors and use of resources for child health.

For example, co-residence with a grandparent (from the child's point of view) may have a positive impact on maternal and child health. Grandparents may encourage the mother to stop smoking or to follow medical treatment for a health condition (Knodel et al., 2009). Their mere presence may reduce other health risk behaviors of the mother. Even if the mother does not modify her health risk behaviors, grandparents may care for an ill child and serve as a break in the link between maternal and child-caring health behaviors. In contrast, co-residence with other wives may not translate into additional assistance to look after an ill child and thus, child health may depend solely on maternal ability to care for the child.

While the top of Fig. 1 provides a theoretical framework in which to interpret **maternal health behaviors**, this research focuses on the outcomes within the dotted box in the lower part of Fig. 1. That is, I explore whether the health risk behaviors observed in mothers convey information on how they may treat the health of their children.

Path A proposes that mothers who adopt health risk behaviors for themselves will treat their children's health in similar ways, such that there is an association between maternal risk behaviors and lower likelihood of immunizations and/or higher likelihood of diarrhea episodes or respiratory infections in the two weeks prior to the survey.

Path B, in contrast, proposes that through the interplay between life chances and life choices in particular social structures, mothers learn and internalize preferences and dispositions that will be enacted to fit a child's health needs in ways that exclude any influence of the mother's health behavior with respect to herself. The health needs of children may be compartmentalized into a different set of dispositions that refer only to children, or that involve concepts of what mothers are expected to do for their children, as separate concepts that are not influenced by adult health behaviors.

Maternal health behaviors on behalf of the child, whether associated or not with her own health behaviors, are viewed as influencing child health. The specific behaviors that mothers practice to prevent or reduce the impact of disease on a child include immunization, quality of food, hygiene practiced in the household, and seeking medical advice or treatment.

Due to data constraints, I am only able to assess whether maternal health risk behaviors influence the timing of immunization. However, the impact of nutrition and hygiene (or medical advice/treatment) are implied to some extent in the observed frequency of diarrhea and severity of respiratory infections, which are the child health outcome measured in the study. This is so because, as mentioned earlier, the extent of domestic hygiene exercised by mothers is associated with prevention of water or food contamination that may result in child diarrhea. In addition, maternal early attention to a respiratory infection may avert subsequent complications such as pneumonia (UNICEF, 2009).

Child health outcomes are influenced both by maternal actions that impact prevention and treatment of diseases and the social structure that may increase risks of disease or protect child health, depending on their position in the stratification dimension. Findings of no association between maternal health risk behaviors and how she treats her children's illnesses will have sociological implications for our understanding of the multi-dimensional formation of habitus. Findings of association between maternal health risk behaviors and child health also have policy implication, not only because of the increased knowledge we can gain of the mother-child interrelations and pathways, but also because it will bring attention to the urgency of investing in improving the social and economic status of women in South Africa, and in offering greater access to healthcare for women and children (Doyal and Hoffman, 2009; Gilbert and Walker, 2002).

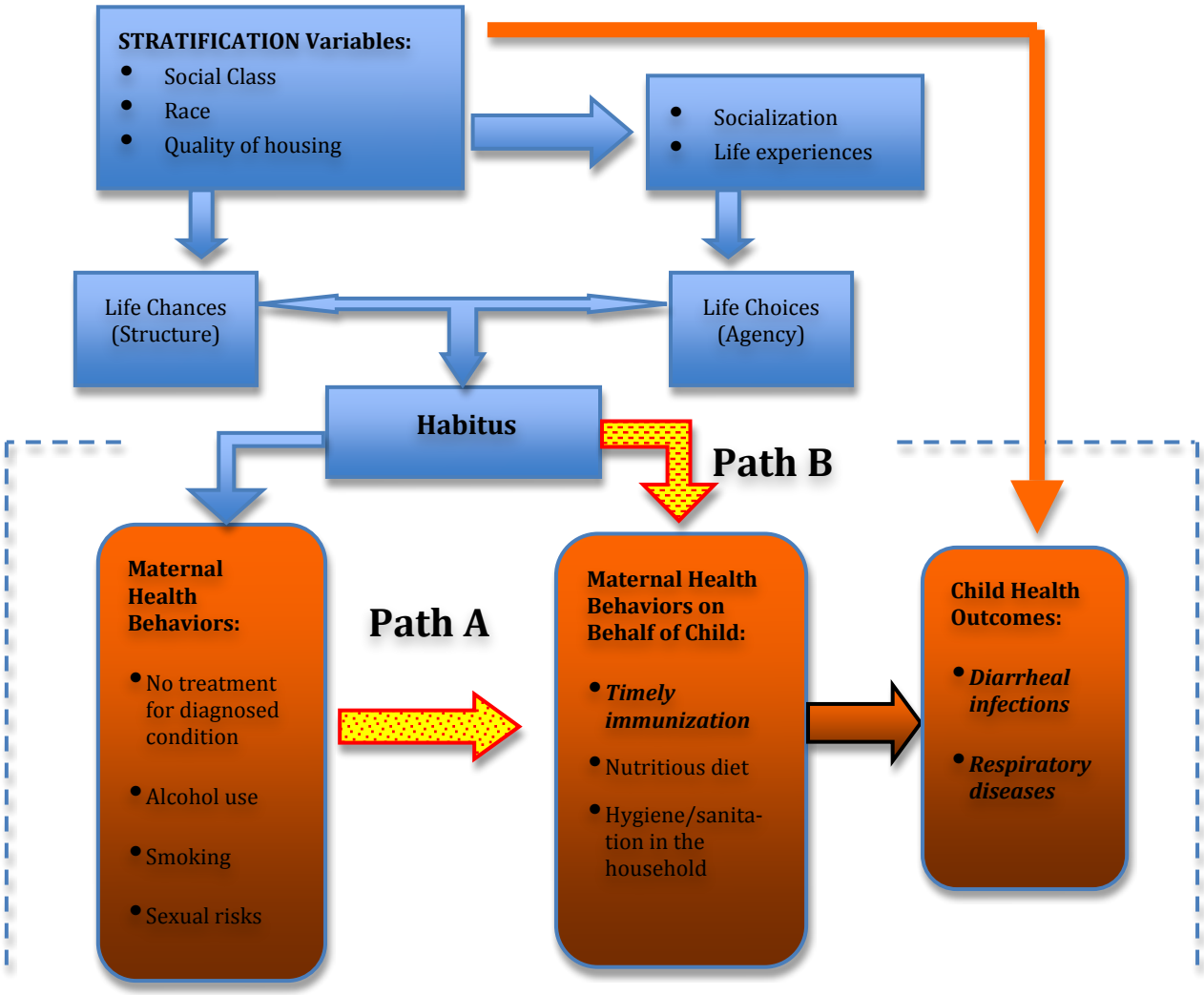

Fig. 1. Conceptual Framework of Association between Maternal Health Risk Behaviors and Child Health Outcomes

The significance of this research is that it addresses a somewhat neglected path through which health and disease may be transmitted inter-generationally. Previous studies have documented other paths, such as the impact of directly transmitting diseases to children, especially maternal transmission to newborns, and the long-term impact of parental modeling on offspring's health behaviors (Wickrama et al., 1999; Coovadia et al., 2009). This study takes a different approach and it joins the limited research that has focused on the relationships between maternal health risk behaviors and what this implies for how children fare *vis a vis* potentially serious diseases such as diarrhea and respiratory infections, which are the two largest causes of death in South African children.

DATA AND METHODOLOGY

The nature of my research questions call for a quantitative approach using survey data based on a probability sample. The rationale is that the focus of this study is on assessing the prevalence of certain behaviors and outcomes in a population, and testing hypotheses about the existence of a generalized statistical relationship between them. In particular, this study seeks to assess the prevalence of certain maternal behaviors among well-defined South African groups, and whether these are statistically associated with the health of their children net of socioeconomic and demographic factors (Strauss and Corbin, 1990; Greenstein, 2003).

Although survey data do not provide narratives about the "why" or "how" of certain behaviors or outcomes, they are ideally suited for statistical analysis, which can isolate the relationship between two variables from multiple other influences, thus facilitating measurement. The survey data I use for this report was collected using a nationally representative probability sample of households in urban and rural areas for each province in South Africa; therefore, findings may be generalized to these areas. However, because the data were collected in 1998, relatively soon after the end of apartheid, a similar analysis with more recent data may provide important insights about changes that may have taken place in the last decade or so in terms of both health behaviors and child outcomes, as well as in the relationship between them.

In sum, in this study my goal is to understand the prevalence of certain behaviors and outcomes among children living with their mother, and how socio-demographic characteristics correlate to them. I seek to answer a gap in the literature, and although for this particular case I believe it best to use a quantitative approach, I also believe that certain follow up questions may be better answered with qualitative or mixed research methods. Qualitative studies based on in-depth interviews with purposefully selected individuals have the potential to bring important perspectives to research in social sciences. In this sense, the distinction between the approaches may be overemphasized as each approach can illuminate unique aspects of a research question.

Data

Demographic and Health surveys (DHS) are important sources of data worldwide that provide tools to monitor the impact of public programs and assess population trends. Two DHS surveys have been conducted in South Africa. However, comparisons with external data sources such as census and vital registration data indicate that the 2003 DHS has data

quality problems that detract from its usefulness. These data quality concerns affect important indicators such as the outcomes of interest in this study: immunization rates, prevalence of diarrhea and prevalence of respiratory infections, which are lower than expected in the 2003 DHS. Similarly, fertility rates, child mortality and the prevalence of hypertension and respiratory conditions in adults are implausibly low compared to other South African data (South Africa Department of Health et al., 2007). For this reason, I chose to conduct this analysis using only the 1998 DHS data, which has been validated as reliable through comparison with other datasets (South Africa Department of Health et al., 2002). Despite the fact that this is not the most up-to-date data set, the 1998 South African DHS sheds light on the relationships of interest in this study because the nature of the association between maternal behaviors and child health outcomes is likely to change only slowly.

This survey was undertaken as a joint effort of several institutions, including the South African Department of Health, the Medical Research Council (MRC), MeasureDHS (formerly MACRO International, Inc.), USAID, the Human Sciences Research Council (HSRC), Statistics South Africa and several universities in South Africa. The survey was designed to obtain nationally representative samples of about 12,000 women ages 15 to 49. In addition, in every household, information about children under age 5 was collected; and in every other household the survey collected data from all adults over age 15. Demographic and behavioral information collected include fertility, maternal and child morbidity and mortality, lifestyles that may affect adult health, and chronic conditions among adults. The response rates were 95 percent among eligible women of reproductive age and 92 percent among the adults interviewed in every second household (South Africa Department of Health et al., 2002).

The 1998 DHS shows broad diversity of children living arrangements in South Africa at the time of the survey. About one-third of children under age 15 lived with both parents, a similar percentage (35%) lived with the mother but not the father, and 25 percent lived with neither parent. Similar patterns of living arrangements are found when looking only at children ages 5 and younger (South Africa Department of Health et al., 2002).

This study focused only on the subsample of 2,440 children under age five that are matched with a mother in the household. There is need, however, for further studies that focus on health outcomes and general wellbeing among children not included in this analysis: those not living with their mother. In general, households with foster children, defined as children under age 15 and living with neither parent in the household, were twice as common in non-urban areas (34 percent) than urban ones (17 percent). Since non-urban areas tend to

be poorer and the absence of a mother has been linked to adverse child health outcomes, findings from this study, which excludes foster children, are likely to overstate the health status and wellbeing of children in 1998 South Africa (South Africa Department of Health et al., 2002).

As with other cross-sectional surveys that collect retrospective information, data are subject to errors in recalling age and past events. This is a shortcoming of any data collection effort, whether in the form of surveys or qualitative interviews. Therefore, caution should be used when interpreting the findings (Boerma et al., 1991; Manesh et al., 2008).

Dependent or Outcome Measures

In this study, child health is measured by three distinct categorical variables. One of these variables is whether the child received all recommended immunizations by age one as stated by the South African immunization program. This variable refers to a longer-term investment on child health and its benefits are not obvious at the time the child receives required vaccinations. The other two variables refer to recent episodes of disease; namely, diarrhea and respiratory infections, which may have serious immediate consequences depending on their severity. The variables are defined as follows:

(a) *Complete immunizations by age one*. The vaccines included in the survey are BCG (to protect against tuberculosis), oral Polio vaccine and DTP (protects against the cluster of diphtheria, tetanus, pertussis), Hepatitis B and measles. This is measured as a dichotomous variable, Yes/No (1=fully vaccinated by age one; 0=otherwise). Only children with a date before age one in their vaccination card for each vaccine were coded as having full immunization. Those for whom their mother reported vaccinations but had no dates, and those who said they did not know if the child had received the vaccines were coded as not fully vaccinated by age one. This latter category also includes those who said their child had not been vaccinated at all.

(b) *Maternal reports of diarrhea in the last two weeks*[1]. Measured as a dichotomous variable, Yes/No (1=child had at least one episode of diarrhea in the last 2 weeks; 0=child did not have diarrhea in the last two weeks). Although the survey contains information about the presence of blood in the stools, there are very few cases (n=36) to allow for their analysis as a separate

[1] The two-week recall period has been adopted by the Demographic and Health Surveys collected in developing countries because of concerns that a longer window may result in recall problems since these data are from maternal reports. That said, there is a risk that such windows may be too short to reveal systematic differences in outcomes (Coughlin, 1990; Boerma et al., 1991).

category, therefore diarrhea cases combine both levels of severity.

(c) *Maternal reports of child respiratory infections in the last two weeks*. Measured as a 3-category variable: 1=child had cough with short, rapid breaths; 2=child had cough but no short, rapid breaths; and 3=child had no cough in the last two weeks. Coughing and fast or difficult breathing denote potentially serious acute respiratory infections that require medical treatment.

Independent or Explanatory Variables

In order to explore whether there is an association between maternal health risk behaviors and child health outcomes, I have constructed four variables that measure risk behaviors along various dimensions:

(a) *Maternal illness behavior*. This variable was constructed by combining the mothers who said they have been diagnosed with a chronic condition in the past, but also said they are not taking any of their prescribed medications. The diagnosed chronic conditions included in this construct are high blood pressure, diabetes, high cholesterol, heart disease, asthma/ emphysema/bronchitis, tuberculosis, and having had a stroke. The variable is coded as 1 if the mother said she has not been diagnosed with any conditions; the variable is coded as 2 if the respondent said she was diagnosed and is taking prescribed medications for at least one of her health conditions; and the variable is coded as 3 if the respondent said she was diagnosed with one of the conditions listed above, but she is not taking any prescribed medications for any of her conditions. Note that the category of not being diagnosed with any condition combines healthy women with other women who simply are not aware of a health condition because they have not consulted a doctor or have not been tested for a particular condition that they may have. This will be the reference category against which the other two groups are compared.

(b) *Currently smoking*. This variable is coded as 0 for those who have never smoked or have quit; and 1 for current smokers.

(c) *Consumes alcohol*. This variable is coded as 0 for those who said they don't drink alcohol; and 1 for those who said they do. This variable is complex in its effect on health since studies report that a small amount of wine can reduce the risks of heart disease, but large amounts may work in the opposite direction (Cockerham, 2005). However, very few women in the sample (only 11 percent) said they consume alcohol. Therefore, limited numbers prevent further subcategories within this variable.

(d) *Risky sexual practices*. This variable is coded as 0 for those who used a condom during last intercourse or said they only have sex with a regular partner; and 1 if they did not use condom in their last intercourse *and* either have sex with casual partners or their partner lives elsewhere.

Since the study aims to determine whether, net of other factors, maternal health risk behaviors have an impact on child health, I also include other variables to control for potential confounding effects. For example, maternal smoking may appear to be significantly associated with a higher likelihood that her child had a respiratory infection in the last two weeks. However, this relationship could be explained by findings that children in the poorest households tend to have higher rates of respiratory infection, and mothers who are poor are more likely to smoke than those in higher-income households. Thus, introducing a variable to control for household assets can clarify that there is no causation between maternal smoking and child respiratory infection, but rather an association between poverty and child health. For the same reasons, I included in the analysis measures of socioeconomic (structural) factors, maternal characteristics, and child characteristics. These are measured as follows:

Household characteristics: To take into account the inequalities in the South African context, I included in my analysis living arrangements, number of children under age 5 in the household (competing for time and resources); type of union of the mother (monogamous, polygamous, not in a union) and whether the male partner co-resides with her; the relationship of the mother to the household head (head, wife, other relative or other non-relative); and a construct to measure socioeconomic status based on the household ownership of various assets, which is based on the South Africa Asset Index computed by Bradshaw and Steyn (2001). Bradshaw and Steyn's Asset Index was developed to measure relative wealth using the South Africa DHS data, and includes information about assets owned by the household as well as about other household characteristics (type of fuel used for cooking, floor and wall materials, ownership of car, TV, etc.) (Bradshaw and Steyn, 2001; Myer et al., 2004). For this analysis, however, I am interested in identifying separately the impact that the source of water and the type of toilet have on child health. For this reason, I re-computed their Asset Index to exclude these two variables. Instead, I have added these variables separately in the regression models because of their relevance not only to housing quality, but also the known impact that lacking piped water and modern toilets have on increasing the risks of child health, particularly diarrhea (Mosley and Chen, 1984). Details are available in

Appendix A. For details about the Asset Index developed by Bradshaw and colleagues see Bradshaw and Steyn (2001).

Maternal characteristics: Some characteristics of the mother other than her health behaviors also influence child health and therefore they should be included in the analysis. These variables include age, race, and education, which are stratification variables but also have been linked to child wellbeing and higher maternal efficacy. In particular, older mothers and more educated mothers tend to be more effective in dealing with child diseases (Desai and Alva, 1998; Cleland and van Ginneken, 1998; Mosley and Chen, 1984). Except for age, these variables are all coded as categorical. Race is coded as 1 if the respondent is Black; 2 for Colored; 3 for White; and 4 for Asian or Indian respondents. Education is coded as 1 for mothers who reported having less than primary education; 2 for mothers with completed primary or some secondary; and 3 for those completing secondary education and beyond.

Child characteristics. There are several child characteristics that increase a child's risk of disease. In particular child age, gender and birth order have been strongly correlated with child health in previous studies. For example, children may be more vulnerable to intestinal infections when they have just been weaned from breast milk, and there are cultures in which child gender may affect child health because boys and girls are valued differently (Desai and Alva, 1998; Cleland and van Ginneken, 1988; Das Gupta, 1990).

Analysis of data

The analysis has been divided into two parts. The first part presents weighted[2] descriptive statistics of the variables in the analysis. In the second part, I used logistic regressions to examine the association between the proposed measures of child health and maternal health risk behaviors. Logistic regression analysis is appropriate because the dependent variables are formulated as categorical. The general equation is expressed as:

$$ln\,[Probability\ of\ Y/Probability\ of\ (1\text{-}Y)] = \alpha + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_K X_K$$

[2] The sample was selected in two stages. First, enumeration areas (EAs) stratified by province and urban and non-urban residence were randomly selected, then households were randomly selected for interview within each selected EAs. Hence, in order to ensure computation of the correct standard errors, the data must be appropriately weighted. I use the survey feature in Stata statistical software (version 9) to take into account the multistage sampling design.

Where Y= the child outcome of interest (child received full immunization by age one, child had diarrhea in the last two weeks, or child had cough in the last two weeks); and the Xs represent the explanatory variables discussed above: maternal health risk behaviors, household characteristics, and maternal and child characteristics. Because of same-mother correlation (more than one child per mother in some cases), I use the cluster command in Stata to correct the standard errors. Regression results are shown in the tables as odds ratios, which are the exponentiated values of β coefficients in the equation above, [Exp(β)]. These are interpreted as the odds of outcome Y associated with that particular X variable. A coefficient lower than 1.0 indicates that the variable reduces the likelihood of the outcome of interest, and vice versa. The *percentage change* in the odds of outcome Y associated with a particular category in the X variable of interest is obtained by subtracting 1 from the odds coefficients and multiplying by 100, ([Coefficient-1]*100) (Gujarati, 1995).

Limitations of the Study

The three child health outcomes of interest in this study are measured only among children who were alive at the time of the survey and living with their mother; this means that there is a selection bias. First, the analysis excludes children not living with their mother, and hence who may be in more vulnerable circumstances than those included in the analysis. In this respect, findings may overstate the wellbeing of South African children at the time of the survey. Second, older children are less likely to develop diarrhea or respiratory infections, and they have survived these illnesses when they were younger; but among the young children in the analysis I only observe those who have not died as a consequence of these diseases. Although I control for child age, it is not possible to account for the association between maternal health risk behaviors and child mortality. Third, the limited number of cases of child illnesses in the sample is insufficient to analyze the more severe diarrhea cases (with blood in the stools), as well as to allow examination of the behavior of mothers in terms of seeking treatment and the type of treatment for a child's disease. Finally, it has been suggested that child morbidity is a gradual process that starts with faltering health due to the accumulation of insults (infections, poor diet, etc.) followed by stunting, and may culminate in death (Mosley and Chen, 1984). Cross-sectional data such as the one used here considers child health status at one point in time, and does not capture the patterns in the occurrences of illnesses (or their cumulative effects) over time as would be possible with longitudinal data.

ANALYSIS OF FINDINGS

In this section I present and discuss the findings of the study. The first part shows the weighted sample frequencies of the 1998 South African children under age 5 living with their mothers. The second part shows findings from logistic regression analysis that attempt to isolate associations between the proposed measures of child health and maternal health risk behaviors from other influences.

Descriptive Statistics

Table 1 shows the weighted frequency (see fn. 2) of each of the variables in the analysis. The first four rows show the percentage of children in the study that present the health outcomes of interest, both in the full sample and by the bottom and top 50 percentiles of the households, as ranked by their location in the Asset Index. The Asset Index is a construct that combines information about access to electricity, cooking materials, housing materials, and ownership of several household assets to provide a household ranking to proxy for socioeconomic status (Bradshaw and Steyn, 2001) (see further details in Appendix A).

According to the 1998 DHS data, nearly 58 percent of the children ages 12-59 months living with their mother had not been fully immunized by age one. When only children in household at the bottom 50 percent of the Asset Index were considered, the percentage of the children in the sample who had not received full immunizations by 12 months of age was much higher (66 percent). The percentage of children not fully immunized by age one in households at the top 50 percent of the Asset Index was not much better, 52 percent. That is, in 1998, only 42 percent of the children in the sample were fully immunized by age 1, and the rest were immunized at a later age (21 percent) or had not yet completed all the required vaccinations (37 percent). The data also show that with the change in dispensation, vaccination coverage increased every year for these children between 1993 and 1997, so that the proportion of children fully vaccinated by age one increased from 28 percent in 1993 to 42 percent in 1997 (not shown but available upon request). Overall, 63 percent of the children in the sample between the ages 12-59 months had received all their immunizations (42% on time plus 21% late) at the time of the survey in 1998. This estimate is low compared to the 75 percent coverage estimates by WHO and UNICEF for the same year (WHO, 2010). However, their measure is computed differently. They only consider children 12-23 months of age, and younger cohorts are more likely to be vaccinated than older cohort due to improvements in coverage. WHO (2010) estimates of full coverage for 2009 was 69

percent among children 12-23 months old, which suggests that coverage has declined in South Africa. This is outside the scope of this report, but is a matter of concern that requires further research.

The other outcomes of interest are the incidence of child diarrhea and respiratory infections. About 13 percent of children had diarrhea in the two weeks preceding the survey, and surprisingly, there were no differences between the top wealthier and the bottom poorer households. Also, mothers reported that 12 percent of the children had simple cough and 22 percent had cough accompanied by short and difficult breathing in the two weeks prior to the survey. The columns for the top and bottom halves of the asset distribution again show few differences in the incidence of cough, and there was even lower incidence among the poorer households compared to the wealthier ones. This is consistent with other findings that the definition of disease is highly subjective and varies by social class (Blaxter, 1990). Where diseases are frequent, an additional episode of diarrhea or cough may be overlooked; in contrast when diseases are rare and brief, these incidents may be most noticed and remembered. There is no solution for this type of bias since it goes beyond the issue of recalling accurately whether the child was sick or not in recent weeks, and is anchored at the level of maternal subjective appreciation of child sickness within her social context. The question of *"Has (NAME) been ill or feverish with a cough at any time in the last 2 weeks?"* followed by, *"When (NAME) was ill with a cough, did he/she breathe with difficulty or faster than usual with short, fast breaths?"* (1998 DHS question items) are both clearly and perhaps deliberately ambiguous, and in sharp contrast with the measurement of immunizations, which must be given on a specific date and age of the child and are recorded on a card.

Quantitative and qualitative studies of the incidence of child diseases reported by different social classes and races in South Africa using alternative data sources would help understand the extent of this bias. However, for the purpose of this study, as long as there is no systematic omission of child illness (e.g., if mothers who smoke are also more likely to forget their child had cough), then there is no reason to suspect that this bias invalidates my findings.

In terms of the prevalence of maternal health risk behaviors, Table 1 shows that 14 percent of the mothers in the sample, regardless of their socioeconomic status, have been diagnosed for a condition and are *not* taking the prescribed medications. These may seem a small proportion, but recall that I have selected women who have children under age five, which means these are young mothers (average age is 29 years old) and likely to be healthy or in the early stages of a health condition. The health conditions for which these mothers

have been diagnosed, either alone or in combination, are high blood pressure (9%), asthma/emphysema/ bronchitis (4%), hearth disease (3%), and tuberculosis (2%), diabetes (1%), and fewer than one percent reported diagnosis of cholesterol or stroke.

Table 1
PERCENTAGE DISTRIBUTION OF SELECTED VARIABLES IN THE ANALYSIS, 1998 SADHS (WEIGHTED SAMPLE)

	Study Sample (n=2,063), %	Bottom 50% Asset Index Distribution	Top 50% Asset Index Distribution
Child health outcomes			
Immunized after 12 months of age or not yet	57.9	66.0	51.8
Had diarrhea in the last two weeks	13.3	13.5	13.0
Had cough in last two weeks	12.3	10.3	14.6
Had cough with short and difficult breathing in last two week	22.1	21.0	22.7
Maternal health risk behaviors			
Diagnosed and not taking medication	14.0	14.0	14.2
Current smoker	8.3	4.8	11.9
Drinks alcohol	10.9	7.7	14.6
Risky sexual practice at last intercourse	23.4	35.7	12.9
Child Age			
0-12 months old	24.1	23.9	24.2
13-24 month old	22.2	23.9	20.6
25-59 months old	53.8	52.2	55.3
Child Sex			
Female	48.9	49.2	48.6
Male	51.1	50.8	51.4
Child Birth Order (Average)	2.8	3.4	2.3
Maternal Age (Average)	29.2	29.6	28.9
Maternal Race			
Black	83.5	97.5	70.2
Colored/Asian/Indian	13.8	2.5	21.4
White	2.7	0.0	8.4
Maternal education			
Less than primary	28.0	43.9	14.0
Completed primary or some secondary	50.0	49.7	50.0
Completed secondary or higher	22.0	6.4	36.0
Maternal marital/union status			
Monogamous, male co-resides	38.3	26.1	49.7
Monogamous, male lives elsewhere	13.8	23.1	6.1
Polygamous, male co-resides	4.6	5.7	3.3
Polygamous, male lives elsewhere	2.3	3.6	1.4
Widowed or divorced	2.3	2.7	2.3
Never married, not living together	38.8	38.8	37.2
Mother's relationship to household head			
Head	23.3	33.4	15.7
Wife	35.5	26.6	43.6
Daughter or other relative	35.3	33.0	36.3
Daughter-in-law	5.2	6.5	3.7
Not related	0.7	0.5	0.7
Source of water			
Piped water (at house, yard, or public tap)	75.8	55.7	92.5
Water from well, river, tanker or other source	24.2	44.3	7.5
Type of toilet			
Flush (own or shared)	41.0	8.3	68.7
Other (latrine, none)	59.0	91.7	31.3

In terms of smoking and alcohol consumption, only 8 percent of the women smoke in the sample, and 11 percent reported alcohol consumption. While these behaviors may tend to go together, their correlation in the sample is only 0.31. Therefore, I keep both in the analysis because they may impact different aspects of child health. For example, smoking is more likely to be associated with child cough than alcohol consumption, but at the extreme, alcohol may be disabling in terms of childrearing. The data show that those in the bottom 50 percent of the asset percentile are about half as likely to smoke or use alcohol than those in the top 50 percent.

In contrast, over two thirds of the mothers in the bottom 50 percent reported that they don't use a condom and either have casual sex partners or their partner does not co-reside with them. In the top 50 percent, only 13 percent of the mothers report these risky sexual practices. Of note, because risky sexual behavior requires a partner, it encompasses additional dimensions compared with the other types of maternal risk behaviors in the study. As discussed earlier, in many instances it could reflect coerced sexual intercourse or the male partner's refusal to wear a condom. In this study, it could be used as an indicator of women status in the household (Gilbert and Walker, 2002; Gilbert and Selikow, 2010).

The rest of Table 1 shows frequencies for selected characteristics of the children, mothers and households in the sample. Half of the children in the sample are under age 2, and about half are girls (49 percent). Mothers in the low 50 percentile have had on average one more birth (3.4 vs. 2.3) but they are of similar age, on average.

In terms of the racial/ethnic distribution of the mothers in the sample, 84 percent are Black, 14 percent are Colored, Asian or Indian, and only 3 percent are White. The racial composition of the bottom and top halves of the sample differs substantially. Most of the mothers in the bottom (poorer) half of the sample are Black (97.5 percent). In the top 50 percent of the Asset Index, about 30 percent of the mothers are non-Black. As discussed above, social class and race are confounded variables in South Africa, and in this study I take the approach of focusing on social class as the structural factor of interest because analysis by race would not be possible due to the relatively few non-Black cases in the sample.

Other statistics on this table suggest that most of the women in the sample are in vulnerable socioeconomic circumstances. Nearly 30 percent of the mothers in the sample have not completed primary education, and another 50 percent have not completed secondary education. Looking at the bottom 50 percent of the sample, about 44 percent have not completed primary schooling and only 6 percent completed secondary or higher. In contrast, 14 percent of the mothers in households ranking in the top half of the sample did not

complete primary while 36 percent completed secondary of higher. Again I find that education, a component of social class, and race are entangled such that knowing race informs not only about social class, but also about schooling.

Living arrangements also differ substantially by social class and race. The variables for household composition are shown separately by maternal marital status and her relationship to the household head in an attempt to tease out the aspects that may impact on the analysis. The only similarity is in the proportion (38 percent) of mothers in the bottom poorer and top wealthier halves of the sample that are never married nor living together with a male partner. But the rest of the mothers have very different living arrangements depending on which half of the Asset Index they are located. Those at the bottom of the asset distribution are half as likely to co-reside with a male partner compared to those at the top, and they are more likely to be the household head rather than the wife to the household head. In general, for the subset of children in the analysis the data show that only 43 percent live with both parents, and 57 percent live with their mother but not the father in the household. In both cases, the proportion of households in which additional adults, usually relatives, co-reside is large. Among the children living with both parents, about half also include other adults. And among the children living with their mother but not the father, in four out of five cases other adults co-reside in the household. There is need for additional studies using more recent data to compare changes in household composition since the 1998 DHS was collected, especially in light of the likely impact that HIV/AIDS has had on household membership.

In this sample, housing differences between the top and bottom halves are also striking. About 56 percent of those in the bottom half have access to piped drinking water, and only 8 percent have access to flush toilet; 93 percent of those in the top half have piped drinking water and 69 percent access to a flush toilet. These findings suggest the need for similar studies comparing the distribution of assets in the population using more recent data.

This overview of the distribution of the variables in the sample suggest that there are very different dynamics by social class and race in terms of whether and how maternal health risk behaviors affect child health. The sample could also have been partitioned into the bottom 60 or 70 percent and the top 40 or 30 percent, and the differences would be even larger. One consideration in choosing to divide the sample in two equal groups for presentation in Table 1 is to keep the number of observations large enough for the statistical analysis in the latter part of this section.

Table 2 provides further exploration of the proportion of mothers who practice each of the selected health risk behaviors by the main stratification systems in South Africa, race,

education and social class. There are large difference in health risk behaviors by group, which is consistent with theoretical arguments that through class-specific socialization and experiences individuals internalize what is appropriate and desirable according to their position within each stratification system (Cockerham, 2005).

Table 2
PREVALENCE OF HEALTH RISK BEHAVIORS BY MATERNAL RACE, EDUCATION AND ASSET INDEX QUINTILE, 1998 SADHS (WEIGHTED SAMPLE)

Selected Maternal Characteristics	Maternal Health Risk Behaviors: Percent of children whose mothers said…			
	…they were diagnosed with a chronic condition and are not taking prescribed meds	…they are current smoker	…they consume alcohol	…they had risky sexual practices (last intercourse)
Prevalence in weighted study sample (n=2,063)	*14.0*	*8.3*	*10.9*	*23.4*
Maternal Race				
Black	13.0	2.6	7.4	26.4
Colored	13.7	50.5	23.3	13.2
Asian	21.2	5.4	15.3	3.6
White	30.4	26.4	49.6	1.4
Maternal education				
Less than primary	15.6	10.6	11.8	34.8
Completed primary or some secondary	13.9	8.7	8.4	22.0
Completed secondary or higher	12.0	4.7	15.6	12.2
Household Asset Index quintile				
Bottom 40%	14.1	4.3	8.0	35.3
Middle 40%	13.0	8.5	9.8	21.7
Top 20%	16.1	15.2	19.5	8.7

Race: The breakdown by race shows that White and Asian mothers are the most likely to not take prescribed medications for a diagnosed condition (30 percent and 21 percent respectively). However, these differences could well be due to Asian and White mothers being more likely to see a doctor, such that they are better informed about their health status than Black mothers in the sample. In the regression analysis below, we control for social class, which may largely explain these differences. In terms of smoking and alcohol consumption, half of the Colored mothers and a quarter of the White mothers in the sample smoke; and half of the White mothers and close to a quarter of the Colored mothers consume alcohol. In contrast, a very small proportion of Blacks and Asians do. Finally, over

one in four Blacks said they have risky sexual practices, while the other groups report much lower percentages.

The largest risks (among those selected for this research) for Black women come from risky sexual practices. Previous research has documented that important barriers to reduce the spread of HIV/AIDS have been the reluctance of males to use condoms, as well as women's inability to negotiate protected sexual intercourse (Jewkes et al., 2010; Leclerc-Madlala, 2004). The low status of Black women in the household is consistent with coercive unsafe sexual intercourse, and with their higher prevalence of risky sexual practices.

Education: The least educated women are more likely to report not following treatment for a health condition, smoking, and risky sexual practices; and the women with higher levels of education are least likely to report these health risk behaviors, except for alcohol consumption. Since only 11 percent of the overall sample of women said they use alcohol, data constraints prevent us from further sub-divisions that would separate alcohol drinkers by frequency and amount. However, not all alcohol consumption is a risk practice. In fact, some studies link daily moderate alcohol consumption to reduced risks of chronic conditions (Cockerham, 2005).

Social class: Using the Asset Index that combines ownership of assets and housing conditions, I have created three groups to further show differences in health behaviors by social class. Those at the bottom 40 percent of the Asset Index distribution, those at the middle 40 percent, and those at the top 20 percent. Table 2 shows that women in the top 20 percent are only somewhat less likely to take medications for a prescribed condition; but those in the top class are more likely to smoke and consume alcohol than those at the bottom or middle groups. Again, women in households in the bottom and middle classes are more likely to report risky sexual practices. Since race and social class are variables that are difficult to separate in South Africa due to long standing patterns of discrimination, the poor are Black mothers in this sample. Over one third of them report that they practice risky sexual behaviors, which as mentioned above is a finding consistent with other research that reports that women's low status in society is also replicated at home, where violence, intimation and coerced unprotected sexual intercourse are not uncommon (Gilbert and Selikow, 2010).

During the theoretical discussion it was argued that individual agency could never be free from structural influences. An example of this are the differences in behaviors observed between social classes. However, there are instances in which structures may crush or overpower agency, such that individuals have no say in their behaviors. This may be the case

with maternal reports of risky sexual practices. Note that overall, about one quarter of the mothers report this risk behavior. The breakdown by race and class shows that uneducated Black women in the poorest groups are the most likely to report risky sexual practices. Other studies find that sexual coercion is most common at the intersection of class, race and gender vulnerabilities. Even if these mothers have the desire to modify this risk behavior, structural conditions seem to limit their options (Cockerham, 2005; Blaxter, 1990). As a risk behavior this is on a different level since it does not come from the actors but rather from their inability to implement agency.

Overall, Table 2 confirms that the prevalence of each health risk behavior in the study varies by race, education and social class. It is difficult to disentangle the role of each stratification factor because of their high inter-correlations. Black women are at the bottom of the income distribution and have the lowest levels of education. The extent to which their behaviors are due to each cultural practices, social class or lack of education simply cannot be ascertained. Moreover, the social transformations that have taken place in the years since apartheid was dismantled suggest the need for analysis of the prevalence of health risk behaviors using more recent data.

Logistic Regression Analysis

As shown in Table 1 and Table 2, there are large differences in the characteristics of mothers by race and social class. This suggests that the relationship between maternal health risk behaviors and child health may also vary by social class or race. Rather than computing a large number of interactions (between each variable and social class and race) in the regressions, I run regressions both for the full sample and also dividing the observations into those in the bottom 50 percent and those in the top 50 percent according to their ranking in the Asset Index (proxy for social class). The division of the sample into two groups is somewhat arbitrary. I could have chosen a different percentile breakdown such as the poorer 60 percent and wealthier 40 percent, or separated the analysis by race, although the sample size clearly would prohibit this option. Thus, the main consideration for choosing to divide the sample evenly is to keep sufficient cases in each group, so that it is possible to examine differences in the dynamics between maternal health risk behaviors and child health by social class.

The process to build the regression models was as follows: Model 1 includes only the maternal health risk behaviors of interest plus controls for child characteristics that include age, gender and birth order. These variables have been recognized in previous research as

impacting significantly various health outcomes. That is, younger children may be more likely to be in contact with health care providers for check ups, and also particular age groups may be more or less vulnerable to certain diseases; mothers may have preferences for boys over girls so child gender may influence health due to the differential provision of resources; and higher birth order children must complete with more siblings for maternal resources so they are in a more vulnerable position than children in lower birth orders (Das Gupta, 1990; Mosley and Chen, 1984).

Next, Model 2 adds maternal characteristics to the regression to assess whether maternal health risk behaviors would continue to have a significant impact on the outcome of interest after taking into account the mother's age, schooling and race. Finally, Model 3 adds structural factors to assess whether associations between health risk behaviors and the child outcome of interest change once living arrangements, social class or housing conditions are taken into account. In the remainder of this section I present and discuss the findings from regression analysis of the impacts of maternal health risk behaviors on child health net of socioeconomic and demographic factors.

Factors associated with children's full immunization by age 1

Findings from the regressions of timing of child immunization on maternal health behaviors and other explanatory variables are shown on Table 3, models 1 to 3. The most important general finding is that maternal alcohol consumption <u>*is*</u> associated with a 45 percent *reduction* in the odds of a child being fully immunized by age one, [(0.55-1.00)*100]. In addition, children under two years of age were twice as likely to have been vaccinated on time compared to older children. This is likely to be explained by the improvements over time in immunization coverage that have taken place in South Africa, especially since the dismantling of apartheid in the early 1990s. Also, and consistent with earlier studies, for each additional prior birth to the mother, the likelihood of a child being fully immunized by age one declines by about 13 percent. Living with non-relatives and not having access to piped drinking water are important structural variables that have a negative impact on timing of immunization. In terms of living arrangements, it may be that household resources are not at the disposal of a mother compared to her access when living with kin. While the Asset Index as a global measure does not contribute to explaining the variation in timing of immunizations, having to use water from wells, springs or other non-piped sources is a measure of extreme poverty in both rural and urban communities in South Africa and is associated with a 30 percent reduction in the likelihood of being immunized by age one.

Table 3
ODDS RATIOS OF COMPLETED IMMUNIZATION BY AGE 1 AND DIARRHEA IN THE LAST TWO WEEKS, 1998 SADHS

Independent variables†	Children between 13 and 59 months of age (n=1,388)			Children between 0 and 59 months of age (n=1,825)		
	All immunizations by age 1 vs. late or not immunized			Diarrhea vs. no diarrhea in last 2 weeks		
	Model 1 OR	Model 2 OR	Model 3 OR	Model 4 OR	Model 5 OR	Model 6 OR
Maternal Health Risk Behaviors						
Maternal chronic illness (None diagnosed)						
Diagnosed and taking medication	1.27	1.14	1.06	1.08	1.27	1.27
Diagnosed and not taking medication	1.31	1.26	1.32	**1.61****	**1.74****	**1.85****
Maternal smoking (never or former smoker)						
Current smoker	0.93	0.64	0.64	1.11	1.32	1.38
Maternal alcohol consumption (No alcohol)						
Drinks alcohol	**0.64****	**0.56****	**0.55****	1.02	1.20	1.17
Maternal sexual practices (Safe sex)						
Risky sexual behaviors	1.00	1.09	1.26	1.03	0.97	0.77
Child's Characteristics						
Child age (25 – 59 months old)						
0 - 12 months old	na	na	na	**2.47*****	**2.25*****	**2.31*****
13 - 24 months old	**2.12*****	**2.29*****	**2.32*****	**4.24*****	**4.01*****	**4.09*****
Child sex (Male)						
Female	0.99	0.99	0.97	0.87	0.90	0.89
Birth order	**0.87*****	**0.84****	**0.87****	**1.07***	**1.11****	**1.13****
Mother's Characteristics						
Maternal age		1.02	1.02		**0.97****	0.98
Maternal race (Black)						
Colored		**1.91*****	**1.66****		0.78	0.79
White		1.97	1.60		**0.35***	0.41
Asian/Indian		**2.33****	1.94		**0.35***	0.43
Maternal education (Less than primary)						
Completed primary or some secondary		1.30	1.29		0.97	0.94
Completed secondary or higher		1.22	1.11		0.93	0.88
Household Composition & Socioeconomic Status						
Number of children under age 5 in hhd (1 or 2)						
3 to 6 children			1.10			1.00
Marital/union status (Monogamous, male coresides)						
Monogamous, male lives elsewhere			0.85			**2.15****
Polygamous, male coresides			0.85			1.46
Polygamous, male lives elsewhere			0.70			**2.85****
Widowed or divorced			1.59			0.77
Never married, not living together			1.32			1.55
Relationship to household head (Head)						
Wife			1.06			1.30
Daughter or other relative			0.77			1.17
Daughter-in-law			1.63			0.97
Not related			**0.10****			0.37
Household Asset Index			1.24			0.99
Source of drinking water (piped, yard or public tap)						
Well, spring, river, tanker, rain or other			**0.69****			0.66
Type of toiled (flush)						
Other (latrine, none)			1.31			1.12
Log-likelihood	-906.98	-892.51	-878.46	-684.20	-677.37	-669.03

† Reference category in parenthesis
§ Includes immunizations reported with unknown dates
na Only children ages 13 to 59 months old are included in the analysis of immunization provision
Coefficients statistically significant at ***p<=.001 and **p<=.05

The significance of race in the timing of immunizations suggests large cultural differences that need further exploration. In South Africa race and social class have strong interactions, so that race coefficients need to be interpreted with caution. To examine the interactions between social class and race, as well as between social class and the other variables in the analysis, the same regression of timing of child immunization on maternal health risk behaviors was run separately for the bottom poorer 50 percent of the sample and the top wealthier 50 percent of the sample. Results are shown in Table 4: models 1 to 3 show results for the bottom (poorer) 50 percent of the sample, and models 4 to 6 show the results for the top (wealthier) 50 percent of the sample.

Essentially, the magnitude of the coefficients for the impact of maternal alcohol use on the timing of immunizations is the same in both groups. However, in the poorer 50 percent of the sample, the coefficients for alcohol do not reach statistical significance because there are very few Black women who drink alcohol. Among the wealthier 50 percent of the sample, maternal smoking is also negatively associated with timely immunizations, but this is not the case in the poorer half of the sample, where there are very few mothers who smoke as well.

There are several factors that differ in their impact on timing of immunizations by social class grouping. In the bottom 50 percent of the Asset Index, two structural variables have the largest impact on immunizations: households with more assets are more likely to immunize their children on time and so are never married mothers. Further studies using more recent data could help elucidate this latter relationship, which may implicate intra-household distribution of power and that each gender may prioritize differently the use of time and household resources. It may be, for example that when mothers live alone, they can implement their preferences and choose to spend more of their limited resources on child needs, while fathers may divert them elsewhere when they live in the same household. Note that in the case of immunizations, a key resource is maternal time, which might be more easily directed to children when there are no competing demands for time from a husband.

There is more variability in the racial composition in the top 50 percent of the sample, and the coefficients for race show that Black mothers (the reference category) are significantly less likely to immunize their children on time compared to all other races. The theoretical discussion presented earlier would argue that these racial differences are explained by differences in habitus associated with differential socialization (culture) to match the differences in resources available in each social class (structural factors).

Table 4
ODDS RATIOS OF COMPLETED IMMUNIZATION BY AGE 1 BY ASSET INDEX PERCENTILE, 1998 SADHS

Independent variables†	All immunizations by age 1 vs. late or not immunized §					
	Bottom 50% of Asset Index Distribution (n=676)			Top 50% of Asset Index Distribution (n=712)		
	Model 1 OR	Model 2 OR	Model 3 OR	Model 4 OR	Model 5 OR	Model 6 OR
Maternal Health Risk Behaviors						
Maternal chronic illness (None diagnosed)						
Diagnosed and taking medication	0.65	0.67	0.62	1.36	1.27	1.26
Diagnosed and not taking medication	1.10	1.12	1.19	1.54	1.47	1.46
Maternal smoking (never or former smoker)						
Current smoker	1.00	1.24	1.18	0.81	**0.55****	**0.49****
Maternal alcohol consumption (No alcohol)						
Drinks alcohol	0.56	0.56	0.54	**0.63****	**0.50****	**0.50****
Maternal sexual practices (Safe sex)						
Risky sexual behaviors	1.04	1.02	1.02	1.25	1.32	1.54
Child's Characteristics						
Child age (25 – 59 months old)						
13 - 24 months old	**1.98*****	**2.01*****	**2.08*****	**2.33*****	**2.64*****	**2.70*****
Child sex (Male)						
Female	1.07	1.07	1.04	0.92	0.94	0.93
Birth order	**0.91****	0.92	0.95	**0.85****	**0.77****	**0.76****
Mother's Characteristics						
Maternal age		1.00	1.00		**1.04****	**1.05****
Maternal race (Black)						
Colored		0.71	0.61		**1.92****	**2.27*****
White		na	na		1.94	**2.39****
Asian/Indian		na	na		**2.19****	**2.57****
Maternal education (Less than primary)						
Completed primary or some secondary		1.26	1.30		1.17	1.31
Completed secondary or higher		1.28	1.19		0.95	1.19
Household Composition & Socioeconomic Status						
Number of children under age 5 in hhd (1 or 2)						
3 to 6 children			0.87			1.40
Marital/union status (Monogamous, male coresides)						
Monogamous, male lives elsewhere			1.90			0.47
Polygamous, male coresides			1.29			0.41
Polygamous, male lives elsewhere			1.44			**0.29****
Widowed or divorced			2.54			1.45
Never married, not living together			**2.38****			0.88
Relationship to household head (Head)						
Wife			1.93			0.77
Daughter or other relative			0.79			0.77
Daughter-in-law			2.08			1.20
Not related			na			0.16
Household asset index			**2.45****			0.84
Source of drinking water (piped, yard or public tap)						
Well, spring, river, tanker, rain or other			0.72			1.13
Type of toiled (flush)						
Other (latrine, none)			1.11			1.27
Log-likelihood	-424.35	-423.28	-878.46	-471.76	-461.77	-452.74

† Reference category in parenthesis
§ Includes immunizations reported with unknown dates
na Not in the analysis due to lack of observations in the category
Coefficients statistically significant at ***p<=.001 and **p<=.05

Even though models 4 to 6 in Table 4 include only those at the top half of the asset distribution, there are still large variations in resources among these households; and these variations are very much correlated and confounded with race, such that it is not possible to separate childcare practices that are due to culture from those due to social class differentials. Thus, that the coefficients for race are significant, rather than the coefficient for social class, confirms the extent to which these two variables move together and cannot be separated.

Finally, in the top 50 percent of the sample, children of mothers in a polygamous non-co-residing marriage are less likely to be immunized on time than children living in other situations, which is consistent with previous research findings that these arrangements reduce access to household resources compared to the situation in co-residing marriages and mother-only households (Omariba, 2007; Madhavan, 2001). As mentioned earlier, the data show that nearly 57 percent of the children living with their mother do no have a father in the household, but in only one out of every five of these cases is the mother the only adult in the household, and the additional co-residing adults are usually relatives.

In both the top and bottom halves of the asset distribution, the age and birth order of the child influences timing of immunizations. Younger children are twice to nearly thrice as likely to be vaccinated on time compared to older children, likely due to better coverage over time; and higher birth order tends to be associated with a lower likelihood of timely immunization.

In sum, the first three models in Table 3 and all models in Table 4 show that running a single regression or separately by bottom and top social classes yield similar findings. Essentially, mothers who drink alcohol *are* associated with lower odds of immunizing their children on time, controlling for other factors including socioeconomic status. This is suggestive of **Path A** in the framework in page 29. That is, mothers who take more risks with their own health also seem to take risks with the health of their children by being less likely to immunize them on time. In addition, structural forces significantly limit access to timely vaccination for individuals living in poverty. There is need for studies using more recent data to ascertain the extent to which this continues to be the case among poor children in South Africa.

What about the other maternal health risks behaviors of interest in this research? One would expect that mothers who do not follow treatment for a chronic condition would tend to delay immunization in their children more than other mothers do because their habitus or disposition would be to postpone such effort, just like with incipient chronic conditions that can be ignored. But I find *no* association. Bourdieu (1984) saw the health behaviors that

come from habitus as part of a person's daily routine that required no effort and no thinking, just as practical logic (Williams, 1995). As such, individuals are not necessarily aware of why they behave one way or another. However, studies about the reasons parents may or may not immunize their children argue that immunization is a planned activity that requires some effort and includes considerations not only about costs, but also about perceptions of their benefits, time orientation, and beliefs. Parents with positive attitudes about the benefits of immunization are more likely to do so, and those who believe vaccines to be less effective or even harmful are less likely to immunize their children (Bond et al., 1998; Pristin et al., 1998). In addition, parents high in future time perspective are less likely to engage in risky behaviors, and hence may be more likely to vaccinate their children on time compared to individuals high in present time perspective, who are more likely to engage in risky behaviors (Boyd and Zimbardo, 2005).

Therefore, it may be that the lack of statistical association between mothers not taking prescribed medications for a condition and child immunization is explained by the fact that vaccinations are deliberate actions that involves complex cost/benefit computations and takes place at a higher level of awareness, which can be influenced by mass education campaigns. In particular, immunization schedules are externally recommended and there are clear, impersonal guidelines that may offset the power of habitus.

In this regard, given the declines in immunization coverage estimated by WHO and UNICEF for South Africa in recent years, a qualitative study to better understand why and when mothers see necessary to immunize their children, and what are the barriers they encounter, would be timely and make an important contribution (WHO, 2010).

Factors associated with diarrheal infections in the last two weeks

The last three columns in Table 3 show the regression models of child diarrhea episodes in the last two weeks on maternal health risk behaviors and other variables. The main finding here is that the children of mothers who do not take prescription medications for a diagnosed condition *are* significantly more likely to have had diarrhea in the two weeks prior to the survey.

The regressions coefficients also show that an important structural factor associated with higher risks of child diarrhea is living in households where married mothers do not co reside with the husband. This is consistent with previous research that mother-only households tend to be at the bottom of the income distribution, especially among Black mothers. In South Africa, Black women are not only less educated, but also more likely to be

unemployed and living in poverty than Black men, and in the absence of male partners, they and their children may face greater risks and disadvantages associated with poverty and poor housing conditions (Gilbert and Walker, 2002). Finally, and consistent with previous research, child age (under age two) and being of a higher birth order are associated with higher risks of diarrhea (Das Gupta, 1990; Mosley and Chen, 1984).

To further investigate social class differences in the association between maternal health risk behaviors and child health, the regression of child diarrhea on maternal health risk behaviors was also run separating the sample into the poorer half and the wealthier half. The results are not shown, but the findings confirm the results from the single regression: The coefficients for mothers not taking medication for a diagnosed condition were in the same order of magnitude (above 1.0) in both regressions, although they were only statistically significant for the poorer 50 percent of the sample, suggesting that wealth can reduce the impact of a mother's health risk behaviors on her children. In addition, not surprisingly, in the poorer half of the sample a higher Asset Index was significantly associated with lower risks of child diarrhea. Finally, in both regressions, child age contributed significantly toward explaining recent episodes of diarrhea, which is consistent with higher vulnerability to intestinal infections in younger children, particularly after weaning from breast milk (Das Gupta, 1990; Mosley and Chen, 1984).

The relationship between a mother not taking the prescribed medications for a condition and her children being more likely to have diarrhea compared to other children is consistent with the proposed conceptual framework. This framework argues that health related behaviors are unthinking acts that individuals are slightly aware of, but not motivated to question or modify because these behaviors are practical and "the way things are" (Williams, 1995). In the conceptual framework these findings would be evidence of **Path A**, in which mothers treat the health of their children in the same way as their own. There is no deliberate harm to their children; rather there is an absence of awareness of the connection between child illness and a mother's own actions. It may be that inertia or a sense of helplessness is the reason a mother postpones treatment for a condition afflicting her. Perhaps this same helplessness contributes to her lack of awareness of the need to adopt certain hygiene practices to avert diarrheal infections. The data does not allow further scrutiny in this particular direction or in terms of her treatment of diarrhea. Rather, there is need for additional studies, both qualitative and quantitative, using more detailed data to examine differences in maternal childrearing practices and treatment of child diarrhea

episodes between mothers who do and do not follow medical prescription for diagnosed conditions, with attention to racial and socioeconomic differences.

Factors associated with cough/respiratory infection in the last two weeks

Table 5 shows the result of the regressions of child cough on maternal health risk behaviors and the other variables of interest. Data limitations prevented running separate regressions by bottom and top halves of the Asset Index distribution because there would be too few cases in each group since there is already a partition by severity of cough (with and without short, rapid breaths).

Child cough may be the result of a common cold virus, but a more serious disease may also cause it. Pneumonia involves cough and an infection in the lungs that can be recognized by fast or difficult breathing (HATiP, 2008). The findings from the regression models featuring cough/respiratory infections are shown in Models 1 to 6. These models are particularly relevant to the study because the data allow for the analysis of the relationship between maternal health risk behaviors and the *severity* of child respiratory infections.

The findings show that child cough *without* short/rapid breathing is *not* associated with maternal health risk behaviors. The age of the child and structural factors are the only variables associated with a common cold; namely, living with non-relatives and lacking access to a flush toilet, and what these mean in terms of access to household resources, housing conditions and sanitation.

On the other hand, cough *with* short/rapid breaths indicating an acute respiratory infection (Table 5, models 4 to 6) *is* associated with maternal health risk behaviors, maternal education, and living arrangements, in addition to the child's age. Similar to the findings in the case of diarrhea episodes in children, the odds that children had an acute respiratory infection in the last two weeks are doubled if the mother has been diagnosed with a condition for which she is not taking medication. Also, consistent with other findings, children under age two are at higher risks of both a cough and developing an acute respiratory infection compared to older children (Rudan et al., 2008). In addition, and similar to the factors associated with diarrhea, the odds of having cough with short rapid breaths are higher for children in households where the male partner is absent. As suggested, mother-only households are at higher risks of poverty and disease because of the gender-based inequalities that keep Black women uneducated, in more precarious employment, and dependent on men for economic survival (Gilbert and Walker, 2002).

Table 5
RELATIVE RISK RATIOS OF CHILD COUGH IN LAST 2 WEEKS, 1998 SADHS

Independent variables†	Children between 0 and 59 months of age (n=1,826)					
	Cough, no short rapid breaths vs. no cough			Cough with short rapid breaths vs. no cough		
	Model 1 RRR	Model 2 RRR	Model 3 RRR	Model 4 RRR	Model 5 RRR	Model 6 RRR
Maternal Health Risk Behaviors						
Maternal chronic illness (None diagnosed)						
Diagnosed and taking medication	1.06	1.02	0.90	1.59	1.70	1.75
Diagnosed and not taking medication	1.43	1.38	1.50	**2.05*****	**2.05*****	**2.09*****
Maternal smoking (never or former smoker)						
Current smoker	0.89	0.64	0.68	1.33	1.33	1.37
Maternal alcohol consumption (No alcohol)						
Drinks alcohol	1.56	1.41	1.41	0.95	0.98	0.95
Maternal sexual practices (Safe sex)						
Risky sexual behaviors	1.18	1.26	1.26	0.93	0.94	0.78
Child's Characteristics						
Child age (25 – 59 months old)						
0 - 12 months old	1.00	1.01	1.02	1.22	1.16	1.18
13 - 24 months old	**1.54****	**1.58****	**1.56****	**2.03*****	**1.98*****	**1.97*****
Child sex (Male)						
Female	1.11	1.10	1.08	1.05	1.05	1.06
Birth order	0.95	0.99	1.05	0.96	1.03	1.02
Mother's Characteristics						
Maternal age		1.00	0.99		0.98	0.98
Maternal race (Black)						
Colored		**1.92****	1.52		1.09	1.10
White		1.68	1.10		1.19	1.28
Asian/Indian		1.67	1.45		1.02	1.13
Maternal education (Less than primary)						
Completed primary or some secondary		1.20	1.06		**1.43****	**1.45****
Completed secondary or higher		1.34	1.00		1.45	1.44
Household Composition & Socioeconomic Status						
Number of children under age 5 in hhd (1 or 2)						
3 to 6 children			0.81			0.93
Marital/union status (Monogamous, male coresides)						
Monogamous, male lives elsewhere			1.27			**2.12****
Polygamous, male coresides			0.50			1.23
Polygamous, male lives elsewhere			1.40			1.36
Widowed or divorced			1.06			**2.51****
Never married, not living together			1.39			1.38
Relationship to household head (Head)						
Wife			1.21			1.56
Daughter or other relative			0.97			1.28
Daughter-in-law			0.62			1.08
Not related			**0.001*****			0.70
Household Asset Index			**1.68****			0.92
Source of drinking water (piped, yard or public tap)						
Well, spring, river, tanker, rain or other			0.86			1.00
Type of toiled (flush)						
Other (latrine, none)			**1.73****			0.82
Log-likelihood	-1530.73	-1520.94	-1500.34	-1530.73	-1520.94	-1500.34

† Reference category in parenthesis
Coefficients statistically significant at ***p<=.001 and **p<=.05

There are two variables significantly associated with child cough and acute respiratory infections that run counter to what is expected. In Table 5 model 3, the coefficient for the household Asset Index suggests that the risks of cough are higher among children in wealthier households compared to poorer ones. This could reflect differences in reporting by social class. Perceptions of health and what it means to be sick are learned and internalized within specific stratification systems, and differ between social classes (Bourdieu, 1984; Williams, 1995). Indeed, while timing of immunizations may be measured more or less objectively, establishing whether there is cough or short breaths might be a more subjective task.

Empirical studies confirm that social classes in which there is a high prevalence of diseases may be *less* likely to report a cough unless it is perceived to be longer lasting or more severe. In contrast, social classes where diseases are not perceived as common may be *more* likely to report even brief episodes as a cough (Blaxter, 1990). This differential in subjective assessment of diseases clearly affects comparisons of incidence and severity across social classes and should be recognized as an unobservable influence with very real consequences. In this study, the impact of differential reporting may be minimized by the fact that comparisons are between mothers who have one or another type of health behavior within particular social classes (i.e., taking into account differences associated with asset ownership, a measure for wealth distribution).

Another finding that is counterintuitive is that the coefficient for maternal education in Table 5 model 6 shows that the odds that a child will have cough with short rapid breathing *increase* by 45 percent if the mother completed primary schooling compared to less educated mothers. I do not have an obvious explanation for this finding except again that the mothers with more education have a more sophisticated understanding of disease and are better able to identify and report health problems. This is an issue that needs further examination. A qualitative study would help us understand better the differences in maternal assessment and reporting of child diseases by mothers of different educational levels and social class.

Although data limitations do not allow me to run separate regression to compare results in the bottom poorer and the top wealthier halves, I did run the analysis removing the top 25 percent wealthier households and removing the bottom 25 percent poorer households, respectively (not shown). The results obtained in each model were similar to the findings for the sample as a whole.

Mothers who do not take their own prescription medications may be more likely than other mothers to wait longer to see if the child gets better on her own, perhaps just like she would do in her own case. For poor mothers, it is not difficult to see that this could be in response to her physical as well as social environment. Perhaps she is overwhelmed by helplessness due to the multitude of crises in her daily life and does not have the energy to deal with child illnesses that may resolve by themselves in a couple of days. Or alternatively, planning a trip to a health provider could be a monumental task that involves finding someone to care for her other children, finding means of transportation, long lines waiting at the clinic, mistreatment from the staff, and low quality of care (WHO, 2006; Wigton, 2008; Chopra et al., 2009). For a simple cough, there is no justification for taking on such an enterprise. In this sense then, waiting for the child to get better on her/his own is an unconscious strategy that matches the mother's objective circumstances (Mull et al., 1994; WHO, 2006; Wigton, 2008; Chopra et al., 2009)

In summary, this section has documented substantial differences by social class and race in the prevalence of most of the health risk behaviors selected for this study. Moreover, it is not possible to separate the influence of race from that of social class because in South Africa these two factors move together as a result of long-standing racism that historically prevented Blacks from gains in education and from social mobility. Studies using more recent data would help ascertain whether the associations found here between race and social class have changed in the years since these data were collected.

In this study, risky sexual practices is the health risk behavior most prevalent among the vulnerable mothers in the sample, which comprises the overlapping groups of Blacks, those at the bottom of the asset ownership index, and those with the least formal schooling. This behavior has been identified by previous research as resulting from gender inequalities and widespread violence and sexual violence against women (Jewkes et al., 2010; Gilbert and Selikow, 2010). In contrast, the health risk behavior most prevalent among White mothers and those in the top 20 percent of the asset distribution is alcohol consumption and to some extent smoking.

Not taking medication for a diagnosed disease is treated here as a risk behavior because of the potential for physical deterioration. This construct refers to mothers who are diagnosed with one or more chronic health conditions but are not taking any medication for them. The health conditions included are: high blood pressure, asthma, diabetes, cholesterol, heart disease, TB or having had a stroke. Surprisingly, the prevalence of mothers who are diagnosed with a condition but do not take their prescribed medication is quite stable across

stratification groupings. Around 13 to 16 percent of mothers in each educational level and income percentile reported this health risk behavior. The exception is that this behavior is more prevalent in Asian (21 percent) and White (30 percent) mothers compared to Black mothers. This could be the result of racial differences in seeking preventive and diagnostic care to begin with. So Asian and White mothers may simply be better informed about their health status because they go more often to the doctor.

The main findings show that there are significant associations between certain maternal health risk behaviors and the health of their children. Specifically, maternal alcohol consumption reduces the likelihood of a child being fully immunized by age one. And the children of mothers who do not take medications for a prescribed condition are significantly more likely to have had diarrhea or respiratory infections in the last two weeks. There is no child health outcome associated with risky sexual practices, but on further reflection, since this may often be a coerced practice, it is in a different dimension than the other behaviors examined here.

These findings suggest that in the conceptual framework the behaviors internalized by mothers about their own health seem to be extended to how they treat the health of their children (**Path A**). That is, mothers who engage in risky health behaviors for themselves tend to do the same when it comes to the health of their children. It may be that mothers who postpone treatments for their own health, are also more likely than other mothers to wait longer to see if a child symptoms clear on their own, perhaps just like she would do in her own case. It is easy to see that the consequences may be more severe in the case of indigent mothers and their children. These delays may be longer for children in poverty due to the material, physical and psychological costs of accessing substandard health care. In this sense, delays in seeking care are the way in which habitus may accommodate the mother's objective circumstances, which include poverty and limited access to resources.

The impact of structural factors on reducing or increasing risks of disease for children is significant in more direct ways as well. Both household asset ownership and living arrangements of the mother and her child influenced the risks of late immunization, diarrhea or cough in children. Higher asset ownership goes hand in hand with better child health outcomes; and children of mothers not co-residing with their male partner, and those whose mothers (and themselves) live with non-relatives are often at higher risks of late immunization, diarrhea and respiratory infections. Living arrangements are meant to capture maternal ability to access and dispose of resources, and this is confirmed by findings that children are at higher risk of disease if their mothers are in non-coresiding polygamous

marriage compared to two-parent marriages. The one exception to this general finding is that among relatively poor mothers, being on their own seems to increase the likelihood of timely immunizations. This might be due to these mothers having fuller control over their time.

Child and maternal health have long been linked as influencing each other. This study has examined an important pathway in which mothers unknowingly may affect the well being of their children. Further studies using more detailed recent data and focusing on extending the analysis to include children not co-residing with a parent are needed to further understand the association between household composition and child health. In addition, there are several qualitative aspects of this research that could prove promising in understanding the specific proximate determinants through which maternal health risk behaviors translate into health costs for young children.

GENERAL DISCUSSION

This research has systematically examined the relationship between a mother's health risk behaviors and various health outcomes in her child/ren. The initial argument was that mothers make many decisions about their children, in particular those that affect their health. Therefore, mothers that practice health risk behaviors could impact child health in several ways: through disease transmission (contagion), through parental modeling, and through neglecting child illness or delaying immunizations. The latter two are the focus of this research.

The child health measures of interest for this study are timing of immunization, and diarrhea and respiratory infection in the last two weeks. Acute respiratory infections and diarrhea have been selected because they are among the main causes of morbidity and mortality among young children in South Africa.

The main findings are that there are significant associations between maternal health risk behaviors and her child's health outcomes. The health risk behaviors found to impact child health are as follows: maternal alcohol consumption is associate with delays in immunization; and her not taking medications for a diagnosed condition is associated with higher likelihood of both diarrhea episodes and acute respiratory infections in the last two weeks. These findings have ramifications in terms of policy since knowing that an individual practices health risk behaviors conveys information about the potential risks for the individual's children.

In addition, household wealth has direct and indirect roles in child health outcomes. Indirectly, the impact of maternal health risk behaviors on child health is reduced in wealthier households. Directly, risks of child illness are higher if they live in housing lacking basic services such as piped water and flush toilet.

Also, household composition is found to influence child health, but in this analysis it was on the side of constraining resources when mothers and children are not co-residing with a male partner, and when they are living with non-kin. Both had negative associations with child health.

The theoretical framework that guided the understanding of the links between individual agency and structure is based on Weber's and Bourdieu's observations of the role and consequences of socialization. Individual agency is influenced by social structures because socialization takes place at the intersection of specific stratification systems (class, gender, race/ethnicity). In the end, successful socialization instills preferences and

dispositions that are consistent with an individual's objective conditions in a way that "make a virtue of necessity" (Bourdieu, 1984, 1990).

In this study, maternal health behaviors are viewed as the product of the interaction of agency and structure. Together, these produce what Bourdieu calls habitus or dispositions and preferences. Habitus dictates routine behaviors that are carried out without thinking because they are taken for granted as "the way things are supposed to be done."

Would habitus produce a different set of dispositions when it comes to children? After all, it could be argued that parental devotion to the wellbeing of one's children is also formed through socialization. Or do the dispositions instilled in individuals through habitus are somehow applied to all those that surround them?

The research findings suggest that the latter is the case. Mothers who follow health risk behaviors for themselves also treat their children's health in similar ways. These mothers may not even be aware that their behaviors impact their own health in negative ways. There is no deliberate harm to their children either. Simply, there is no awareness of a connection between their own routine behaviors and their child health outcomes.

The view that agency is shaped by structure, and that at our very core we are programmed to reproduce inequalities in health from one generation to the next also has implications for health interventions on behalf of mother and child. From this perspective, it is not realistic to target maternal behaviors for change without also addressing social context. Habitus may be modified by experiences, but it will not willingly do so.

Alternatively, and even more concerning as an explanation, the findings reported here could be due to overwhelming and constraining social structures that do not allow maternal agency any room to act in ways that protect her or her child's health. In particular, the measure of maternal risky sexual practices reflects gender structures/inequalities more than maternal habitus. Given the high rates of poverty in South Africa, it could be that the poorest mothers in the sample do not follow medical treatment because they can't, and that the significant associations with higher risks of child infections are due to constraining structures that prevent them from protecting the health of their children as well.

To elucidate further the reasons for my findings, there is need for additional analysis that captures structural changes in recent years, and whether these have an impact on the association found between maternal health risk behaviors and her child's health.

CONCLUSIONS

This study set out to examine the relationship between a mother's health risk behaviors and various health outcomes in her child/ren using the 1998 Demographic and Health Survey data representative of South African women and their children. The relationship between mothers and the health of their children is of interest because mothers are the first to realize their child may be sick, and their behavior may reduce the impacts of adverse circumstances on child health.

Previous studies have documented that mothers may influence the health of their children in both positive and negative ways. Examples include maternal infection transmission to newborns, as well as the long-term impact of parental modeling on offspring's health behaviors. The significant of this study is that it focuses instead on an alternative and neglected path in which maternal health behaviors may impact the health of her children. It examines what are the implications of certain maternal health risk behaviors for her children's risks of late immunization, diarrhea and respiratory infections. In South Africa the latter two are potentially serious diseases accounting for a high proportion of deaths among children under age 5.

There are several important findings from this research. Mainly, that there are significant associations between maternal health risk behaviors and child health. This is surprising in light of the view that parents' responsibility is viewed as protecting their children's well being. However, it becomes a reasonable finding under the framework that certain behaviors that impact health are routine and unquestioned acts that have been internalized as practical ways of life.

An additional finding is that health risk behaviors are distributed differently by race in ways that cannot be separated from the influence of social class. White and Asian/Indian mothers are more likely to neglect a diagnosed medical condition while Blacks are more likely to practice risky sexual behaviors. However, risky sexual practices are not associated with negative child health outcomes. Rather, this behavior has been identified as resulting from pervasive gender inequalities and reflects the vulnerability of the overlapping group of uneducated, poor, and Black mothers. Since there have been important social and economic changes in South Africa since these data were collected, additional studies using new survey data would provide an important contribution to the understanding of the differential prevalence of health risk behaviors by race.

There are also other variables that have a significant influence on child health that should be mentioned here. These include child and maternal characteristics, living situation, and structural factors:

- Living situation dynamics – children are more likely to have had diarrhea and acute respiratory infections recently if they live in a household where the father is not co-residing with them. Similarly, children are at higher risks of late immunization and cough when they live with non-relatives, suggesting limited access to household resources;
- Housing conditions – type of toilet and source of drinking water have an impact on child health outcomes. Children are at higher risks of cough when they don't have access to a flush toilet, and they are less likely to have received timely immunizations when they don't have access to piped water.
- Child age and birth order – children under age two are more vulnerable to diarrhea and cough compared to older ones; and a higher birth order is associated with lower likelihood of timely immunizations and higher odds of diarrhea episodes in the last two week.

The findings in this research suggest that there is a gap in the literature about health risk behaviors that needs to be addressed in South Africa. In particular, there is need to bring to light the many intra-household and inter-generational linkages in terms of health outcomes and how these outcomes may be affected by the household conditions and composition.

RECOMMENDATIONS

There are two areas in which the findings of this research may be translated into recommendations. On the one hand, some policy recommendations directed at health interventions are suggested by the findings. On the other, there are research recommendations to further explore the inter-generational and intra-household links regarding health outcomes. These are not obvious by any means, but the investment is likely to pay off handsomely in terms of our understanding of the social transmission of disease.

Policy recommendations

The epidemiological transition signaled by shifts in the patterns and causes of morbidity and mortality from acute infectious diseases to chronic conditions also brought along changes in the extent to which individuals are considered responsible for their own health. For many chronic and degenerative diseases, onset and severity are associated with long-term harmful health behaviors such as a poor diet, smoking or a sedentary lifestyle (Cockerham, 2005). Chronic diseases cannot be cured, only prevented or managed. Therefore, individuals are viewed as playing a larger role than before in disease prevention. Moreover, public health interventions reinforce this view by using messages about individual responsibility in their educational campaigns targeting harmful health behaviors (Giddens, 1991; Cockerham, 2005).

The findings in this study suggest a different configuration. In particular, that health risk behaviors are the result of both structure and individual choice, and that structure must be taken into account in interventions that aim to change health behavior. This seems to be the case in particular with risky sexual practices. Although this variable did not have a significant impact on child health outcomes, it was found to be concentrated among poor Black women. It is suspected that the part attributable to agency is quite negligible compared to gender inequalities that result in the dismissal of Black women's desire for safe sex.

In addition, the risks of recent episodes of diarrhea and respiratory infections are significantly higher among children whose mothers are diagnosed with a health condition but do not take the prescribed medications, and this association is stronger among indigent groups. Structural factors should be taken into consideration when planning health interventions. In particular, prior to developing initiatives to improve maternal and child health in poor communities, there is need for qualitative studies to better understand structural barriers to healthcare services among the poor. Messages targeting individual

behaviors are likely to fail if they ignore the context in which mothers make decisions about their own and their children's health.

Future research

There is much to learn about how and why household composition impacts behaviors and outcomes of its members. Studies using more recent data to explore the relationship between prevalence of adult risk behaviors, household composition, and child health outcomes are needed. In addition, the large proportions of mother-only, neither-parent and multiple-generation households in South Africa require that studies focus on how these various household configurations impact child health. As noted earlier, this study includes only children living with their mothers, but future studies should look at the growing proportion of child fostering households and how these children fare on several dimensions. For example, it may be that the impact of child grants on child health differs by household composition, which would have strong policy implications for the wellbeing of children.

Another avenue of research is that of subjective assessment of child health by caregivers. While there seems to be less room for guessing when child vaccinations are due because there are clear guidelines, this is not the case when it comes to other child illnesses. Qualitative studies could compare domestic preventive activities caregivers undertake on behalf of children's health, as well as their assessment and treatment of diarrhea and acute respiratory infections by caregiver's race, social class and household composition.

Finally, given the WHO and UNICEF estimates of declining immunization coverage in South Africa, quantitative and qualitative research is needed to better understand the correlates and drivers of this trend (WHO, 2010).

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APPENDIX

APPENDIX 1: Asset Index Constructs

Although the Demographic and Health Surveys do not collect information about household income, it asks a battery of questions about asset ownership that allow measurement of socioeconomic status. The procedure used by Bradshaw and Steyn (2001) is an iterated factor analysis based on the World Bank's method, and it computes scoring factors for each of a set of variables deemed relevant to South Africa in the measurement of socioeconomic status.

The details are available from Bradshaw and Steyn (2001). In a nutshell, the Asset Index uses only the scores of the first principal component. For each observation, subtracting the mean and dividing by the standard deviation standardizes the variables included in the analysis. Next, the standardized variable is multiplied by the variable's scoring coefficient obtained from factor analysis. Summing across all the variables selected for inclusion yields the Asset Index for each household. The formula is:

$$A_j = f_1 \text{ x } (a_{j1} - a_1) / (s_1) + \ldots f_n \text{ x } (a_{jn} - a_n) / (S_n)$$

Where A_j is the Asset Index for household j; f is the scoring coefficient obtained from the factor analysis for each asset included in the index; a_{j1} is the value for that asset for household j and asset n; and the mean and standard deviation for each asset n are represented by a_n and s_n, respectively.

Table A shows the variables included by Bradshaw and Steyn (2001) in their computation of the Asset Index for South Africa using the 1998 DHS. These include main source of drinking water, type of toilet facility, fuel used for cooking or heating, number of rooms used for sleeping, main material of floors and walls, hunger, and household ownership of specific assets (e.g., car, sheep, etc.). I have computed two Asset Index series. The first is based on their scoring coefficients and the standardized variables they include. The second excludes main source of drinking water and type of toilet facility since I plan to include these variables directly in my regression analysis. The rationale is that diarrhea and other child diseases are strongly influenced by them, and isolating their impact enhanced the outcomes in the statistical models in this study. To compute the second Asset Index, I have recomputed the scoring coefficients without those two variables and carry out the rest of the computations as described above.

The Asset Index is a continuous variable that can be grouped in quintiles to obtain the bottom 20 or 40 percent of the households according to the Index, or top richest 20 percent.

The last columns of Table A show the comparison among quintiles in the proportion of households that have the assets that were included. For example, the first row in Table A shows that the Asset Index obtained by Bradshaw and Steyn (B&S) indicates that among the poorest 40 percent of the households, only .16 out of 1 (or 16 percent) of these households have electricity; 89 percent have electricity among households that are classified as middle 40 percent of the Asset Index quintiles; and all (1.0 or 100 percent) of the households who fall into the 20 percent richest have electricity. The proportion of households that have each of these assets by the Asset Index computed without source of drinking water and type of toilet facility is listed under the LF heading. As shown, the proportions are similar with and without those variables. I have included the latter Asset Index (LF) in the regressions.

Table A
SCORING FACTORS AND COMPARISON OF TWO ASSET INDEXES (BRADSHAW AND STEYN AND THE AUTHOR'S RE-COMPUTED INDEX), 1998 SADHS

Variables	Scoring Coefficient computed by Bradshaw and Steyn (2001) (B&S)	Scoring Coefficient computed by author for this study (LF)†	Proportion of households that answered "Yes" to asset in question, by percentile in the two versions of the Asset Index construct*					
			Poorest 40% in…		Middle 40% in...		Richest 20% in...	
			B&S Index	LF Index	B&S Index	LF Index	B&S Index	LF Index
Has electricity	0.082	0.096	.16	.16	.89	.88	1.0	1.0
Own radio	0.027	0.025	.65	.64	.84	.85	.97	.97
Own TV	0.070	0.098	.15	.13	.72	.74	.98	.98
Own refrigerator	0.113	0.155	.04	.02	.63	.65	1.0	1.0
Own bicycle	0.015	0.031	.08	.07	.15	.14	.39	.41
Own motorcycle	0.014	0.017	.00	.00	.01	.01	.07	.07
Own car	0.067	0.086	.02	.02	.14	.14	.81	.83
Own telephone	0.096	0.120	.00	.00	.19	.19	.92	.92
Own personal computer	0.027	0.038	.00	.00	.01	.01	.25	.25
Own washing machine	0.075	0.109	.00	.00	.07	.07	.81	.82
Own donkey/horse	-0.008	-0.011	.06	.06	.01	.02	.02	.02
Own sheep/cattle	-0.009	-0.024	.24	.23	.06	.07	.03	.04
Uses electricity for cooking/heating	0.143	0.183	.02	.01	.69	.70	.98	.98
Uses gas for cooking/heating	0.021	0.022	.04	.04	.11	.11	.11	.11
Uses paraffin for cooking/heating	-0.021	-0.022	.59	.60	.33	.33	.02	.02
Uses wood for cooking/heating	-0.042	-0.050	.63	.62	.12	.13	.01	.02
Uses coal for cooking/heating	0.015	-0.001	.06	.07	.12	.12	.02	.02
Uses animal dung for cooking/heating	-0.014	-0.012	.03	.03	.00	.00	.00	.00
Uses other fuel for cooking/heating	0.006	0.009	.00	.00	.00	.00	.01	.01
Number of members per sleeping room	-0.013	-0.029						
Main floor material is earth	-0.530	0.000	.49	.49	.03	.03	.00	.00
Main floor material is wood	-0.137	0.017	.01	.01	.01	.01	.02	.02
Main floor material is cement	-0.539	0.053	.32	.33	.42	.41	.03	.03
Main floor material is vinyl	-0.470	0.050	.13	.12	.30	.29	.12	.13
Main floor is carpet	-0.438	0.087	.05	.05	.16	.16	.56	.56
Main floor material is tiles	-0.275	0.044	.00	.00	.06	.07	.20	.18
Main floor material is parquet	-0.156	0.026	.00	.00	.02	.02	.06	.06
Other floor material	-0.067	0.010	.00	.00	.00	.00	.01	.01
Has plastic or cardboard walls	0.080	-0.027	.03	.03	.03	.03	.00	.00
Has mud walls	0.165	-0.133	.44	.44	.02	.02	.00	.00
Has mud and cement walls	0.148	-0.060	.15	.14	.08	.09	.01	.01
Has corrugated iron walls	0.142	-0.048	.11	.12	.09	.09	.00	.00
Has prefab walls	0.031	-0.008	.00	.00	.00	.00	.00	.00
Has bare brick walls	0.184	-0.054	.12	.12	.18	.17	.05	.06
Has plastered walls	0.346	0.000	.13	.13	.59	.59	.93	.92
Has other wall material	0.051	-0.014	.01	.01	.01	.01	.01	.01

Table A (Continued)
SCORING FACTORS AND COMPARISON OF TWO ASSET INDEXES (BRADSHAW AND STEYN AND THE AUTHOR'S RE-COMPUTED INDEX), 1998 SADHS

Variables	Scoring Coefficient computed by Bradshaw and Steyn (2001) (B&S)	Scoring Coefficient computed by author for this study (LF)†	Proportion of households that answered "Yes" to asset in question, by percentile in the two versions of the Asset Index construct*					
			Poorest 40% in…		Middle 40% in...		Richest 20% in...	
			B&S Index	LF Index	B&S Index	LF Index	B&S Index	LF Index
Often goes hungry	0.146	-0.075	.23	.24	.09	.08	.01	.00
Sometimes goes hungry	0.205	-0.108	.50	.51	.32	.31	.02	.02
Seldom goes hungry	0.100	-0.033	.04	.04	.07	.07	.02	.02
Never goes hungry	0.308	0.000	.22	.21	.53	.54	.96	.96
Has piped drinking water inside dwelling	2.875	n/a	.03	.06	.39	.37	.96	.92
Has piped drinking water on site	2.501	n/a	.15	.17	.43	.40	.03	.07
Has piped drinking water in public tap	2.285	n/a	.36	.33	.12	.15	.00	.00
Drinking water is from water carrier/tanker	0.571	n/a	.02	.02	.00	.01	.00	.00
Drinking water is from borehole/well	0.931	n/a	.04	.04	.02	.02	.00	.00
Drinking water is from dam/river/stream/spring	2.002	n/a	.35	.34	.02	.03	.00	.00
Drinking water is from rain water tank	0.579	n/a	.02	.02	.01	.01	.00	.00
Drinking water is from bottled water	0.142	n/a	.00	.00	.00	.00	.00	.00
Other source of drinking water	0.648	n/a	.02	.02	.01	.01	.00	.00
Uses own flush toilet	2.894	n/a	.02	.07	.53	.49	1.0	.97
Uses shared flush toilet	1.051	n/a	.03	.03	.06	.06	.00	.01
Uses bucket latrine	1.494	n/a	.09	.09	.10	.10	.00	.01
Uses pit latrine	2.615	n/a	.53	.49	.28	.32	.00	.01
Has no toilet facility	1.917	n/a	.33	.32	.02	.03	.00	.00
Uses other toilet facility	0.366	n/a	.00	.01	.01	.00	.00	.00

† The Asset index computed by the author excludes the variables for source of drinking water and type of toilet facilities.

* B&S = Proportion of households who own a particular asset by percentile, according to the Asset Index computed by Bradshaw & Steyn using the 1998 South Africa DHS (Bradshaw & Steyn, 2001).
LF = Proportion of households who own a particular asset by percentile according to the Asset Index re-computed by the author for this study. Differences between the two indexes are due to excluded variables in the re-computed index (source of drinking water and type of toilet facilities are omitted).

APPENDIX 2: Distribution of Selected Variables by Child Health Outcomes

Table B shows the distribution of the variables in the analysis in the full sample and by the child health outcomes of interest in this study. The table shows that mothers who have been diagnosed but are not taking medications are overrepresented when only children who had cough of diarrhea in the last two weeks are considered, relative to the full sample. Also, the proportion of mothers who use alcohol is higher among children immunized late or not yet compared to the sample as a whole. These differences do not take into account other factors such as child or maternal age or education. However, the correlation suggests that there is an impact of maternal health risk behaviors on child outcomes.

Table B also shows that older children are less likely to have had diarrhea in the recent weeks preceding the survey, 46 percent of the children who had diarrhea recently are two years of age or older, while they make up 54 percent of the children in the sample as a whole. Younger children are more vulnerable to infections, particularly after weaning from maternal breast milk but over time build more resistance to infection.

Children age two and older are also less likely to have been immunized on time. That is, about 77 percent of the children who were immunized late or not yet are two years or age or older. It may be that this is the result of recent improvements in vaccination coverage so that children are increasingly likely to be vaccinated within their first year of life.

Other relationships that are further explored in the analysis are maternal race, education, marital status, living arrangements and two measures of socioeconomic status (Asset Index and type of toilet). Table B suggests that White children are somewhat overrepresented among those who reported a recent illness episode. They make up 5 percent of those who were ill recently, but only 3 percent in the sample.

In the sample as a whole, 28 percent of the mothers have less than primary education, but when only children who were immunized late or not yet are considered, the proportion of mothers with low education increases to one-third. That is, maternal education seems to be positively correlated with timely immunization. In contrast, only 31 percent of the children who had diarrhea recently come from the bottom 40 percent in the Asset Index distribution. In other word, children from the poorest households are underrepresented among those who had diarrhea or cough recently. The reason for this unexpected relationship most likely is differential reporting of illness since environments with high density of diseases impact individuals' perception of what is or is not "an episode" of disease. The Asset Index is a

construct that includes several measures of quality of life, and it is difficult to assess which factors are implied in these findings. However, I also use the alternative measure of type of toilet, and in this case, as expected, those with no access to a flush toiled are more likely to have had diarrhea or cough recently, and to be immunized late. Both measures are used in the analysis because the Asset Index has been is associated with several measures of lower socioeconomic status (see Appendix A).

Table B
PERCENTAGE DISTRIBUTION OF SELECTED VARIABLES BY CHILD HEALTH OUTCOMES, 1998 SADHS (WEIGHTED SAMPLE)

Variables	**Study Sample (%)**	Child had diarrhea, cough or both in last 2 weeks (%)	Child was Immunized late or not yet (%)
Maternal treatment of her chronic illnesses			
None diagnosed	82.9	77.1	85.0
Diagnosed and taking medication	3.1	2.8	2.8
Diagnosed and not taking medication	14.0	20.1	12.2
Maternal smoking			
Never/former smoker	91.7	91.3	91.3
Current smoker	8.3	8.7	8.7
Maternal alcohol consumption			
Does not drink alcohol	89.1	88.7	87.0
Drinks alcohol	10.9	11.3	13.0
Maternal sexual practices			
Reports safe sex at last intercourse	76.6	76.7	74.9
Risky-sexual practice at last intercourse	23.4	23.3	25.1
Child Age			
0-12 months old	24.1	24.0	
13-24 month old	22.2	30.2	23.2
25-59 months old	53.8	45.8	76.8
Child Sex			
Female	48.9	51.3	49.5
Male	51.1	48.7	50.5
Child Birth Order (Average)	2.8	2.8	3.1
Maternal Age (Average)	29.2	28.8	30.3
Maternal Race			
Black	83.5	81.9	86.8
Colored/Asian	13.8	12.7	10.0
White	2.7	5.4	3.2
Maternal education			
Less than primary	28.0	25.7	33.4
Completed primary or some secondary	50.0	50.4	46.4
Completed secondary or higher	22.0	23.9	20.2
Maternal marital/union status			
Monogamous, male coresides	38.3	36.6	37.7
Monogamous, male lives elsewhere	13.8	14.7	15.2
Polygamous, male coresides	4.6	4.0	4.6
Polygamous, male lives elsewhere	2.3	2.1	3.4
Widowed or divorced	2.3	1.9	2.4
Never married, not living together	38.8	40.8	36.7
Mother's relationship to household head			
Head	23.3	23.9	25.9
Wife	35.5	33.7	35.6
Daughter or other relative	35.3	37.9	33.1
Daughter-in-law	5.2	3.9	4.2
Not related	0.7	0.7	1.2
Household Asset Index percentile			
Poorest	40.0	31.3	41.5
Middle	40.0	43.7	36.9
Wealthier	20.0	25.0	21.6
Type of toilet			
Flush (own or shared)	41.0	41.8	37.1
Other (latrine, none)	59.0	58.2	62.9