

ABSTRACT

Title of dissertation: PSYCHOLOGICAL WELL-BEING AND
HEALTH GAINS IN THE DEVELOPING
WORLD: EVIDENCE FROM PERU AND
MALAWI
Sarah W. Dickerson

Dissertation directed by: Professor Carol Graham
School of Public Policy

In this dissertation, I assess the relationship between psychological well-being and health gains in Peru and Malawi. The first chapter consists of a comprehensive and systematic examination of research that frames the quantitative analyses found in the second and third chapters. It investigates literature on the relationship between maternal well-being and multiple dimensions of health in children and adolescents. It also explains how maternal depression may interact with poverty to worsen offspring's outcomes. Then, it explores literature on the association between catastrophic health expenditure in Malawi and two of its potential predictors: unexplained happiness and access to antiretroviral therapy (ART), a treatment regimen for people living with HIV/AIDS. The second chapter assesses the impacts of maternal depression and life satisfaction on children in Peru. Using panel data from rounds three (2009-2010) and four (2013-2014) of Young Lives Peru, I find that children's self-reported life satisfaction and health positively correlate with maternal life satisfaction and negatively associate with maternal depression. Furthermore, maternal life satisfaction predicts whether a female adolescent smokes, while maternal depression predicts smoking behavior and misinformation on pregnancy amongst male adolescents. The third chapter investigates the relationships between household catastrophic health expenditure in Malawi and two predictors, antiretroviral therapy (ART) and unexplained happiness. Using data from round two (2004-2005) and round three (2010-2011) of Malawi's Integrated Household Survey, I

find that proximity to ART-providing clinics and higher levels of psychological well-being associate with reduced likelihood of catastrophic health expenditure.

PSYCHOLOGICAL WELL-BEING AND HEALTH GAINS IN THE DEVELOPING
WORLD: EVIDENCE FROM PERU AND MALAWI

by

Sarah W. Dickerson

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2018

Advisory Committee:
Dr. Carol Graham, Chair
Dr. Jeremy Barofsky
Dr. David Crocker
Dr. Maureen Cropper
Dr. Phillip Swagel

© Copyright by
Sarah Wren Dickerson
2018

Dedication

To my family

Acknowledgements

First and foremost, I would like to thank my advisor and dissertation chair, Carol Graham, for her inspiration, guidance, and support. After introducing me to the topic of happiness economics, she patiently guided me through each step of the dissertation process. I would like to express my sincere gratitude for her careful edits and the time and energy she devoted to our meetings. I aspire to be as accomplished and supportive as she, and am truly grateful for her mentorship.

I am also grateful to my committee member Jeremy Barofsky for his constant support and patience. He generously offered his expertise and time, which ensured my productivity throughout this experience. Without him, this project would have been significantly more time-consuming and challenging.

I would like to express gratitude to David Crocker, Maureen Cropper, and Phillip Swagel for agreeing to serve on my committee and for their time and feedback. I am deeply appreciative of the connections provided by these committee members and the discussions on ways in which the dissertation could be improved. Additionally, Sergio Pinto, Julia Ruiz Pozuelo, and John Juneau II shared their vast knowledge of statistical analysis. I am incredibly thankful for their dedication to the accuracy of the econometrics used in this dissertation.

I would like to recognize several individuals who provided essential contextual information on Malawi. Jessica Ochalek and Marelize Gorgens shared knowledge of HIV/AIDS and health care spending in the country. I am thankful for their willingness to answer questions about these topics as I pieced together background information for the first and third chapters of this dissertation.

I would also like to thank Mary Penny and the Young Lives team in Peru. Thank you for providing access to the data used in the second chapter. Also, thank you for meeting with me in Peru and explaining in detail the process by which data are collected. Team members' anecdotes about experiences in the field contributed to essential background information on mental health in the country.

Thank you to the University of Maryland's School of Public Policy for providing the financial support needed to complete this dissertation, and to the Maryland

community for their comments and constructive criticism. I have also benefitted from my time at the Brookings Institution, where I met a number of inspiring individuals who encouraged my professional development and demonstrated enthusiasm for this project.

Finally, I would like to thank the friends and family who supported me throughout this process. I am especially grateful to my parents, Pamela Pehrsson and Russell Dickerson. Your unwavering encouragement, unconditional love, and entertaining accounts of your own experiences as Ph.D. students, made this exciting challenge seem surmountable.

Table of Contents

1. Introduction	1
2. Psychological Well-being and Health Gains in Peru and Malawi: A Review of the Literature	4
2.1 Part I: Maternal Psychological Well-being and Child Outcomes in Peru.....	4
I. Introduction.....	4
II. Literature Review	5
III. Conclusions	18
2.2 Part II: Unexplained Happiness and Access to Antiretroviral Therapy in Malawi: the impacts on catastrophic health expenditure	20
I. Introduction.....	20
II. Literature Review	22
III. Conclusions	35
3. Maternal Psychological Well-being and Children’s Outcomes in Peru: A quantitative analysis	37
3.1 Introduction	37
3.2 Variables.....	39
3.3 Data	39
3.4 Methods and Mechanisms	42
3.5 Literature	47
3.6 Results	51
3.7 Discussion and Policy Implications.....	61
3.8 Conclusions	64
4. The Impacts of Access to Antiretroviral Therapy and Psychological Well-being on Catastrophic Health Expenditure in Malawi	66
4.1 Introduction	67
4.2 Background: Health infrastructure, HIV/AIDS, and psychological well-being	70
4.3 Variables.....	73
4.4 Data	74
4.5 Methods and Mechanisms	77
4.6 Literature	81
4.7 Results	85
4.8 Discussion and Policy Implications.....	92
4.9 Conclusions	96
5. Appendix	99
6. Bibliography.....	136

Tables and Figures

Figure 2.1: Reported Maternal Depression Symptoms.....	51
Figure 2.2: Reported Maternal Happiness	52
Table 2.1: Summary of Statistics for Maternal Happiness Models	99
Table 2.2: Summary of Statistics for Maternal Depression Models.....	99
Table 2.3: Summary of Statistics for Smoking Models.....	100
Table 2.4: Summary of Statistics for Misinformation on Pregnancy Models.....	100
Table 2.5 Maternal Happiness and Child Health.....	54
Table 2.5.a.: Maternal Happiness and Child Health with Birth Weight	101
Table 2.6: Maternal Happiness and Child Health, Ordered Logit	102
Table 2.7: Maternal Happiness and Child Health by Gender, Pooled OLS.....	103
Table 2.8: Maternal Happiness and Child Health by Gender, Fixed Effects.....	104
Table 2.9: Lagged Maternal Happiness and Child Health.....	105
Table 2.10 Reported Maternal Depression and Child Health.....	55
Table 2.10.a.: Reported Maternal Depression and Child Health with Birth Weight	106
Table 2.11: Reported Maternal Depression and Child Health, Ordered Logit	107
Table 2.12: Reported Maternal Depression and Child Health by Gender, Pooled OLS.....	108
Table 2.13: Reported Maternal Depression and Child Health by Gender, Fixed Effects	109
Table 2.14: Lagged Maternal Depression and Child Health.....	110
Table 2.15: Maternal Happiness and Child Happiness.....	56
Table 2.15.a.: Maternal Happiness and Child Happiness with Birth Weight	111
Table 2.16: Maternal Happiness and Child Happiness, Ordered Logit	112
Table 2.17: Maternal Happiness and Child Happiness by Gender, Pooled OLS.....	113
Table 2.18: Maternal Happiness and Child Happiness by Gender, Fixed Effects.....	114
Table 2.19: Lagged Maternal Happiness and Child Happiness.....	115
Table 2.20: Reported Maternal Depression and Child Happiness.....	57
Table 2.20.a.: Reported Maternal Depression and Child Happiness with Birth Weight	116
Table 2.21: Reported Maternal Depression and Child Happiness, Ordered Logit	117
Table 2.22: Reported Maternal Depression and Child Happiness by Gender, Pooled OLS.....	118
Table 2.23: Reported Maternal Depression and Child Happiness by Gender, Fixed Effects	119
Table 2.24 Lagged Maternal Depression and Child Happiness.....	120
Table 2.25 Maternal Happiness and Whether Adolescent Smokes	58
Table 2.26: Maternal Happiness and Whether Adolescent Smokes, Logit.....	121
Table 2.27 Reported Maternal Depression and Whether Adolescent Smokes	59
Table 2.28: Reported Maternal Depression and Whether Adolescent Smokes, Logit.....	121
Table 2.29: Reported Maternal Depression and Adolescent Smoking with IV, Mean Marginal Effects	122

Table 2.30: Maternal Happiness and Misinformation on Pregnancy.....	60
Table 2.31: Maternal Happiness and Misinformation on Pregnancy, Logit.....	122
Table 2.32: Reported Maternal Depression and Misinformation on Pregnancy.....	61
Table 2.33: Reported Maternal Depression and Misinformation on Pregnancy, Logit.....	123
Table 2.34: Reported Maternal Depression and Misinformation on Pregnancy with IV, Mean Marginal Effects.....	135
Figure 3.1: ART-providing clinics (2004-2012).....	83
Figure 3.2: Household Distance to Clinics, in kilometers.....	86
Figure 3.3: Negative Log Distance (Proximity) to Clinics.....	87
Table 3.0: Spending on health categories (in kwacha), 2004-2005.....	124
Table 3.1: Spending on health categories (in kwacha), 2010-2011.....	124
Table 3.2: Summary of Statistics, 2004-2005 households.....	125
Table 3.3: Summary of Statistics, 2010-2011 households.....	125
Table 3.4: Closer than Mean Distance and Catastrophic Expenditure.....	88
Table 3.5: Proximity and Catastrophic Expenditure.....	90
Table 3.6: Unexplained Happiness and Catastrophic Expenditure.....	91
Table 3.7: Closer than Mean Distance and Catastrophic Expenditure, Mean Marginal Effects.....	126
Table 3.8: Closer than Mean Distance and Catastrophic Expenditure at 20 % threshold, OLS.....	127
Table 3.9: Closer than Mean Distance and Catastrophic Expenditure at 30 % threshold, OLS.....	128
Table 3.10: Closer than Mean Distance and Catastrophic Expenditure at 40 % threshold, OLS.....	129
Table 3.11: Proximity 2010 and Catastrophic Expenditure, Mean Marginal Effects.....	130
Table 3.12: Proximity and Catastrophic Health Expenditure at 20 % threshold, OLS.....	135
Table 3.13: Proximity and Catastrophic Expenditure at 30 % threshold, OLS.....	132
Table 3.14: Proximity and Catastrophic Expenditure at 40 % threshold, OLS.....	133
Table 3.15: Impact of Unexplained Happiness on Catastrophic Expenditure, Logit.....	134
Table 3.16: Unexplained Happiness without Weights, Mean Marginal Effects.....	135

1. Introduction

In this dissertation, I examine the relationship between psychological well-being and specific health gains in the developing world. Psychology literature indicates a connection between happiness and multiple dimensions of physical health, but aspects of this connection remain unknown. In particular, there is a lack of information on the impact of psychological well-being in developing country contexts. Few studies have examined how poverty interacts with maternal happiness to shape children's outcomes or how happiness in developing countries influences catastrophic health expenditure.

Findings from relevant studies suggest that higher levels of life satisfaction correlate with an assortment of health gains. Positive maternal psychological well-being contributes to growth, cognitive development, and socio-emotional well-being in children. Maternal depression can cause toxic stress, which may have lasting negative effects on children's developmental outcomes. Poverty may exacerbate this stress by contributing to suboptimal living environments, worse nutrition, and increased risk of illness. It may also elevate stress levels amongst children's parents by provoking thoughts about availability and allocation of household resources.

Happiness may also contribute to lower probability of catastrophic health expenditure through its impacts on income, positive health outcomes, and risk behaviors. Literature suggests that individuals with elevated levels of life satisfaction earn higher salaries later in life, an outcome that could increase capacity to pay for medical bills. Furthermore, happiness positively associates with improved physical health outcomes, such as longevity, and reduced likelihood of coronary heart problems, immune disorders, and certain types of cancer. Finally, happier individuals may be less inclined to engage in sexual risk behaviors, such as unprotected sexual intercourse. These positive outcomes could reduce the possibility of high medical payments that contribute to catastrophic spending.

In the chapters that follow, I examine the relationship between psychological well-being and several unexplored outcomes in developing countries: subjective life satisfaction and health of children in Peru, adolescent risk behaviors in Peru, and catastrophic health expenditure in Malawi. I also assess the relationship between

catastrophic health expenditure and improved access to antiretroviral therapy (ART), the regimen of medications used to treat HIV/AIDS.

The first chapter is a review of the literature that consists of two parts and frames the quantitative analyses of Peru and Malawi. Part I presents background information on the link between maternal psychological well-being and children's health outcomes. Pertinent studies on this relationship focus upon younger children in developed countries, but key questions remain on how maternal depression interacts with poverty to influence adolescents. Part II explores literature on the association between catastrophic health expenditure in Malawi and two of its predictors: unexplained happiness and access to ART. Prior research examines certain demographic and socioeconomic determinants of catastrophic health expenditure, but these two predictors remain unexplored. Part II also investigates literature on the channels of effects through which these predictors could mitigate high out-of-pocket health payments.

In the second chapter, I empirically investigate the relationship between maternal psychological well-being and the health outcomes of children and adolescents in Peru. Magdalena Bendini's dissertation (2015), as overseen by her advisor Carol Graham, explored these research questions. Bendini's (2015) dissertation uses panel data from the Young Lives survey to assess the relationship between early childhood development and stress in Peru. She examines the effect of maternal depression upon children's stress, and how this stress impacts physical growth during early life. She also investigates the link between maternal depression and children's cognitive development.

My findings build upon her analyses of these relationships. Using panel data from the Young Lives Peru survey, I find that children's reported life satisfaction and health positively associate with maternal life satisfaction and negatively correlate with maternal depression. Furthermore, maternal life satisfaction predicts whether a female adolescent smokes, while maternal depression predicts smoking behavior and misinformation on pregnancy amongst male adolescents. The analyses highlight the importance of protecting poor children against the stress caused by maternal depression and addressing maternal depression before it can generate lasting negative effects.

In the third chapter, I assess the impacts of access to ART and psychological well-being on household catastrophic health expenditure in Malawi. Like other disease-

specific treatment programs, ART functions as a form of insurance, protecting against health and financial risk for those with HIV. Higher levels of psychological well-being may also mitigate risks by boosting earnings, improving physical health, and mitigating sexual risk behavior. Using data from two rounds of Malawi's Integrated Household Survey, I find that improved access to ART leads to a reduction in catastrophic expenditure. I also find that areas with higher aggregate well-being in 2004-2005 experience lower likelihood of catastrophic expenditure, when controlling for distance to ART-providing clinics.

Taken together, these chapters broaden empirical understanding of the health outcomes associated with psychological well-being and access to ART. While several studies have explored the impacts of happiness, maternal psychological well-being as a determinant of child outcomes remains largely unexplored in developing country settings. The analysis of access to ART as a form of insurance also addresses a gap in the existing literature. Empirical evidence suggests that proximity to ART can increase labor time amongst those who do and do not have HIV/AIDS, but this analysis points to the importance of an additional benefit - protection against catastrophic spending.

Further research could build upon findings presented in this dissertation. Specifically, it could identify strategies for detecting and mitigating maternal depression in impoverished settings. Prior research has produced valuable insights on appropriate methods for tackling maternal depression in developed countries, but the interaction between poverty and mental health suggests that additional investigation is needed to understand the most effective policies for mother-child pairs living in poverty. Also, the insurance effect of disease-specific treatments, such as ART, requires further investigation. These assessments could examine the economic benefits associated with ART-providing programs and other disease-specific treatment programs in impoverished settings outside of Malawi.

Chapter I.
Psychological Well-being and Health Gains in Peru and Malawi:
A Review of the Literature

Part I: Maternal Psychological Well-being and Child Outcomes in Peru

I. Introduction

Depression, a common mental disorder known for its deleterious and lasting effects on mood, afflicts over 300 million people across the globe (WHO, 2017). Physical symptoms include headache, tiredness, loss of sleep, gastrointestinal problems, and pains in the joints, limbs, and back (Trivedi, 2004). Depressed individuals may also lose interest in the activities once enjoyed and the motivation needed to accomplish tasks both big and small (Beck et al., 1961).

These symptoms can worsen an individual's emotional and physical state, but they also present problems for the friends, family members, and employers of the depressed. For example, in a longitudinal observational study, Adler et al. (2006) find that depression predicts various dimensions of job performance, including time management and ability to perform tasks. Sadness, pessimism, and loss of interest can affect social networks by causing depressed persons to isolate themselves from friends and family members. In children and adolescents, it may cause isolation by peers (Poquiz and Frazer, 2016).

The socio-emotional, cognitive, and physical outcomes of offspring with depressed mothers help illustrate how psychological well-being impacts social networks. Challenges linked with maternal depression arise in offspring infancy and can persist into adulthood (Felitti et al., 1998; Dong et al., 2003; Dube et al., 2006). Some studies also indicate that maternal depression may correlate with certain risk behaviors in adolescence, such as substance abuse and unsafe sexual behaviors (Wickham et al., 2015; Dube et al., 2006; Sticknick et al., 2014; Hillis et al., 2001).

Many of these trends have been documented in developed countries and amongst younger children, but the association has not been thoroughly studied in impoverished

settings. Empirical research on adolescent outcomes in developing countries is also sparse. Thus, the empirical analysis in Chapter II fills an important gap; it examines maternal depression and child/adolescent outcomes in Peru, a country that is not only relatively poor, but also highly unequal in its distribution of wealth.

The literature review that follows provides crucial context for understanding why and how maternal mental health impacts child and adolescent outcomes in Peru. It assesses the mechanisms through which maternal depression and life satisfaction could impact offspring, as well as the empirical research that supports these claims. Furthermore, it provides an overview of happiness in Peru and the steps taken by the Peruvian government to improve mental health care. Taken together, these components illuminate the various ways in which maternal psychological well-being might shape children's outcomes in developing countries.

II. Literature Review

a. Psychological well-being: an overview

There are two types of psychological well-being, positive well-being, often referred to as happiness, and negative well-being, which is also referred to as depression. While depression cannot be considered the opposite of positive well-being, the causal methods by which these two types of well-being affect children's outcomes are often quite similar. Furthermore, evidence suggests that maternal happiness can have positive impacts on the health and cognitive functioning of children, while maternal depression can be detrimental to these outcomes.

i. Positive well-being

Positive well-being is typified by regular positive feelings, infrequent negative feelings, and elevated levels of contentedness with one's life (Nikolaou, 2012). It can be separated into two types of well-being: hedonic and evaluative. Hedonic well-being (also called experienced or adaptive well-being) accounts for daily mood and the positive and

negative feelings that accompany that mood. It is measured using survey questions about positive and negative feelings, such as “Did you feel happy yesterday?” (Graham and Nikolova, 2015). Evaluative well-being reflects general satisfaction with life, including satisfaction with work, relationships, and health (Stone and Mackie, 2013).

The Cantril ladder, an instrument used to assess evaluative well-being, enables individuals to examine their overall quality of life compared to others (Cantril, 1965). It asks respondents to imagine a ladder with ten steps. The first step, located at the bottom of the ladder, represents a respondent’s worst possible life, while the tenth step represents his/her best possible life. The respondent is asked to name the step on which he/she stands at this point in time (Cantril, 1965). Those who place themselves on higher steps have higher levels of evaluative well-being.

ii. Negative well-being

Depressed individuals experience aspects of negative well-being, including distress, negative mood, and hyperarousal (Clark and Watson, 1991; Diener, 2000). Their emotional symptoms may include overwhelming feelings of sadness, pessimism, helplessness, and inferiority or inadequacy. These individuals may also experience a loss of interest and drive (Beck et al., 1961). Physical symptoms may include pain in the joints, back, and limbs, tiredness, inability to sleep, loss of appetite and gastrointestinal distress (Trivedi, 2004).

Young Lives, the organization from which the data for Chapter II were obtained, asks mothers a range of questions to determine the extent and nature of their depression as they relate to these symptoms. The questionnaire is not diagnostic and cannot fully differentiate between anxiety and depression. However, it asks questions that address many of the physical and emotional symptoms described above. These include questions about physical symptoms of depression, such as whether the mother frequently feels tired, sleeps poorly, or suffers from headaches and shaky hands. It also includes questions about overwhelming feelings of sadness, such as the tendency to cry more than usual or have suicidal thoughts. Finally, it addresses aspects of engagement in one’s life and conceptions of worthiness. These include questions about loss of interest, enjoyment of

daily activities, and whether the mother feels like a worthless person.

b. Maternal Well-being and Offspring Outcomes: The Causal Mechanisms

The psychological well-being of mothers is particularly noteworthy because it can affect offspring through several mechanisms. The first mechanism through which it influences children is heritability - children with happier mothers are genetically inclined towards higher levels of well-being. Studies on twins suggest that a large component of happiness is determined by genetic make-up and that many individuals may have a happiness set-point from which they do not fluctuate significantly over the course of a lifetime (Lykken and Tellegen, 1996). Conversely, children of depressed parents may be genetically predisposed to depression (Rutter, 1990).

The second mechanism through which maternal life satisfaction influences children's outcomes is parenting practices (Harmon, 2010). A happier mother may be more sensitive and attentive to her child's needs, which helps facilitate early childhood development, while depressed mothers are less engaged with their children and less attentive to their needs. Depressed mothers may struggle to play, sing, or read with their children or to carry out the tasks needed to promote children's physical well-being, such as childproofing the home (Harmon, 2010). Furthermore, they are more likely to punish and reject their children, which can lead to anxiety, withdrawal, and conduct disorders in the offspring (MacEwen and Barling, 1991).

The third mechanism responsible for the association between maternal well-being and child outcomes is security of attachment between child and mother (Berger and Spiess, 2011). Attachment between mother and offspring plays a role in early child development because it affects the verbal and behavioral skills of the child, including language development (Van Ijzendoorn et al., 1995; Korntheuer et al., 2007; Berger and Spiess, 2011). Using data from the German Socio-Economics Panel Study, Berger and Spiess (2011) find that two and three-year-olds with happier mothers have improved verbal and motor skills. These children are also more likely to demonstrate normal socio-emotional behavior at five and six years old.

Insecure attachment caused by maternal depression contributes to child stress. High stress levels, marked by continued elevation of the hormone cortisol, put the body on a continual state of alert and can hinder growth of the child, weaken the immune system, and increase susceptibility to acute and chronic illness (McEwen, 2000; National Scientific Council on the Developing Child, 2005). Elevated stress hormones also impact emotional regulation and increase the risks of depression in children and adolescents (Field, 1998).

Each of the mechanisms described help explain the relationship between maternal well-being and child development, but it is important to note that the direction of causality could run the other way. A mother might report lower levels of life satisfaction if she fears her child is developing at a suboptimal rate. Alternatively, she could report higher levels of well-being if she believes her child is healthy. Data on children's physical well-being at the time of birth could address this possibility of reverse causality, which is why tables in the appendix include variables for children's birth weight.

c. Maternal Well-being and Offspring Outcomes: Empirical Evidence

i. Children's physical health

Common mental disorders (CMD), such as depression and anxiety, associate with higher levels of stress in parents and their children. Exposure to this stress can lead to illness and stunted growth in the children (Stratakis, 2006; Bendini, 2016). For example, in a longitudinal study of Latina mothers in San Francisco, Wojcicki et al. (2011) find that during the first two years of life, children of depressed mothers gain weight at a slower rate than children whose mothers are not depressed. Bendini (2015) finds that maternal depression in Peru hampers maternal engagement, which may contribute to worse nutritional outcomes and impaired growth during early childhood. McEwen (2007) finds that over time, persistent stress caused by maternal depression can weaken the child's immune system and increase susceptibility to acute and chronic illness.

Maternal depression can also affect children's physical health through poor parenting practices. Depression hinders parents' caretaking abilities, making it difficult

for them to provide the necessary nutrition and supervision (Lovejoy et al., 2000; Melchior et al., 2009; Harpham et al., 2005). For example, in their cross-sectional study of communities from 20 sites in Ethiopia, India, Peru, and Vietnam, Harpham et al. (2005) identify a positive relationship between maternal depression and suboptimal nutritional status of children.

Exposure to adverse childhood experiences (ACEs), such as growing up in a household in which someone has mental illness, can also predict physical health issues later in life (Felitti et al., 1998; Dong et al., 2003; Dube et al., 2009). Two retrospective cohort studies in San Diego demonstrate that ACEs increase risk for serious diseases much later in life, controlling for other risk factors. Dong et al. (2003) find that adults exposed to an ACE are 1.2 to 1.6 times more likely to contract liver disease. Dube et al. (2009) find that 64 percent of adults with autoimmune disease experienced at least one ACE. Moreover, those with two or more ACEs are more likely to be hospitalized for immune-related conditions in adulthood than those with no ACEs.

ii. Children's mental health and cognitive development

Maternal depression also impacts socio-emotional development in infants and children (Cummings and Kouros, 2009). It can affect infants by causing the mother to become intrusive or withdrawn. Intrusive mothers become hostile and inject themselves into their infant's activities, causing the infants to become angry and reject their mothers. Withdrawn mothers limit their interactions with infants and become unresponsive to infant needs. This can cause the infants to develop in a way that is more detached than infants of non-depressed mothers. For example, infants of withdrawn mothers are more likely to look away from those attempting to interact with them (Cohn and Tronick, 1989; Hart et al., 1998).

Infants of depressed mothers may also struggle with cognitive performance. For example, in his panel study of mother-infant pairs, Murray (1992) reports that infants of non-depressed mothers outperform infants of depressed mothers on object concept tasks. They are less likely to exhibit signs of insecure attachment to their mothers, as well as minor behavioral challenges. In their panel study, Murray et al. (1996) find that depressed

mothers are less sensitive to infants' experiences, leading to disturbances in mother-infant interactions, and worse infant cognitive outcomes at 18 months of age.

Evidence from developing countries corroborates the link between maternal depression and infant outcomes (Walker et al., 2007). In Barbados, maternal depressive symptoms associate with delayed infant social development, while maternal moods correlate with worse motor development in infants (Galler et al., 2000). Evidence from a cohort study in India suggests that postnatal depression predicts adverse mental development quotient scores in infants (Patel et al., 2003). In South Africa, depressed mothers are less engaged with and responsive to their infants' needs, suggesting impaired attachment between mother-infant pairs (Cooper et al., 1999).

Lower levels of responsiveness and attentiveness amongst depressed mothers continue to impact offspring into early childhood. For example, Murray et al. (1999) report that maternal depression predicts children's behavior and social adjustment at the age of five. The authors also find that children of depressed mothers are less likely to react positively to friendly approaches. Furthermore, Murray et al. (1996) find that early exposure to maternal inattentiveness and insensitivity can contribute to poor cognitive functioning at the age of five.

Bendini (2015) corroborates this link in her dissertation on maternal depression and child cognitive development in Peru. Using the Peabody Picture Vocabulary Test (PPVT) scores as a measure of cognitive development, she determines that chronic cases of depression have lasting impacts on child performance. The impacts are worse for male children, as well as children whose mothers did not complete primary school.

As the children of depressed mothers become older, they are more likely to experience common mental disorders such as depression and anxiety. In their study on the impacts of maternal mental disorders on children ages eight to 16, Hammen et al. (1987) find that even when controlling for chronic stress, children of mothers with affective disorder (especially unipolar affective disorder), perform worse in school, have higher rates of behavioral problems, and demonstrate lower levels of social aptitude. In their panel study of 220 youth ages six to 23, Weissman et al. (1987) find that children of depressed parents are at an increased risk of depression, substance abuse, suboptimal social functioning, and poor performance in school.

Depression and low self-efficacy (personal belief in how well one copes with challenges) in mothers may also lead to lower levels of self-efficacy in adolescents. Shin, Lee, and Miller-Daly's (2013) study on 93 low-income mother-adolescent pairs from metropolitan Pennsylvania, finds maternal depression can translate to poor maternal-adolescent communication. The absence of open and satisfying communication associates with higher levels of youth depression. It also predicts lower levels of self-efficacy in the adolescents, causing them to feel less confident in their competencies and abilities to positively influence others.

The effects of maternal psychological well-being can persist into adulthood (Raposa et al., 2014; Edwards et al., 2003; Anda et al., 2006). For example, in a study that follows 815 Australian youth and their mothers over a 20-year period, Raposa et al. (2014) find that maternal depression impacts social functioning and depressive symptoms in the early to mid-twenties. According to this study, "maternal depression had a significant total indirect effect on youth depression via early childhood health and its psychosocial consequences."

d. Adolescent risk behaviors: the impact of maternal life satisfaction and depression

The impact of maternal life satisfaction and depression on risk behaviors in adolescents has not been thoroughly studied in developing countries, but current research suggests maternal mental health could play a critical role in understanding substance abuse and delinquent behaviors in youth (Wickham et al., 2015; Dube et al., 2006; Sticknick et al., 2014; Hillis et al., 2001). In their study on risk behaviors amongst Canadian adolescents between the ages of 16 and 17, Wickham et al. (2015) find that maternal depression during childhood (ages six to ten) increases the risks of various suboptimal behaviors in adolescence. Adolescents of depressed parents are more likely to smoke cigarettes at a younger age, drink alcohol, abuse drugs (marijuana and hallucinogens), and engage in violent behaviors. Adolescents whose mothers display recurrent depressive symptoms are also more likely to display nonviolent delinquent behavior, such as property destruction or theft.

Research on ACEs and alcohol consumption in adolescence corroborate these findings. For example, in their retrospective cohort study, Dube et al. (2006) find that all individual ACEs, including depression or mental illness of a household member, increase risk of alcohol consumption in mid adolescence (ages 15 to 17). Amongst those who had ever consumed alcohol, individual ACEs increase the likelihood of drinking before the age of 14 by 20 to 70 percent.

Maternal depression and ACEs may also increase the risk of certain sexual behaviors in adolescence. In their multivariate analysis of at-risk boys, Sticknick et al. (2014) find that high levels of depression and low levels of nurturing in early childhood increase the likelihood of unsafe sexual behavior in adolescents. In their study of ACEs and sexual risk behaviors in women from San Diego, California, Hillis et al. (2001) find that ACEs associate with increased risk of intercourse before age 15, increased self-perceived AIDS risk, and having 30 or more sexual partners.

Positive maternal well-being can mitigate these risk behaviors in adolescents. For example, a happier, more communicative mother may be more inclined to discuss risks associated with unsafe sex. In their cross-sectional analysis of 14 to 17 years olds and their mothers, Miller et al. (1998) find that adolescents are more likely to use condoms during their first sexual encounter if their mothers have discussed the importance of condom use. This communication also encourages adolescents to practice safe sex over the course of their lifetimes.

Open communication between parents and children is critical to child development (Laursen and Collins, 2004). When parents do not attempt to communicate with their adolescent children about risks, children are more likely to turn to peers for information. This can lead to misinformation, especially about sexual norms and behaviors (Whitaker and Miller, 2000). It can also lead to sexual intercourse at a younger age. For example, in their study on the sources of sexual information and adolescent beliefs about sex, Bleakly et al. (2009) find that adolescents who learn about sex from friends, cousins, and the media are more likely to engage in sexual intercourse than adolescents who obtain their information from parents, grandparents, and religious leaders.

Several studies indicate that female adolescents may be more sensitive to the maternal depression than male adolescents (Fergusson et al., 1995; Goncalves et al., 2016). For example, Fergusson et al. (1995) follow 934 adolescents and their mothers to examine the relationship between maternal depression and rates of depression in 15 and 16-year-olds living in New Zealand. They find a positive association for female adolescents but no association for male adolescents. Goncalves et al. (2016) evaluate maternal depression and its impact on episodes of depression and anxiety in offspring during the transition into adulthood. They report positive relationships for both male and female offspring, but greater predictive power for the females. Daughters whose mothers experienced depression and anxiety are 4.6 times more likely to indicate similar symptoms at ages 18/19, 24, and 30 than daughters of non-depressed mothers.

There are several explanations for why female adolescents may be more sensitive to maternal depression. Aseltine, Gore, and Colten (1994) indicate that female children exhibit “greater vulnerability to intrafamilial stress.” Furthermore, Gilligan (1982) argues that females may be more sensitive to maternal depression because they are more inclined toward attachment and connectedness to others than males. Female children’s psychological development is more strongly associated with intimate relationships and bonding with family and peers. When this attachment is hindered by maternal depression, the female child may develop depressive symptoms (Raja, McGee, and Stanton, 1992).

e. Poverty and suboptimal child development

Numerous studies have examined impacts of maternal depression and life satisfaction on children and adolescent outcomes, but the focus is skewed towards mother-child pairs in developed countries. While the studies indicate some important trends in how maternal well-being impacts offspring, they sometimes fail to demonstrate how poverty and maternal depression interact, and how this influences outcomes. This may be problematic as rates of maternal depression are significantly higher in developing countries (Walker et al., 2007). Additional research on impoverished countries, such as Peru, could demonstrate challenges posed by poverty.

Poverty can impact children's outcomes in two ways: first, by affecting the child's development directly and second, by influencing the child's parents. Children are affected directly by risk of infections, poor nutrition, environmental toxins, and substandard academic outcomes (Phillips and Shonkoff, 2000; Center on the Developing Child, 2010; McLoyd, 1998). For example, McLoyd (1998) finds that family-level poverty, lower socio-economic status, and residing in economically disadvantaged areas each predict lower IQ scores, impaired cognitive functioning, and worse academic performance. This is partially explained by environmental factors in impoverished homes, such as exposure to lead.

Elevated stress levels also explain how poverty contributes to poor school performance and other negative outcomes in children. In a psychoneuroendocrine study of 217 children and 139 mothers, Lupien et al. (2000) find that children raised in abject poverty are more likely to present physical symptoms of chronic stress. This stress associates with worse performance on tasks that measure working memory and cognitive control.

Poverty also impacts children through its effects upon their parents. Poverty inhibits parents' ability to provide optimal childcare due to the impact of scarcity on human functioning (Mullainathan and Shafir, 2013). When an individual's mind is consumed by thoughts of scarcity, such as inadequate funds for survival, the individual cannot focus on other aspects of life.

For poor parents, this scarcity makes it more difficult to plan ahead or tend to children's needs. For example, impoverished parents are less likely to send their children to school, assist with homework, or to get their children vaccinated (Taberer, 1998; Mullainathan and Shafir, 2013; Adler et al., 2007). A study on child caregivers in Peru determines that only 46 percent of caregivers wash their hands after using the toilet. When hand-washing practices are examined by income level, the authors find that 56 percent of caregivers in the top income quartile wash their hands after toilet use, compared to 34 percent in lowest income quartile. Similar hand washing practices were identified after caregivers helped children use the toilet and before feeding children (Galiani and Orsola-Vidal, 2010).

Poor parents are also at an elevated risk for depression, making it difficult to provide adequate childcare. Bendini (2015) explains that this stems from the stress generated by poverty. Poor mothers are unable to maintain good health or achieve higher levels of life satisfaction, leading to maternal depression and impaired maternal caregiving abilities.

Additional studies help confirm this relationship between maternal depression and poverty. In their panel study on pregnant mothers in Goa, India, Patel et al. (2002) find that poverty and poor marital relationships associate with depression. In a cross-sectional study using a nationally representative stratified random sample of 8,060 American mothers, Kahn et al. (2000) find that women who fall into the lowest income quintile are almost four times more likely to report depressive symptoms than women in the highest quintile (33 percent compared to 9 percent). The emergence of these depressive symptoms can hamper maternal caregiving abilities, leading to suboptimal development among children and worse outcomes later in life (Barling et al., 1993; Scientific American, 2010).

Children of poor parents are also more likely to experience neglect and abuse, leading to adverse health conditions later in life. For example, in a study on children in the Wisconsin welfare system, Cancian et al. (2010) identify a positive relationship between low income and child abuse. Like the presence of a depressed or mentally ill household member in a childhood home, this abuse qualifies as an ACE, and can contribute to cardiovascular disease, chronic lung disease, cancer, common mental disorders, alcoholism, and substance abuse in adulthood (Felitti et al., 1998; Edwards et al., 2003).

f. Peru's health trends and infrastructure

Despite its uneven wealth distribution and a 20.7 poverty headcount ratio (World Bank, 2016), quality of life in Peru continues to improve. The government has invested in health infrastructure, including mental health infrastructure, so that all individuals have access to care. Between 1993 and 1996, the Ministry of Health's budget doubled and public health expenditure increased from USD \$1.2 billion to USD \$3 billion (Cotlear,

2000; World Bank, 1998). This prompted the expansion of public health clinics and upgrades to clinic equipment (Valdivia, 2002).

Health indicators amongst children and adults improved throughout this period of transition, and into the 21st century. The under-five mortality rate dropped from 80 out of 1,000 live births in 1990 to 15 out of 1,000 in 2016 (UN Inter-agency Group for Child Mortality Estimation, 2017). During this period, the mortality rate decreased from 148.03 per 1,000 to 95.83 per 1,000 for adult females, and from 214.4 per 1,000 to 154.3 per 1,000 for adult males (UN Population Division's World Population Prospects, 2017).

Mental health care has improved as well. By 2015, Peru had established 21 community mental health centers in six regions throughout the country, signifying a 150 percent increase in the number of centers since the Ministry of Health began its initiative to improve care (Ministerio de Salud, 2015). Each of the mental health centers provide care for the following groups: children and adolescents; adults; addicts; and those aiming to participate in or spearhead community initiatives (Ministerio de Salud, 2017).

Improved mental health regulations also facilitated advancements in mental health care. In 2015, the Government approved Law No. 29889, which aims to protect and preserve universal and equitable access to health care for individuals with mental health issues (Ministerio de Salud, 2015). The regulations ensure that psychologists and psychiatric specialists are available to patients in need of mental health care services. They also encourage medical staff to resocialize and reintegrate patients into communities and family networks (Ministerio de Salud, 2015).

Despite advancements in Peru's physical and mental health care provisions, health concerns persist. As in many developing countries, pollution causes influenza and pneumonia, which can develop into acute respiratory infections (Romieu et al., 2002). According to the Institute for Health Metrics and Evaluation, acute respiratory illness ranks as the third leading cause of death amongst children under the age of five, causing 11 percent of deaths. Amongst adults, acute respiratory illness is the number one leading cause of death, killing 17.8 thousand adults in 2012 (WHO, 2017). Overcrowding and poor access to health clinics or vaccines may contribute to these infections (Ruutu et al., 1990; WHO, 2007).

Certain health concerns in Peru disproportionately afflict adolescents. The Global Youth Tobacco Survey indicates that 10.9 percent of males and 8.4 percent of females between the ages 13 and 15 used tobacco in 2014, compared to 4.7 percent of adults aged 35 and above in 2012 (Morgan et al., 2017). Cigarette consumption remains low for the region, but the health problems caused by tobacco are well documented. Smoking contributes to chronic obstructive pulmonary disease, cardiovascular disease, and several types of cancer (Muller and Wehbe, 2008).

Teen pregnancy poses an additional health concern for adolescents in Peru. One study, which uses Young Lives survey data, reports that nearly 20 percent of young Peruvian women give birth before the age of 19 (Sanchez, 2017). The government has responded to the issue through several initiatives, such as the Extended School Day Program (Jornada Escolar Completa), a program that lengthens the school day and supports adolescents in urban areas (Sanchez, 2017). However, the proportion of teen mothers in Peru is nearly twice as high as the prevailing global pregnancy rate, suggesting that additional interventions may be appropriate (WHO, 2014).

Evidence from round four of the Young Lives Peru survey shows that many adolescents are unaware that pregnancy can result from initial sexual encounter. As previously suggested, improved communication between adolescents and parents could help mitigate sexual risk behavior in teens. When mothers initiate conversations about the importance of contraception, their children are more likely to use contraception during intercourse (Miller et al., 1998). This is why the empirical analysis accompanying this literature review examines the correlation between maternal happiness and adolescent knowledge of pregnancy risk; a happier mother could be more inclined to discuss this matter with her children.

g. Overview: Happiness in Peru

Average happiness levels in Peru continue to rise, a trend that could have enormous implications for child health and psychological well-being in the country. The 2017 World Happiness Report, which uses data on Cantril ladder scores from the Gallup World Poll, indicates that Peru ranks 12th out of 126 countries for changes in happiness.

With a 0.70 increase in average ladder score, it was one of 58 countries to show growth in happiness between 2005-2007 and 2014-2016.

Peru's average Cantril ladder score ranks 63rd in the world. Of the seven possible predictors of ladder scores, social support is most important, while GDP per capita is a close second. These findings differ from most countries surveyed, where GDP per capita is more important than social support (World Happiness Report, 2017).

Additional literature on happiness in Latin America supplements the country-specific information included in the 2017 World Happiness Report. In an analysis of the Latinobarometer poll for Latin America, Graham and Felton (2005) find that relative income is more important to individual happiness than absolute income. While average country-level incomes do not correlate with individual happiness, relative income differences do. This suggests that financial inequality may associate with lower levels of happiness in Peru.

Happiness in Latin America is further explained by social capital, which includes social trust, networks, and norms that form as a result of friendships, familial bonds, and religion. In their analysis of social capital and happiness in 18 Latin American countries between the years 2000 to 2010, Mochón Morcillo and de Juan Diaz (2016) find that happiness in Latin America positively correlates with each of the following: social relationships and participation in voluntary organizations; trust in other individuals and institutions; and community engagement. This explains why social support was the best predictor of Peru's average Cantril ladder score between 2014 and 2016.

III. Conclusions

Peru is developing at a rapid pace, across multiple dimensions. Moderate and extreme poverty rates continue to fall thanks to a growing economy, strong export sector, and expanding employment (World Bank, 2017). Since 2011, access to water and sanitation services have improved and roads in rural areas have been rehabilitated (World Bank, 2017). The government invests in hospital development and mental health facilities, which contributes to health gains (Valdivia, 2002; Ministerio de Salud, 2015). Peruvians report being happier than they were in the early 2000s: the 2017 World

Happiness Report indicates that the average Cantril ladder score increased by 0.70 between 2004-2005 and 2014-2016.

Despite this progress, some health concerns, including common mental disorders, continue to afflict large segments of the population. Data from Young Lives Peru show that upwards of 10 percent of women report seven or more depressive symptoms, a number that Bendini (2015) associates with depressive disorder. The overwhelming feelings of sadness, physical pain, loss of sleep and appetite, and gastrointestinal distress that accompany depression make this a particularly devastating disorder (Trivedi, 2004).

Maternal depression is also harmful to friends and family of the depressed, including children. In infants and children, it can impair socio-emotional and cognitive development (Cummings and Kouros, 2009). It can also worsen physical health by placing children's bodies in a continual state of alert, weakening the immune system, and stunting growth (Stratakis, 2006). In adolescents, it can lead to substance abuse, violent delinquent behaviors, and unsafe sexual behaviors (Wickham et al., 2015; Dube et al., 2006; Sticknick et al., 2014; Hillis et al., 2001).

Impacts of maternal depression are particularly acute in impoverished settings. For example, poverty exacerbates children's risk of illness and the quality of nutrition received. It also associates with elevated levels of environmental toxins and worse cognitive performance (Phillips and Shonkoff, 2000; Center on the Developing Child, 2010; McLoyd, 1998). Chronic stress serves as the channel through which poverty impacts illness and school performance (McLoyd, 1998). Environmental toxins in homes also help explain impoverished children's outcomes (Lupien et al., 2000).

For the sake of depressed mothers living in poverty and the children who suffer as a result, additional resources and training should be directed towards mental health care. Peru needs a strategy to detect and mitigate maternal depression so that the majority of children do not have to endure the challenges it creates. Research suggests that intervening in early childhood, while children's developing systems are still malleable, may be the most effective strategy for mitigating the negative effects of maternal depression. For example, the Center on the Developing Child (2009) argues that it is more challenging and time consuming to reverse damage caused by maternal depression as children become older. Interventions may include pediatric screening for maternal

depression and therapy for mothers. Country-specific intervention trials may be required to determine which initiatives are most successful in limiting the impacts of maternal depression in Peru.

Part II: Unexplained Happiness and Access to Antiretroviral Therapy in Malawi: the impacts on catastrophic health expenditure

I. Introduction

In the early 2000s, the Malawian government, in collaboration with private actors and international organizations, began to increase the number of health clinics providing antiretroviral therapy (ART), a treatment designed to slow the progression of HIV into AIDS (Jahn et al., 2016). This scale-up served as part of a collective effort to combat the HIV/AIDS epidemic as it spread throughout Southern African and other regions across the globe. Scientists, international organizations, and government actors recognized the health risk posed by this disease and worked to improve HIV research and global access to ART (Vella et al., 2012; Goliber, 2002).

The expansion of ART-providing clinics in Malawi resulted in several positive health outcomes. Specifically, it reduced new infections and improved life expectancy for the infected (Ministry of Health, 2016). It also led to mental health benefits, including reduced depression and anxiety. Individuals in HIV-endemic areas may witness friends and family members contract the deadly disease. Access to treatment can lower mortality and increase optimism, thereby improving psychological well-being of those who do not have the disease (Baranov et al., 2015).

This paper serves as a literature review for Chapter III, which analyzes another externality associated with ART expansion: catastrophic health expenditure. Access to ART-providing clinics may preserve the health of people living with HIV (PLHIV), enabling them to live longer, healthier lives in which they continue earning incomes. For example, in a South African study, McLaren (2017) determines that ART access improves labor force participation amongst black males. Empirical evidence also suggests that improved access to ART predicts increases in daily work time for HIV-

negative persons. This correlation is explained by the reductions in perceived mortality risk and the improvements to mental health described above (Baranov et al., 2015).

In protecting HIV-negative persons and PLHIV against financial risk, ART functions as a form of insurance for HIV-related risk. Its disease-specific effectiveness supports the theory proposed by Lakdawalla, Malani, and Reif (2014) that new medical advancements can provide substantial insurance value. Studies on the advantages of medical advancements do not typically include risk-reduction value (Philipson and Jena, 2005; Yin et al., 2012), but evidence on positive economic externalities associated with proximity to ART suggests that it provides enormous risk-reduction benefits.

The link between ART expansion and reduced financial risk could prove especially valuable in Malawi, where many individuals pay medical bills out-of-pocket (OOP). Social health insurance is still unavailable and private medical insurance plays only a minor role in health care financing, so OOP health payments and catastrophic spending persist. Once catastrophic health expenditure is taken into account, the proportion of Malawians living below the poverty line increases by nearly one percent (Mchenga et al., 2017).

Understanding the predictors of catastrophic spending in Malawi can shed light on how to alleviate financial risks. Some of the socioeconomic and demographic determinants have been explored (Mussa, 2015), but ART access and baseline happiness have not. Therefore, in addition to examining the impact of ART availability, Chapter III also assesses the link between higher unexplained happiness in 2004-2005 and catastrophic health expenditure in 2010-2011. The literature reviewed in this chapter outlines the evidence that could help explain this relationship.

The channels through which life satisfaction may reduce catastrophic spending include improved physical health outcomes, changes in risk behavior, and higher earnings. Happier individuals are less likely to experience negative health effects later in life, such as higher death rates or coronary heart disease (Diener and Chan, 2011; Rugulies, 2002; Kubzansky et al., 2001; Weitoft and Rosen, 2005). For example, Diener and Chan (2011) find that after controlling for baseline health and socioeconomic status, subjective well-being leads to improved longevity and physical health. Amongst the elderly, happiness correlates with small health gains, such as improved gait and walking

speed (Stephens et al., 2014). Early research on subjective well-being established this positive relationship, but causality was difficult to determine. Recent evidence using diverse methods supports the notion that subjective well-being leads to improvements in health and longevity (Diener and Chan, 2011).

Subjective well-being may also impact catastrophic expenditure through its impacts on risk behaviors. For example, Leith, Pezza, and Roy (1996) show that personal recollections of self-defeating behavior trigger negative moods and lead to risky decisions. In their study on risk behaviors amongst gay men, Kalichman et al. (1997) find that lower life satisfaction predicts unprotected sexual intercourse. Therefore, in a high HIV environment like Malawi, happiness could have significant impacts on health.

Happiness may also influence catastrophic health expenditure through its impacts on earnings. Studies suggest that elevated levels of life satisfaction in youth associate with higher earnings in adulthood. Those who are happier when they are young are more likely to graduate from college and be promoted at work (DeNeve and Oswald, 2012). Also, positive moods may predict higher levels of productivity (Oswald et al., 2009).

This literature review assesses the studies that could help explain catastrophic spending's link to happiness and ART availability in Malawi. It also outlines relevant background information on health indicators and infrastructure in the country. In doing so, it aims to clarify the findings in Chapter III and deepen knowledge of Malawi's unique health concerns.

II. Literature Review

i. Malawi's health trends and infrastructure

Malawi is a country in which GDP per capita is very low, predicting poor health outcomes (World Bank, 2016). Much of the population lives in rural areas with poor infrastructure and the economy remains highly subsistent and uncompetitive, leaving little room for income growth (Mataya, 2002). However, recent signs of economic growth, generous donor funding, and the government's commitment to health care present an opportunity for improvements to public health.

Increases in life expectancy and reductions in mortality rates indicate that some of these improvements are already taking place. Life expectancy rose from 44 in 2000 to 64 in 2015. The country fairs better than two of its neighbors, Zambia and Mozambique, where the life expectancies are 61 and 55, respectively (World Bank, 2015). Life expectancy in Malawi is only slightly lower than its third neighbor, Tanzania, where per capita income is 2.4 times higher and the average person lives until the age of 65 (World Bank, 2016; World Bank, 2015). Malawi's under-five mortality rate decreased from 122 per 1,000 live births in 2006 to 112 per 1,000 in 2010, while infant mortality dropped from 72 per 1,000 live births in 2006 to 66 per 1,000 in 2010 (WHO, 2016).

According to the Malawi Demographic and Health Survey 2010, Malawi's maternal mortality has also declined. The rate dropped from 807 deaths per 100,000 live births in 2006 to 675 deaths per 100,000 live births in 2010. This improvement can be attributed to the expansion of Malawi's health infrastructure for basic emergency obstetric care in remote areas, as well as the provision of free care to mothers and children across many of the country's health facilities (WHO, 2016). However, the maternal mortality rate is still high by regional and absolute standards (WHO, 2016). Common causes of maternal death include "hemorrhage, pre-eclampsia /eclampsia, unsafe abortion, infection, and obstructed labor." Complications from HIV/AIDS, malaria, anemia, and tuberculosis also impact maternal mortality (WHO, 2016).

The diseases that contribute to maternal mortality also afflict individuals across the general population. The World Health Organization reports that HIV/AIDS causes approximately 27 percent of deaths in Malawi, a proportion greater than the next four causes of death combined (WHO, 2016). The WHO also listed malaria and diarrheal diseases amongst the top ten leading causes of death in the country (WHO, 2016).

An additional complication is the lack of surgical facilities available in rural areas. Though 84 percent of Malawi's population is rural, the majority of surgeons reside in cities, contributing to low levels of surgical activity in district hospitals. This problem persists despite construction of new hospitals and support from the WHO to perform surgery within districts where hospitals are built (Tindall et al., 2007).

Barriers to surgical care and disease eradication persist, but the country's health systems and mortality rates show dramatic signs of improvement thanks to government

and donor funding. Financial commitments help support the interventions needed to tackle leading causes of death in the country. For example, of the USD \$314 million spent annually on interventions, USD \$21.2 million supports ART for men, USD \$32.4 million funds ART for women, and USD \$7.7 million is directed toward ART for children. Malarial interventions also comprise a large portion of cumulative intervention costs: approximately USD \$1.4 million is spent on pregnant women, USD \$9.45 million on children, and USD \$9.5 million on adults. Many of the other interventions treat diarrhea in children and adults. For example, USD \$0.2 million is spent on Cotrimoxazole for children, USD \$1.8 million on zinc as a diarrheal treatment, and USD \$3.1 million on the rotavirus vaccine (Ochalek et al., 2016).

The Ministry of Health has made a number of additional efforts to improve health care. For example, it instituted service level agreements, i.e. official commitments between service providers and clients, to improve access to medical care, particularly for the rural poor (WHO, 2016). It has also implemented a mapping system of health facilities to determine where to construct new facilities and rehabilitate old ones. The Ministry of Health hopes to further improve access for the citizens who reside in remote areas (WHO, 2016). Also, ART is free of charge for most patients in the country. There may be a small handling fee (for example, at a private clinic in Lilongwe, a bottle of medication costs approximately 500 Kwacha, or USD \$0.70 USD in 2017 dollars), but the government does not charge anyone in need of medication (Rwabukwisi, 2017). Finally, the country lacks a social insurance scheme, but health care is free at point of use in public hospitals (Mchenga et al., 2017).

ii. HIV/AIDS and ART expansion

Recent advancements in Malawi's health sector are largely characterized by attempts to combat HIV/AIDS. When the disease first appeared in the mid-1980s, efforts to contain transmission did not unfold as anticipated. HIV spread throughout many parts of the country and by the late 1990's approximately 15.3 percent of the total population and 30 percent of pregnant women were HIV positive (UNAIDS, 2017; UNAIDS/WHO, 2004). In response to the mounting global health concern, the international scientific

community increased efforts to counteract the effects of the disease (Vella et al., 2012). By the early 2000s, scientists had developed ART to suppress the virus and delay the progression of HIV into AIDS. Access to this therapy helped improve quality of life for PLHIV and lower Malawi's prevalence rate to 10.6 percent in 2016 (Ministry of Health, 2016).

Two key players, the World Health Organization (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS), helped ensure that PLHIV had access to the life-saving medicine provided by ART. Their "3 by 5" plan, which was launched in December 2003, prompted a worldwide scale-up of ART-providing clinics. Under this initiative, the total number of ART-receiving individuals across the globe increased from 400,000 in December 2003 to 1.3 million in December 2005. The total number ART-providing clinics increased from 500 sites in June 2004 to 5,100 at the end of 2005 (WHO, 2006).

The growth of ART-providing clinics was especially notable in Africa, the epicenter of the epidemic. In the first quarter of 2003, Zambia had only three ART-providing sites, but added more than 110 in the two years that followed. Botswana began with seven sites in July 2003, but had established 32 by the final quarter of 2005. The number of ART-providing clinics in Rwanda increased from 16 at the end of 2003 to 76 by September 2005 (WHO, 2006).

Malawi experienced one of the largest expansions in ART availability. Before its scale-up began, there were fewer than ten ART-providing centers in the public sector, and approximately 3,000 infected persons receiving treatment. The country contained approximately 930,000 persons living with HIV, 100,000 new infections each year, and 170,000 individuals in need of ART. Treatment centers were largely unstructured and few health care workers received the training needed to properly care for patients (Jahn et al., 2016). However, within six months of the program's launch, 19 public health facilities had begun providing ART (Jahn et al., 2016). Some of these ART-providing clinics were built specifically with the purpose of supplying ART, but the majority were integrated into existing clinics (Gorgens, 2017). Placement of clinics was decided at the country level as part of the Ministry of Health's approach to HIV prevention and treatment. Generally, this placement was needs based using localized estimates of

prevalence. In the years that followed, the number of ART-providing facilities grew rapidly, and by 31 December 2015 the country had established 716 ART-providing clinics. These clinics delivered ART to 872,567 new patients, 68 percent of whom were still alive and receiving treatment in December 2015 (Jahn et al., 2016).

The Ministry of Health and the Global Fund to Fight AIDS, Tuberculosis, and Malaria both played important roles in this ART scale-up. The government outlined its objectives to ensure adequate provisions for infected persons, including provision of long-term ART, oversight of the treatment process and outcomes on a quarterly basis, and patient compliance. Support from one major donor, the Global Fund, helped the Ministry execute a comprehensive strategy that accommodated the country's existing resources and infrastructure (Jahn et al., 2016).

The scale-up that was made possible by these actors has generated a number of positive externalities for Malawians. Access to ART reduces mortality rates amongst those receiving the treatment (Lowrance et al., 2007). It also lowers the perceived mortality risk amongst the HIV-negative (Baranov et al., 2015). Economic benefits have been documented as well. For example, Baranov et al. (2015) find that improved access to ART increases daily work time by 33 minutes for HIV-negative persons who reside within six kilometers of an ART clinic. Furthermore, it “increases daily cultivation time by 15 minutes and other production time by 12 minutes” (Baranov et al., 2015).

Despite the positive externalities associated with the scale-up, challenges to HIV/AIDS reduction still exist. For example, diagnosing and treating HIV positive men has proven difficult. Men are less likely than women to seek medical care during advanced stages of immunodeficiency and to comply with their treatment, leading to higher mortality rates in male patients (Chen et al., 2008). Another challenge is women's adherence to the Option B+, a treatment approach that offers life-long ART to all pregnant women with HIV (Gugsa et al., 2017). An observational cohort study on women receiving this treatment reports a loss to follow-up of 22 percent (Tenthani et al., 2014).

Additional impediments to implementation of HIV policy include understaffing in health clinics, inadequate supply of medication, and the illnesses that threaten the well-being of PLHIV (Jahn et al., 2016). Even in appropriately staffed clinics, health care workers may lack training on how to engage in active dialogue with their patients.

Instead, the workers rely on pill count to glean information about patients' adherence to treatment (Dasgupta et al., 2016). Furthermore, resources are allotted according to number of clinics in an area, population size, and availability of funds, rather than pervasiveness of poverty or disease (WHO, 2017).

There is also the challenge of continued cultural practices that facilitate transmission of HIV (WHO, 2016). Some areas still practice traditional cleansing rituals that mark females' transition into adulthood. As part of these rituals, parents and other family members pay an older man called a *hyena* to have unprotected sex with the young woman. Reports of HIV-positive *hyenas* have surfaced in recent years, causing concern amongst human rights groups that operate within the country (Ford, 2016).

iii. Out-of-pocket health payments and catastrophic spending

Inadequate access to ART or a patient's failure to follow his/her treatment regimen can exacerbate illness and cause financial strain (Haacker, 2004). This manifests in a combination of ways. If a wage earner with HIV becomes too ill to work or dies, then the household loses income (Wagstaff and Lindelow, 2010). The health shock caused by HIV may also contribute to income loss by increasing out-of-pocket (OOP) spending on medical treatments (Haacker, 2004). Theory indicates that risk-averse persons will attempt to save money to protect themselves against shocks (Deaton, 1992; Carroll, 1997), but in actuality, many households hold insufficient savings and assets to cope with shocks (Caner and Wolff, 2004). Therefore, the financial effects of HIV in an impoverished country, even amongst risk-averse individuals, may be particularly dire. Even if household consumption does not vary significantly after a health shock, negative consequences can result through responses that reduce long-term productive investments in human and physical capital.

This paper focuses upon a particular aspect of financial strain associated with HIV/AIDS, catastrophic health expenditure. Catastrophic spending occurs when OOP health payments account for a large portion of a household's capacity to pay (Xu, 2003). Here, capacity to pay is taken to mean a household's non-subsistence expenditure, i.e. its total consumption expenditure after subsistence needs, such as food, have been met. Total

consumption expenditure is used to calculate this variable because unlike income, which can vary when exposed to shock, it is likely to be smoothed over time (Xu et al., 2007).

The threshold at which health expenditure qualifies as ‘catastrophic’ differs by study, and can range from five to 40 percent of the household’s capacity to pay. A higher threshold may be used when households face extreme poverty (Xu, 2003). For example, Xu (2003) sets the threshold of health payments at 40 percent of ‘capacity to pay.’ He finds that for most low and medium-income countries, the proportion of households with catastrophic health expenditures at this threshold is five percent or less. (For example, 2.29 percent of households in Zambia and 0.03 percent in South Africa are catastrophic spenders.)

Catastrophic spending is problematic because it is pushing approximately 100 million people into poverty worldwide (WHO, 2015). In Malawi, between 0.73 and 9.37 percent of the households encounter catastrophic spending, depending on the size of the threshold used (Mchenga et al., 2017). Once catastrophic spending is taken into account, an additional 0.93 percent of Malawians fall below the poverty line. This finding is consistent with other studies on the impoverishing effects of catastrophic spending (Dorjdagva et al., 2016; Kien et al., 2016; Li et al., 2012).

These studies demonstrate that catastrophic spending provides an important measure of health shocks’ economic impact at the household level, but there are several limitations to the approach. First, catastrophic spending fails to account for households that are unable to pay their medical bills. These households are forced to forgo treatment and experience worse health outcomes and lower levels of welfare as a result. Additionally, Gertler and Gruber (2002) find that earnings losses in Indonesia have a greater impact on living standards than health expenditures. Despite these limitations, catastrophic spending provides useful insights into the relationship between health shocks and their economic consequences.

iv. Catastrophic health expenditure: prevention and mitigation

There are several strategies that may be used to prevent catastrophic spending. One approach is universal health insurance, which can help cover the costs of medication

and private providers, and encourage patients to seek medical care before their conditions worsen. Encouraging early preventive action is important because it helps save lives and money (Comfort, Duflo, and Banerjee, 2016). Insurance schemes may also provide options to prepay for health care, ensuring that households are not subjected to sudden and unexpected bills (Xu et al., 2005).

In practice, however, certain drawbacks accompany universal health insurance schemes. For example, in their assessment of the National Health Insurance Scheme (NHIS) in rural Ghana, Powell-Jackson et al. (2014) do not identify any overarching health gains for those who are covered by the insurance. While free care lowers catastrophic spending and leads to improvements amongst those with anemia, overall health gains are not observed. Furthermore, Agyepong et al. (2016) report that Ghanaians covered by this insurance plan continue to pay some medical bills themselves, which has discouraged the uninsured from enrolling in the program.

The majority of studies on health insurance examine the obstacles to full insurance and the government's role in overcoming them. However, medical technologies that target specific diseases may provide a preferred form of insurance against financial risk like catastrophic spending. This is because the dissemination of that technology can generate measurable health gains (Lakdawalla, Malani, and Reif, 2014). This form of insurance has not been thoroughly assessed, but Lakdawalla, Malani, and Reif (2014) suggest that it could provide greater value than universal health care. For example, ART, the new medical technology designed to combat HIV/AIDS, reduces mortality, but also helps PLHIV lead healthier lives. This allows for continued employment, which may boost income and mitigate high out-of-pocket payments. Availability of ART also contributes to increased labor time amongst HIV-negative persons by augmenting happiness and reducing perceived mortality risk (Baranov et al., 2015).

Lakdawalla, Malani, and Reif (2014) refer to this as the insurance value of medical innovation. Some advanced medical treatments are expensive, but those that function properly also reduce risk associated with illness (Philipson and Zanjani, 2013). Traditional evaluations of medical technologies assess cost-effectiveness, but fail to account for this risk-reducing capability. In areas with imperfect health insurance and

high prevalence of disease, like Malawi, medical technologies can play an important role in combating illness and lowering risk.

For households that lack preventive options, like disease-specific treatment programs, coping strategies may be employed to deal with the effects of health shocks. These strategies can help households cover costs and continue to meet basic needs (Snel and Staring, 2001). They include a range of tactics, internal or external to the household. External strategies may include borrowing from friends and family, the receipt of small loans (microcredit), or government support. Internal strategies may include use of savings, reduced consumption, altered labor activities (such as migration to a city with greater job opportunities), or sale of assets (Snel and Staring, 2001).

v. Happiness in Malawi: An overview

The second portion of the empirical analysis in Chapter III examines whether likelihood of catastrophic health expenditure differs according to unexplained happiness in 2004-2005. The average Cantril ladder score in Malawi was 3.97 in 2017. The country ranked 136th out of 155 countries worldwide and 29th out of the 44 African countries surveyed. Unlike Peru, its score did not improve between 2005-2007 and 2014-2016; instead, it dropped by 0.39 points (World Happiness Report, 2017). The report indicates that one factor contributing to the low score was lack of trust in former President Joyce Banda, who was charged with corruption (World Happiness Report, 2017; AlJazeera, 2017).

Hinks and Davies (2009) use data from approximately 11,000 households in the 2004-2005 Malawian Integrated Household Survey (IHS) to identify additional factors that characterize life satisfaction in the country. For example, they find gendered differences in happiness levels; men are more likely than women to select the lowest happiness score available. This is supported by findings on gender and well-being across the world. Graham and Chattopadhyay (2013) find that women are generally happier than men, with the exception of several low-income countries. However, in Malawi, the story becomes complicated when marital status is taken into account. Among those Malawians who are widowed or separated, females are less happy than males, suggesting that the

dissolution of a marital union creates vulnerability for females. Finally, Hinks and Davies (2009) find that females in polygamous relationships are less satisfied than those who are not, while Muslim men in polygamous relationships are happier.

Hinks and Davies (2009) also determine that happiness in Malawi is characterized by geographic location. A slightly higher proportion of urbanites report being “very unsatisfied”, 28.21 percent compared to 23.86 percent of those living in rural areas. However, urbanites have a higher average satisfaction score, with only 14.23 percent indicating that they are “unsatisfied,” compared to 41.25 percent in rural areas. This finding is consistent with Easterlin et al.’s (2011) cross-country analysis on urban-rural differences in subjective well-being. In many developing countries, urbanites have higher happiness levels due to higher incomes and better educational and job opportunities.

Hinks and Davies (2009) explain that happiness in Malawi is also tied to wealth. Those living in extreme poverty are more likely to report that they are “very unsatisfied,” “unsatisfied,” or “neither satisfied nor unsatisfied” than those in moderate poverty. This is consistent with findings on the link between wealth and life satisfaction: as individual income rises within a country, so does reported well-being (Easterlin, 1974).

Finally, Hinks and Davies (2009) report the correlation between religion and reported happiness. Findings indicate that individuals who belong to traditional pre-colonial religions are more likely to report that they are “very unsatisfied” or “unsatisfied” than Muslims.¹ Research on the general association between religion and happiness is somewhat contradictory; while much of the literature suggests a positive relationship between religious belief and life satisfaction, research that uses the Depression–Happiness Scale (which contains questions on feelings of depression and happiness) consistently identifies no link between the two variables (Lewis and Cruise, 2007).

Education also predicts reported happiness levels in Malawi. Using 2005 data, Hinks (2009) finds that those who completed primary school are happier than those with no education. However, those who completed secondary school have lower happiness

¹ According to the CIA World Factbook 2015 estimates, approximately 26.9 percent of Malawians identify as Protestant, 18.1 percent as Catholic, 41.9 percent as other Christian, 12.5 percent as Muslim, 0.1 percent as other, and 0.5 percent as none.

levels than other groups, a finding that is inconsistent with the literature (Graham and Hoover, 2006). One possible explanation for this trend is that educated Malawians expect higher earnings and a better quality of life. Only 10.4 percent of female Malawians attended secondary school between 2008 and 2012 (UNICEF, 2016), and it is conceivable that well-educated women expected to secure higher paying jobs after completing school. If and when these expectations were not met, they may feel less satisfied with their lives than those who did not complete secondary school.

Age also correlates with reported happiness in Malawi. Selin and Davey (2012) find that the relationship between age and life satisfaction in Malawi is non-linear, and reaches its low point at approximately 46 – 55 years of age before beginning to increase. This is consistent with most happiness research on age, which indicates that the relationship between happiness and age follows a U-shaped curve; it begins to drop in the early 20s, reaches a low point in middle age, and then begins to climb again (Graham and Pozuelo, 2017). Frey and Stutzer (2002) explain that most individuals begin to accept their lives as they age because the gap between expectations and reality narrows. Also, older workers may have secure employment while younger workers feel uncertain about their career paths.

Finally, Hinks (2009) investigates the link between crime and happiness amongst heads of households in Malawi. Using 2005 cross-sectional data, the author finds that crime is a gendered issue. For male respondents, a physical attack negatively affects happiness. For females, it is only the subjective feeling of insecurity that negatively associates with well-being.

There is also a more general relationship between happiness and crime, one in which low and high levels of crime do not seem to affect self-reported happiness as much as moderate levels of crime. This finding is documented within nations in southern Africa. For example, Moller (2005) reports that in South Africa, it is only when residents have to endure the uncertainty of an attack (in a moderately crime-ridden area), that happiness is affected. Once crime becomes an expected part of life, its influence wanes.

vi. Happiness and catastrophic spending

This section examines the channels of effect through which happiness influences catastrophic health expenditure. One of these channels is improved physical health. Higher levels of happiness correlate with improved longevity and a number of health gains, even among diseased populations. Another channel is income augmentation. Research shows that happier people earn more later in life, which could mitigate catastrophic spending. Finally, happiness affects risk-taking behavior and therefore future health status. This could also impact catastrophic spending.

Positive psychological well-being is linked to several improvements in physical health, including reduced likelihood of coronary heart disease. In a meta-analysis of 11 studies, Rugulies (2002) reports that depression predicts cardiovascular disease in healthy individuals. In a longitudinal study of 1,306 adults in the Greater Boston area, Kubzansky et al. (2001) find that optimism reduces likelihood of heart attack and coronary heart disease. In a separate longitudinal study of 34,511 Swedish participants ages 16 to 74, Weitoft and Rosen (2005) report that higher baseline anxiety and nervousness associate with ischemic heart disease.

Health benefits from psychological well-being also contribute to increased longevity. In their meta-analysis of longitudinal studies on subjective well-being and mortality, Diener and Chan (2011) confirm that happier people live longer. In a longitudinal study of elderly English men and women, Steptoe and Wardle (2011) examine the link between death rates and positive affect, the feeling or experience of being happy. They find that respondents in the highest third of positive affect have a death rate of 3.6 percent, while those in the middle group have a death rate of 4.6 percent, and those in the lowest third have a death rate of 7.3 percent.

Specific studies have examined these associations for PLHIV. For example, in their meta-analysis of 35 studies, Chida and Steptoe (2008) analyze the correlation between positive psychological well-being and reduced mortality in healthy populations and PLHIV. They find that positive well-being correlates with reduced mortality in both groups. Schneiderman et al. (2001) find that certain interventions that target happiness could improve immune function in PLHIV. These studies imply that happiness could

help predict fewer health concerns in HIV-endemic settings, reducing the need for costly medical care that contributes to catastrophic spending.

Recent research on the link between happiness and health supports these findings while expanding upon the channel of effect. In her book *Happiness for All?*, Graham (2017) finds that one driver of happiness (and subsequent positive health outcomes) is that optimistic people are more likely to have faith in their futures. They are more likely to make investments in their health and education.

Household earnings may also explain the relationship between reported happiness and catastrophic spending. For example, DeNeve and Oswald (2012) use sibling fixed effects to examine whether happier individuals become better off financially. They find that adolescents and young adults who report higher life satisfaction or positive affect earn higher salaries later in life. Those with higher reported happiness are more optimistic and extroverted, increasing their likelihood of completing college and being promoted at work.

Additional studies verify the link between positive subjective well-being and higher earnings and/or productivity. For example, Graham et al. (2004) find that a one-point increase in unexplained happiness in Russia in 1995 led to a three percent increase in income in 2000. Diener et al. (2002) identify a positive relationship between cheerfulness amongst elite college students and income 19 years later. Oswald et al. (2009) find that positive mood predicts productivity for tasks performed in a laboratory setting. These findings support the idea of a “happiness advantage” (Shawn, 2010), the notion that happier individuals are more likely to succeed professionally (Lyubomirsky et al., 2005).

Finally, a relationship exists between life satisfaction and sexual risk behaviors that could have important implications for catastrophic spending in high HIV environments like Malawi. For example, in their cross-sectional study of college students in Southern Ethiopia, Zerihun, Birhanu, and Kebede (2013) find that life satisfaction is negatively correlated with youth risk behaviors. Higher levels of life satisfaction associate with greater likelihood of condom usage during sexual encounters and lower likelihood of having multiple sexual partners. In their study of 430 homosexual men and predictors of sexual risk behavior, Kalichman et al. (1997) find that those who engage in

unprotected intercourse outside of their relationships are more likely to have lower levels of life satisfaction. This tendency toward risky sexual behavior amongst those with lower levels of happiness could lead to greater risk of HIV/AIDS, and higher probability of catastrophic health expenditure.

III. Conclusions

For a poor country, Malawi's health outcomes show remarkable signs of progress. Increases in donor support and government commitment to improved health care enable individuals to access the treatment they need. Falling mortality and HIV/AIDS rates and rising life expectancy reflect these advancements (WHO, 2016). However, the HIV/AIDS rate still hovers at 10.6 percent for adults, an issue that threatens health and financial security (Ministry of Health, 2016). High OOP payments continue to push some households deeper into poverty (Mchenga et al., 2017). Malawians affected by catastrophic health expenditure have to rely upon savings, support from friends and family, donor aid, and other strategies to cope with the financial devastation.

Improved access to ART-providing clinics may mitigate illness and the catastrophic spending that forces households into poverty and it may also increase hope through the agency that access provides. ART is generally free (or nearly free), which helps provide an affordable approach to stalling the advancement of disease (Siegfried et al., 2010). Also, access to care could enable individuals who do and do not have HIV to continue working and earning incomes (McLaren, 2017). Furthermore, this access predicts improvements in mental health for HIV-negative persons (Baranov et al., 2015). By contributing to positive economic externalities and lowering the financial risk associated with HIV/AIDS, ART functions as a type of insurance.

Catastrophic spending may also be linked to baseline happiness levels. The studies reviewed in this chapter suggest that individuals with higher levels of happiness earn more, an effect that could allow for greater resilience to high OOP medical payments (DeNeve and Oswald, 2012). Higher levels of life satisfaction also correlate with improved physical health outcomes, such as longevity and reduced risk of heart

problems, as well as reduced likelihood of engaging in risky sexual behaviors. These channels could lead to lower medical bills in the long term.

By presenting literature on the potential predictors of catastrophic spending in Malawi, Part II of this chapter frames the quantitative analysis conducted in Chapter III. It clarifies why baseline happiness and availability of ART may associate with lower levels of catastrophic spending. In doing so, it helps justify actions taken to improve life satisfaction and access to disease-specific medical technologies. It also encourages additional research on the role of these determinants in countries afflicted by poverty.

Chapter II.

Maternal Psychological Well-being and Children's Outcomes in Peru:

A quantitative analysis

I. Introduction

This chapter examines a predictor of children's outcomes that has not been thoroughly studied: maternal psychological well-being. In their review of the literature on this topic, Berger and Spiess (2009) find that several studies have examined disparate predictors of children's outcomes. These include objective economic measures, including maternal employment (Baum, 2003; James-Burdumy, 2005; Ruhm, 2008), economic resources (Taylor et al., 2004), and formal childcare (Elder and Lubotsky, 2009; Magnuson et al., 2007). Other studies have assessed the impacts of stressful or traumatic events, such as neglect or abuse, on children's physical health and social, emotional, and cognitive functioning (Dong et al., 2003; Dube et al., 2009).

Some of the aforementioned predictors, such as maternal employment, do not significantly impact child development, but maternal life satisfaction plays an important role in children's outcomes (Nunner-Winkler, 2000). Literature indicates that higher levels of maternal well-being associate with improved social and verbal skills and cognitive development in children (Nikolaou, 2012; Berger and Spiess, 2011; Korntheuer et al., 2007). Conversely, maternal depression can negatively impact children's stress levels, overall mental and physical health, and educational outcomes (Cummings and Kouros, 2009; Fergusson, 1995).

Several studies have examined these trends amongst mother-child pairs in developed countries, but literature on maternal well-being in developing countries is comparatively scarce. For example, prominent studies on maternal depression and child indicators have been carried out in the United States, Canada, and New Zealand, while studies on positive maternal well-being have been carried out in the United Kingdom and Germany (Cummings and Kouros, 2009; Paediatric Child Health, 2004; Fergusson, 1995; Nikolaou, 2012; Berger and Spiess, 2011). Understanding the causal link in developing countries is more difficult due to limited availability of longitudinal data on both

maternal well-being and child outcomes (Harpham et al., 2005).

Studies on mother-child pairs in developed countries have generated valuable insights, but literature continues to affirm the importance of wealth in predicting child outcomes. This has created a gap in academic understanding of how maternal depression and poverty interact to affect children. Poverty exposure in childhood can introduce an array of developmental challenges, which may confound the impacts of maternal depression. This impoverishment increases children's risk of exposure to infection, poor nutrition, and environmental toxins, and can also impair cognitive functioning and educational outcomes (Phillips and Shonkoff, 2000; Center on the Developing Child, 2010; McLoyd, 1998). More information is needed on how maternal psychological well-being interacts with poverty to affect children residing in impoverished areas.

This literature gap extends to the adolescents of depressed mothers living in poverty. Empirical studies on the link between maternal well-being and adolescent outcomes are less prevalent than those examining younger children, and seldom assess subjects living in developing countries. Additional evidence is needed on how maternal psychological well-being shapes adolescent risk behaviors in impoverished settings.

This paper addresses these literature gaps using the Young Lives Survey in Peru datasets, which cover a range of demographic and socioeconomic factors amongst mothers and children living in Peru. It investigates empirically the effects of maternal life satisfaction and depression on child health and life satisfaction in Peru. The hypothesis is that maternal depression impairs parenting abilities and security of attachment between mother and child, leading to worse health and life satisfaction scores, while higher levels of maternal well-being have the opposite effect. The paper also assesses the impact of maternal life satisfaction and depression on two adolescent risk behaviors: smoking and misinformation on pregnancy. The hypothesis is that maternal depression predicts poor mental health outcomes in adolescents (such as lower self-esteem), which may increase likelihood of smoking. Also, maternal depression interferes with communication between mother and adolescent, leading to misinformation about pregnancy risk. These negative impacts are made worse by poverty. Findings from these analyses provide meaningful insights into a developing country whose economic, health, and life satisfaction indicators continue to improve as the 21st century progresses.

II. Variables

Independent variables:

- i. Maternal life satisfaction: measured using Cantril ladder score, ranging from one to nine
- ii. Maternal depression: measured using a depression score, ranging from zero to 20

Dependent variables:

- i. Child life satisfaction: measured using Cantril ladder score, ranging from one to nine
- ii. Child health: measured on a scale from one to five, with one being very poor general health and five being very good general health
- iii. Binary indicator variable for misinformation on pregnancy: Respondents answered “true,” “I don’t know,” or “false” in response to the following statement: “*A woman cannot get pregnant the first time she has sex.*” For this variable, “true” and “I don’t know” are coded as one and “false” is coded as zero
- iv. Binary indicator variable for whether adolescents smoke

III. Data

This paper draws upon the Young Lives Survey in Peru, an international research project conducted by the University of Oxford and core-funded by the UK Department for International Development between 2001 and 2007. Young Lives collects data as part of an ongoing initiative to evaluate the evolution of childhood poverty in four developing countries: Peru, Ethiopia, India, and Vietnam. The four waves of survey rounds have been carried out over the course of the children’s lives, starting in infancy for the younger cohort. They consist of a child questionnaire (for an older and younger cohort in the case of Peru), a household questionnaire, and a community questionnaire.

Young Lives data are publicly available except for some components, such as the

Self Reporting Questionnaire (SRQ20), which is used to assess depression in mothers. Confidential access to this depression data was provided for the purposes of this study. The SRQ20 is a screening (case-finding) tool included in the Young Lives Survey and recommended by the World Health Organization. It contains 20 yes/no questions with a reference period of the previous 30 days. It has acceptable levels of dependability and validity for developing countries like Peru. It is not diagnostic and cannot completely distinguish between anxiety and depression, but due to the interconnectedness of the two conditions and their ability to undermine maternal care, the data are valuable and appropriate for the purposes of this study.

Data on maternal life satisfaction are found in the core questionnaires. The questionnaires use Cantril ladder scores to measure this life satisfaction. The Cantril ladder allows for assessment of overall quality of life compared to others, meaning that it measures the evaluative well-being of the mothers.

The data collected on children are found in the core questionnaires and cover a range of demographic and socioeconomic factors. They capture various aspects of children's lives, including early development, wealth index of the household, and whether the child received assistance from social programs. The child questionnaires are distributed to older and younger cohorts and are very similar in composition. However, the older cohort survey conducted in round four also consists of a self-administered questionnaire, which covers questions about drug use, sexual practices, and experiences with domestic and gang-related violence.

The survey respondents reside in 20 districts that were randomly selected throughout Peru (ten in the highlands, seven on the coast, and three in the jungle.) Within each of the chosen districts, Young Lives selected 100 households with at least one child born between 2001 and 2002. Children from the top five percent of districts (as determined by the district poverty ranking) were excluded from the project, as Young Lives is concerned with children in lower socio-economic households (Wilson et al., 2006). Despite this focus on poorer children, the data mirrors the general Peruvian population in a number of indicators (Bendini, 2015).

Some of the survey participants were unable to provide feedback for all four rounds, but the attrition rate between rounds was fairly low by international standards

(Outes-Leon et al 2011). The study retained approximately 87 percent of older cohort members between rounds one and four, and 90 percent of younger children. Furthermore, in their study on early nutrition and cognition amongst the younger participants, Outes-Leon et al. (2011) determined that the attrited households in the Peruvian Young Lives survey are “not systematically different from non-attrited households based on observable characteristics.” The authors determine that the potential biases caused by attrition amongst the younger cohort are negligible (Outes-Leon and Dercon, 2008).

There are currently four separate waves of available data. The initial survey was conducted in 2002 and included younger children between five and 22 months in age, as well as older children between the ages of six and 12. At the time of the follow-up in 2006-2007, index children were between four and six years old, while older children were between the ages of 10 and 15. During the third round in 2009, younger children were between seven and eight years of age, while members of the older cohort were between 13 and 17. Finally, the fourth round of data, collected in 2014 and archived in 2016, included younger children between 11 and 13 and older children between the ages of 17 and 22.

This paper analyzes health and happiness outcomes amongst the children, as well as adolescent behaviors amongst the older cohort. Approximately 2,000 younger children and 700 older children enrolled in round one, with a total attrition rate of approximately 10 percent by round four. The first two models focus on younger cohort children present in rounds three and four, for whom health and life satisfaction data were available. The adolescent models use maternal data from round three and adolescent data from round four.

IV. Methods and Mechanisms

The findings on child life satisfaction and health are obtained using ordinary least squares regressions (OLS); this method is the most common linear model approach in the social sciences. It also allows for straightforward interpretation of results.

OLS findings are confirmed using ordered logit regressions. There are several limitations to OLS, and it is advisable to confirm size and magnitude of findings using

alternative methods. For example, OLS assumes respondent scores of ‘one’ and ‘nine’ are comparable and that the intervals between respondents’ scales are even. However, the exact distance between Cantril ladder response values is unknown; respondents believe a score of ‘one’ is highly unfavorable and a score of ‘nine’ is highly favorable, but they may not view the gap between scores of ‘one’ and ‘two’ as equivalent to the gap between scores of ‘eight’ and ‘nine.’

OLS assumes that the Cantril ladder scores are linear and cardinal in nature (so that a score of eight is twice that of four, for example), while ordered logit simply predicts the probability that a respondent will be in a particular ordinal category. In practice, the regression results using both approaches tend to be virtually identical, but OLS coefficients can be more easily interpreted and compared. Therefore, OLS findings are presented in the body of the text and the ordered logit findings used to confirm these results can be found in the appendix.

For models examining adolescent risk behaviors, dependent variables are dichotomous, meaning that logit regressions are more appropriate than OLS. This is because logit models force predictions to fall within the 0 - 1 interval. Using the dichotomous dependent variables, they determine the probability of a certain outcome. The reader can pinpoint the factors that lead to the likelihood of the outcome occurring, such as the probability of being an adolescent smoker.

There are several ways to compute the effect of an independent variable when using the logit model. This paper examines the mean marginal effects, which report the effect of a one-unit change in each covariate on the probability of obtaining the outcome. The marginal effects are found by computing the derivative of the conditional mean function with respect to the covariate. Logit coefficients are included in the appendix.

i. Reported Maternal Depression (Model I) and Maternal Happiness (Model II): the impacts on child happiness and health

Pooled OLS and fixed effects are used to assess the impacts of self-reported maternal depression and life satisfaction on reported child life satisfaction and health. For these models, data from survey rounds three and four are used. Ordered logit regressions

are reported in the appendix. Using these methods, the econometric specifications are:

$$Y_{tij} = \beta_0 + \beta_1 D_{tij} + \beta_2 X_{tij} + \beta_3 \lambda_{ij} + \varepsilon_{tij} \quad (I)$$

$$Y_{tij} = \beta_0 + \beta_1 L_{tij} + \beta_2 X_{tij} + \beta_3 \lambda_{ij} + \varepsilon_{tij} \quad (II)$$

Where Y_{tij} denotes *either* the child Cantril ladder score or general health score for child i , from mother j , in time t . In model I, D_{tij} captures the impact of maternal depression score, i.e. the number of affirmative responses to 20 questions about depressive symptoms. The parameter of interest, β_1 , measures the impact of maternal depression on child reported life satisfaction or health. In model II, L_{tij} captures maternal Cantril ladder score, a measure of life satisfaction, on a scale from one to nine.

All regressions incorporate a vector of demographic and community controls, X_{tij} . This controls for factors that may influence parental investments in children such as maternal education², wealth index (which is based on housing quality, access to services, and consumer durables), urban dummy, job loss, and whether the child's father lives at home. Paternal involvement is a necessary control because evidence indicates that non-depressed fathers may be able to buffer the impacts of maternal depression on infant interaction behavior (Hossain et al., 1994). The model also includes covariates for child age and whether the child is ethnically indigenous, as both of these factors can influence psychological well-being and health (Montenegro and Stephens, 2006).

The regressions also examine impacts by child gender, as some studies find that female children are more sensitive to maternal depression than males (Aseltine, Gore, and Colten, 1994; Gilligan, 1982). Finally, the models also include λ_{ij} to account for unobserved characteristics fixed over time that affect children's health status. The variable ε_{tij} is a random, idiosyncratic error term.

Unobserved factors may impact households between rounds and drive maternal depression and children's outcomes. To deal with this possibility, an instrumental variable (IV) approach is used in the maternal depression model (model I) to account for

² Maternal education is separated into the following categories: no education, some primary school, completed primary school, some secondary school, completed secondary school, some technical/pedagogical school, completed technical/pedagogical school, some university, completed university, completed master's degree.

any potential omitted variable bias. The variable used is the percent of mothers experiencing maternal depression within the mother's community.³

Several steps are taken as part of the instrumental variable approach. First, the reported maternal depression score is regressed on all covariates, including the instrumental variable. This is important because one of the conditions for an instrumental variable to be valid is that it must strongly correlate with the variable being instrumented, i.e. the reported maternal depression score. Furthermore, the coefficient for "percent of depressed mothers in the community" must be strongly significant. Finally, the exclusion restriction must be met, meaning that there cannot be an additional variable driving both community maternal depression and child health and happiness. To account for this exclusion restriction, the model also controls for the percent of people within the given community who have lost their jobs.

There are two potential mechanisms through which the instrumental variable may affect maternal mental health. First, higher levels of community depression may increase the likelihood of a mother's depressive symptoms, as evidence indicates that people are more susceptible to depression when surrounded by depressed individuals (Haeffel and Hames, 2014). Secondly, the proportion of depressed mothers may indicate whether there is an additional external factor driving maternal depression, such as the weather in that community (Rosenthal et al., 1984).

Regression models presented in the appendix also control for the possibility of reverse causality using children's birth weight.⁴ If a child's poor health triggers maternal depression, then findings would be misleading. Therefore, the models control for birth weight to ensure that suboptimal infant health does not drive maternal well-being. In their longitudinal study of mother-child pairs in the United States, Singer et al. (1999) confirm that mothers of children with very low birth weights experience greater stress, even after the child has reached three years of age. Their finding corroborates evidence from cross-sectional studies on the link between infants with very low birth weight and maternal

³ The percent of mothers experiencing depression in the community is not used as an IV for models that deal with maternal happiness because the IV does not strongly correlate with the variable being instrumented, i.e. maternal happiness.

⁴ This variable is only included in the appendix tables because many data for birth weight are unavailable. The inclusion of this variable reduces the number of observations in each model.

depression (Blumberg, 1980; Pederson et al., 1987).

ii. Maternal Depression (Model III) and Maternal Happiness (Model IV): the impacts on adolescent smoking behavior

The models that investigate adolescent outcomes, such as smoking habits and misinformation on pregnancy, do not allow for fixed or random effects, as adolescent data are limited to one survey round. Logit regressions are used to assess the impact of maternal life satisfaction and depression in round three (2009-2010) on adolescent smoking habits in round four (2013-2014). The econometric specifications of these models are:

$$Y_{tij} = \beta_0 + \beta_1 D_{1tij-1} + \beta_2 X_{2tij} + \beta_3 X_{3tij} + \varepsilon_{tij} \quad (\text{III})$$

$$Y_{tij} = \beta_0 + \beta_1 L_{1tij-1} + \beta_2 X_{2tij} + \beta_3 X_{3tij} + \varepsilon_{tij} \quad (\text{IV})$$

Where Y_{tij} is a dummy variable for whether an adolescent smokes in round four (2013-2014), for adolescent i , from mother j , in time t . Model III examines the impact of maternal depression on this outcome while model IV examines the impact of maternal life satisfaction. In model III, D_{1tij-1} captures the impact of maternal depression score in round three (2009-2010). In model IV, L_{1tij-1} captures the maternal Cantril ladder score in round three (2009-2010).

In both models, X_{2tij} accounts for individual characteristics that could increase likelihood of smoking, including physical health, anxiety, and alcohol consumption. X_{3tij} denotes the additional circumstances that could influence smoking habits, such as wealth index, maternal educational attainment, whether friends smoke, and whether parents smoke. These controls are included based on controls used in previous studies on adolescent smoking. For example, in their longitudinal study of low socioeconomic status (SES) middle-schoolers in New York City, Epstein et al. (1999) find that social influences from friends and family impact whether adolescents smoke cigarettes. Furthermore, in a longitudinal cohort study of adolescents in Sweden, Joffer et al. (2014) identify the following predictors of smoking: gender (with females being more likely to

smoke), a favorable outlook on drugs and alcohol, low self-esteem, poor health, worse “family mood”, and lower parental education. While Young Lives does not have data on self-esteem and “family mood”, the models can control for alcohol consumption, whether friends and parents smoke, adolescent gender, reported health, and maternal education.

As an instrumental variable, the maternal depression model controls for the percent of mothers experiencing maternal depression in the mother’s community. This helps address any omitted variable bias and control for unobserved factors that may drive maternal depression. Finally, the models include the random error term, ε_{ij} .

iii. Maternal Depression (Model V) and Maternal Happiness (Model VI): impacts on misinformation on pregnancy

The final two models use logit regressions to examine the impacts of reported maternal life satisfaction and depression on adolescent knowledge of reproductive health. Specifically, they determine whether an adolescent mistakenly believes (or does not know) that a woman cannot become pregnant the first time she has sex. Maternal depression and life satisfaction data are from round three, while adolescent outcome data are from round four. The econometric specifications of these models are:

$$Y_{ij} = \beta_0 + \beta_1 D_{1ij-1} + \beta_2 X_{2ij} + \beta_3 X_{3ij} + \varepsilon_{ij} \quad (V)$$

$$Y_{ij} = \beta_0 + \beta_1 L_{1ij-1} + \beta_2 X_{2ij} + \beta_3 X_{3ij} + \varepsilon_{ij} \quad (VI)$$

Where Y_{ij} is a dummy variable for whether the adolescent believes a woman cannot become pregnant the first time she has sex, for adolescent i , from mother j , in time t . In model V, D_{1ij-1} captures the number of maternal depressive symptoms experienced in round three (2009-2010), on the scale from zero to 20. In model VI, L_{1ij-1} captures maternal Cantril ladder score in round three (2009-2010).

Here, X_{2ij} controls for individual characteristics that may affect reproductive health knowledge, such as educational attainment, overall health, and alcohol consumption. The variable X_{3ij} controls for additional characteristics that could affect reproductive health knowledge. Specifically, it controls for wealth index, maternal

educational attainment, whether the adolescent's father lives at home, and abuse within the household. Wickham et al.'s (2015) model on maternal depression and adolescent risk behavior informs the inclusion of covariates that address maternal education and wealth. Thompson et al. (2008) identify single-parent households as a predictor of teen pregnancy, and Gökçe et al. (2007) find that family violence is a predictor amongst Turkish teens.

The maternal depression model in the appendix also includes the instrumental variable to control for the rate of maternal depression in the community. As mentioned, the variable deals with any omitted variable bias and controls for unobserved characteristics that may influence maternal depression. Finally, both models include the random error term, ε_{tj} .

V. Literature

Although related, the positive and negative components of psychological well-being are disparate constructs (Karademas, 2007). For example, evaluative positive well-being is illustrated by satisfaction with life, i.e. satisfaction with work, relationships, and health (Stone and Mackie, 2013). Hedonic positive well-being is defined by mood and daily experiences (Graham and Nikolova, 2015). These characterizations contribute to a more complex understanding of positive well-being than the absence of reported negative mood or depressive symptoms (Clark and Watson, 1991).

Furthermore, some aspects of negative well-being cannot be captured by understandings of positive well-being. Negative well-being deals with feelings of distress, negative mood, and hyperarousal, which may occur in response to anxiety and altered arousal responses (Clark and Watson, 1991; Diener, 2000). One facet of this negative well-being is depression, and the physical and socio-emotional symptoms with which it associates.

Despite independent characterizations of positive and negative well-being, the causal methods by which they affect child outcomes are often quite similar. For example, maternal depression may cause insecure attachment between child and mother, impairing the neural pathways needed for normal early child development and healthy brain

functioning. Insecure attachment also increases stress in the child and leads to adverse physical and socio-emotional outcomes (McEwen 2000; National Scientific Council on the Developing Child 2005; Field, 1998). Happier mothers may be better equipped to provide the continuous and responsive care needed for secure attachment. They are able to communicate and bond with their children, which may link to lower stress levels and improved child outcomes (Berger and Spiess, 2011).

Maternal psychological well-being (both negative and positive) may also affect children through additional channels. One such channel is heritability: children with happier mothers are genetically predisposed to higher levels of well-being (Lykken and Tellegen, 1996), while children of depressed parents are genetically predisposed to depression (Rutter, 1990). Maternal well-being also influences children's outcomes through parenting practices (Harmon, 2010). A happier mother may be more attuned to the needs of her child, while a depressed mother may be disengaged or overly intrusive.

There are a number of child outcomes associated with maternal psychological well-being, some of which are physical. For example, children of depressed mothers may experience stunted growth and illness (Stratakis, 2006). They may also suffer from physical ailments in adulthood, such as heart, liver, and lung disease, cancer, and skeletal fractures (Felitti et al., 1998). A retrospective cohort study of adults in San Diego, California, finds that adverse childhood experiences (ACEs), such as maternal depression, increase risk for immune-related conditions later in life (Dube et al., 2009).

Maternal depression also impacts socio-emotional and cognitive development of children. For example, depressed mothers may become intrusive or withdrawn from infant children. Intrusive mothers may inject themselves into their infant's activities, causing the infants to become angry and reject their mothers, while disengaged mothers become less responsive to their infant children, causing insecure attachment between mother and child (Cohn and Tronick, 1989; Hart et al., 1998). Insecure attachment is deleterious to emotional development, and can lead to worse cognitive performance (Murray, 1992).

This stands in contrast to the impact of positive maternal life satisfaction on social functioning and subjective well-being of children. Using the two-stage least squares method, Nikolaou (2012) finds that higher levels of maternal life satisfaction contribute

to improved social skills and fewer behavioral problems in young German children. Household income would have to increase by approximately £50,632 (approximately USD \$82,000 in 2012 dollars) to compensate for the effect of a 1-point reduction in maternal life satisfaction on child social skills.

Childhood exposure to maternal depression may influence social and behavioral outcomes in adolescence and adulthood. For example, Hammen et al. (1987) find that children of mothers with chronic depression are more likely to experience behavioral issues, perform poorly in school, and struggle in social situations. Many of these problems persist into adolescence and adulthood (Raposa et al., 2014; Edwards et al., 2003; Anda et al., 2006).

Maternal depression may also increase the incidence of adolescent risk behaviors. For example, in a study on adolescent risk behavior in Canada, Wickham et al. (2015) find that maternal depression during childhood (ages six to ten) increases the risk of several suboptimal behaviors in adolescence. These include smoking cigarettes at a younger age, alcohol and drug (marijuana and hallucinogens) abuse, and violent behavior.

Maternal depression may also increase sexual risk behavior in adolescence. In their multivariate analysis of at-risk boys, Sticknick et al. (2014) find that early childhood experience with parental depression increases the risk of unsafe sexual behavior in teens. In their study of ACEs (including depression) and sexual risk behaviors in women from San Diego, California, Hillis et al. (2001) find that ACEs correlate with increased likelihood of intercourse before the age of 15, increased self-perceived AIDS risk, and having 30 or more sexual partners.

These outcomes differ sharply from the effects of higher maternal life satisfaction. Happier mothers generally have better communication skills, allowing them to interact with their children in a way that mitigates risk behaviors. For example, in their cross-sectional analysis of mothers and their adolescent children, Miller et al. (1998) find that condom use during first sexual encounter is higher amongst teens whose mothers have discussed the importance of contraception. This open communication also encourages safe sex over the course of an adolescent's lifetime.

Economic deprivation complicates the effects of maternal life satisfaction on child outcomes. It can disrupt child development by increasing the risk of infection and environmental toxins and by contributing to suboptimal nutrition. It can undermine the well-being and capabilities of parents by reducing the funds needed for survival (Phillips and Shonkoff, 2000; Center on the Developing Child, 2010; McLoyd, 1998).

The income–achievement gap further highlights the association between poverty and child outcomes (Evans and Schamberg, 2008). For example, in a study of 1,253 children in grades two to seven, Pungello et al. (1996) find that low income negatively correlates with academic achievement. Heckman (2006) finds that the average standardized test score for children ages six to twelve increases with household income.

The effects of chronic stress help explain this link between impoverishment and child indicators. Evans et al. (2011) determine that childhood poverty exposes children to stressful environments in which they encounter various psychosocial and physical demands. This exposure can hinder developmental and adaptive capabilities, such as attention, memory, and language skills. Moreover, in an analysis of chronic physiological stress, Evans and Schamberg (2008) find that the longer a child lives in poverty, the worse his/her working memory in early adulthood. Exposure to poverty between birth and 13 years of age increases allostatic load - the wear and tear on the body that builds in response to chronic stress. These increases in allostatic load during childhood damage working memory in young adulthood.

Poverty also impacts children through its effects on parents. This is because scarcity of wealth and resources can negatively influence human functioning (Mullainathan and Shafir, 2013). When scarcity consumes ones' thoughts, it becomes difficult to concentrate upon other matters, such as caregiving. With a 2016 poverty rate of 20.7 percent, Peru still struggles with this scarcity. However, the country is also experiencing rapid economic growth and Peruvians continue to escape poverty (World Bank, 2017). Advancements in health care, such as improved access to hospitals and mental health facilities complement these gains (Valdivia, 2002).

Average life satisfaction has risen alongside economic growth, a trend that could signify important reductions in maternal depression. According to the 2017 World Happiness Report, Peru ranks 12th out of 126 countries for positive changes in happiness.

Also, with a 0.70 increase in average Cantril ladder score between 2005-2007 and 2014-2016, it was one of only 58 countries to experience an increase in its average happiness score.

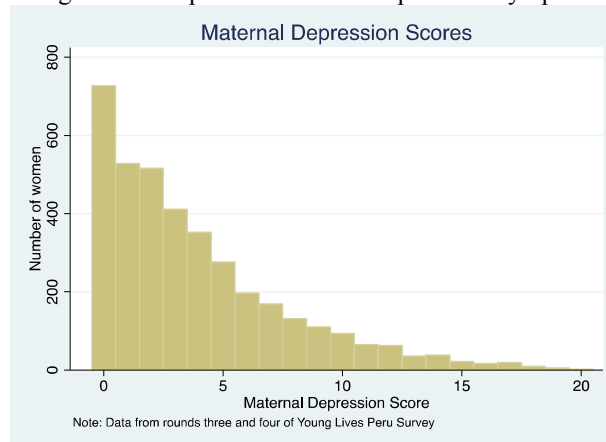
VI. Results

i. Descriptive Statistics

This section provides descriptive statistics on variables of interest included in the models. Figure 2.1 displays the distribution of maternal depression scores across rounds three and four. The depression score is the sum of the depressive symptoms reported by the respondent, and can range from zero to 20.

This distribution of maternal depressive symptoms in Figure 2.1 is right skewed, with an average score of 3.81 and a standard deviation of 3.82. When broken down into quartiles, 74.73 percent of respondents reported scores between a zero and five, 18.2 percent between six and ten, 5.83 percent between eleven and fifteen, and 1.25 percent between sixteen and twenty.

Figure 2.1. Reported Maternal Depression Symptoms

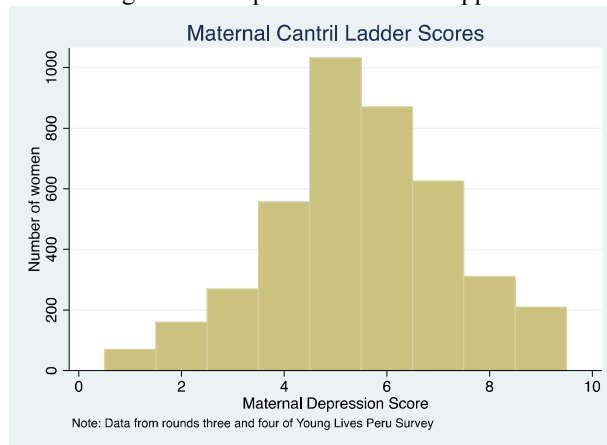


Some of the depressive symptoms received a higher proportion of affirmative responses than others. For example, when survey rounds were combined, 59.91 percent of women reported feeling nervous, tense, or worried and 41.09 percent reported feeling

unhappy. However, only 4.40 percent reported that they had considered ending their lives and 5.14 percent felt as though they were worthless. The percentage of women experiencing physical symptoms of depression also varied. For example, 39.58 percent reported headaches, while 12.80 percent indicated that they suffered from poor digestion and 8.48 percent reported shaking in their hands.

Figure 2.2 shows the distribution of maternal Cantril ladder scores for rounds three and four. The distribution is closer to normal, with a mean score of 5.50 out of nine and a standard deviation of 1.76. Approximately 12.15 percent of respondents reported Cantril ladder scores between one and three, 59.95 reported scores between four and six, and 27.92 percent reported scores between seven and nine.⁵

Figure 2.2. Reported Maternal Happiness



Descriptive statistics on children’s health outcomes also provide useful context. The average reported health score for children in rounds three and four was 3.7 out of five. The most common categories are ‘good’ health, with 57.75 percent of responses and ‘average’ health with 33.50 percent. Comparatively, 0.17 percent report ‘very poor’ health, 1.42 report ‘poor’ health, and 7.15 report ‘very good’ health. The distribution for children’s Cantril ladder score is left skewed, with an average score of 6.75. Approximately 6.42 percent of respondents report happiness scores between one and three, 36.37 percent between four and six, and 57.22 percent between seven and nine.

⁵ For a summary of statistics, see Table 2.0 in appendix.

Adolescent outcomes in round four of the survey also provide useful information. Approximately 47 percent of adolescents report that they smoke. Of the adolescents surveyed, 27.16 percent smoke rarely, 12.05 percent smoke at least once a month, 6.79 percent at least once a week, and 1.02 percent smoke daily. Also, approximately 41.38 percent of these adolescents believe a woman cannot become pregnant the first time she has sex or do not know whether or not she can become pregnant.

ii. Results: Child health score

Table 2.5 reports the pooled OLS and fixed effects results for the model that examines maternal Cantril ladder score and child health. It also lists the controls included in the model.⁶ Findings include a positive, statistically significant link between the maternal ladder score and child health. When pooled OLS is used, a one-unit increase in maternal ladder score corresponds with a 0.0527 increase in the child health score.⁷

When child fixed effects are used to control for unobserved time-invariant characteristics, the findings remain statistically significant.⁸ A one-unit increase in maternal ladder score corresponds with a 0.0340 increase in child health score. Fixed effects results are also statistically significant when examined by gender. (See Tables 2.7 and 2.8 in appendix for gender-specific pooled OLS and fixed effects results.)

Table 2.9 in the appendix reports pooled OLS and child fixed effects results when the lagged happiness variable is used. The inclusion of the lag specification does not impact the direction of the maternal happiness coefficient or statistical significance. Lagged maternal happiness from the previous round also has a statistically significant and positive association with child health.

⁶ Table 2.5.a. includes a control for birth weight and can be found in the appendix.

⁷ Ordered logit results can be found in Table 2.6 in appendix. Marginal effects are available from author upon request.

⁸ Indigenous ethnicity is dropped from the fixed effects models because it remains consistent across time.

Table 2.5: Maternal Happiness and Child Health

Child Health	(1) Pooled OLS	(2) Fixed effects
Maternal Happiness	0.0527*** (0.00641)	0.0340*** (0.00948)
Child age (months)	-0.000649 (0.00299)	0.00389 (0.0191)
Dad at home	0.0226 (0.0338)	-0.0176 (0.0703)
Wealth index	0.220*** (0.0796)	-0.107 (0.160)
Urban dummy	0.0177 (0.0323)	0.00755 (0.119)
Maternal education	0.0103 (0.00677)	-0.0467 (0.0833)
Child Indigenous	0.0481 (0.0779)	-
Job Loss	-0.0430 (0.0522)	-0.117* (0.0680)
Percent Job loss	0.0934 (0.216)	0.00961 (0.474)
Round	-0.0123 (0.144)	-0.217 (0.904)
Observations	3,065	3,065
R-squared	0.040	0.014

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.10 shows the pooled OLS and fixed effects results for the models that examine maternal depression and child health score.⁹ It also includes the fixed effects results using the instrumental variable, percent of depressed mothers in the community. When pooled OLS is used, a one-unit increase in maternal depression score corresponds with a 0.0267 decrease in child health score, a finding that is statistically significant.¹⁰

When fixed effects are used, a one-unit increase in maternal depression score corresponds with a 0.0219 decrease in child health score. Findings are also negative and statistically significant when the instrumental variable is used. The third column of Table 2.10 shows that a one-unit increase in maternal depression is linked to a 0.138 decrease in child health score when the instrumental variable is included in the fixed effects model.

⁹ Table 2.10.a. in the appendix includes the birth weight of the child.

¹⁰ Ordered logit results can be found in Table 2.11 in the appendix. Marginal effects are available from the author upon request.

Table 2.10: Reported Maternal Depression and Child Health

Child Health	(1) Pooled OLS	(2) Fixed Effects	(3) FEIV
Depression Score	-0.0267*** (0.00298)	-0.0219*** (0.00492)	-0.138* (0.0712)
Child age (months)	-0.00115 (0.00299)	-0.000779 (0.0196)	-0.00192 (0.0185)
Dad at home	0.0118 (0.0339)	-0.0319 (0.0715)	-0.136 (0.112)
Wealth index	0.288*** (0.0798)	-0.0455 (0.159)	0.110 (0.213)
Urban dummy	0.0213 (0.0321)	0.0380 (0.109)	-0.00291 (0.134)
Maternal education	0.00986 (0.00673)	-0.0506 (0.0832)	-0.0871 (0.0979)
Child Indigenous	0.0349 (0.0778)	-	-
Job Loss	-0.0402 (0.0534)	-0.108 (0.0680)	-0.0935 (0.0849)
Percent Job loss	0.193 (0.213)	-0.248 (0.286)	-0.520 (0.389)
Round	0.0391 (0.144)	0.0375 (0.930)	0.220 (0.888)
Observations	3,064	3,064	3,064
R-squared	0.044	0.019	0.019

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The impact of maternal depression remains negative when the sample is separated by gender. (See Tables 2.12 and 2.13 in the appendix.) Furthermore, the inclusion of the lag specification does not impact the direction of the effect or statistical significance. (See Table 2.14 in appendix.)

iii. Results: Child Happiness

Table 2.15 shows the pooled OLS and fixed effects results for maternal ladder score and child ladder score (referred to as maternal happiness and child happiness, respectively).¹¹ It also indicates findings for the controls included in the model. When the pooled OLS estimation is used, a one-unit increase in maternal ladder score corresponds with a 0.230 increase in child ladder score, a finding that is statistically significant.¹²

¹¹ Table 2.15.a. in the appendix includes birth weight of child.

Table 2.15: Maternal Happiness and Child Happiness

Child Happiness	(1) Pooled OLS	(2) Fixed Effects
Maternal Happiness	0.230*** (0.0203)	0.241*** (0.0339)
Child age (months)	-0.0145 (0.00957)	-0.0402 (0.0594)
Dad at home	0.00506 (0.106)	0.303 (0.275)
Wealth index	-0.246 (0.251)	-0.0199 (0.573)
Urban dummy	0.176* (0.102)	0.247 (0.375)
Maternal education	0.0706*** (0.0213)	-0.0186 (0.219)
Child Indigenous	-0.0751 (0.243)	-
Job Loss	0.166 (0.165)	0.0544 (0.245)
Percent Job loss	1.035 (0.682)	1.892 (1.849)
Round	0.189 (0.461)	1.386 (2.817)
Observations	3,037	3,037
R-squared	0.071	0.074

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

When fixed effects are used, a one-unit increase in maternal ladder score corresponds with a 0.241 increase in child ladder score. Results are also statically significant when the effect is examined by child gender. (See Tables 2.17 and 2.18 in the appendix.) A lagged maternal happiness variable is included in Table 2.19 in the appendix, and positively correlates with child happiness, but is not statistically significant. Its inclusion does not impact the direction, magnitude, or statistical significance of the finding in Table 2.15.

Table 2.20 reports the pooled OLS, fixed effects, and fixed effects with instrumental variable results for the model that examines reported maternal depression and child ladder scores.¹³ Using pooled OLS, a one-unit increase in depression score corresponds with a 0.0327 decrease in children's ladder score.¹⁴

¹² Table 2.16 in the appendix lists ordered logit findings. Marginal effects are available from the author upon request.

¹³ Table 2.20.a. in the appendix includes the child's birth weight.

Table 2.20: Reported Maternal Depression and Child Happiness

Child Happiness	(1) Pooled OLS	(2) Fixed Effects	(3) FEIV
Depression Score	-0.0327*** (0.00961)	-0.0218 (0.0172)	-0.0221 (0.227)
Child age (months)	-0.0119 (0.00974)	-0.0362 (0.0612)	-0.0354 (0.0711)
Dad at home	0.0440 (0.109)	0.333 (0.281)	0.279 (0.317)
Wealth index	-0.0155 (0.257)	0.149 (0.587)	-0.0560 (0.636)
Urban dummy	0.146 (0.103)	0.232 (0.401)	0.0215 (0.430)
Maternal education	0.0877*** (0.0217)	-0.000730 (0.241)	0.0547 (0.302)
Child Indigenous	-0.139 (0.248)	-	-
Job Loss	0.0631 (0.172)	0.102 (0.245)	0.100 (0.257)
Percent Job loss	1.655** (0.686)	-0.452 (0.908)	-0.237 (1.316)
Round	0.0857 (0.470)	1.254 (2.908)	1.125 (3.404)
Observations	3,036	3,036	2,664
R-squared	0.036	0.038	0.038

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

When time-invariant unobserved characteristics are controlled for using fixed effects, a one-unit increase in ladder score corresponds with a 0.0218 decrease in child ladder score. However, when fixed effects are used, the p-value is above 0.10, so results are not statistically significant. The effects are also negative when the birth weight and instrumental variables are included (see Table 2.20.a. in appendix). Finally, they remain negative when the lagged maternal depression variable is used (see Table 2.24).

iv. Results: Whether an Adolescent Smokes

Table 2.25 shows the relationship between maternal ladder score and whether an adolescent smokes, using mean marginal effects. Here the mean marginal effects are reported for the full sample, males, and females. This is because the literature suggests

¹⁴ Table 2.21 in the appendix lists ordered logit findings. Marginal effects are available from the author upon request.

that female smoking habits may be more sensitive to maternal depression.

Table 2.25: Maternal Happiness and Whether Adolescent Smokes

Adolescent Smokes	(1) All	(2) Male	(3) Female
Maternal Happiness	-0.0186 (0.0152)	0.0149 (0.0213)	-0.0349** (0.0159)
Maternal Education	-0.0136 (0.0148)	-0.0338* (0.0199)	0.00864 (0.0158)
Wealth Index	-0.197 (0.181)	0.233 (0.225)	-0.532*** (0.204)
Child Health	0.0420 (0.0434)	0.0513 (0.0575)	0.00806 (0.0465)
Anxiety	0.0926* (0.0530)	0.0612 (0.0758)	0.0394 (0.0571)
Friends Smoke	0.264*** (0.0531)	0.291*** (0.0878)	0.109* (0.0614)
Parents Smoke	-0.00137 (0.0763)	0.0543 (0.101)	0.0537 (0.0875)
Adolescent Drinks	0.388*** (0.0467)	0.355*** (0.0869)	0.292*** (0.0552)
Observations	478	247	231

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Findings indicate a negative relationship for females: a one-unit increase in the maternal ladder score associates with a 3.49 percent decrease in the likelihood of a female adolescent smoking. The effect is also negative for the full sample, but results are not statistically significant. Findings for males are statistically insignificant and positive, which may be explained by the small sample size and the fact that there are only two male adolescents whose mothers scored a ‘one’ on the Cantril ladder. Coefficients (found in Table 2.26 the appendix) tell a similar story: there is a negative, statistically significant relationship between female adolescent smoking behavior and maternal life satisfaction.

Table 2.27 shows mean marginal effects for the model that examines maternal depression and adolescent smoking. Findings reveal that a one-unit increase in maternal depression associates with a 1.86 percent increase in the probability that an adolescent smokes. Results are statistically significant for the full sample and males, but just above the threshold of statistical significance for females.

Table 2.27: Reported Maternal Depression and Whether Adolescent Smokes

	(1)	(2)	(3)
Adolescent Smokes	All	Male	Female
Maternal Depression	0.0186** (0.00722)	0.0252** (0.0105)	0.0115 (0.00726)
Maternal Education	-0.0109 (0.0148)	-0.0225 (0.0201)	0.00763 (0.0159)
Wealth Index	-0.226 (0.181)	0.166 (0.229)	-0.521** (0.205)
Child Health	0.0462 (0.0435)	0.0576 (0.0577)	0.00702 (0.0465)
Anxiety	0.0962* (0.0532)	0.0512 (0.0758)	0.0471 (0.0576)
Friends smoke	0.269*** (0.0532)	0.321*** (0.0891)	0.119* (0.0612)
Parents smoke	-0.00478 (0.0761)	0.0446 (0.101)	0.0369 (0.0852)
Adolescent drinks	0.386*** (0.0471)	0.355*** (0.0885)	0.281*** (0.0557)
Observations	478	247	231

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.21 in the appendix reports the coefficients for the logit model. Results are statistically significant and positive for the full sample and males. The p-value for the female sample is slightly above the threshold of statistical significance. There is a loss of statistical significance when the two-step least squares regressions are used to introduce the instrumental variable (Table 2.29 in appendix). Unobserved differences between adolescents and children could explain this effect, as could small sample size. Despite the finding, there is a negative link between maternal depression and adolescent smoking.

Overall, these findings suggest that maternal life satisfaction and depression have an important relationship with adolescent smoking behavior. Higher maternal ladder scores associate with lower likelihood of smoking amongst female adolescents, while higher maternal depression scores correlate with greater likelihood of smoking for the full sample. Research indicates that female adolescents may be more sensitive to maternal mental health, but it appears this is only the case with maternal life satisfaction.

v. Results: Misinformation on Reproductive Health

Table 2.30 uses mean marginal effects to report the impact of maternal life satisfaction on whether an adolescent believes a woman cannot become pregnant the first time she has sex. Findings are not statistically significant. Here, adolescent and maternal educational attainment are the only statistically significant predictors of whether an adolescent (from the full sample) believes a woman cannot become pregnant the first time she has sex; A higher level of educational attainment decreases the probability of being misinformed. Table 2.31 in the appendix reports the logit coefficients for this model. The size of the coefficient is 0.006, but results are not statistically significant.

Table 2.30: Maternal Happiness and Misinformation on Pregnancy

Misinformation on Pregnancy	(1) All	(2) Male	(3) Female
Maternal Happiness	0.00127 (0.0145)	-0.0256 (0.0220)	0.0110 (0.0189)
Maternal Education	-0.0336** (0.0155)	-0.00508 (0.0224)	-0.0573*** (0.0209)
Wealth Index	-0.181 (0.171)	-0.404* (0.231)	0.108 (0.247)
Dad at home	0.0692 (0.0552)	0.0963 (0.0797)	0.0884 (0.0743)
Adolescent drinks	0.0187 (0.0538)	0.0868 (0.0790)	0.00900 (0.0718)
Adolescent health	-0.00443 (0.0401)	-0.0700 (0.0589)	0.0455 (0.0524)
Family abuse	0.0799 (0.0633)	0.0689 (0.104)	0.107 (0.0791)
Adolescent Education	-0.0389** (0.0172)	-0.00553 (0.0234)	-0.0879*** (0.0237)
Observations	389	206	183

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.32 reports the relationship between maternal depression and whether an adolescent incorrectly believes a woman cannot become pregnant the first time she has sex. Mean marginal effects indicate that a one-unit increase in maternal depression score corresponds with 1.55 percent increase in the probability of an adolescent believing a woman cannot become pregnant the first time she has sex. Results are statistically significant at the 95 percent confidence interval. Table 2.33 in the appendix reports the

logit coefficients for this model. Results are also statistically significant for the full sample and male adolescents.

Statistical significance is lost when the instrumental variable, percent of depressed mothers in the community, is introduced to models (See Table 2.34 in the appendix). This could be the result of unobserved differences between children, but it is likely due to small sample size. Despite the finding, there is a positive link between maternal depression and misinformation on pregnancy.

Table 2.32: Reported Maternal Depression and Misinformation on Pregnancy

Misinformation on Pregnancy	(1) All	(2) Male	(3) Female
Maternal Depression	0.0155** (0.00658)	0.0199** (0.00907)	0.0126 (0.00919)
Maternal Education	-0.0297* (0.0154)	0.00126 (0.0225)	-0.0580*** (0.0205)
Wealth Index	-0.220 (0.170)	-0.518** (0.228)	0.105 (0.247)
Dad at home	0.0707 (0.0543)	0.0799 (0.0784)	0.0944 (0.0733)
Adolescent drinks	0.0214 (0.0535)	0.0967 (0.0780)	0.0102 (0.0713)
Adolescent health	-0.000433 (0.0397)	-0.0592 (0.0581)	0.0472 (0.0523)
Family abuse	0.0617 (0.0635)	0.0626 (0.103)	0.0873 (0.0814)
Adolescent Education	-0.0360** (0.0171)	-0.00437 (0.0232)	-0.0843*** (0.0240)
Observations	389	206	183

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

VII. Discussion and Policy Implications

These findings corroborate empirical evidence on the detrimental impacts of maternal depression. They demonstrate that maternal depression’s effects are not confined to those who are ill; they also affect those under the mother’s care. For example, maternal depression negatively influences child health and life satisfaction. It can impact children later in life by increasing the probability of adolescent risk behaviors. Conversely, having a happier mother leads to improved child and adolescent outcomes.

Interventions are needed to address maternal mental health and protect children against the harmful effects of maternal depression. If designed and implemented properly, they could curb maternal depression and facilitate physical and psychological development in the next generation. Failure to do so could result in a missed opportunity to benefit society as a whole (Center on the Developing Child, 2009).

Literature suggests that any policy aimed at tackling maternal depression should take place early in a child's life because the remediation efforts become more expensive and less impactful as time goes on (Center on the Developing Child, 2009). Children's developing systems are highly malleable in early life, but become less so as a child reaches adolescence. Some studies indicate that interventions in families with older children can have positive effects on child development outcomes (National Research Council and Institute of Medicine, 2009; Beardslee, 2008), but it becomes much more difficult to reverse damage if interventions occur beyond early childhood (Greenough and Black, 1992).

Pediatric screening is the best method for detecting maternal depression while the mothers' children are still young. The American Academy of Pediatrics confirms that pediatricians can screen mothers for depression and inform them about effective treatment and follow-ups. This responsibility falls on pediatricians because maternal interaction with health care workers is often limited to children's doctor appointments.

There are several challenges associated with these pediatric screenings. Heneghan et al. (2000) argue that pediatricians do not always recognize depressive symptoms in mothers. In many cases, they lack the knowledge and training to properly diagnose depression. Furthermore, the training required to accurately screen for maternal depression requires substantial financial resources. Financial restraints may force some countries to finance more pressing policy schemes. In addition, because of financial constraints, pediatricians know that nothing can be done to treat maternal depression, thereby weakening their incentive to screen for the disorder.

If funds are available, trained pediatricians may be able to evaluate depressed mothers and prescribe antidepressant medications. In a randomized placebo controlled study, sertraline administered to non-depressed women who had previously experienced post-partum depression (PPD) helped prevent the recurrence of depression and lengthen

time to relapse (Wisner et al., 2004). However, in a separate placebo controlled study that administered the antidepressant nortriptyline, no difference was found in reoccurrence or rate of relapse. Approximately 25 percent of subjects in both groups relapsed during the 20-week study period (Wisner et al., 2001). Additional research is needed to determine whether antidepressants adequately reduce the time to relapse of PPD.

Several studies indicate that interventions focused on interactions between mothers and their children can also mitigate the negative impacts of maternal depression (Center on the Developing Child, 2009). For example, a yearlong program that provided psychotherapy to toddlers and their parents finds that interventions facilitated cognitive development amongst toddlers of depressed mothers (Cicchetti, Rogosch, and Toth, 2000). Another program targeted at mother-infant pairs of lower socioeconomic status, finds daily support in the form of communication coaching and improved educational opportunities for mothers can improve child outcomes (Field, 2002).

There are some limitations to these intervention trials. First, program designers cannot determine the degree to which the intensity of these programs affects outcomes. Also, the high cost of intensive interventions may hinder implementation. Furthermore, previous interventions have utilized a limited number of subjects; reproducing successful models and taking them to scale could prove challenging. Finally, the persistence of additional common mental disorders in maternal subjects confounds the process of designing programs that address unique mental health issues (Center on the Developing Child, 2009).

Despite these shortcomings, interventions that focus on parent-child interactions are more successful in facilitating child development than interventions that focus exclusively on adults. For example, Forman et al. (2007) find that treatment for maternal depression may improve maternal stress in the short term (six months), but it does not prevent worse outcomes in children in the long term (eighteen months). Using a group of depressed women assigned to interpersonal psychotherapy and a non-depressed group, the authors find depressed mothers in the treatment group still rated their children worse in behavioral issues, attachment security, and temperament than non-depressed mothers.

In a review of the recent evidence on this subject, Nylén et al. (2006) confirm that reducing maternal depressive symptoms may fail to protect children against the stress

generated by depression. Treatments must focus on interactions between mother and child to safeguard the children against potentially deleterious effects. The authors report that “mother-infant psychotherapies and home-based interventions” are usually effective in mitigating the harmful outcomes for children of depressed mothers.

VIII. Conclusions and future research

i. Conclusions

A great deal is known about how income and family structure influence children’s outcomes (Dahl and Lochner, 2012; Hill et al., 2010), but comparably little is known about the role of maternal well-being (Nikolaou, 2012). This paper deepens academic understanding of this relationship. It does so by providing empirical evidence on how maternal depression and life satisfaction influence offspring in impoverished areas of Peru. While many studies have explored the impacts of maternal life satisfaction and depression in the developed country context, few have examined mother-child pairs in developing countries, and fewer still have studied impacts on adolescents.

This paper shows the impacts in Peru, a developing country. Maternal life satisfaction, as measured using the Cantril ladder score, positively associates with improved outcomes in children. An increase in Cantril ladder score corresponds with higher reported health and life satisfaction in offspring. Greater maternal life satisfaction also decreases the likelihood of adolescent smoking in females. However, it does not have a statistically significant impact on adolescent understanding of pregnancy risk.

Results also demonstrate a statistically significant correlation between reported maternal depression and outcomes of children and adolescents. Specifically, an increase in reported maternal depression corresponds with a decrease in reported child health and life satisfaction. It also correlates with increased likelihood of adolescent smoking and misinformation on pregnancy risk amongst male adolescents.

There are some limitations to these findings. For example, mothers’ depressive symptoms are reported and not clinically diagnosed. Clinical psychologists might interpret the mothers’ symptoms differently, and classify certain reported symptoms as

more or less severe than others. Furthermore, the sample includes impoverished and semi-impoverished Peruvians, but not those in the top five percent of earnings. Inclusion of wealthier Peruvians could yield different results.

Despite these limitations, findings are robust and confirm the need for public investment in prevention and mitigation of maternal depression. Successful interventions will follow several guidelines, including early intervention. Programs designed to alleviate maternal depression alone may improve mothers' moods, but are unlikely to permanently improve child outcomes. Instead, programs should address child-mother interaction, perhaps in the form of communication coaching. They should occur early in the children's lives when physical and socio-emotional well-being are still malleable.

These interventions could contribute to significant progress in mitigating the detrimental impacts of depression, but many developing countries lack the means to implement them (Patel et al., 2002). Public and private funds are directed elsewhere because costs are high and resources scarce. However, Peru has begun to recognize the importance of mental health care; it has increased the number of mental health centers in recent years and improved regulations designed to protect and assist those struggling with mental health issues. This is an important step toward combating maternal depression.

Additional progress will include pilot studies that follow the aforementioned guidelines and improved information on how stress interacts with poverty to affect children and adolescents. This research could guide policies that target the challenges experienced by youth in this unique setting. Doing so could secure improved outcomes for Peru's next generation and benefit society as a whole.

ii. Suggestions for future research

Additional empirical research could use the most recent round of Young Lives Peru data, collected in the spring of 2017, to build upon this study. Assessments could generate insights on how maternal psychological well-being affects children's health and life satisfaction as the children advance into young adulthood. Findings will contribute to academic understanding of the interaction between poverty and maternal well-being, as well as the literature on long-term effects of adverse childhood events.

Research using this round of data could also generate knowledge on the link between maternal depression and adolescent risk behaviors. This might include assessments of the link between maternal depression and crime, as crime could create negative spillovers within communities. A positive association between the variables could strengthen the justification for spending public resources on combatting maternal depression.

Future research that uses Young Lives data could also address the importance of aspirations in determining future outcomes. In a recent article, Graham (2017) finds that in the United States, poor whites report high levels of desperation, stress, and anger than their black and Hispanic counter-parts. Lack of hope amongst this group is linked to a rise in premature mortality, which can be explained by increased rates of suicide, drug and alcohol poisoning, and stalled progress against lung cancer and heart disease. Conversely, mortality rates have fallen amongst groups with higher rates of optimism about their futures, such as blacks and Hispanics. While the explanations for these trends are complex, it appears that desperation leads to premature death and may also erode hope amongst poorer, white, middle-aged Americans.

Graham (2017) also explains that the role of hope could be especially important for impoverished populations in developing countries. In these settings, individuals with greater optimism are significantly more likely to invest in their futures. They are more inclined to invest in their education and health, and make calculated choices regarding marriage and fertility. Young Lives Survey data could be used to further examine this link between aspirations and decision-making in poor areas.

Chapter III.

The Impacts of Access to Antiretroviral Therapy and Psychological Well-being on Catastrophic Health Expenditure in Malawi

I. Introduction

Across the developing world, there is a growing movement for universal health coverage (UHC). This includes broad-based insurance that provides large financial risk protection benefits. In some instances, it may also include disease-specific treatment programs that function as a limited form of insurance by protecting individuals against health and financial risks posed by disease. This paper is one of the first to analyze the insurance benefits associated with a disease-specific treatment program. It examines the impact of antiretroviral therapy (ART), a treatment regimen for people living with HIV/AIDS, on catastrophic health expenditure in Malawi.

Catastrophic health expenditure occurs when high out-of-pocket (OOP) health payments account for a significant percentage of household expenditure. They are harmful because they force approximately 100 million people across the globe into poverty (WHO, 2015; Xu, 2005). There are several examples of catastrophic health expenditure's impoverishing effects throughout the developing world (Dorjdagva et al., 2016; Kien et al., 2016; Li et al., 2012). In the Sub-Saharan country of Malawi, households that rely on OOP health payments also experience these impoverishing effects. For example, the proportion of Malawians that fell below the 2011 poverty line increased from 50.98 percent to 51.91 percent once catastrophic health expenditure was taken into account (Mchenga et al., 2017).

Several studies have determined that improved health insurance coverage can reduce the likelihood of catastrophic health expenditure (Berki, 1986; Wyszewianski, 1986; Russell, 2004). In their study on Vietnam's health insurance and household consumption, Wagstaff and Pradhan (2005) find that social health insurance lowers OOP health payments and the likelihood of catastrophic health expenditure. It also increases health care utilization and improves health outcomes for the insured.

Comfort, Duflo, and Banerjee (2016) find that insurance coverage can improve resilience to shocks in several key ways. It covers the cost of medications, encourages individuals to visit health care facilities before their ailments become life threatening, and incentivizes high quality care amongst providers. It also safeguards against financial instability by reducing the probability of catastrophic health expenditure. In short, insurance provides a safety net for those it covers.

Disease-specific treatment programs, such as ART, may also provide insurance value. This is especially true of medical technologies that treat epidemics such as HIV/AIDS. In fact, Lakdawalla, Malani, and Reif (2014) argue that the insurance value of a new medical technology may be greater than the value of broad-based health insurance. This is because medical advancement lowers the variance in quality of life between those who do and do not have a disease.

For people living with HIV/AIDS (PLHIV), ART availability may preserve physical health so that continued employment is possible (McLaren, 2017; Thirumurthy et al., 2008; Bor et al., 2012). A steady income earned through these labor activities helps guard against financial risk associated with high OOP payments. This means access to ART could protect PLHIV against catastrophic health expenditure.

Baranov et al. (2015) find that ART availability provides spillover benefits by increasing labor time for HIV-negative Malawians. Using a difference-in-difference strategy that controls for economic and demographic factors, the authors find that access to ART yields a 33-minute increase in daily work time for HIV-negative individuals who live within six kilometers of an ART clinic. The explanation is that proximity to ART lowers subjective mortality risk and improves psychological well-being. High prevalence of HIV/AIDS associates with anxiety, depression, and other common mental disorders, but availability of ART can lower depression, improve well-being, and reinforce belief in one's capabilities. This is similar to studies that find insurance access improves psychological well-being by reducing stress (Chemin et al., 2016).

This channel of effect informs the selection of another predictor that may influence catastrophic health expenditure: baseline happiness. Proximity to ART may function as a form of insurance, but psychological well-being also affects economic outcomes. Neither determinant has been thoroughly assessed in studies on catastrophic

spending in Malawi, allowing this paper to fill a gap in the literature.

Psychological well-being could influence catastrophic spending through one of several channels. Literature on the link between income and life satisfaction confirms that this association is possible. Individuals who are happier in their youth become better off financially in adulthood (DeNeve and Oswald, 2012; Diener, 2002).

Happiness could also affect catastrophic spending through its effects on health practices and longevity. Research suggests that happier people live longer, even if they are HIV positive (Chida and Steptoe, 2008). They are less likely to experience coronary disease and heart attacks (Rugulies, 2002; Kubzansky et al., 2001; Weitoft and Rosen, 2005). They are also more likely to have faith in their futures, leading to investments in health (Graham, 2017). These positive health experiences could reduce likelihood of catastrophic spending.

Finally, higher levels of life satisfaction could mitigate the risk behaviors that lead to catastrophic spending. For example, in their study on Ethiopian college students, Zerihun, Birhanu, and Kebede (2013) find that individuals with higher levels of life satisfaction are less likely to engage in risk behaviors. Happier individuals are more likely to use condoms during sexual encounters and less likely to have multiple sexual partners. These practices could have important implications for protecting against HIV/AIDS and the catastrophic spending that ensues.

Using data from the 2004-2005 and 2010-2011 rounds of Malawi's Integrated Household Survey (IHS) and the Ministry of Health, this paper analyzes the impacts of these predictors on catastrophic health expenditure in Malawi. A difference-in-difference technique compares changes in likelihood of catastrophic spending for those living near and far from ART-providing clinics, before and after ART's introduction.

Mean marginal effects are also used to assess the link between unexplained happiness and catastrophic spending at the town level. In this instance, town level unexplained happiness serves as a proxy for individual level happiness. Data from the 2004-2005 and 2010-2011 rounds of IHS are used in a cross-sectional analysis. The model includes variables for unexplained baseline happiness in 2004-2005 and the occurrence of catastrophic spending in 2010-2011.

Some of the socioeconomic and demographic determinants of Malawi's high OOP health payments have been assessed by Mussa (2015), and are outlined in the discussion. Disease-specific treatment programs as a form of insurance and psychological well-being remain unexplored. By assessing the impacts of these predictors, this paper contributes to literature on catastrophic health expenditure, psychological well-being, and the insurance value of ART. Findings may be used to guide health policy and provide evidence on economic externalities associated with new medical technologies.

II. Background: Health infrastructure, HIV/AIDS, and psychological well-being

Malawi is a developing country in sub-Saharan Africa that faces a number of development challenges. More than half the population lives below the poverty line and the majority of individuals reside in rural areas where infrastructure is lacking (World Bank, 2016; The World Factbook, 2017). Employment opportunities are scarce, forcing many individuals to operate within the informal economy. In 2014, the minimum wage increased from 317 kwacha/day (USD \$1.3 in 2014 dollars) to 511 kwacha/day (USD \$2.1 in 2014 dollars), but the vast majority of workers – informal sector workers – did not benefit from the change (Danish Trade Union, 2014).

Despite these challenges, economic indicators show some signs of improvement. GNI per capita rose from USD \$290 in 2004 to \$430 in 2010 and GDP increased from USD \$3.47 billion to \$6.5 billion. The 2010 poverty rate remained high compared to the international poverty line of USD \$1.90 per day, but the national poverty headcount ratio fell from 52.4 to 50.7 percent (IMF, 2017; World Bank, 2017).

Malawi has also succeeded in improving health infrastructure and outcomes. Life expectancy increased from 44 to 64 between 2000 and 2015 and mortality rates fell from 807 deaths per 100,000 live births in 2006 to 675 deaths per 100,000 live births in 2010. Child mortality fell from 122 per 1,000 live births in 2006 to 112 per 1,000 in 2010. This can be explained in part by improvements to Malawi's health infrastructure in remote areas, and the provision of free care to mothers and children (WHO, 2016).

Malawi's Ministry of Health aims to provide free health care at all health clinics, but financial constraints complicate these efforts (Mchenga et al., 2017). Like most

developing countries, Malawi lacks the resources needed to address all of its health challenges. Also, government health expenditure as a percent of GDP dropped from 12.8 percent in 2004-2005 to 9.7 percent in 2008-2009.

While government financing has fallen, donor funding increased overall (Mchenga et al., 2017). Between 2002-2003 and 2008-2009, donor support increased from 46 to 66 percent of total health expenditure (World Bank, 2013). (Around 2010, funding dropped in response to widespread government corruption. Since then, vertical funding, also known as ‘disease specific’ programs, have become the norm and funding has recovered). The WHO and Joint United Nations Programme on HIV/AIDS (UNAIDS) supported health initiatives, including the scale-up of ART. However, the private sector must continue to cover a sizable portion of medical expenses. It finances approximately 27 percent of total health expenditure, and of this private financing, 53.4 percent consists of OOP health payments. Private medical insurance plays only a minor role in health care financing, and social medical insurance is unavailable, so many individuals are forced to cover the costs of their medical bills (Mchenga et al., 2017).

There are several major health concerns facing the actors that finance Malawi’s health care system. One is malaria, the fifth leading cause of death in the country. Between 2000 and 2010, the government and other donors invested in various measures to prevent the spread of the illness. These measures include Artemisinin-based Combination Therapy (ACT), a cheap and effective medication used to treat malaria. Donors also focus on other public health measures that could combat the spread of malaria, such as indoor residual spraying and insecticide treated nets (USAID, 2016).

While malaria continues to affect several parts of Malawi, it might be argued that HIV/AIDS constitutes the biggest health concern facing financiers. Approximately 10.6 percent of the population is HIV positive, making Malawi one of countries with the highest prevalence in the world. In 2003, the Ministry of Health and the Global Fund to Fight AIDS, Tuberculosis, and Malaria contributed heavily to the scale-up of treatment programs. They developed a comprehensive strategy for patient treatment and compliance (Jahn et al., 2016).

Efforts to improve access helped lower the rate of HIV and illness-related prime age mortality (Barofsky and Baranov, 2015), but a number of HIV policy implementation

challenges persist. Jahn et al. (2016) discuss the prevalence of understaffing in clinics, inadequate drug supply, and the non-communicable diseases that undermine the health of HIV patients. Furthermore, patient information is meant to remain anonymous, but some clinics record and publicize patient data (Dasgupta et al., 2016). An additional concern is the distribution of resources to the health care system. Funds are allocated according to number of clinics, population size, and existing resources, rather than pervasiveness of poverty or disease (WHO, 2017).

Attrition amongst sub-groups of HIV patients also presents a significant obstacle to ART adherence. For example, Malawian men are less likely to seek and comply with treatment at advanced stages of immunodeficiency than women. Men may be dissuaded because of the stigma associated with HIV/AIDS in Malawi. Also, women could have added incentives to seek care: they are usually the primary caretakers of children and they are more vulnerable to sexual exploitation than men, leading to higher risk of infection (Chen et al., 2008). Still, this does not explain why many pregnant women fail to follow up after initial treatment. In their study on pregnant and breastfeeding women with HIV, Tweya et al. (2014) find that one-fifth of women missed a scheduled clinic appointment. Study participants reported that travel, illness, lack of transport money, misunderstanding the informational session on treatment, and side effects associated with ART were among the primary impediments to adherence.

While HIV/AIDS is perhaps the most well-known health concern in Malawi, mental health challenges also comprise an important aspect of overall well-being in the country. On a scale from one to five, the average household happiness score obtained using 2004 IHS survey data is 2.42. Furthermore, with an average Cantril ladder score of 3.97 (out of ten), Malawi ranks 136th out of 155 countries surveyed in the 2017 World Happiness Report.

One explanation for these low happiness scores is that living in an impoverished, HIV-endemic country may associate with higher rates of anxiety and depression. For example, 30 percent of respondents in rural Malawi report feeling depressed and 44 percent indicate that they have experienced anxiety in the past month (Baranov et al., 2015). Also, Malawi is a developing country with a low GDP per capita, and research suggests that reported well-being rises with income (Easterlin, 1974).

One of the most problematic aspects of the average Cantril ladder score in Malawi is that it appears to be falling. Between the 2005-2007 and 2014-2016, it dropped by 0.391 points (World Happiness Report, 2017). One factor that may be contributing to this low score is lack of trust in the former President Joyce Banda (World Happiness Report, 2017), who remains embroiled in a USD \$250 million corruption scandal (AlJazeera, 2017).

Another hindrance to elevated levels of psychological well-being is scarcity of resources (Udedi, 2016). In his qualitative assessment of opinions on mental health care in Malawi, Kavinya (2011) identifies a push for additional funding. For example, Mathews Simbota, a student of Malawi College of Health Sciences, claims, “shortages of resources and skills result in patients only being treated with medicines and the lack of psychosocial care reduces the effectiveness of the treatment.”

A 2016 policy brief published by the Ministry of Health suggests that the need for improved mental health care is pressing. The government must incorporate mental health into primary health care, direct more resources toward mental health, and improve training for mental health care workers so they are able to properly detect and treat individuals struggling with mental health issues. At the moment, there is a shortage of mental health professionals who can provide this care.

III. Variables

Model I: Distance to ART-providing clinic and catastrophic spending

Independent variables:

- i. Continuous distance variable, which uses negative log of distance between random offset of cluster center-points for households and nearest 2010-2011 ART-providing clinic
- ii. Binary indicator variable for households located less than the mean distance from an ART-providing clinic

Dependent variable:

i. Binary indicator variable for whether the household was a catastrophic health spender. Catastrophic spending is calculated at three distinct thresholds: when health payments exceed 20, 30, and 40 percent of the household's 'capacity to pay.' Here, capacity to pay is the total annual household expenditure minus average food expenditure or subsistence expenditure (whichever is smaller). Average food expenditure is the average amount spent on food, scaled by adjusted household size. Subsistence expenditure is the mean food expenditure at the poverty line (where households must allocate 45 to 55 percent of total expenditure to food), scaled by adjusted household size. The smaller of the two values is subtracted from total annual household expenditure to obtain household capacity to pay.

Model II: Unexplained happiness and catastrophic spending

Independent variable:

i. Unexplained baseline happiness (2004-2005) at the town level; this variable is the residual from a regression that examines various predictors of happiness

Dependent variable:

i. Binary indicator variable for the occurrence of catastrophic spending amongst any of the households in that particular town in 2010-2011. Catastrophic spending is calculated at the 20, 30, and 40 percent thresholds

IV. Data

This paper uses data from two rounds of the Malawi Integrated Household Survey (IHS), collected in 2004-2005 and 2010-2011. Approximately 11,000 households were surveyed in 2004-2005 and 12,000 households in 2010-2011. Malawi's National

Statistics Office surveys these households approximately every five years in an effort to assess the changing conditions in the country. Sponsors include the Government of Malawi, the World Bank, the Government of Norway, Irish Aid, the Department for International Development (DFID), Millennium Challenge Corporation, and German Development Corporation. The lead producers were the National Statistical Office and the Ministry of Economic Planning and Development. Insights gleaned from the data contribute to evidence-based policy formulation and a deepened understanding of development in Malawi (World Bank, 2012).

The surveys provide GPS coordinates for household clusters, which are used to create the distance variable used in Model I. The coordinates use a random offset of cluster center-points of 0-2 kilometers in urban areas and 0-5 kilometers in rural areas, with 1 percent of rural clusters offset by 0-10 kilometers. IHS data are combined with Ministry of Health data on clinic location and date of initiation of ART. The IHS also contains data for additional covariates used in the models, such as age, number of elderly household members, and number of children within the household.

The variable for distance to nearest ART-providing clinic is constructed using GPS coordinates at the district level. Many of the households fall into the same district level cluster, placing them at the same latitude and longitude. Using these X and Y coordinates, the distance in kilometers to nearest 2010 ART-providing clinic can be calculated. If these data are unavailable, distance to the next closest ART-providing clinic is used. Then, the negative log of distance is taken for ease of interpretation. Distance is also measured using a dichotomous variable that signals whether the household was closer than the mean distance from an ART-providing clinic.

Data on happiness, found in the 2004-2005 IHS survey, were also used to construct a variable of interest in this study. In a module entitled “subjective assessment of well-being”, the IHS survey asks “overall, how satisfied (content, happy) are you with your life?” on a scale from one to five, with one being ‘very unsatisfied’ and five being ‘very satisfied’. Responses convey the evaluative well-being of the respondents, i.e. their general satisfaction with life.

Happiness is initially measured at the individual level on a scale from one to five, with five being the highest. Then, these scores are used to determine average happiness

within the towns. A regression analysis explores the potential demographic and socioeconomic determinants of this happiness, including age, wealth, education, and illness. The residual from this regression is used to create a variable for unexplained town-level happiness, which ultimately serves as a proxy for individual happiness. The model also includes weights to account for the number of households within each town in 2010.

There are 162 towns included in the happiness model. Surveyors visited 221 towns in 2004-2005 (49 of which were urban and 172 were rural) and 281 in 2010-2011 (81 of which were urban and 200 were rural), but only 162 were revisited across rounds. Of these 162 towns, all are rural. This means that only about 70 percent of towns surveyed are represented in the model, but that 87 percent of rural towns are represented. Thus, it may be difficult to interpret results as nationally representative, but findings do provide an overview of the association in rural areas. Malawi's population was 84 percent rural in 2016, making these findings particularly useful (World Bank, 2016).

Several steps were also taken to build the catastrophic spending variable. First, the thresholds of catastrophic spending were identified. Catastrophic spending occurs when medical spending exceeds 5 to 40 percent of the 'capacity to pay,' i.e. total consumption expenditure minus subsistence or average food expenditure (whichever value is smaller). World Health Organization researchers (O'Donnell et al., 2008) and Xu (2003) use the 40 percent threshold, but there is no clear guidance on which is most appropriate. This has led some scholars to examine effects at different levels. Here, I elected to examine impacts at the 20, 30, and 40 percent thresholds.

The steps taken to calculate catastrophic spending in this paper mirror the steps explained in Chapter 18 of O'Donnell et al.'s (2008) guide on health equity. First, let T represent OOP payments on medical care, x represent total household expenditure, and $f(x)$ represent subsistence, or food, expenditure. If $T/[x-f(x)]$ exceeds threshold z , then the household is deemed a catastrophic spender. The value of z signifies the point at which the fraction of total nondiscretionary spending allocated to medical care impairs household quality of life, and ranges from 20 to 40 percent of nondiscretionary expenditure in this paper.

Following this method, x includes annual household expenditure, including expenditure on medical care, housing, food, clothes, and additional resources, adjusted for household size. Expenditure on medical care includes spending on illness and injury (for medicine, tests, consultation, and in-patient fees), medical care not related to illness (preventive health care, prenatal visits, and check ups), non-prescription medication (including Panadol, Fansidar, and cough syrup), and hospitalization or overnight stays in a medical facility.¹⁵ Next, $f(x)$, represents subsistence expenditure. As recommended by Xu et al. (2003), the first step to determining subsistence expenditure is to calculate average food expenditure of households that allocate 45-55 percent of expenditure to food. Subsistence expenditure is taken to be the poverty line scaled by adjusted household size and food expenditure scaled by adjusted household size. The ‘capacity to pay’ is the total annual household expenditure minus the subsistence or food expenditure (whichever is smaller). If the proportion of non-subsistence expenditure spent on medical care (represented by T) exceeds threshold z , the household is a catastrophic spender. Using the IHS survey data, the percent of catastrophic spenders at the 20, 30, and 40 percent thresholds are 8.79, 5.44, and 3.60, respectively.

These steps were also taken to devise the catastrophic spending variable for Model II. However, values were collapsed at the town level to indicate whether any of the households within the town were catastrophic spenders in 2010-2011. Findings show that 83 percent of the 162 towns in the sample contain households that experienced catastrophic spending at the 40 percent threshold. On average, 3.8 percent of households within these towns were catastrophic spenders.

IV. Methods and Mechanisms

Model I uses the difference-in-difference technique to determine the impact of being near and far from an ART-providing clinic, before and after ART’s introduction. The technique determines the differential impact of ‘being close’ versus ‘being far’ from 2010-2011 clinics as HIV treatment became available throughout Malawi. As with any

¹⁵ For an overview of average yearly household spending by health care category, see Tables 3.0 and 3.1 in the appendix.

similar identification strategy, it is assumed that proximity to ART-providing clinics is uncorrelated with unobservable conditions that may influence the outcomes. The identifying assumption behind the difference-in-difference model is that the average change in the control group represents the change that would have occurred in the treatment group, had the intervention not occurred. In this context, this implies that households far from the 2010 clinics experienced the average change that would have occurred to households near health clinics, had the scale-up never happened. Results show whether the scale-up of ART-providing clinics that occurred between 2004-2005 and 2010-2011 associates with reduced likelihood of catastrophic spending.

A linear probability model is used to determine the effect of this scale-up. Results calculated using linear probability models are easier to interpret than logistic regression results, especially when the coefficient of interest is an interaction (in this case, an interaction between the year 2010 and proximity to nearest ART-providing clinic). Ai and Norton (2003) justify this technique, claiming that interpretation of interaction coefficients is straightforward when linear models are used.

Model II uses a logistic regression model because the dependent variable is binary and an interaction is not being interpreted as the treatment effect. Logistic regression models are typically more appropriate for binary dependent variables because they determine the natural log odds that the independent variable equals one of the two categories. In this case, they indicate the likelihood of catastrophic expenditure.

Mean marginal effects are used to report the findings for the logit model. They indicate the effect of a one-unit change on the probability of catastrophic expenditure. The mean marginal effects are determined by computing the derivative of the conditional mean function with respect to the covariate. They are included in the main body of the text, while the logit coefficients are included in the appendix.

Model I.

To estimate the effect of ART access on catastrophic spending, we compare changes in catastrophic spending for households near and far from ART, before and after ART's scale-up. The main threat to causal inference is that improved access to ART

covaries with unobserved factors correlated with improved economic conditions. These unobservable conditions could drive any positive effect that appears to be associated with clinic access. Socioeconomic and demographic variables are included to control for this variation. The difference-in-difference specification is the following:

$$Y_{ict} = \alpha + \beta_1 * 2010 + \beta_2 * dist_{ct} + \beta_3 (2010 * dist_{c2010}) + \beta_4 * otherdist_{ct} + \beta_5 * X_{ict} + \beta_6 * reg_{ict} + \beta_7 * season_{ict} + \epsilon_{ict}$$

For household *i*, in cluster *c*, and time *t* = [2004,2010], where the dependent variable, Y_{ict} , is a binary indicator variable for whether catastrophic spending occurred at the 20, 30, or 40 percent threshold. The variable 2010 represents the effect of year 2010. The variable $dist_{ct}$ signifies the effect of proximity to the nearest 2010 ART-providing clinic, while $2010 * dist_{c2010}$ signifies the impact of proximity after scale-up. Distance is measured in two ways: a dichotomous variable indicating whether the household is located less than the mean distance (8.47 kilometers) from an ART-providing clinic, and a continuous variable for the negative log distance to the nearest ART-providing health clinic ($-\log[dist_{c2010}]$). The second distance variable is used for ease of interpretation; findings indicate the differential change in the probability of catastrophic expenditure for households near versus far from ART-providing clinics in 2010 (after ART became available) compared to 2004.

Since we know that distance to infrastructure is associated with economic wellbeing, $otherdist_{ct}$ accounts for log distance to the nearest road and agricultural development office (ADMARC). Additionally, X_{ict} controls for demographic factors, including age, age squared, number of chronically ill, number of children, and number of elderly within the household. It also controls for OECD-modified consumption equivalence scale, rather than household size, because the “needs of a household grow with each additional member but – due to economies of scale in consumption – not in a proportional way” (OECD, 2013). This scale, which is used by Xu (2003) in his multi-country analysis of catastrophic spending, assigns the first household member a value of 1, each additional adult a value of 0.5 and each child a value of 0.3.

The variable reg_{ict} is used to control for region, specifically the more densely

populated central and southern regions. The variable $season_{ict}$ represents a control for the hot wet season between December and April, the period of time when agricultural and health shocks (primarily from increased malaria incidence) are most likely to occur. (Note: substituting monthly dummies for the seasonal variable does not change direction or statistical significance of findings.) Finally, the model includes the random error term ϵ_{ict} . The full sample is included in the initial logit regression, followed by separate regressions for the rural and urban samples.

Model II.

This model examines the impact of unexplained happiness at the town level in 2004 on likelihood of catastrophic spending in 2010. The model follows the method used in Graham et al. (2004), which corrects for the usual determinants of psychological well-being before examining the effect of “residual” or “unexplained” happiness on income and health. The first step to the estimation is a regression analysis that assesses the potential demographic and socioeconomic predictors of happiness, including age, wealth, education, and illness. The residual from this regression is used to create a variable for each town’s unexplained happiness.

Using this residual, one can examine the effect of unexplained happiness on likelihood of catastrophic spending at the town level. 162 towns were surveyed during both rounds, each of which are included in the model and weighted by number of households within the town. The econometric specifications are the following:

$$Y_{ct} = \alpha + \gamma * happiness_{S_{ct-1}} + \delta * dist_{ct} + \tau * otherdist_{ct} + \beta X_{ct} + \lambda * reg_{ct} + \epsilon_{ct}$$

Where Y_{ct} is a binary indicator variable for whether catastrophic spending occurred in 2010, for town c in time t . The variable for unexplained happiness in 2004 is represented by $\gamma * happiness_{S_{ct-1}}$. The variable $dist_{ct}$ signifies the effect of town proximity to 2010 ART-providing clinic. The variable $otherdist_{ct}$ accounts for the log distance to nearest road and log distance to nearest ADMARC. The variable X_{ct} is used to control for demographic factors, such as average age and educational level of heads of households

within the town. The variable reg_{ct} signifies a vector of geographic controls for the region. The urban indicator variable is omitted because all towns in this sample are located in rural areas. Finally, the model includes the random error term, ε_{ct} .

V. Literature

Across the developing world, catastrophic health expenditure continues to afflict impoverished households (Dorjdagva et al., 2016; Kien et al., 2016; Li et al., 2012). Malawi is no exception to the trend; in a study that uses round three (2010-2011) IHS data, Mchenga et al. (2017) find that between 0.73 and 9.37 percent of Malawian households are catastrophic spenders. Values are calculated at the 10, 20, 30, and 40 percent thresholds. This paper, which uses data from IHS rounds two and three, estimates that 3.60, 5.44, and 8.79 percent of households are catastrophic spenders at the 20, 30, and 40 percent thresholds.

The characteristics of catastrophic spending in Malawi have not been thoroughly assessed, but Mussa (2015) has analyzed several socioeconomic and demographic predictors using a zero-inflated beta regression. He finds that age and wealth reduce likelihood of OOP payments. The number of young and elderly household members, sick household members, and rural location increase the likelihood of health spending.

One factor that likely increased the incidence of catastrophic spending in Malawi was the rise of HIV/AIDS, a deadly and devastating disease that spread rapidly throughout sub-Saharan Africa in the 1980s and 1990s. Malawi was amongst those hardest hit by the disease, and by the late 1990's HIV prevalence reached approximately 15.3 percent of the total population (UNAIDS, 2017). Prevalence has fallen since, but approximately 10.6 percent of adults continue to live with HIV/AIDS.

ART-providing clinics limit disease transmission and increase the longevity of PLHIV (Barofsky and Baranov, 2015). The scale-up of ART-providing clinics may also reduce likelihood of catastrophic spending, due to ART's positive impacts on economic outcomes, such as labor time. ART access enables PLHIV to continue working and earning wages, thereby lowering the total cost of HIV and reducing the variance in quality of life between those who do and do not have the disease. For example, in a study

conducted in Western Kenya, Thirumurthy et al. (2008) find that six months after beginning treatment, there is a 20 percent increase in the likelihood of an AIDS patient participating in the labor force and a 35 percent increase in weekly hours worked. In a study on AIDS treatment and labor outcomes in South Africa, McLaren (2017) finds that access to ART-providing clinics increases employment and labor force participation amongst black men. Access also increases work time for the HIV-negative by lowering perceived mortality risk and reducing depression and anxiety (Baranov et al., 2015). Lakdawalla, Malani and Reif (2014) refer to this benefit as the “insurance value of medical innovation.”

Insurance plays a valuable role in reducing OOP health payments and likelihood of catastrophic expenditure. In their study on universal health coverage in Thailand, Limwattananon et al. (2015) find that for groups of households with insurance, OOP expenditure dropped by 28 percent, on average. The risk associated with medical payments fell by three-fifths, on average. Powell-Jackson et al. (2014) also identify the health gains associated with extended coverage. In their assessment of health care in rural Ghana, they find that free care lowers health spending and leads to improvements amongst those with anemia. However, there are no health gains for the intervention population as a whole. Access to free care had no impact on self-reported illness or actions taken to prevent malaria.

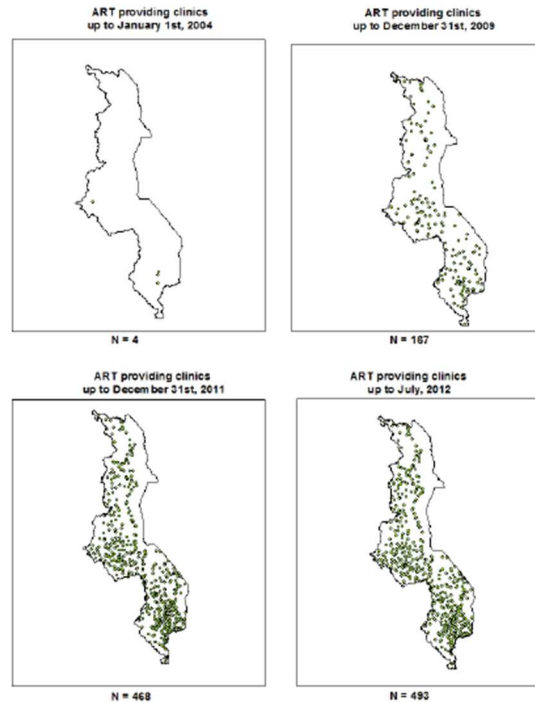
In theory, universal health insurance should reimburse patients the cost of their medical expenses, but this seldom occurs in practice. Real-world health insurance schemes do not eliminate costs associated with healthcare. Therefore, advancements in medical technologies are also needed to protect against health risks. According to Lakdawalla, Malani and Reif (2014), medical advancements (e.g. ART) serve as a type of insurance by reducing the risks associated with disease and lowering the difference in quality of life between PLHIV and HIV negatives.

Assessments of the economic value of health spending often ignore the insurance value of these medical advancements because they rely upon cost effectiveness analyses to determine value. Lakdawalla, Malani and Reif (2014) argue that medical advancements actually provide greater value than market health insurance. They find that the total insurance value of new medical technologies “adds about 100 percent to the

traditional valuation of medical technology.” In Malawi, a country with suboptimal private medical insurance and high rates of HIV/AIDS, medical advancements could add great value.

The recent scale-up of ART-providing clinics offers a unique opportunity to study the impacts of the medical advancement’s insurance value. Since the government-backed initiative began in 2003, the number of health clinics providing ART has increased dramatically. In 2004, there were four ART-providing clinics and by 2012 this number had grown to 493 (see Figure 3.1). By 31 December 2015, the country had established 716 ART-providing clinics (Jahn et al., 2016).

Figure 3.1: ART-providing clinics (2004 to 2012)



Source: Barofsky, J. and Baranov, V. (2015) The End of AIDS: The Economic Effects of Antiretroviral Therapy at Scale in Malawi.

Another unexplored factor that may influence likelihood of catastrophic spending is positive psychological well-being, which can be either hedonic or evaluative. Hedonic well-being, also known as experienced or adaptive well-being, measures daily mood (Graham and Nikolova, 2015). Evaluative well-being examines overall satisfaction with life (Stone and Mackie, 2013). The questions asked in the IHS survey qualify as

evaluative because they ask respondents about their general contentment.

One explanation for positive well-being's potential link to catastrophic spending is that happier individuals earn higher wages in the long-term. For example, DeNeve and Oswald (2012) find that adolescents and young adults who report higher life satisfaction or positive affect, i.e. the feeling or experience of being happy, earn higher incomes later in life. Diener et al. (2002) find that positive mood amongst elite college students predicts higher income in adulthood. These earnings could help soften the impact of OOP payments by increasing 'capacity to pay'.

Happiness may impact future earnings through its effects on labor productivity. In his study on happiness and productivity, Sgroi (2015) finds that happier individuals are 12 percent more productive than those who are not happy. In a separate experiment that examines the impacts of bereavement, he finds that unhappiness reduces productivity.

There may also be a link between psychological well-being and maintenance of physical health. Steptoe et al. (2014) followed 3,199 British persons ages 60 + over eight years to understand their positive affect and physical abilities, such as walking speed and gait. They find an association between physical function and happiness, even when controlling for age and income. Those who were happiest are 80 percent less likely to develop two or more impairments in daily functions than unhappy participants. Likewise, Graham (2017) finds that optimistic individuals are more likely to have hope for the future, which increases investment in health, savings, and education.

Research also indicates that higher levels of life satisfaction correlate with longer lifespans, improved immune function, and reduced likelihood of coronary heart disease and stroke (Chida and Steptoe, 2008; Steptoe and Wardle, 2011; Diener and Chan, 2011; Ostir, Markides, and Peek, 2001; Boehm and Kubzansky, 2012). For example, Chida and Steptoe (2008) conduct a meta-analysis that assesses the link between positive psychological well-being and mortality in healthy and diseased populations. They find that positive well-being correlates with reduced mortality amongst PLHIV. In their study on health psychology and chronic disease management, Schneiderman et al. (2001) find that certain psychosocial interventions could help boost immune function in PLHIV. These findings suggest that higher levels of life satisfaction in the HIV-endemic country

Malawi could contribute to longevity and improved physical well-being, perhaps mitigating future health payments.

Finally, happiness may associate with catastrophic spending through its impacts on risk behavior. Evidence suggests that those with lower levels of life satisfaction are more likely to engage in unsafe sexual behaviors. For example, in their study of homosexual men and predictors of sexual risk behavior, Kalichman et al. (1997) find that those with lower levels of life satisfaction are more likely to engage in unprotected intercourse outside of their relationships. This could ultimately lend itself toward greater risk of contracting HIV, and incurring the medical expenses that follow diagnosis.

VI. Results

Household socioeconomic and demographic characteristics

This section provides descriptive statistics on demographic and socioeconomic characteristics of households sampled in the both survey rounds. Approximately every five years, the National Statistics Office, with assistance from the World Bank, conducts this nationally representative survey to monitor and assess the changing conditions in the country. It targets groups of households affected by poverty.

When datasets are combined, 84.4 percent of households are rural, while 15.6 percent are urban. Roughly 16.91 percent of households are located in the north, 36.25 in the central region, and 46.84 in the southern region. The mean household age is 24 years, while the median is 19.6. Approximately half of households have at least one child under the age of five, and roughly 15 percent contain an elderly member. Approximately 48 percent of respondents were in monogamous marriages in 2004-2005 and 2010-2011. Christianity is the most popular religion and the majority of individuals reside in central or southern Malawi, where HIV/AIDS is most prevalent. Roughly 78 percent of 2004 respondents and 82 percent of 2010 respondents had at least some schooling.

Descriptive statistics on happiness suggest that Malawi's subjective life satisfaction is suboptimal. The average household happiness score is 2.42 out of five and approximately 38 percent of 2004-2005 IHS respondents selected a 'two,' making this

the most popular category. Only 5.57 percent of respondents selected a five. These findings are unsurprising given Malawi's average Cantril ladder score in 2017 was 3.97 out of ten (World Happiness Report, 2017).

Infrastructure and economic conditions are lacking in some respects, but also show signs of improvement. Mean household distance to roads dropped from 20.29 kilometers in 2004-2005 to 8.37 kilometers in 2010-2011. Average household distance to ADMARCs fell from 10.28 kilometers in 2004-2005 to 8.06 kilometers in 2010-2011. However, poverty in rural areas climbed from 56 to 57 percent between 2004 and 2010, and extreme poverty from 24 to 28 percent, a finding that is verified by the IMF (2017).¹⁶

Distance to 2010 ART-providing clinics

Figure 3.2 shows the distance to 2010 ART-providing clinics for 2004 and 2010 households. The average household distance was 9.16 kilometers in 2004-2005 and 7.83 in 2010-2011, while median distance was 7.99 in 2004-2005 and 6.54 in 2010-2011. The standard deviation is approximately six kilometers for both rounds, with a minimum distance of less than one kilometer and a maximum of approximately 35 kilometers.¹⁷

Figure 3.2. Household Distance to Clinics, in kilometers

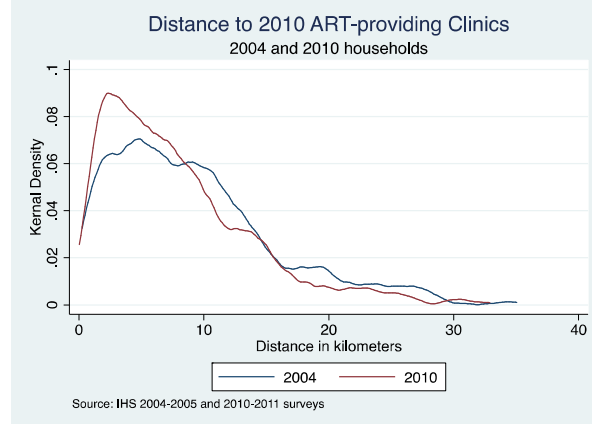


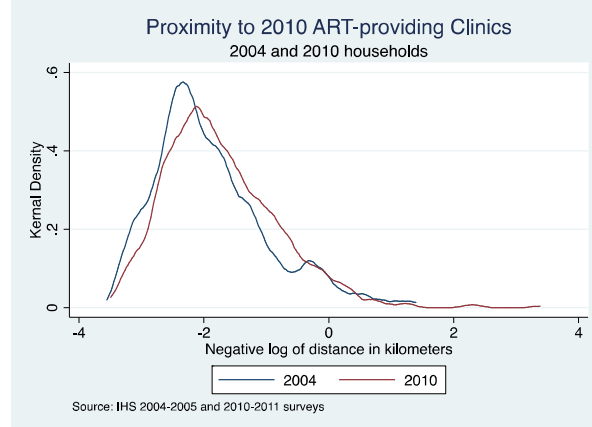
Figure 3.3 displays the negative log distance (proximity), which is used for ease of interpretation of findings. Using this measure, mean distance was -1.89 in 2004-2005

¹⁶ See appendix for mean, standard deviation, maximum and minimum of other variables in models.

¹⁷ The average distance between 2004 households and 2004 clinics was approximately 29 kilometers.

and -1.73 in 2010-2011. For both the proximity variable and the distance used in Figure 3.2, similar distributions are observed in 2004-2005 and 2010-2011. This is not a reflection of the expansion of the campaign (because it does not examine distance between 2004 households and 2004 ART-providing clinics), but rather the distribution of households in each survey. Furthermore, the expansion of ART-providing clinics led to a twelve-kilometer decrease in mean distance to ART-providing clinics.

Figure 3.3. Negative Log Distance (Proximity) to Clinics



Model I.

Table 3.4 reports the impact of a household being closer than mean distance from a 2010 ART-providing clinic on likelihood of catastrophic spending at the 20, 30, and 40 percent thresholds, using the linear probability model. Findings indicate that being closer than the mean in 2010 associates with a 3.3 percentage point reduction in the probability of catastrophic expenditure at the 20 percent threshold ($p < 0.05$). To examine the impact for households further than mean distance, the coefficient (0.0327) is divided by the percent of 'far away' households that experienced catastrophic spending in 2010 (approximately 8.96 percent). This suggests a 36 percent reduction for households further than mean distance. A 1.2 percentage point reduction is observed at the 30 percent threshold and 1.3 percentage point reduction at the 40 percent threshold, but results are only statistically significant at the 20 percent threshold.

Table 3.7 in the appendix reports mean marginal effects. It shows a statistically significant negative correlation between closeness and catastrophic spending at the 20

percent threshold. Effects are also examined by urban/rural location, at each threshold (see appendix). The tables show that the likelihood of catastrophic spending at the 20 percent threshold falls for both rural and urban homes that are closer than mean distance. However, results are not statistically significant for urban homes.

Table 3.4: Closer than Mean Distance and Catastrophic Expenditure

Catastrophic Expenditure	(1) 20 % threshold	(2) 30 % threshold	(3) 40 % threshold
Closer	0.00693 (0.0110)	-0.00164 (0.00819)	0.00465 (0.00679)
Year 2010	0.00648 (0.0109)	0.00350 (0.00845)	0.00461 (0.00691)
Closer 2010	-0.0327** (0.0144)	-0.0124 (0.0109)	-0.0128 (0.00887)
Eq. scale	0.0515*** (0.00387)	0.0371*** (0.00330)	0.0270*** (0.00280)
No. of elderly	0.0351*** (0.00883)	0.0294*** (0.00794)	0.0168*** (0.00644)
No. of Children	0.0164*** (0.00442)	0.0114*** (0.00377)	0.0108*** (0.00333)
Hot wet season	0.0151** (0.00689)	0.00835 (0.00532)	0.00823* (0.00434)
Age	5.24e-05 (0.000750)	0.000335 (0.000624)	0.000376 (0.000505)
Age ²	-1.26e-06 (9.08e-06)	-4.92e-06 (7.54e-06)	-3.59e-06 (5.82e-06)
Log Km. to ADMARC	0.00351 (0.00367)	0.00217 (0.00286)	0.00268 (0.00214)
Log Km. to Road	0.00440** (0.00218)	0.00454*** (0.00150)	0.00336*** (0.00120)
Central Region	0.0628*** (0.00838)	0.0437*** (0.00646)	0.0288*** (0.00499)
Southern Region	0.0411*** (0.00747)	0.0318*** (0.00600)	0.0239*** (0.00490)
Chronic Illness	0.0391*** (0.00539)	0.0228*** (0.00442)	0.0142*** (0.00346)
Far hh cat. spender %	0.0896	0.0558	0.0358
Observations	20,363	20,363	20,363
R-squared	0.049	0.035	0.025

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.4 also displays several other important findings. For example, the benefit of being close to a 2010 ART-providing clinic is only realized after the scale-up occurs. The finding for the ‘closer’ variable, which captures household distance to an ART-providing clinic before and after the scale-up, is insignificant, suggesting that location

alone does not account for change in catastrophic health expenditure. The year 2010 does not predict catastrophic spending either, implying that the ART scale-up, rather than 2010-specific conditions, influences catastrophic spending.

Using the negative log distance variable, Table 3.5 reports the change in probability of catastrophic expenditure when the distance from the mean is cut by 5.36 kilometers. It displays results at the 20, 30, and 40 percent thresholds. A 5.36-kilometer decrease in distance from the mean reduces the probability of catastrophic spending at the 20 percent threshold by 2 percentage points.¹⁸ To examine the impact for those who are further than mean distance at this threshold, the coefficient for ‘proximity 2010’ may be divided by the percent of ‘far away’ households experiencing catastrophic spending in 2010. This indicates a 23 percent reduction in likelihood of catastrophic spending for households further than the mean.

Findings also indicate that the probability of catastrophic spending falls by 1.3 percentage points at the 30 percent threshold and 0.8 percentage points at the 40 percent threshold. Using the method described above, this translates to a 23 percent reduction in likelihood of catastrophic spending for ‘far away’ households at each threshold. The table for mean marginal effects in the appendix also indicates a negative and statistically significant link at each threshold.

Linear probability models are also used to examine effect by urban/rural indicator. Tables found in the appendix show that ART availability associates with reduced likelihood of catastrophic spending for rural homes. Results are statistically significant at each threshold. Findings presented in Table 3.5 also verify that the ART scale-up influenced catastrophic expenditure, rather than geographic location alone. This is because the coefficient for ‘proximity 2010’ is statistically significant, but the coefficient for ‘proximity’ is not. Here, it should be noted that ‘proximity 2010’ captures the effect after scale-up, while ‘proximity’ captures household distance before and after scale-up.

The majority of the demographic and socioeconomic controls displayed in Tables 3.4 and 3.5 help predict catastrophic health expenditure. The number of elderly, children,

¹⁸ Reducing distance by a factor of e , so that distance is reduced by more than half, allows for correct interpretation of the coefficient. This corresponds to a 5.36-kilometer decrease in distance from the mean (8.47 kilometers).

and chronically ill household members has a statistically significant and positive relationship with catastrophic spending. Interviews that occurred during the hot wet season also correlate with an increase in the probability of catastrophic spending at the 20 and 40 percent thresholds. This may be explained by the weather (which contributes to malaria) and agricultural shocks that occur during the season. Residence in central and southern Malawi, where rates of HIV/AIDS are higher, associates with greater likelihood of catastrophic spending. Household cluster distance to nearest road also correlates with increased probability of catastrophic spending.

Table 3.5: Proximity and Catastrophic Expenditure

Catastrophic Expenditure	(1) 20 % threshold	(2) 30 % threshold	(3) 40 % threshold
Proximity	0.00562 (0.00646)	0.00336 (0.00487)	0.00375 (0.00353)
Year 2010	-0.0507*** (0.0158)	-0.0280** (0.0123)	-0.0182* (0.00931)
Proximity 2010	-0.0202*** (0.00759)	-0.0127** (0.00589)	-0.00819* (0.00446)
Eq. scale	0.0517*** (0.00386)	0.0373*** (0.00330)	0.0271*** (0.00281)
No. of elderly	0.0349*** (0.00885)	0.0291*** (0.00795)	0.0168*** (0.00645)
No. of Children	0.0162*** (0.00443)	0.0112*** (0.00377)	0.0108*** (0.00333)
Hot wet season	0.0150** (0.00688)	0.00856 (0.00531)	0.00820* (0.00435)
Age	0.000126 (0.000751)	0.000381 (0.000622)	0.000395 (0.000504)
Age ²	-2.13e-06 (9.10e-06)	-5.47e-06 (7.54e-06)	-3.79e-06 (5.81e-06)
Log Km. to ADMARC	0.00358 (0.00376)	0.00236 (0.00291)	0.00282 (0.00223)
Log Km. to Road	0.00416* (0.00221)	0.00446*** (0.00153)	0.00334*** (0.00122)
Central Region	0.0617*** (0.00837)	0.0433*** (0.00646)	0.0286*** (0.00503)
Southern Region	0.0405*** (0.00738)	0.0315*** (0.00594)	0.0236*** (0.00481)
Chronic Illness	0.0392*** (0.00540)	0.0229*** (0.00441)	0.0142*** (0.00346)
Far hh cat. spender %	0.0896	0.0558	0.0358
Observations	20,363	20,363	20,363
R-squared	0.049	0.035	0.025

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Model II.

Table 3.6 shows the effect of unexplained happiness at the town-level on the occurrence of catastrophic health expenditure, using mean marginal effects. After weighting for the households within each of the 162 towns, it demonstrates that ‘unexplained’ or ‘residual’ happiness has a negative and statistically significant relationship with catastrophic spending. The result is significant at the one percent level, and the coefficient implies that a one-point increase in unexplained happiness associates with a 2.2 percent decrease in the likelihood of catastrophic spending at the 20 percent threshold. Unexplained happiness also associates with a 0.8 percent reduction in probability of catastrophic spending at the 30 percent threshold and a 1.1 percent reduction at the 40 percent threshold. The logit coefficients, found in Table 3.15 in the appendix, confirm the negative relationship between the variables.

Table 3.6: Unexplained Happiness and Catastrophic Expenditure

Catastrophic Expenditure	(1) 20% threshold	(2) 30% threshold	(3) 40% threshold
Unexplained happiness	-0.0217*** (0.000135)	-0.00810*** (0.000165)	-0.0112*** (0.000208)
Proximity to ART	-0.0169*** (0.000235)	-0.0246*** (0.000319)	-0.0373*** (0.000402)
Log Km. to ADMARC	0.000494*** (4.21e-05)	0.00488*** (5.79e-05)	-0.00910*** (6.28e-05)
Log Km. to Road	-0.00152*** (1.75e-05)	-0.00283*** (2.37e-05)	-0.00256*** (3.20e-05)
Age	0.00216*** (0.000104)	-0.0229*** (0.000129)	-0.0313*** (0.000171)
Education	-0.00348*** (0.000218)	-0.00932*** (0.000298)	-0.0467*** (0.000372)
Central Region	0.0627*** (0.000912)	0.100*** (0.00110)	0.0724*** (0.00112)
Southern Region	0.0792*** (0.000907)	0.0939*** (0.00109)	0.0487*** (0.00114)
Observations	2,264,839	2,264,839	2,264,839

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 3.6 also displays findings for control variables. For example, town location within the central or southern region, as compared to the north, positively associates with catastrophic spending. This could be explained by the fact that the south and central regions are more densely populated and have higher rates of HIV/AIDS. This table also shows that infrastructure, including distance to roads and ADMARCS, and demographic traits such as age and education, correlate with catastrophic expenditure. When weights are removed from the model (see Table 3.16 in appendix), much of the statistical significance is lost for these coefficients, but the link between unexplained happiness and catastrophic expenditure at the 20 percent threshold remains negative and statistically significant.

VII. Discussion and Policy Implications

This paper builds upon Mussa's (2015) study on the socioeconomic and demographic determinants of catastrophic health expenditure and OOP payments in Malawi. Mussa (2015) identifies the following statistically significant determinants of catastrophic health expenditure: the number of young and elderly household members, the number of chronically ill household members, household income level, household location, and access to health and economic infrastructure. Mussa (2015) defines health infrastructure as "a place to purchase common medicines, a health clinic, a nurse, midwife or medical assistant, and groups or programs providing insecticide-treated mosquito bed nets free or at low cost." He finds that health infrastructure lowers the mean and variance of OOP health payments.

This paper expands upon his analysis by exploring two previously unstudied predictors: the role of HIV-specific insurance, as measured by improved access to ART-providing clinics; and psychological well-being. In his analysis of health infrastructure, Mussa (2015) does not specifically assess ART as a form of insurance. The distinction is important, as HIV/AIDS remains the leading cause of death in Malawi (CDC, 2016), and ART expansion provides critical care to PLHIV and economic benefits to the population as a whole (Ministry of Health, 2016).

i. ART as a form of insurance:

In recent years, there has been a push toward universal health coverage (UHC), especially in developing countries. Dr. Margaret Chan (2013) at WHO helps explain the movement, stating “UHC is the single most powerful concept that public health has to offer...the umbrella concept that demands solutions to the biggest problems facing health systems.” The Sustainable Development Goals also highlight the value of UHC. They aim to achieve UHC and improve access to safe and affordable medications as part their commitment to eradicating AIDS, malaria, tuberculosis, and other communicable diseases by 2030 (UNDP, 2017).

Despite this push, there is an ongoing debate as to whether broad-based health insurance can generate as many health gains as medical advancements, and whether it is the best path toward achieving UHC. The national health insurance scheme (NHIS) in Ghana provides a clear example of this. Agyepong et al. (2016) find that insured Ghanaian patients still incur health expenses, causing frustration amongst NHIS users and discouraging others from enrollment. In their randomized control experiment, Powell-Jackson et al. (2014) identify additional challenges linked to the broad-based health insurance in Ghana. They find that free healthcare has a positive impact on anemic children, but does not affect healthcare users as a whole. Furthermore, removing the user fees does not alter the preventive actions taken to protect against malaria.

Vertically integrated disease-specific treatment programs may help overcome some of the limitations to broad-based health insurance programs like Ghana’s NHIS and represent an effective option to move toward UHC. Vertical programs have become increasingly popular in impoverished areas with poor health services and high rates of disease (Elzinga, 2005). Lakdawalla, Malani, and Reif (2014) argue that their insurance value is greater than that of broad-based health insurance. This is especially true of medical advancements that address severe health conditions. Conventional evaluations rely upon cost-effectiveness analyses, but the new medical technologies can reduce financial and health risks, making them more valuable than conventional methods suggest.

ART has provided considerable value in Malawi. The rapid scale-up of ART-

providing clinics in 2003 precipitated several health and economic improvements in the country. HIV-attributable adult mortality dropped significantly (Dasgupta et al., 2016). In the rural north, where many individuals fall below the poverty line, the introduction of ART led to a 32 percent drop in the mortality rate amongst adults ages 15–59 (Floyd et al., 2010). The scale-up also generated positive economic outcomes, such as increased labor time for HIV-negative individuals (Baranov et al., 2015). This chapter confirms that ART access also correlates with a drop in the likelihood of catastrophic health expenditure. Those who lived closer than 8.47 kilometers from 2010 ART-providing clinics are less likely to be catastrophic spenders. Furthermore, an increase in proximity (as measured by negative log distance) to a 2010 ART-providing clinic associates with reduced likelihood of catastrophic spending.

These positive externalities support Lakdawalla, Malani, and Reif (2014)'s theory that new medical technologies may provide greater insurance value than broad-based health insurance. Therefore, it can be argued that the largest gains in both health and well-being can be achieved by introducing medical advancements in areas where devastating diseases such as HIV/AIDS, malaria, and tuberculosis threaten local populations. Additional research is required to assess the extent of the gains generated by medicines that treat these illnesses.

ii. Policies aimed at improving happiness:

Improvements in life satisfaction are not realized through policies that specifically target happiness, but rather through channels that enrich other aspects of well-being. For example, Baranov et al. (2015) argue that access to ART positively correlates with subjective psychological well-being and feelings of calmness, but negatively associates with anxiety and depression. Also, individuals are more likely to believe they can accomplish activities or achieve goals when they live closer to clinics. High prevalence of HIV/AIDS can contribute to anxiety, depression, and other common mental disorders among those who are HIV-positive, and by creating spillovers to the HIV-negative. Many individuals residing in HIV-endemic areas lose friends and family members to the disease, exacerbating mental trauma. This means that ART access serves as one of

several channels through which happiness may be improved.

The What Works Centre for Wellbeing, an independent research organization based in England, supports the notion that interventions should target alternative facets of well-being in order to augment life satisfaction. The organization has created a “community well-being theory of change” diagram to illustrate that on-the-ground interventions help improve quality of life, strengthen social networks, and reinforce democratic participation; in the long-term, these interventions also enrich individual and community well-being.

In one of their 2017 reports, the What Works Centre identifies some of the specific interventions that help improve life satisfaction. For example, it finds that job-training programs increase job satisfaction and overall satisfaction with life. A one-point increase in job satisfaction in the United Kingdom correlates with a 0.17 increase in life satisfaction. In their study on health care providers in Malawi, Fogarty et al. (2014) show that those with greater job training opportunities are more satisfied with their jobs. Although the study does not examine impacts on life satisfaction, it is conceivable that the training could have produced the same benefits described in the What Works Centre’s study. Additional research is required to determine any causal links.

The What Works Centre also evaluates policies designed to enrich cultural experiences, such as sports or music. For example, the Silver Song Club for older individuals interested in music was designed as a cultural intervention aimed at promoting the arts. Participants indicated that the weekly singing lessons also improved their mental health and general quality of life (Wright and Peasgood, 2017).

In Malawi, there are several artistic interventions that may enhance psychological well-being. For example, Hivos Southern Africa, in partnership with the Royal Norwegian Embassy in Malawi launched a Cultural Fund of Malawi in 2016 to promote the arts. With a budget of nearly half a million euros, they support theater, film, fashion, music, and other artistic endeavors. Initiatives such as these provide artistic outlets, but they may also enrich individual and community happiness.

VIII. Conclusions and Future Research

i. Conclusions

This chapter explains that ART access and unexplained happiness associate with reduced likelihood of catastrophic health expenditure in Malawi. When a household is closer than mean distance from an ART-providing clinic, improved access reduces the probability of catastrophic spending at the 20 percent threshold. When the negative log distance variable is used, improved access lowers the likelihood across all thresholds. Unexplained happiness associates with a lower probability of catastrophic health expenditure across the 20, 30, and 40 percent thresholds.

There are several channels through which these outcomes occur. Improved access to ART may impact catastrophic spending by increasing work time amongst both men and women who are HIV-negative (Baranov et al, 2015). It may also enable PLHIV to maintain their health and continue working, even after they have contracted the disease. This employment may help protect against financial risks, such as catastrophic health expenditure.

Protection against health and financial risk enables ART to function as a type of insurance. It helps lower the difference in quality of life between those who do and do not have HIV, reduces perceived mortality, and associates with positive economic externalities. Findings also indicate a link between happiness and catastrophic spending in Malawi. However, data are limited to the town level. Weights have been included to account for the number of households within each town, but a more appropriate analysis would examine the impact of happiness at the individual level.

Despite this data limitation, several channels of effect explain the association between unexplained happiness and likelihood of catastrophic spending in Malawi. Unexplained happiness may augment future earnings and capacity to pay, leading to reduced likelihood of catastrophic spending. Literature suggests that those who are happier in their youth are more likely to graduate from college and climb the professional ladder, allowing them to earn more as adults. Positive well-being may also influence catastrophic spending through its impacts on physical health. Happier individuals live

longer and are less likely to experience coronary heart problems, immune disorders, stroke, and certain types of cancer. One study suggests that happier people also demonstrate improved walking speed and gait as they age.

Malawi's average Cantril ladder score is low compared to the majority of countries surveyed for the 2017 World Happiness Report, leaving room for substantial gains. Programs and policies that specifically target happiness may not be the most appropriate way to increase happiness levels, but interventions that target overall well-being could facilitate gains. The What Works Centre for Wellbeing outlines interventions designed to improve job satisfaction and the arts, both of which may benefit life satisfaction. Similar initiatives could prove effective in improving life satisfaction and combatting catastrophic spending in Malawi.

Broad-based health insurance schemes are often considered the most straightforward approach to eliminating high OOP payments, but this paper identifies an alternative approach. Disease-specific medical treatments, such as ART, can be used to protect individuals against the financial risks associated with illness. Programs that elevate life satisfaction may also strengthen the cause, as higher levels of happiness are known to boost earnings. However, this analysis is limited to the country of Malawi and findings may not be applicable in all developing countries, so further research on catastrophic health expenditure in impoverished settings is needed. New insights will supplement literature on psychological well-being and targeted medical advancements in areas with high rates of disease.

ii. Suggestions for future research

Additional research could explore the links between disease-specific medical advancements and catastrophic spending in other developing countries. Insights gleaned from such research could contribute to the discussion on the insurance value of new medical technologies. It could stimulate new research on the optimal methods for avoiding burdensome health payments in impoverished settings.

Further research on Malawi could investigate the impacts of other shocks that afflict the country. Environmental shocks (e.g. drought and flood) and agricultural shocks

(e.g. increases in crop prices, crop disease, and livestock disease) continue to exacerbate health outcomes and impede economic growth. In 2015, the country faced drought and floods, and in 2016, drought returned. The World Bank (2016) argues that adverse weather-related events will likely continue. Malawi must identify appropriate methods to cope with agricultural shocks while continuing fiscal discipline to ensure improved economic growth.

The shocks impede Malawi's advancement for several reasons. Drops in agricultural production intensify food insecurity in the already-impooverished country. The 2016 Malawi Vulnerability Assessment Committee (MVAC) report indicates that 6.5 million Malawians face food insecurity (USAID, 2017). This introduces a number of health challenges to those with unreliable access to food. It can also provoke HIV transmission risk behaviors. For HIV patients receiving ART, food insecurity associates with lower baseline CD4 cell count, reduced ART adherence, and decreased probability of long-term survival (Anema et al, 2009).

The economic outcomes associated with agricultural and environmental shocks are correspondingly bleak. The sustained increase in maize prices (caused by the reduction in availability) increases inflation. In 2015, when droughts and floods beleaguered the country, the overall output of the agricultural sector contracted by 2.0 percent of GDP. A fall in domestic demand and a decline in the growth of Malawi's trading partners hindered growth in key sectors (World Bank, 2016).

Using data from rounds two and three of Malawi's Integrated Household Survey, one could examine the impact of these environmental and agricultural shocks on likelihood of catastrophic health expenditure and labor productivity in Malawi. Furthermore, IHS contains data on the coping mechanisms employed after shocks. These data could be used to determine the influence and impact of donor funding on ameliorating the negative impacts of agricultural and environmental shocks.

Appendix

Table 2.1: Summary of Statistics for Maternal Happiness Models

Variable	Mean	Std. Dev.	Min	Max
Age in Months	99.64	32.60	53.03	164
Dad at home	.88	.32	0	1
Wealth index	.57	.20	0	.95
Urban	.73	.44	0	1
Maternal Education	3.06	2.03	0	9
Indigenous	.02	.14	0	1
Birth Weight	3200.53	508.01	1000	5200
Job loss	.05	.22	0	1
Percent Job loss	.07	.05	0	.33

Table 2.0: Summary of Statistics for Maternal Depression Models

Variable	Mean	Std. Dev.	Min	Max
Age in Months	118.61	24.07	85.57	164
Dad at home	.85	.36	0	1
Wealth Index	.58	.20	0	.95
Urban	.74	.44	0	1
Maternal Education	3.02	2.05	0	9
Indigenous	.02	.15	0	1
Birth Weight	3200.85	506.61	1000	5200
Job loss	.05	.21	0	1
Percent job loss	.05	.05	0	.5

Table 2.3: Summary of Statistics for Smoking Models

Variable	Mean	Std. Dev.	Min	Max
Maternal Education	2.76	1.92	0	9
Wealth index	.63	.17	.03	.91
Child health	3.62	.62	1	5
Anxiety	.63	.48	0	1
Friends smoke	.73	.45	0	1
Parents smoke	.13	.34	0	1
Adolescent Drinks	.70	.46	0	1

Table 2.4: Summary of Statistics for Misinformation on Pregnancy Models

Variable	Mean	Std. Dev.	Min	Max
Maternal Education	2.76	1.92	0	9
Wealth index	.63	.17	.03	.91
Dad at home	.72	.45	0	1
Adolescent Drinks	.71	.46	0	1
Child health	3.63	.62	1	5
Physical abuse	.18	.38	0	1
Education	4.59	1.57	0	8

Table 2.5.a.: Maternal Happiness and Child Health with Birth Weight

Child Health	(1) Pooled OLS	(2) Fixed Effects
Maternal Happiness	0.0544*** (0.00691)	0.0345*** (0.0101)
Child age (months)	0.000287 (0.00317)	0.00474 (0.0198)
Dad at home	0.0179 (0.0351)	-0.0571 (0.0705)
Wealth index	0.231*** (0.0844)	-0.117 (0.168)
Urban dummy	0.00504 (0.0351)	-0.0245 (0.129)
Maternal education	0.00867 (0.00710)	-0.0447 (0.0918)
Child Indigenous	0.0949 (0.0867)	-
Birth weight	4.10e-05* (2.36e-05)	-
Job loss	-0.0432 (0.0532)	-0.117* (0.0698)
Community job loss	0.185 (0.230)	0.138 (0.485)
Round	-0.0666 (0.153)	-0.268 (0.938)
Observations	2,688	2,688
R-squared	0.043	0.016

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.6: Maternal Happiness and Child Health, Ordered Logit

Child Health	(1) All	(2) Male	(3) Female
Maternal Happiness	0.170*** (0.0213)	0.189*** (0.0308)	0.155*** (0.0296)
Child age (months)	6.42e-05 (0.00987)	-0.00121 (0.0138)	0.000632 (0.0142)
Dad at home	0.0876 (0.112)	0.0551 (0.169)	0.113 (0.149)
Wealth index	0.781*** (0.262)	0.482 (0.364)	1.029*** (0.382)
Urban dummy	-0.00102 (0.105)	0.135 (0.150)	-0.137 (0.149)
Maternal education	0.0275 (0.0224)	-0.00267 (0.0302)	0.0585* (0.0336)
Child Indigenous	0.162 (0.257)	0.163 (0.387)	0.172 (0.343)
Job Loss	-0.169 (0.172)	-0.0619 (0.247)	-0.260 (0.242)
Percent Job loss	0.314 (0.711)	0.788 (1.015)	-0.0818 (1.002)
Round	-0.133 (0.476)	-0.0886 (0.665)	-0.143 (0.683)
Observations	3,065	1,553	1,512

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.7: Maternal Happiness and Child Health by Gender, Pooled OLS

Child Health	(1) All	(2) Male	(3) Female
Maternal Happiness	0.0527*** (0.00641)	0.0582*** (0.00919)	0.0480*** (0.00898)
Child age (months)	-0.000649 (0.00299)	-0.00128 (0.00416)	-0.000257 (0.00433)
Dad at home	0.0226 (0.0338)	0.0155 (0.0512)	0.0286 (0.0454)
Wealth index	0.220*** (0.0796)	0.124 (0.110)	0.305*** (0.116)
Urban dummy	0.0177 (0.0323)	0.0624 (0.0458)	-0.0269 (0.0457)
Maternal education	0.0103 (0.00677)	0.00159 (0.00915)	0.0186* (0.0101)
Child Indigenous	0.0481 (0.0779)	0.0544 (0.119)	0.0481 (0.104)
Job Loss	-0.0430 (0.0522)	-0.00529 (0.0739)	-0.0790 (0.0740)
Percent Job loss	0.0934 (0.216)	0.251 (0.309)	-0.0443 (0.305)
Round	-0.0123 (0.144)	0.00743 (0.200)	-0.0191 (0.209)
Observations	3,065	1,553	1,512
R-squared	0.040	0.040	0.043

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.8: Maternal Happiness and Child Health by Gender, Fixed Effects

Child Health	(1) All	(2) Male	(3) Female
Maternal Happiness	0.0340*** (0.00948)	0.0445*** (0.0147)	0.0264** (0.0124)
Child age (months)	0.00389 (0.0191)	0.0180 (0.0266)	-0.0121 (0.0260)
Dad at home	-0.0176 (0.0702)	0.155* (0.0896)	-0.212** (0.104)
Wealth index	-0.107 (0.160)	-0.150 (0.225)	-0.104 (0.227)
Urban dummy	0.00755 (0.119)	6.96e-05 (0.161)	0.00435 (0.176)
Maternal education	-0.0467 (0.0833)	-0.175** (0.0849)	0.0599 (0.130)
Child Indigenous	-	-	-
Job Loss	-0.117* (0.0680)	-0.105 (0.107)	-0.147* (0.0852)
Percent Job loss	0.00961 (0.474)	0.337 (0.621)	-0.591 (0.716)
Round	-0.217 (0.904)	-0.879 (1.263)	0.538 (1.230)
Observations	3,065	1,553	1,512
R-squared	0.014	0.024	0.018
Number of Children	1,626	823	803

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.9: Lagged Maternal Happiness and Child Health

Child Health	(1) Pooled OLS	(2) Fixed Effects
Maternal Happiness	0.0500*** (0.00653)	0.0326*** (0.0104)
Lagged Happiness	0.0148** (0.00645)	-0.00572 (0.0105)
Child age (months)	-0.000339 (0.00301)	0.00410 (0.0199)
Dad at home	0.0185 (0.0343)	-0.0118 (0.0731)
Wealth index	0.198** (0.0802)	-0.0888 (0.162)
Urban dummy	0.0172 (0.0324)	0.0343 (0.119)
Maternal education	0.00801 (0.00680)	-0.0419 (0.0834)
Child Indigenous	0.0504 (0.0782)	-
Job Loss	-0.0392 (0.0523)	-0.106 (0.0681)
Percent Job loss	0.0812 (0.217)	0.00445 (0.478)
Round	-0.0430 (0.145)	-0.232 (0.943)
Observations	3,020	3,020
R-squared	0.040	0.015

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.10.a.: Reported Maternal Depression and Child Health with Birth Weight

Child Health	(1) Pooled OLS	(2) Fixed Effects	(3) FEIV
Maternal Depression	-0.0257*** (0.00312)	-0.0206*** (0.00507)	-0.138** (0.0615)
Child age (months)	-0.000550 (0.00307)	0.00602 (0.0194)	0.00225 (0.0184)
Dad at home	0.0251 (0.0329)	0.0483 (0.0725)	-0.0132 (0.0940)
Wealth index	0.327*** (0.0824)	-0.0615 (0.164)	0.0811 (0.209)
Urban dummy	0.0126 (0.0344)	-0.0496 (0.115)	-0.100 (0.141)
Maternal education	0.00947 (0.00672)	0.00391 (0.0403)	-0.0594 (0.0610)
Indigenous	0.0901 (0.0822)	-	-
Birth weight	4.42e-05* (2.27e-05)	-	-
Job Loss	-0.0568 (0.0519)	-0.163** (0.0671)	-0.107 (0.0874)
Community job loss	0.0808 (0.240)	-0.312 (0.348)	-0.700 (0.452)
Round	0.00990 (0.148)	-0.280 (0.923)	0.0355 (0.887)
Observations	2,844	2,844	2,844
R-squared	0.046	0.022	0.016

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.11: Reported Maternal Depression and Child Health, Ordered Logit

Child Health	(1) All	(2) Male	(3) Female
Depression Score	-0.0888*** (0.00989)	-0.0836*** (0.0138)	-0.0960*** (0.0143)
Child age (months)	-0.00160 (0.00989)	-0.00517 (0.0138)	0.00142 (0.0142)
Dad at home	0.0465 (0.112)	0.0389 (0.170)	0.0552 (0.150)
Wealth index	0.991*** (0.265)	0.702* (0.366)	1.265*** (0.386)
Urban dummy	0.0152 (0.105)	0.180 (0.150)	-0.141 (0.149)
Maternal education	0.0263 (0.0224)	0.00228 (0.0300)	0.0510 (0.0336)
Child Indigenous	0.0933 (0.256)	0.106 (0.389)	0.0925 (0.341)
Job Loss	-0.156 (0.177)	0.00895 (0.253)	-0.303 (0.250)
Percent Job loss	0.656 (0.709)	0.645 (0.963)	0.623 (1.053)
Round	0.0412 (0.478)	0.204 (0.669)	-0.0902 (0.687)
Observations	3,064	1,549	1,515

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.12: Maternal Depression and Child Health by Gender, Pooled OLS

Child Health	(1) All	(2) Male	(3) Female
Depression Score	-0.0267*** (0.00298)	-0.0247*** (0.00417)	-0.0293*** (0.00428)
Child age (months)	-0.00115 (0.00299)	-0.00243 (0.00417)	-0.000120 (0.00430)
Dad at home	0.0118 (0.0339)	0.0132 (0.0517)	0.0120 (0.0452)
Wealth index	0.288*** (0.0798)	0.191* (0.111)	0.381*** (0.116)
Urban dummy	0.0213 (0.0321)	0.0767* (0.0457)	-0.0310 (0.0454)
Maternal education	0.00986 (0.00673)	0.00340 (0.00913)	0.0161 (0.0100)
Child Indigenous	0.0349 (0.0778)	0.0386 (0.119)	0.0344 (0.103)
Job Loss	-0.0402 (0.0534)	0.0107 (0.0757)	-0.0887 (0.0755)
Percent Job loss	0.193 (0.213)	0.231 (0.291)	0.138 (0.315)
Round	0.0391 (0.144)	0.0913 (0.201)	0.000213 (0.208)
Observations	3,064	1,549	1,515
R-squared	0.044	0.038	0.055

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.13: Maternal Depression and Child Health by Gender, Fixed Effects

Child Health	(1) All	(2) Male	(3) Female
Depression Score	-0.0219*** (0.00492)	-0.0237*** (0.00738)	-0.0195*** (0.00647)
Child age (months)	-0.000779 (0.0196)	0.0160 (0.0292)	-0.0173 (0.0254)
Dad at home	-0.0319 (0.0715)	0.133 (0.0927)	-0.210** (0.106)
Wealth index	-0.0455 (0.159)	-0.0737 (0.222)	-0.0423 (0.229)
Urban dummy	0.0380 (0.109)	-0.0531 (0.150)	0.104 (0.157)
Maternal education	-0.0506 (0.0832)	-0.153* (0.0926)	0.0383 (0.128)
Child Indigenous	-	-	-
Job Loss	-0.108 (0.0680)	-0.0962 (0.107)	-0.139 (0.0848)
Percent Job loss	-0.248 (0.286)	-0.221 (0.403)	-0.261 (0.401)
Round	0.0375 (0.930)	-0.748 (1.385)	0.809 (1.203)
Observations	3,064	1,549	1,515
R-squared	0.019	0.026	0.024
Number of childid1	1,626	823	803

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.14: Lagged Maternal Depression and Child Health

Child Health	(1) Pooled OLS	(2) Fixed Effects	(3) FEIV
Maternal Depression	-0.0272*** (0.00299)	-0.0221*** (0.00493)	-0.137** (0.0666)
Lagged Depression	-0.00535* (0.00285)	-0.00144 (0.00358)	-0.00470 (0.00485)
Child age (months)	-0.00140 (0.00300)	0.000636 (0.0198)	-0.000381 (0.0185)
Dad at home	0.00719 (0.0340)	-0.0409 (0.0713)	-0.143 (0.109)
Wealth index	0.288*** (0.0801)	-0.0410 (0.160)	0.135 (0.217)
Urban dummy	0.0197 (0.0323)	0.0411 (0.110)	-0.00507 (0.134)
Maternal education	0.00969 (0.00675)	-0.0601 (0.0901)	-0.0927 (0.102)
Child Indigenous	0.0323 (0.0778)	-	-
Job Loss	-0.0347 (0.0534)	-0.110 (0.0676)	-0.0865 (0.0856)
Percent Job loss	0.199 (0.214)	-0.229 (0.284)	-0.513 (0.388)
Round	0.0515 (0.145)	-0.0306 (0.938)	0.144 (0.885)
Observations	3,042	3,042	3,042
R-squared	0.048	0.026	0.026

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.15.a: Maternal Happiness and Child Happiness with Birth Weight

Child Happiness	(1) Pooled OLS	(2) Fixed Effects
Maternal Happiness	0.228*** (0.0219)	0.224*** (0.0352)
Child age (months)	-0.0185* (0.0102)	-0.0401 (0.0625)
Dad at home	-0.0330 (0.110)	0.261 (0.285)
Wealth index	-0.275 (0.266)	-0.249 (0.615)
Urban dummy	0.180 (0.111)	0.0659 (0.416)
Maternal education	0.0712*** (0.0223)	0.0448 (0.241)
Indigenous	0.150 (0.270)	-
Birth weight	8.34e-05 (7.46e-05)	-
Job Loss	0.148 (0.168)	0.0589 (0.252)
Community job loss	1.437** (0.725)	2.060 (1.964)
Round	0.294 (0.489)	1.304 (2.964)
Observations	2,663	2,663
R-squared	0.078	0.082

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.16: Maternal Happiness and Child Happiness, Ordered Logit

Child Happiness	(1) All	(2) Male	(3) Female
Maternal Happiness	0.227*** (0.0197)	0.174*** (0.0276)	0.281*** (0.0282)
Child age (months)	-0.0168* (0.00888)	-0.00229 (0.0123)	-0.0336*** (0.0129)
Dad at home	0.0249 (0.0974)	0.0783 (0.147)	0.00473 (0.130)
Wealth index	-0.266 (0.234)	-0.400 (0.326)	-0.0947 (0.339)
Urban dummy	0.181* (0.0959)	0.127 (0.136)	0.206 (0.136)
Maternal education	0.0542*** (0.0195)	0.0824*** (0.0264)	0.0290 (0.0291)
Child Indigenous	0.000811 (0.237)	-0.701* (0.361)	0.491 (0.311)
Job Loss	0.164 (0.156)	0.0958 (0.214)	0.258 (0.226)
Percent Job loss	0.974 (0.624)	1.177 (0.884)	0.731 (0.887)
Round	0.243 (0.427)	-0.487 (0.593)	1.080* (0.618)
Observations	3,037	1,541	1,496

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.17: Maternal Happiness and Child Happiness by Gender, Pooled OLS

Child Happiness	(1) All	(2) Male	(3) Female
Maternal Happiness	0.230*** (0.0203)	0.174*** (0.0285)	0.284*** (0.0289)
Child age (months)	-0.0145 (0.00957)	-0.00104 (0.0131)	-0.0296** (0.0140)
Dad at home	0.00506 (0.106)	0.0413 (0.158)	-0.00907 (0.145)
Wealth index	-0.246 (0.251)	-0.414 (0.340)	-0.0100 (0.373)
Urban dummy	0.176* (0.102)	0.0923 (0.142)	0.227 (0.146)
Maternal education	0.0706*** (0.0213)	0.0982*** (0.0283)	0.0422 (0.0324)
Child Indigenous	-0.0751 (0.243)	-0.701* (0.360)	0.398 (0.331)
Job Loss	0.166 (0.165)	0.0891 (0.228)	0.248 (0.239)
Percent Job loss	1.035 (0.682)	1.596* (0.954)	0.456 (0.977)
Round	0.189 (0.461)	-0.475 (0.629)	0.936 (0.676)
Observations	3,037	1,541	1,496
R-squared	0.071	0.066	0.087

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.18: Maternal Happiness and Child Happiness by Gender, Fixed Effects

Child Happiness	(1) All	(2) Male	(3) Female
Maternal Happiness	0.241*** (0.0339)	0.195*** (0.0483)	0.287*** (0.0467)
Child age (months)	-0.0402 (0.0594)	0.120 (0.0784)	-0.178** (0.0773)
Dad at home	0.303 (0.275)	0.469 (0.336)	0.131 (0.450)
Wealth index	-0.0199 (0.573)	-0.655 (0.767)	0.797 (0.859)
Urban dummy	0.247 (0.375)	0.980* (0.531)	-0.558 (0.483)
Maternal education	-0.0186 (0.219)	0.192 (0.264)	-0.156 (0.329)
Child Indigenous	-	-	-
Job Loss	0.0544 (0.245)	-0.180 (0.291)	0.251 (0.386)
Percent Job loss	1.892 (1.849)	1.327 (2.388)	2.300 (2.866)
Round	1.386 (2.817)	-6.214* (3.719)	7.949** (3.672)
Observations	3,037	1,541	1,496
R-squared	0.074	0.074	0.092
Number of Children	1,616	818	798

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.19: Lagged Maternal Happiness and Child Happiness

Child Happiness	(1) Pooled OLS	(2) Fixed Effects
Maternal Happiness	0.224*** (0.0208)	0.242*** (0.0387)
Lagged Happiness	0.00316 (0.0205)	0.0187 (0.0369)
Child age (months)	-0.0148 (0.00969)	-0.0568 (0.0600)
Dad at home	0.00154 (0.109)	0.307 (0.286)
Wealth index	-0.225 (0.255)	0.0264 (0.587)
Urban dummy	0.157 (0.103)	0.240 (0.385)
Maternal education	0.0735*** (0.0216)	-0.0215 (0.220)
Child Indigenous	-0.0893 (0.246)	-
Job Loss	0.147 (0.167)	0.0435 (0.247)
Percent Job loss	1.061 (0.689)	1.858 (1.863)
Round	0.211 (0.467)	2.165 (2.851)
Observations	2,993	2,993
R-squared	0.069	0.072

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.20.a.: Maternal Depression and Child Happiness with Birth Weight

Child Happiness	(1) Pooled OLS	(2) Fixed Effects	(3) FEIV
Maternal Depression	-0.0422*** (0.0100)	-0.0266 (0.0174)	-0.0305 (0.194)
Child age (months)	-0.0143 (0.00998)	-0.0158 (0.0601)	-0.0160 (0.0676)
Dad at home	0.0420 (0.105)	0.120 (0.267)	0.118 (0.278)
Wealth index	-0.0491 (0.264)	0.334 (0.605)	0.339 (0.620)
Urban dummy	0.156 (0.111)	-0.173 (0.404)	-0.173 (0.408)
Maternal education	0.0902*** (0.0216)	-0.000196 (0.118)	-0.00234 (0.182)
Indigenous	-0.239 (0.261)	-	-
Birth weight	8.32e-05 (7.34e-05)	-	-
Job Loss	0.0217 (0.167)	0.0115 (0.247)	0.0132 (0.255)
Community job loss	1.811** (0.770)	0.402 (1.106)	0.389 (1.339)
Round	0.104 (0.481)	0.177 (2.852)	0.193 (3.257)
Observations	2,818	2,818	2,818
R-squared	0.048	0.048	0.027

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.21: Maternal Depression and Child Happiness, Ordered Logit

Child Happiness	(1) All	(2) Male	(3) Female
Depression Score	-0.0299*** (0.00875)	-0.0317*** (0.0122)	-0.0271** (0.0127)
Child age (months)	-0.0145 (0.00887)	-0.00143 (0.0123)	-0.0286** (0.0128)
Dad at home	0.0640 (0.0978)	0.103 (0.149)	0.0591 (0.130)
Wealth index	-0.0720 (0.235)	-0.286 (0.328)	0.179 (0.340)
Urban dummy	0.145 (0.0960)	0.115 (0.136)	0.139 (0.136)
Maternal education	0.0697*** (0.0194)	0.0990*** (0.0264)	0.0387 (0.0289)
Child Indigenous	-0.0861 (0.238)	-0.778** (0.360)	0.402 (0.314)
Job Loss	0.0780 (0.159)	0.0510 (0.218)	0.105 (0.231)
Percent Job loss	1.466** (0.621)	1.475* (0.853)	1.551* (0.911)
Round	0.165 (0.428)	-0.500 (0.595)	0.872 (0.618)
Observations	3,036	1,537	1,499

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.22: Reported Maternal Depression and Child Happiness by Gender, Pooled OLS

Child Happiness	(1) All	(2) Male	(3) Female
Depression Score	-0.0327*** (0.00961)	-0.0352*** (0.0130)	-0.0287** (0.0142)
Child age (months)	-0.0119 (0.00974)	0.000399 (0.0132)	-0.0254* (0.0144)
Dad at home	0.0440 (0.109)	0.0627 (0.161)	0.0457 (0.150)
Wealth index	-0.0155 (0.257)	-0.262 (0.345)	0.297 (0.384)
Urban dummy	0.146 (0.103)	0.0848 (0.142)	0.173 (0.151)
Maternal education	0.0877*** (0.0217)	0.116*** (0.0284)	0.0544 (0.0333)
Child Indigenous	-0.139 (0.248)	-0.808** (0.363)	0.385 (0.341)
Job Loss	0.0631 (0.172)	0.0391 (0.235)	0.0717 (0.252)
Percent Job loss	1.655** (0.686)	1.602* (0.907)	1.817* (1.044)
Round	0.0857 (0.470)	-0.528 (0.637)	0.752 (0.696)
Observations	3,036	1,537	1,499
R-squared	0.036	0.048	0.032

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.23: Reported Maternal Depression and Child Happiness by Gender, Fixed Effects

Child Happiness	(1) All	(2) Male	(3) Female
Depression Score	-0.0218 (0.0172)	-0.0120 (0.0237)	-0.0253 (0.0256)
Child age (months)	-0.0362 (0.0612)	0.128 (0.0813)	-0.166** (0.0794)
Dad at home	0.333 (0.281)	0.471 (0.345)	0.190 (0.455)
Wealth index	0.149 (0.587)	-0.298 (0.775)	0.642 (0.885)
Urban dummy	0.232 (0.401)	0.872 (0.530)	-0.456 (0.583)
Maternal education	-0.000730 (0.241)	0.302 (0.276)	-0.263 (0.355)
Child Indigenous	-	-	-
Job Loss	0.102 (0.245)	-0.165 (0.292)	0.338 (0.387)
Percent Job loss	-0.452 (0.908)	-0.392 (1.064)	-0.518 (1.550)
Round	1.254 (2.908)	-6.588* (3.860)	7.427** (3.778)
Observations	3,036	1,537	1,499
R-squared	0.038	0.052	0.039
Number of Children	1,616	818	798

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.24: Lagged Maternal Depression and Child Happiness

Child Happiness	(1) Pooled OLS	(2) Fixed Effects	(3) FEIV
Maternal Depression	-0.0319*** (0.00964)	-0.0228 (0.0174)	0.132 (0.207)
Lagged Depression	0.00628 (0.00921)	0.0180 (0.0133)	0.0226 (0.0149)
Child age (months)	-0.0127 (0.00978)	-0.0352 (0.0607)	-0.0315 (0.0714)
Dad at home	0.0484 (0.109)	0.345 (0.281)	0.486 (0.338)
Wealth index	-0.0460 (0.258)	0.189 (0.594)	-0.0496 (0.666)
Urban dummy	0.170 (0.104)	0.237 (0.406)	0.256 (0.405)
Maternal education	0.0864*** (0.0217)	0.0511 (0.254)	0.0931 (0.309)
Child Indigenous	-0.127 (0.248)	-	-
Job Loss	0.0527 (0.172)	0.0779 (0.247)	0.0540 (0.260)
Percent Job loss	1.663** (0.688)	-0.434 (0.908)	-0.0470 (1.191)
Round	0.118 (0.472)	1.200 (2.886)	0.857 (3.418)
Observations	3,014	3,014	3,014
R-squared	0.038	0.041	0.041

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.26: Maternal Happiness and Whether Adolescent Smokes, Logit

Adolescent Smokes	(1) All	(2) Male	(3) Female
Maternal Happiness	-0.0754 (0.0617)	0.0672 (0.0959)	-0.202** (0.0927)
Maternal Education	-0.0551 (0.0598)	-0.152* (0.0897)	0.0499 (0.0916)
Wealth Index	-0.798 (0.732)	1.050 (1.014)	-3.075** (1.208)
Child Health	0.170 (0.176)	0.231 (0.259)	0.0466 (0.269)
Anxiety	0.378* (0.219)	0.272 (0.332)	0.229 (0.335)
Friends Smoke	1.141*** (0.256)	1.229*** (0.371)	0.661* (0.392)
Parents Smoke	-0.00555 (0.309)	0.253 (0.490)	0.294 (0.454)
Adolescent Drinks	1.769*** (0.266)	1.503*** (0.383)	1.858*** (0.428)
Observations	478	247	231

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.28: Maternal Depression and Whether Adolescent Smokes, Logit

Adolescent Smokes	(1) All	(2) Male	(3) Female
Maternal Depression	0.0751** (0.0292)	0.114** (0.0479)	0.0658 (0.0416)
Maternal Education	-0.0442 (0.0600)	-0.102 (0.0911)	0.0436 (0.0911)
Wealth Index	-0.917 (0.734)	0.753 (1.041)	-2.975** (1.197)
Child Health	0.187 (0.176)	0.261 (0.262)	0.0401 (0.265)
Anxiety	0.393* (0.220)	0.229 (0.336)	0.272 (0.335)
Friends smoke	1.166*** (0.258)	1.360*** (0.383)	0.714* (0.390)
Parents smoke	-0.0194 (0.309)	0.209 (0.489)	0.203 (0.452)
Adolescent drinks	1.760*** (0.267)	1.509*** (0.389)	1.759*** (0.420)
Observations	478	247	231

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.29: Maternal Depression and Adolescent Smoking with IV, Mean Marginal Effects

	(1)	(2)	(3)
Adolescent Smokes	All	Male	Female
Maternal Depression	0.0337 (0.0480)	0.0194 (0.0577)	-0.0162 (0.110)
Maternal Education	-0.0281 (0.0374)	-0.0761 (0.0561)	0.0200 (0.0538)
Wealth Index	-0.576 (0.436)	0.575 (0.620)	-1.797*** (0.680)
Child Health	0.0930 (0.106)	0.118 (0.152)	0.0112 (0.156)
Anxiety	0.251* (0.133)	0.170 (0.199)	0.145 (0.215)
Friends smoke	0.676*** (0.151)	0.771*** (0.231)	0.405* (0.222)
Parents smoke	-0.0109 (0.192)	0.142 (0.291)	0.142 (0.282)
Adolescent drinks	1.060*** (0.155)	0.904*** (0.233)	1.024*** (0.233)
Observations	478	247	231

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.31: Maternal Happiness and Misinformation on Pregnancy, Logit

	(1)	(2)	(3)
Misinformation on Pregnancy	All	Male	Female
Maternal Happiness	0.00560 (0.0638)	-0.114 (0.0990)	0.0523 (0.0903)
Maternal Education	-0.147** (0.0694)	-0.0225 (0.0996)	-0.273** (0.106)
Wealth Index	-0.797 (0.757)	-1.794* (1.052)	0.514 (1.176)
Dad at home	0.308 (0.251)	0.442 (0.384)	0.426 (0.367)
Adolescent drinks	0.0826 (0.238)	0.398 (0.377)	0.0429 (0.342)
Adolescent health	-0.0195 (0.176)	-0.311 (0.265)	0.217 (0.252)
Family abuse	0.346 (0.273)	0.299 (0.441)	0.511 (0.386)
Adolescent Education	-0.171** (0.0772)	-0.0245 (0.104)	-0.419*** (0.127)
Observations	389	206	183

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2.33: Maternal Depression and Misinformation on Pregnancy, Logit

Misinformation on Pregnancy	(1) All	(2) Male	(3) Female
Maternal Depression	0.0689** (0.0301)	0.0895** (0.0427)	0.0607 (0.0449)
Maternal Education	-0.132* (0.0699)	0.00567 (0.101)	-0.279*** (0.106)
Wealth Index	-0.982 (0.763)	-2.336** (1.077)	0.505 (1.186)
Dad at home	0.320 (0.251)	0.370 (0.376)	0.460 (0.367)
Adolescent drinks	0.0957 (0.241)	0.452 (0.384)	0.0492 (0.343)
Adolescent health	-0.00193 (0.177)	-0.267 (0.265)	0.226 (0.253)
Family abuse	0.271 (0.277)	0.276 (0.447)	0.420 (0.396)
Adolescent Education	-0.160** (0.0777)	-0.0197 (0.105)	-0.405*** (0.128)
Observations	389	206	183

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.34: Maternal Depression and Misinformation on Pregnancy with IV, Mean Marginal Effects

Misinformation on Pregnancy	(1) All	(2) Male	(3) Female
Maternal Depression	-0.0391 (0.0487)	-0.0401 (0.0575)	0.0204 (0.118)
Maternal Education	-0.0954** (0.0425)	-0.0369 (0.0644)	-0.166*** (0.0630)
Wealth Index	-0.381 (0.479)	-0.994 (0.704)	0.322 (0.716)
Dad at home	0.178 (0.151)	0.202 (0.227)	0.271 (0.218)
Adolescent drinks	0.0407 (0.145)	0.201 (0.232)	0.0294 (0.207)
Adolescent health	-0.0240 (0.107)	-0.181 (0.158)	0.137 (0.155)
Family abuse	0.248 (0.174)	0.188 (0.271)	0.272 (0.316)
Adolescent Education	-0.107** (0.0471)	-0.0114 (0.0628)	-0.251*** (0.0839)
Observations	389	206	183

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.0: Spending on health categories (in kwacha), 2004-2005

Health category	(1) Mean	(2) SD
Illness and injury	10.60776	110.8526
Non-illness care	1.326902	31.88665
Nonprescription medication	9.333129	86.9802
Hospitalization	623.6675	2562.925

Table 3.1: Spending on health categories (in kwacha), 2010-2011

Health category	(1) Mean	(2) SD
Illness and injury	20.11778	359.5341
Non-illness care	3.646725	145.9091
Nonprescription medication	14.85856	146.9085
Hospitalization	1091.703	5681.461

Table 3.2: Summary of Statistics, 2004-2005 households

Variable	Mean	SD	Min	Max
Eq. scale	2.35	.87	1	10
No. of elderly	.18	.46	0	5
No. of children	.63	.75	0	5
Hot wet season	.43	.50	0	1
Age	24.12	13.45	6.2	99
Age ²	995.15	1110.95	57.25	9801
Log Km. to ADMARC	1.96	1.09	-6.91	6.70
Log Km. to road	1.97	1.83	-6.91	5.99
Central region	.38	.49	0	1
Southern region	.47	.50	0	1
No. Chronically ill	.44	.78	0	8

Table 3.3: Summary of Statistics, 2010-2011 households

Variable	Mean	Std. Dev.	Min	Max
Eq. scale	2.31	.80	1	7.9
No. of elderly	.16	.43	0	4
No. of children	.60	.72	0	4
Hot wet season	.47	.50	0	1
Age	24.19	14.14	7	110
Age ²	1004.17	1196.35	96.5	12100
Log Km. to ADMARC	1.79	.85	-3.0	3.64
Log Km. to road	1.17	1.69	-4.6	4.05
Central Region	.34	.47	0	1
Southern Region	.47	.50	0	1
No. Chronically ill	.24	.53	0	7

Table 3.7: Closer than Mean Distance and Catastrophic Expenditure, Mean Marginal Effects

Catastrophic expenditure	(1) 20 % threshold	(2) 30% threshold	(3) 40 % threshold
Closer	0.00674 (0.00877)	-0.000628 (0.00634)	0.00390 (0.00497)
Year 2010	0.00752 (0.00883)	0.00452 (0.00645)	0.00459 (0.00518)
Closer 2010	-0.0315** (0.0123)	-0.0120 (0.00900)	-0.0110 (0.00694)
Eq. scale	0.0382*** (0.00272)	0.0252*** (0.00207)	0.0169*** (0.00152)
No. of elderly	0.0243*** (0.00585)	0.0179*** (0.00458)	0.00940*** (0.00345)
No. of Children	0.00876*** (0.00327)	0.00523** (0.00261)	0.00494** (0.00214)
Hot wet season	0.0135** (0.00618)	0.00694 (0.00455)	0.00660* (0.00352)
Age	-0.00250*** (0.000819)	-0.00171*** (0.000653)	-0.00121** (0.000533)
Age ²	2.64e-05*** (9.26e-06)	1.75e-05** (7.22e-06)	1.33e-05** (5.56e-06)
Log Km. to ADMARC	0.00321 (0.00364)	0.00196 (0.00274)	0.00243 (0.00199)
Log Km. to Road	0.00420* (0.00215)	0.00420*** (0.00147)	0.00299*** (0.00114)
Central Region	0.0559*** (0.00728)	0.0374*** (0.00540)	0.0238*** (0.00405)
Southern Region	0.0349*** (0.00650)	0.0258*** (0.00502)	0.0186*** (0.00384)
Chronic Illness	0.0233*** (0.00304)	0.0124*** (0.00225)	0.00718*** (0.00160)
Observations	20,363	20,363	3,127

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 3.8: Closer than Mean Distance and Catastrophic Expenditure at 20 % threshold, OLS

Catastrophic Expenditure	(1) All	(2) Rural	(3) Urban
Closer	0.00693 (0.0110)	0.0129 (0.0118)	0.0523 (0.0381)
Year 2010	0.00648 (0.0109)	0.00533 (0.0110)	0.0342 (0.0378)
Closer 2010	-0.0327** (0.0144)	-0.0339** (0.0154)	-0.0443 (0.0400)
Eq. scale	0.0515*** (0.00387)	0.0549*** (0.00418)	0.0317*** (0.00934)
No. of elderly	0.0351*** (0.00883)	0.0301*** (0.00924)	0.0840*** (0.0290)
No. of Children	0.0164*** (0.00442)	0.0155*** (0.00474)	0.0190 (0.0126)
Hot wet season	0.0151** (0.00689)	0.0160** (0.00757)	0.0169 (0.0149)
Age	5.24e-05 (0.000750)	0.000124 (0.000821)	0.000890 (0.00164)
Age ²	-1.26e-06 (9.08e-06)	-1.24e-06 (9.81e-06)	-1.92e-05 (2.14e-05)
Log Km. to ADMARC	0.00351 (0.00367)	0.00325 (0.00416)	-0.00562 (0.00555)
Log Km. to Road	0.00440** (0.00218)	0.00259 (0.00239)	0.00878 (0.00560)
Central Region	0.0628*** (0.00838)	0.0654*** (0.00922)	0.0412** (0.0174)
Southern Region	0.0411*** (0.00747)	0.0421*** (0.00832)	0.0195* (0.0113)
Chronic Illness	0.0391*** (0.00539)	0.0400*** (0.00570)	0.0254* (0.0144)
Observations	20,363	17,236	3,127
R-squared	0.049	0.048	0.050

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.9: Closer than Mean Distance and Catastrophic Expenditure at 30 % threshold, OLS

Catastrophic Expenditure	(1) All	(2) Rural	(3) Urban
Closer	-0.00164 (0.00819)	0.00196 (0.00883)	0.0484** (0.0239)
Year 2010	0.00350 (0.00845)	0.00285 (0.00855)	0.0193 (0.0225)
Closer 2010	-0.0124 (0.0109)	-0.0138 (0.0117)	-0.0167 (0.0241)
Eq. scale	0.0371*** (0.00330)	0.0398*** (0.00368)	0.0224*** (0.00666)
No. of elderly	0.0294*** (0.00794)	0.0263*** (0.00828)	0.0540** (0.0271)
No. of Children	0.0114*** (0.00377)	0.0100** (0.00413)	0.0167* (0.00888)
Hot wet season	0.00835 (0.00532)	0.00889 (0.00591)	0.0100 (0.0104)
Age	0.000335 (0.000624)	0.000280 (0.000684)	0.00102 (0.00137)
Age ²	-4.92e-06 (7.54e-06)	-4.16e-06 (8.13e-06)	-1.11e-05 (2.05e-05)
Log Km. to ADMARC	0.00217 (0.00286)	0.00165 (0.00325)	-0.00151 (0.00406)
Log Km. to Road	0.00454*** (0.00150)	0.00354** (0.00165)	0.00446 (0.00417)
Central Region	0.0437*** (0.00646)	0.0447*** (0.00720)	0.0367*** (0.0117)
Southern Region	0.0318*** (0.00600)	0.0326*** (0.00671)	0.0177** (0.00788)
Chronic Illness	0.0228*** (0.00442)	0.0242*** (0.00472)	0.00425 (0.0103)
Observations	20,363	17,236	3,127
R-squared	0.035	0.034	0.037

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.10: Closer than Mean Distance and Catastrophic Expenditure at 40 % threshold, OLS

Catastrophic Expenditure	(1) All	(2) Rural	(3) Urban
Closer	0.00465 (0.00679)	0.00681 (0.00730)	0.0445*** (0.0155)
Year 2010	0.00461 (0.00691)	0.00387 (0.00700)	0.0198* (0.0102)
Closer 2010	-0.0128 (0.00887)	-0.0117 (0.00956)	-0.0256* (0.0139)
Eq. scale	0.0270*** (0.00280)	0.0301*** (0.00320)	0.0108*** (0.00407)
No. of elderly	0.0168*** (0.00644)	0.0142** (0.00677)	0.0362* (0.0204)
No. of Children	0.0108*** (0.00333)	0.0117*** (0.00368)	0.00102 (0.00600)
Hot wet season	0.00823* (0.00434)	0.00849* (0.00483)	0.00995 (0.00714)
Age	0.000376 (0.000505)	0.000403 (0.000558)	0.000480 (0.00109)
Age ²	-3.59e-06 (5.82e-06)	-3.14e-06 (6.30e-06)	-8.05e-06 (1.67e-05)
Log Km. to ADMARC	0.00268 (0.00214)	0.00193 (0.00243)	0.000692 (0.00291)
Log Km. to Road	0.00336*** (0.00120)	0.00248* (0.00131)	0.00158 (0.00265)
Central Region	0.0288*** (0.00499)	0.0300*** (0.00554)	0.0216** (0.00866)
Southern Region	0.0239*** (0.00490)	0.0252*** (0.00549)	0.00750 (0.00525)
Chronic Illness	0.0142*** (0.00346)	0.0149*** (0.00375)	0.00387 (0.00717)
Observations	20,363	17,236	3,127
R-squared	0.025	0.026	0.020

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.11: Proximity 2010 and Catastrophic Expenditure, Mean Marginal Effects

Catastrophic Expenditure	(1) 20 % threshold	(2) 30 % threshold	(3) 40 % threshold
Proximity	0.00569 (0.00549)	0.00335 (0.00408)	0.00343 (0.00279)
Year 2010	-0.0534*** (0.0159)	-0.0288** (0.0123)	-0.0172* (0.00885)
Proximity 2010	-0.0223*** (0.00730)	-0.0134** (0.00558)	-0.00806** (0.00404)
Eq. scale	0.0385*** (0.00272)	0.0253*** (0.00207)	0.0170*** (0.00153)
No. of elderly	0.0239*** (0.00584)	0.0176*** (0.00456)	0.00928*** (0.00344)
No. of Children	0.00853*** (0.00326)	0.00508* (0.00260)	0.00490** (0.00214)
Hot wet season	0.0136** (0.00614)	0.00728 (0.00450)	0.00664* (0.00350)
Age	-0.00243*** (0.000816)	-0.00166** (0.000648)	-0.00119** (0.000528)
Age ²	2.57e-05*** (9.26e-06)	1.70e-05** (7.20e-06)	1.31e-05** (5.53e-06)
Log Km. to ADMARC	0.00319 (0.00370)	0.00203 (0.00276)	0.00254 (0.00206)
Log Km. to Road	0.00395* (0.00217)	0.00410*** (0.00149)	0.00296** (0.00116)
Central Region	0.0553*** (0.00734)	0.0371*** (0.00543)	0.0237*** (0.00411)
Southern Region	0.0348*** (0.00647)	0.0255*** (0.00497)	0.0185*** (0.00380)
Chronic Illness	0.0232*** (0.00303)	0.0124*** (0.00223)	0.00716*** (0.00160)
Observations	20,363	20,363	20,363

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 3.12: Proximity and Catastrophic Health Expenditure at 20 % threshold, OLS

Catastrophic Expenditure	(1) All	(2) Rural	(3) Urban
Proximity	0.00562 (0.00646)	0.0159* (0.00894)	0.0148 (0.0179)
Year 2010	-0.0507*** (0.0158)	-0.0699*** (0.0239)	-0.0208 (0.0147)
Proximity 2010	-0.0202*** (0.00759)	-0.0280*** (0.0108)	-0.0178 (0.0183)
Eq. scale	0.0517*** (0.00386)	0.0551*** (0.00418)	0.0318*** (0.00930)
No. of elderly	0.0349*** (0.00885)	0.0299*** (0.00924)	0.0821*** (0.0300)
No. of Children	0.0162*** (0.00443)	0.0156*** (0.00475)	0.0190 (0.0130)
Hot wet season	0.0150** (0.00688)	0.0163** (0.00756)	0.0154 (0.0146)
Age	0.000126 (0.000751)	0.000154 (0.000821)	0.000880 (0.00174)
Age ²	-2.13e-06 (9.10e-06)	-1.50e-06 (9.82e-06)	-1.92e-05 (2.33e-05)
Log Km. to ADMARC	0.00358 (0.00376)	0.00394 (0.00415)	-0.00326 (0.00587)
Log Km. to Road	0.00416* (0.00221)	0.00277 (0.00240)	0.00858 (0.00547)
Central Region	0.0617*** (0.00837)	0.0650*** (0.00923)	0.0423** (0.0192)
Southern Region	0.0405*** (0.00738)	0.0406*** (0.00828)	0.0210* (0.0110)
Chronic Illness	0.0392*** (0.00540)	0.0400*** (0.00566)	0.0256* (0.0146)
Observations	20,363	17,236	3,127
R-squared	0.049	0.048	0.050

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.13: Proximity and Catastrophic Expenditure at 30 % threshold, OLS

Catastrophic Expenditure	(1) All	(2) Rural	(3) Urban
Proximity	0.00336 (0.00487)	0.0108* (0.00646)	0.0171 (0.0146)
Year 2010	-0.0280** (0.0123)	-0.0456** (0.0185)	-0.00710 (0.0147)
Proximity 2010	-0.0127** (0.00589)	-0.0199** (0.00830)	-0.0156 (0.0150)
Eq. scale	0.0373*** (0.00330)	0.0399*** (0.00368)	0.0224*** (0.00663)
No. of elderly	0.0291*** (0.00795)	0.0260*** (0.00828)	0.0519* (0.0281)
No. of Children	0.0112*** (0.00377)	0.0100** (0.00414)	0.0168* (0.00929)
Hot wet season	0.00856 (0.00531)	0.00948 (0.00589)	0.00892 (0.0103)
Age	0.000381 (0.000622)	0.000295 (0.000684)	0.000915 (0.00141)
Age ²	-5.47e-06 (7.54e-06)	-4.28e-06 (8.13e-06)	-9.65e-06 (2.18e-05)
Log Km. to ADMARC	0.00236 (0.00291)	0.00230 (0.00325)	0.00101 (0.00401)
Log Km. to Road	0.00446*** (0.00153)	0.00374** (0.00166)	0.00485 (0.00413)
Central Region	0.0433*** (0.00646)	0.0448*** (0.00721)	0.0396*** (0.0130)
Southern Region	0.0315*** (0.00594)	0.0316*** (0.00670)	0.0195** (0.00770)
Chronic Illness	0.0229*** (0.00441)	0.0243*** (0.00468)	0.00451 (0.0102)
Observations	20,363	17,236	3,127
R-squared	0.035	0.034	0.036

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.14: Proximity and Catastrophic Expenditure at 40 % threshold, OLS

Catastrophic Expenditure	(1) All	(2) Rural	(3) Urban
Proximity	0.00375 (0.00353)	0.0103** (0.00501)	0.00212 (0.0100)
Year 2010	-0.0182* (0.00931)	-0.0276* (0.0151)	-0.000763 (0.00747)
Proximity 2010	-0.00819* (0.00446)	-0.0123* (0.00672)	0.00241 (0.0109)
Eq. scale	0.0271*** (0.00281)	0.0301*** (0.00320)	0.0106*** (0.00401)
No. of elderly	0.0168*** (0.00645)	0.0141** (0.00677)	0.0353* (0.0206)
No. of Children	0.0108*** (0.00333)	0.0117*** (0.00368)	0.00187 (0.00640)
Hot wet season	0.00820* (0.00435)	0.00877* (0.00484)	0.00796 (0.00654)
Age	0.000395 (0.000504)	0.000408 (0.000558)	0.000588 (0.00112)
Age ²	-3.79e-06 (5.81e-06)	-3.14e-06 (6.30e-06)	-1.02e-05 (1.76e-05)
Log Km. to ADMARC	0.00282 (0.00223)	0.00250 (0.00247)	0.000923 (0.00288)
Log Km. to Road	0.00334*** (0.00122)	0.00267** (0.00131)	0.00111 (0.00267)
Central Region	0.0286*** (0.00503)	0.0300*** (0.00556)	0.0215*** (0.00826)
Southern Region	0.0236*** (0.00481)	0.0242*** (0.00545)	0.00757 (0.00511)
Chronic Illness	0.0142*** (0.00346)	0.0149*** (0.00372)	0.00439 (0.00697)
Observations	20,363	17,236	3,127
R-squared	0.025	0.026	0.018

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.15: Impact of Unexplained Happiness on Catastrophic Expenditure, Logit

Catastrophic Expenditure	(1) 20% threshold	(2) 30% threshold	(3) 40% threshold
Unexplained happiness	-0.335*** (0.00223)	-0.0758*** (0.00154)	-0.0695*** (0.00129)
Proximity to ART	-0.261*** (0.00364)	-0.230*** (0.00301)	-0.232*** (0.00250)
Log Km. to ADMARC	0.00762*** (0.000650)	0.0457*** (0.000547)	-0.0565*** (0.000392)
Log Km. to Road	-0.0234*** (0.000274)	-0.0265*** (0.000225)	-0.0159*** (0.000200)
Age	0.0334*** (0.00161)	-0.214*** (0.00124)	-0.194*** (0.00107)
Education	-0.0537*** (0.00336)	-0.0872*** (0.00279)	-0.290*** (0.00233)
Region II	0.696*** (0.00866)	0.775*** (0.00742)	0.428*** (0.00623)
Region III	0.974*** (0.00898)	0.711*** (0.00724)	0.276*** (0.00619)
Constant	0.805*** (0.0478)	6.350*** (0.0388)	7.069*** (0.0333)
Observations	2,264,839	2,264,839	2,264,839

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 3.16: Unexplained Happiness without Weights, Mean Marginal Effects

	(1)	(2)	(3)
Catastrophic Expenditure	20% threshold	30% threshold	40% threshold
Unexplained happiness	-0.0411*	-0.0255	-0.0304
	(0.0232)	(0.0272)	(0.0311)
Proximity to ART	-0.00990	-0.00805	-0.0301
	(0.0417)	(0.0542)	(0.0631)
Log Km. to ADMARC	-0.00471	-0.00266	-0.00859
	(0.00440)	(0.00607)	(0.00772)
Log Km. to Road	-0.00263	-0.00252	-0.00150
	(0.00316)	(0.00430)	(0.00502)
Age	0.00914	-0.0245	-0.0368*
	(0.0147)	(0.0176)	(0.0209)
Education	-0.0340	-0.0731*	-0.0917*
	(0.0323)	(0.0426)	(0.0507)
Region II	0.111	0.107	0.176
	(0.107)	(0.120)	(0.140)
Region III	0.0742	0.00475	0.0624
	(0.121)	(0.137)	(0.156)
Observations	162	162	162

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Bibliography

- Adler, D., McLaughlin, T. J., Rogers, W. H., Chang, H., Lapitsky, L., & Lerner, D. (2006). Job Performance Deficits Due to Depression. *The American Journal of Psychiatry*, *163*(9), 1569-1576.
- Adler, N., Stewart, J., Cohen, M., Cullen, M., Roux, A. D., Dow, W., & Williams, D. (2007). Researching for a Healthier Life: Facts on Socioeconomic Status and Health in the U.S. *The John D. and Catherine T. MacArthur Foundation Research Network on Socioeconomic Status and Health*, *43*.
- Agyepong, I. A., Abankwah, D. N. Y., Abroso, A., Chun, C., Dodoo, J. N. O., Lee, S., . . . Asenso-Boadi, F. (2016). The “Universal” in UHC and Ghana’s National Health Insurance Scheme: policy and implementation challenges and dilemmas of a lower middle income country. *BMC Health Services Research*, *16*(504).
- Ai, C., & Norton, E. (2003). Interaction terms in logit and probit models. *Economic Letters*, *80*, 123-129.
- Analytical summary - Health financing system*. (2017). Retrieved from WHO.
- Anda, R., Felitti, V., Bremner, J., Walker, J., Whitfield, C., Perry, B., . . . Giles, W. (2006). The enduring effect of abuse and related adverse experiences in childhood. *European Archives of Psychiatry and Clinical Neuroscience*, *256*(3), 174-186.
- Aseltine, R. H., Gore, S., & Colten, M. E. (1994). Depression and the social developmental context of adolescence. *Journal of Personality and Social Psychology*, *67*(2), 252-263.
- AVERT. (2017). *HIV and AIDS in East and Southern Africa Regional Overview*.
- AVERT. (2017). *HIV and AIDS in Malawi*.
- Azevedo, J. P., Favara, M., Haddock, S. E., Lopez-Calva, L. F., Muller, M., & Perova, E. (2012). Teenage Pregnancy and Opportunities in Latin America and the Caribbean: On Teenage Fertility Decisions, Poverty and Economic Achievement. *World Bank*.
- Baranov, V., Bennett, D., & Kohler, H.-P. (2015). The Indirect Impact of Antiretroviral Therapy: Mortality Risk, Mental Health, and HIV-Negative Labor Supply. *J Health Econ*, *44*, 195-211.
- Barling, J., MacEwen, K. E., & Nolte, M. (1993). Homemaker role experiences affect toddler behaviors via maternal well-being and parenting behavior. *Journal of Abnormal Child Psychology*, *21*(2), 213-229.
- Barofsky, J., & Baranov, V. (2015). *The End of AIDS: The Economics Effects of Antiretroviral Therapy at Scale in Malawi*.
- Baum, C. L. (2003). Does early maternal employment harm child development? An analysis of the potential benefits of leave taking. *Journal of Labor Economics*, *21*(409-448).
- Beardslee, W. R., Wright, E. J., Gladstone, T. R. G., & Forbes, P. (2008). Long-term effects from a randomized trial of two public health preventive interventions for parental depression. *Journal of Family Psychology*, *21*, 703-713.
- Beck, A. T., Ward, C. H., & Mendelson, M. (1961). An Inventory for Measuring Depression. *Arch Gen Psychiatry*, *4*(5), 651-571.
- Bendini, M. (2015). *The Effect of Stress on Developmental Trajectories: Empirical Evidence from Peru*. School of Public Policy. University of Maryland.
- Berger, E. M., & Spiess, K. C. (2011). Maternal Life Satisfaction and Child Outcomes: Are They Related? *Journal of Economic Psychology*, *32*, 142-158.
- Berki, S. E. (1986). A Look at Catastrophic Medical Expenses and the Poor. *Health Affairs*, 138-

- Bleakly, A., Hennessy, M., Fishbein, M., & Jordan, A. (2009). How Sources of Sexual Information Relate to Adolescents' Beliefs about Sex *American Journal of Health Behavior*, 33(1), 37-48.
- Boehm, J., & Kubzansky, L. (2012). The heart's content: the association between positive psychological well-being and cardiovascular health. *Psychol Bull*, 138, 655–691.
- Bor, J., Tanser, F., Newell, M.-L., & Bärnighausen, T. (2012). In A Study Of A Population Cohort In South Africa, HIV Patients On Antiretrovirals, Nearly Full Recovery Of Employment *Health Affairs*, 31(7).
- Cancian, M., Shook Slack, K., & Youn Yang, M. (2010). The Effect of Family Income on Risk of Child Maltreatment. *Institute for Research on Poverty*.
- Caner, A., & Wolff, E. N. (2004). Asset Poverty in the United States, 1984-99: Evidence from the Panel Study of Income Dynamics *Review of Income and Wealth*, 50(4), 493-518.
- Cantril, H. (1965). *The pattern of human concerns*. New Brunswick, NJ: Rutgers University Press.
- Carroll, C. (1997). Buffer-Stock Saving and the Life Cycle/Permanent Income Hypothesis. *Quarterly Journal of Economics*, 112(1), 1-55.
- Center for Disease Control and Prevention (CDC). (2016). *Global Health - Malawi*. Retrieved from Atlanta, Georgia.
- Center on the Developing Child. (2009). *Maternal Depression Can Undermine the Development of Young Children: Working Paper No. 8*. Harvard University. Retrieved from [Http://www.Developingchild.harvard.edu](http://www.Developingchild.harvard.edu)
- Center on the Developing Child. (2010). The foundations of lifelong health are built in early childhood.
- Chan, M. (2013). *Ministerial meeting on universal health coverage*, Geneva, Switzerland
- Chemin, M., Haushofer, J., & Jang, C. (2015). *Health Insurance Reduces Stress: Evidence From A Randomized Experiment in Kenya*.
- Chen, S., Yu, J., Harries, A. D., Bong, C., Kolola-Dzimadzi, R., Tok, T., . . . Wang, J. (2008). Increased mortality of male adults with AIDS related to poor compliance to antiretroviral therapy in Malawi. *Trop in Med Health*, 13(4), 513-519.
- Chida, Y., & Steptoe, A. (2008). Positive psychological well-being and mortality: a quantitative review of prospective observational studies. *Psychosom Med*, 70(7), 741-756.
- Cicchetti, D., Rogosch, F. A., & Toth, S. L. (2000). The efficacy of toddler-parent psychotherapy for fostering cognitive development in offspring of depressed mothers. *Journal of Abnormal Psychology*, 28(2), 135-148.
- Clark, L. A., & Watson, D. (1991). Handbook of social and clinical psychology: The health perspective In C. R. Snyder & D. R. Forsyth (Eds.), *General affective dispositions in physical and psychological health* (pp. 221-245). New York: Pergamon.
- Cohn, J., & Tronick, E. (1989). Specificity of infants' response to mothers' affective behavior. *J Am Acad Child Adolesc Psychiatry*, 28(2), 242-248.
- Comfort, A., Duflo, E., & Banerjee, A. (2016). Is Health Care Spending Impoverishing? Evidence from Micro-lending Clients' Health Care Seeking Patterns in Karnataka, India.
- Cooper, P. J., Tomlinson, M., Swartz, L., Woolgar, M., Murray, L., & Molteno, C. (1999). Post-partum depression and the mother-infant relationship in a South African peri-urban settlement. *Br J Psychiatry*, 175, 554-558.
- Cotlear, D. (2000) Peru: reforming health care for the poor. . Washington DC: World Bank.

- Cummings, E. M., & Kouros, C. (2009). Maternal depression and its relation to children's development and adjustment *Encyclopedia of Early Childhood Development*.
- Dahl, G. B., & Lochner, L. (2012). The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit. *American Economic Review*, 102(5), 1927-1956.
- Danish Trade Union. (2014). *Malawi Labour Market Profile*.
- Dasgupta, A. N. Z., Wringe, A., Crampin, A. C., Chisambo, C., Koole, O., Makombe, S. Church, K. (2016). HIV policy and implementation: a national policy review and an implementation case study of a rural area of northern Malawi. *AIDS Care*, 28(9).
- Deaton, A. (1992). *Understanding Consumption* Oxford University Press.
- Deaton, A. (2008). Income, Aging, Health and Wellbeing Around the World: Evidence from the Gallup World Poll. *Journal of Economic Perspectives*, 22, 53-72.
- DeNeve, J.-E., & Oswald, A. J. (2012). Estimating the influence of life satisfaction and positive affect on later income using sibling fixed effects. *Proceedings of the National Academy of Sciences of the United States of America*, 109(49), 19953-19958.
- Diener, E. (2000). Subjective well-being: the science of happiness, and a proposal for a national index. *American Psychologist*, 55, 34-43.
- Diener, E., & MY, C. (2011). Happy people live longer: subjective well-being contributes to health and longevity. *Applied Psychol Health Well Being*, 3, 1-43.
- Diener, E., Nickerson, C., Lucas, R., & Sandvik, E. (2002). Dispositional affect and job outcomes. *Soc Indic Res*, 59, 229-259.
- Dong, M., Dube, S., Felitti, V., Giles, W., & Anda, R. (2003). Adverse childhood experiences and self-reported liver disease: new insights into the causal pathway. *Arch Intern Med*, 163(16), 1949-1956.
- Dorjdagva, J., Batbaatar, E., Svensson, M., Dorjsuren, B., & Kauhanen, J. (2016). Catastrophic health expenditure and impoverishment in Mongolia. *International Journal for Equity in Health*, 15(105).
- Dube, S. R., Fairweather, D., Pearson, W. S., Felitti, V. J., Anda, R. F., & Croft, J. B. (2009). Cumulative Childhood Stress and Autoimmune Diseases in Adults. *Psychosom Med*, 71(2), 243-250.
- Dube, S., Miller, J., Brown, D., Giles, W., Felitti, V., Dong, M., & Anda, R. (2006). Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. *Journal of Adolescent Health*, 38(4), 1-10.
- Easterlin, R. A. (1974). Does Economic Growth Improve the Human Lot? Some Empirical Evidence.
- Easterlin, R. A., Angeluscu, L., & Zweig, J. (2011). The Impact of Modern Economic Growth on Urban-Rural Differences in Subjective Well-Being *World Development*, 39(12), 2187-2198.
- Edwards, V., Holden, G., Felitti, V., & Anda, R. (2003). Relationship between multiple forms of childhood maltreatment and adult mental health in community respondents: results from the adverse childhood experiences study. *American Journal of Psychiatry*, 160(8), 1453-1460.
- Elder, T. E., & Lubotsky, D. H. (2009). Kindergarten Entrance Age and Children's Achievement: Impacts of State Policies, Family Background, and Peers. *The Journal of Human Resources*, 44(3), 641-682.
- Elzinga, G. (2005). *Vertical-horizonal synergy of the health workforce*.

- Epstein, J. A., Williams, C., Botvin, G. J., Diaz, T., & Ifill-Williams, M. (1999). Psychosocial predictors of cigarette smoking among adolescents living in public housing developments. *Tobacco Control*, 8(8), 45-52.
- Evans, G., & Schamberg, M. (2008). Childhood poverty, chronic stress, and adult working memory. *Proceedings of the National Academy of Sciences of the United States of America*, 106(6), 6545-6549.
- Expertos internacionales destacan estrategia de salud mental del Minsa. (2017). Retrieved from <http://www.minsa.gob.pe/?op=51¬a=16964>
- Felitti, V., Anda, R., & Nordenberg, D. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine*, 14(4), 245-258.
- Fergusson, D. M., L.J., H., & M.T., L. (1995). Maternal depressive symptoms and depressive symptoms in adolescents *Journal of Child Psychology and Psychiatry*, 36(7), 1161-1178.
- Field, T. (1998). Maternal depression effects on infants and early interventions. *Prev Med.*, 27(2), 200-203.
- Field, T. (2002). *Prenatal effects of maternal depression*. Retrieved from Washington, DC:
- Floyd, S., Molesworth, A., Dube, A., Banda, E., Jahn, A., Mwafulirwa, C., . . . French, N. (2010). Population-Level Reduction in Adult Mortality after Extension of Free Anti-Retroviral Therapy Provision into Rural Areas in Northern Malawi. *PLoS Medicine*.
- Fogarty, L., Kim, Y. M., Juon, H.-S., Tappis, H., Noh, J. W., Zainullah, P., & Rozario, A. (2014). Job satisfaction and retention of health-care providers in Afghanistan and Malawi. *Human Resources for Health*, 12(11).
- Ford, L. (2016). Outrage over two-year sentence for HIV-positive Malawi 'hyena'. *The Guardian*.
- Forley, L., & Mathanga, D. (2016). *Evaluation of the Impact of Malaria Control Interventions on All-Cause Mortality in Children under Five Years of Age in Malawi*.
- Forman, D. R., O'Hara, M. W., Stuart, S., Gorman, L. L., Larsen, K. E., & Coy, K. C. (2007). Effective treatment for postpartum depression is not sufficient to improve the developing mother-child relationship. *Development and psychopathology*.
- Frankel, A. S. (2012). *Predictors of Adolescent Sexual Intentions and Behavior: Attitudes, Parenting, and Neighborhood Risk*. Florida International University Miami, Florida.
- Frey, B. S., & Stutzer, A. (2002). What Can Economists Learn from Happiness Research? *Journal of Economic Literature*, 20(2), 402-435.
- Galiani, S., & Orsola-Vidal, A. (2010). *Hand-washing Behavior: Findings from the Impact Evaluation Baseline Survey in Peru*.
- Galler, J. R., Harrison, R. H., Ramsey, F., Forde, V., & S.C., B. (2000). Maternal depressive symptoms affect infant cognitive development in Barbados. *J Child Psychol Psychiatry*, 41(6), 747-757.
- GDP per capita (current US\$). (2016). Retrieved from: http://data.worldbank.org/indicator/NY.GDP.PCAP.CD?year_high_desc=true
- Gertler, P., & Gruber, J. (2002). Insuring consumption against illness *American Economic Review*, 92(1), 51-76.
- Gilligan, C. (1982). *In a Different Voice*. United States of America: Havard University Press.
- Goal 3: Good Health and Well-Being (2017). Retrieved from <http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-3-good-health-and-well-being.html>

- Gökçe, B., Özşahin, A., & Zencir, M. (2007). Determinants of adolescent pregnancy in an urban area in Turkey: A population-based case-control study. *Journal of Biosocial Science*, 39, 301-311.
- Goliber, T. (2002). The International Response to HIV/AIDS. *Population Reference Bureau*.
- Gonçalves, H., Pearson, R. M., Horta, B. L., González-Chica, D. A., Castilho, E., Damiani, M., Victora, C. G. (2016). Maternal depression and anxiety predicts the pattern of offspring symptoms during their transition to adulthood. *Psychological Medicine*, 46(2). doi:10.1017/S0033291715001956
- Gorgens, M. (2017). [Conversation on ART-providing clinics in Malawi].
- Graham, C. (2017). Do Aspirations and Well-Being Matter to Future Outcomes? Lessons from the Young Lives Survey in Peru. Retrieved from <http://www.younglives.org.uk/content/do-aspirations-and-well-being-matter-future-outcomes-lessons-young-lives-survey-peru>
- Graham, C. (2017). *Happiness for All? Unequal Hopes and Lives in Pursuit of the American Dream*. Princeton: Princeton University Press.
- Graham, C. (2017). Is the American dream really dead? *The Guardian*.
- Graham, C., & Chattopadhyay, S. (2013). Gender and well-being around the world. *Int. J. Happiness and Development*, 1(2), 212-232.
- Graham, C., & Felton, A. (2005). Inequality and happiness: Insights from Latin America. *The Journal of Economic Inequality*, 4(1), 107-122.
- Graham, C., & Hoover, M. (2006). *Optimism and Poverty in Africa: Adaptation or a Means to Survival?*
- Graham, C., & Nikolova, M. (2015). Bentham or Aristotle in the Development Process? An Empirical Investigation of Capabilities and Subjective Well-being. *World Development*, 68, 163-179.
- Graham, C., & Pozuelo, J. R. (2017). Happiness, Stress, and Age: how the U curve varies across people and places *Journal of Population Economics*, 225-264.
- Graham, C., Eggers, A., & Sukhtankar, S. (2004). Does happiness pay?: An exploration based on panel data from Russia. *Journal of Economic Behavior and Organization*, 55(3), 319-342.
- Greenough, W., & Black., J. (1992). *Induction of brain structure by experience: Substrate for cognitive development*. Paper presented at the Minnesota symposia on child psychology, Hillsdale, NJ.
- Haacker, M. (2004). The Impact of HIV/AIDS on Government Finance and Public Services *The Macroeconomics of HIV/AIDS*. Washington, DC: International Monetary Fund.
- Haas, A., Tenthani, L., Msukwa, M., Tal, K., Jahn, A., & Gadabu, O. (2016). Retention in care during the first 3 years of antiretroviral therapy for women in Malawi's option B+ programme: an observational cohort study. *Lancet HIV*, 3(4), 175-182.
- Haefffel, G., & Hames, J. (2014). Cognitive vulnerability to depression can be contagious. *Clinical Psychological Science*.
- Hammen, C., Gordon, D., Burge, D., Adrian, C., Jaenicke, C., & Hiroto, D. (1987). Maternal affective disorders, illness and stress: Risk for children's psychopathology. *Am J Psychiatry*, 144, 736-734.
- Harmon, K. (2010). Mothers' Depression Can Go Well Beyond Children's Infancy. *Scientific American*.
- Harpham, T., Huttly, S., De Silva, M., & Abramsky, T. (2005). Maternal mental health and child

- nutritional status in four developing countries. *PubMed*.
- Harries, A. D., Makombe, S. D., Libamba, E., & Schouten, E. J. (2011). Why did the scale-up of HIV treatment work?: a case example from Malawi. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *57*.
- Hart, S., Field, T., del Valle, C., & Pelaez-Nogueras, M. (1998). Depressed mothers' interactions with their one-year-old infants. *Infant Behav Dev*, *21*(519-25).
- Heckman, J. J. (2006). Skill Formation and the Economics of Investing in Disadvantaged Children. *Science*, *312*.
- Heneghan, A. M., Silver, E. J., Bauman, L. J., & Stein, R. E. K. (2000). Do pediatricians recognize mothers with depressive symptoms?. *Pediatrics*, *106*, 1367-1373.
- Hillis, S. D., Anda, R. F., Felitti, V. J., & Marchbanks, P. A. (2001). Adverse Childhood Experiences and Sexual Risk Behaviors in Women: A Retrospective Cohort Study. *Family Planning Perspectives*, *33*(5), 206-211.
- Hinks, T. (2009). Crime and happiness amongst heads of households in Malawi. *Journal of Happiness Studies*, *11*(4), 457-476.
- Hinks, T., & Davies, S. (2009). Life satisfaction in Malawi and the importance of relative consumption, polygamy and religion. *Journal of International Development*, *20*(7).
- Hossain, Z., Field, T., Gonzalez, J., Malphurs, J., Del Valle, C., & Pickens, J. (1994). Infants of "depressed" mothers interact better with their nondepressed fathers. *Infant Mental Health Journal*, *15*(4).
- International Monetary Fund (IMF). (2017). *Malawi: Economic Development Document* Retrieved from Washington, DC.
- Jahn, A., Harries, A. D., Schouten, E. J., Libamba, E., Ford, N., Maher, D., & Chimbwandira, F. (2016). *Scaling-up antiretroviral therapy in Malawi*. Retrieved from World Health Organization.
- James-Burdumy, S. (2005). The Effect of Maternal Labor Force Participation on Child Development. *Journal of Labour Economics*, *23*(177-211).
- Joffer, J., Burell, G., Bergström, E., Stenlund, H., Sjörs, L., & Jerdén, L. (2014). Predictors of smoking among Swedish adolescents. *BMC Public Health*, *14*. doi: 10.1186/1471-2458-14-1296.
- Joyce Banda: Africa is not poor. (2017). *Al Jazeera*. Retrieved from <http://www.aljazeera.com/programmes/upfront/2017/12/joyce-banda-africa-poor-171201110638875.html>
- Kahn, R., Wise, P., Kennedy, B., & Kawachi, I. (2000). State income inequality, household income, and maternal mental and physical health: cross sectional national survey. *Pub Med*, *321*(7272), 1311-1315.
- Karademas, E. C. (2007). Positive and negative aspects of well-being: Common and specific predictors. *Personality and Individual Differences*, *43*, 277-287.
- Kavinya, T. (2011). Opinions on Mental health care in Malawi: Is Malawi getting mental health care right? *Malawi Medical Journal*, *23*(3), 98.
- Kien, V. D., Minh, H. V., Giang, K. B., Dao, A., Tuan, L. T., & Ng, a. N. (2016). Socioeconomic inequalities in catastrophic health expenditure and impoverishment associated with non-communicable diseases in urban Hanoi, Vietnam. *International Journal for Equity in Health*, *15*.
- Korntheuer, P., Lissmann, I., & Lohaus, A. (2007). Bindungssicherheit und die Entwicklung von Sprache und Kognition. *Kindheit und Entwicklung*, *16*, 180-189.

- Kubzansky, L. D., Sparrow, D., Vokonas, P., & Kawachi, I. (2001). Is the Glass Half Empty or Half Full? A Prospective Study of Optimism and Coronary Heart Disease in the Normative Aging Study. *Psychosomatic Medicine*, 63, 910-916.
- Lakdawalla, D., Malani, A., & Reif, J. (2014). *The Insurance Value of Medical Innovation*.
- Laursen, B., & Collins, W. A. (2004). Parent-Child Communication During Adolescence In A. L. Vangelisti (Ed.), *Handbook of Family Communication* (pp. 333-348): Erlbaum.
- Lewis, C., & Cruise, S. (2007). Religion and happiness: Consensus, contradictions, comments and concerns. *Mental Health, Religion & Culture*, 9(3).
- Li, Y., Wu, Q., Xu, L., Legge, D., Hao, Y., Gao, L., . . . G, W. (2012). *Factors affecting catastrophic health expenditure and impoverishment from medical expenses in China: policy implications of universal health insurance*.
- Limwattananon, S., Neelsen, S., O'Donnell, O., Prakongsai, P., Tangcharoensathien, V., van Doorslaer, E., & Vongmongkol, V. (2015). Universal coverage with supply-side reform: The impact on medical expenditure risk and utilization in Thailand. *Journal of Public Economics*, 121, 79-94.
- Lovejoy, M., Graczyk, P., O'Hare, E., & Neuman, G. (2000). Maternal depression and parenting behavior: a meta-analytic review. *Clinical Psychology Review*, 20(5), 561-592.
- Lowrance, D., Makombe, S., Harries, A., Yu, J., Aberle-Grasse, J., Eiger, O., . . . Libamba, E. (2007). Lower Early Mortality Rates Among Patients Receiving Antiretroviral Treatment at Clinics Offering Cotrimoxazole Prophylaxis in Malawi. *Journal of Acquired Immune Deficiency Syndromes*, 46(1), 56-61.
- Lupien, S., King, S., Meaney, M., & McEwen, B. (2000). Child's stress hormone levels correlate with mother's socioeconomic status and depressive state. *Biol Psychiatry*, 48(10), 976-980.
- Lykken, D., & Tellegen, A. (1996). Happiness is a Stochastic Phenomenon. *Psychological Science*, 7(3), 186-189.
- Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychol Bull*, 131(6), 803-855.
- MacEwen, K. E., & Barling, J. (1991). Effects of maternal employment experiences on children's behavior via mood, cognitive difficulties, and parenting behavior. *Journal of Marriage and the Family*, 53, 635-644.
- Magnuson, K. A., Ruhm, C. J., & Waldfogel, J. (2007). Does prekindergarten improve school preparation and performance? *Economics of Education Review*, 26, 33-51.
- Malawi MDG Endline Survey 2014. (2015). Retrieved from Malawi: http://www.nsomalawi.mw/images/stories/data_on_line/demography/MDG%20Endline/MES%202014%20Report.pdf
- Mataya, C. (2002). *Malawi*. Retrieved from <http://www.fao.org/docrep/005/y4632e/y4632e0n.htm#fn85>
- McEwen, B. (2000). Allostasis and Allostatic load: Implications for Neuropsychopharmacology. *Neuropsychopharmacology*, 22, 108-124.
- Mchenga, M., Chirwa, G. C., & Chiwaula, L. S. (2017). Impoverishing effects of catastrophic health expenditures in Malawi. *Journal of the International Society for Equity in Health*, 6(25).
- McLaren, Z. M. (2017). The Effect of Access to AIDS Treatment on Employment Outcomes in South Africa.

- McLoyd, V. (1998). Socioeconomic disadvantage and child development. *American Psychologist*, 53(2), 185-204.
- Melchior, A., Caspi, M., Howard, L., Amber, A., Bolton, H., Mountain, N., & Moffitt, T. (2009). Mental health context of food insecurity: a representative cohort of families with young children. *Pediatrics*, 124(4), 564-572.
- Miller, B. C., Norton, M. C., Fan, X., & Christopherson, C. R. (1998). Pubertal Development, Parental Communication, and Sexual Values in Relationship to Adolescent Sexual Behaviors. *The Journal of Early Adolescence*, 18(1). doi:10.1177/0272431698018001002
- Miller, K. S., Levin, M. L., Whitaker, D. J., & Xu, X. (1998). Patterns of condom use among adolescents: the impact of mother-adolescent communication. *American Journal of Public Health*, 88(10), 1542-1544.
- Ministerio de Salud (2017). Expertos internacionales destacan estrategia de salud mental del Minsa. Retrieved from <http://www.minsa.gob.pe/?op=51¬a=16964>
- Ministry of Health (MoH). (2010). *Malawi and Health Systems 20/20*. Retrieved from Lilongwe.
- Ministry of Health (MoH). (2016). *Summary Sheet Preliminary Findings: The Malawi Population-Based HIV Impact Assessment*.
- Mochón Morcillo, F., & de Juan Díaz, R. (2016). *Happiness and Social Capital: Evidence from Latin American Countries*. Retrieved from
- Montenegro, R. A., & Stephens, C. (2006). Indigenous Health 2: Indigenous health in Latin America and the Caribbean. *Lancet*, 367, 1859–1869.
- Morgan, B., Leifheit, K., Romero, K., Gilman, R., Bernabe-Ortiz, A., Miranda, J. J., . . . Checkley, W. (2017). Low cigarette smoking prevalence in peri-urban Peru: results from a population-based study of tobacco use by self-report and urine cotinine *Tobacco Induced Diseases*, 15(32).
- Mullainathan, S., & Shafir, E. (2013). *Scarcity: Why Having Too Little Means So Much*. New York, NY: Henry Holt and Company, LLC.
- Muller, F., & Wehbe, L. (2008). Smoking and smoking cessation in Latin America: a review of the current situation and available treatments. *Int J Chron Obstruct Pulmon Dis*, 3(2), 285-293.
- Murray, L. (1992). The impact of postnatal depression on infant development. *J Child Psychol Psychiatry*, 33(3), 543-561.
- Murray, L., Fiori-Cowley, A., Hooper, R., & Cooper, P. (1996). The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcome. *Child Development*, 67(5), 2512-2526.
- Murray, L., Hipwell, A., Hooper, R., Stein, A., & Cooper, P. (1996). The cognitive development of 5-year-old children of postnatally depressed mothers. *J Child Psychol Psychiatry*, 37(8), 927-935.
- Murray, L., Sinclair, D., Cooper, P., Ducournau, P., & Turner, P. (1999). The Socioemotional Development of 5-year-old Children of Postnatally Depressed Mothers. *Journal of Child Psychiatry*, 40(8), 1259-1271.
- Mussa, R. (2015). Catastrophic health payments in Malawi: analysis of determinants using a zero-inflated beta regression. *Munich Personal RePEc Archive*.
- National Research Council and Institute for Medicine. (2009). *Depression in parents, parenting, and children: Opportunities to improve identification, treatment, and prevention*. Retrieved from Washington, DC.
- National Scientific Council on the Developing Child. (2005). *Excessive stress disrupts the*

- architecture of the developing brain: Working paper no. 3.* Retrieved from [Www.Developingchild.Harvard.Edu](http://www.Developingchild.Harvard.Edu)
- National Statistic Office. (2011). *Malawi Demographic and Health Survey 2010*. Retrieved from Calverton, Maryland: <https://dhsprogram.com/pubs/pdf/FR247/FR247.pdf>
- National Statistic Office. (2012). *Malawi Third Integrated Household Survey (IHS3) 2010-2011: Basic Information Document*.
- Nikolaou, D. (2012). Happy Mothers, Successful Children: Effects of Maternal Life Satisfaction on Child Outcomes. *Job Market Paper*.
- Nunner-Winkler, G. (2000). Rabenmütter? Zur Vereinbarkeit von Familie und Beruf. *Max-Planck-Forschung*.
- Nylen, K. J., Moran, T. E., Franklin, C. L., & O'hara, M. W. (2006). Maternal depression: A review of relevant treatment approaches for mothers and infants. *Infant Mental Health Journal, 27*(4), 373-343.
- O'Donnell, O., Doorslaer, E. v., Wagstaff, A., & Lindelow, M. (2008). *Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation*. Retrieved from Washington, DC.
- Ochalek, J., Claxton, K., Revill, P., Sculpher, M., & Rollinger, A. (2016). Supporting the Development of an Essential Health Package: Principles and Initial Assessment for Malawi. York, UK: Center for Health Economics.
- OECD. (2013). *OECD Framework for Statistics on the Distribution of Household Income, Consumption and Wealth*: OECD Publishing.
- Ostir, G., Markides KS, Peek, M., & Goodwin, J. (2001). The association between emotional well-being and the incidence of stroke in older adults. *Psychosom Med, 63*(2), 210-215.
- Oswald, A. J., Proto, E., & Sgroi, D. (2009). Happiness and productivity *Institute for the Study of Labor, Bonn*.
- Outes-Leon, I., & Dercon, S. (2008). *Survey Attrition and Attrition Bias in Young Lives, Technical Note 5*. Retrieved from Oxford.
- Outes-Leon, I., Porter, C., & Sánchez, A. (2011). *Early Nutrition and Cognition in Peru: A Within-Sibling Investigation*. IDB. University of Oxford.
- Patel, V., DeSouza, N., & Rodrigues, M. (2003). Postnatal depression and infant growth and development in low income countries: a cohort study from Goa, India *Archives of Disease in Childhood, 88*, 34-37.
- Patel, V., Rodrigues, M., & DeSouza, N. (2002). Gender, Poverty, and Postnatal Depression: A Study of Mothers in Goa, India. *The American Journal of Psychiatry, 159*(1), 43-47.
- Philipson, T. J., & Zanjani, G. (2013). Economic Analysis of Risk and Uncertainty induced by Health Shocks: A Review and Extension. *The National Bureau of Economic Research*.
- Philipson, T., & Jena, A. (2005). Who Benefits from New Medical Technologies? Estimates of Consumer and Producer Surpluses for HIV/AIDS Drugs. *Forum for Health Economics and Policy, 9*(2), 1-31.
- Phillips, D., & Shonkoff, J. P. (2000). *From Neurons to Neighborhoods: The Science of Early Childhood*: National Academy of Sciences.
- Poquiz, J. L., & Frazer, A. L. (2016) Depression in Children and Adolescents. Clinical Child Psychology Program.

- Powell-Jackson, T., Hanson, K., Whitty, C. J. M., & Ansah, E. K. (2014). Who benefits from free healthcare? Evidence from a randomized experiment in Ghana. *Journal of Development Economics*, 107(C), 305-319.
- Pungello, E. P., Kupersmidt, J. B., Burchinal, M. R., & Patterson, C. J. (1996). Environmental risk factors and children's achievement from middle childhood to early adolescence. *Developmental Psychology*, 32(4), 755-767.
- Raja, S. N., McGee, R., & Stanton, W. (1992). Perceived Attachments to Parents and Peers and Psychological Well-Being in Adolescence. *Journal of Youth and Adolescence*, 21(4), 471-485.
- Raposa, E., Hammen, C., Brennan, P., & Najman, J. (2014). The Long-Term Effects of Maternal Depression: Early Childhood Physical Health as a Pathway to Offspring Depression. *Journal of Adolescent Health*, 54(1).
- Romieu, I., Samet, J. M., Smith, K. R., & Bruce, N. (2002). Outdoor Air Pollution and Acute Respiratory Infections Among Children in Developing Countries. *Journal of Occupational & Environmental Medicine*, 44(7), 640-649.
- Rosenthal, N., Sack, D., Gillin, J., Lewy, A., Goodwin, F., Davenport, Y., . . . Wehr, T. (1984). Seasonal affective disorder. A description of the syndrome and preliminary findings with light therapy. *Archives of general psychiatry*, 41(1), 72-80.
- Rugulies, R. (2002). Depression as a predictor for coronary heart disease: a review and meta-analysis. *American Journal of Preventive Medicine*, 23(1), 51-61.
- Ruhm, C. J. (2008). Maternal Employment and Adolescent Development. *Labour Economics*, 15(5), 958-983.
- Rural population (% of total population)* (2016). Retrieved from <https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS>
- Russell, S. (2004). The Economic Burden of Illness for Households in Developing Countries: A Review of Studies Focusing on Malaria, Tuberculosis, and Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome. *American Journal of Tropical Medicine and Hygiene*, 71, 147-155.
- Rutter, M., O'Connor, T., Bredenkamp, D., & Team, R. A. E. S. (1999). Attachment disturbances and disorders in children exposed to early severe deprivation. *Infant Mental Health Journal*, 20(1), 10-29.
- Ruutu, P., Halonen, P., Meurman, O., Torres, C., Paladin, F., & Yamaoka, K. (1990). Viral lower respiratory tract infections in Filipino children. *J Infect Dis*, 175-179.
- Rwabukwisi, J. M. V. (2017) *Discussion with Clinic Doctor /Interviewer: S. Dickerson*. Lilongwe Health Clinic.
- Schneiderman, N., Antoni, M. H., Saab, P. G., & Ironson, G. (2001). Health psychology: psychosocial and biobehavioral aspects of chronic disease management. *Annu Rev Psychol*, 52, 555-580.
- Selin, H., & Davey, G. (2012). *Happiness Across Cultures: Views of Happiness and Quality of Life in Non-Western Cultures*: Springer Netherlands
- Sgroi, D. (2015) *Happiness and productivity: Understanding the happy- productive worker*. London.
- Shawn, A. (2010). *The Happiness Advantage*. New York: Random House.
- Shin, Y. J., Lee, J. K., & Miller-Daly, M. (2013). The effects of maternal emotional wellbeing on mother-adolescent communication and youth emotional wellbeing. *Communication*

- Research Reports*, 30(2), 137-147.
- Siegfried, N., Uthman, O., & Rutherford, G. (2010). Optimal time for initiation of antiretroviral therapy in asymptomatic, HIV-infected, treatment-naive adults *Cochrane Database of Systematic Reviews*(3).
- Singer, L. T., Salvator, A., & Guo, S. (1999). Maternal Psychological Distress and Parenting Stress After the Birth of a Very Low-Birth-Weight Infant. *JAMA*, 281(9), 799-805.
- Snel, E., & Staring, R. (2001). Poverty, migration, and coping strategies *European Journal of Anthropology*(38), 7-22.
- Step toe, A., & Wardle, J. (2011). Positive affect measured using ecological momentary assessment and survival in older men and women. *Proc Natl Acad Sci*, 108(45), 18244–18248.
- Step toe, A., Oliveira, C. d., Demakakos, P., & Zaninotto, P. (2014). Enjoyment of life and declining physical function at older ages: a longitudinal cohort study. *Cmaj*, 186(4).
- Stevenson, B., & Wolfers, J. (2009). The Paradox of Declining Female Happiness *American Economic Journal*, 1(2), 190-225.
- Stone, A., & Mackie, C. (2013). *Subjective Well-Being: Measuring Happiness, Suffering, and Other Dimensions of Experience*. Retrieved from Washington, DC:
- Stratakis, C. (2006). Cortisol and growth hormone: clinical implications of a complex, dynamic relationship. *Pediatric Endocrinology Review*, 333–338.
- Taberer, R. (1998). *Childhood Poverty and School Attainment, Causal Effect and Impact on Lifetime Inequality* in “Persistent Poverty and Lifetime Inequality.”
- Taylor, B. A., Dearing, E., & McCartney, K. (2004). Incomes and outcomes in early childhood. *Journal of Human Resources*, 39, 980-1007.
- Tenthani, L., Haas, A. D., Tweya, H., Jahn, A., van Oosterhout, J.J., Chimbwandira, F., Olivia, K. (2014). Retention in care under universal antiretroviral therapy for HIV-infected pregnant and breastfeeding women (‘Option B+’) in Malawi. *AIDS*, 28(4), 589-598.
- The Center for Wellbeing (2017). *Wellbeing benefits of job-related learning: Analysing data from Understanding Society: the UK Household Longitudinal Survey (UKHLS)*.
- The World Factbook. (2017). Central Intelligence Agency. Retrieved from Washington, DC: <https://www.cia.gov/library/publications/the-world-factbook/index.html>
- Thirumurthy, H., Zivin, J. G., & Goldstein, M. (2008). The Economic Impact of AIDS Treatment: Labor Supply in Western Kenya. *J Hum Resour*, 43(3), 511-552.
- Thompson, S. J., Bender, K. A., Lewis, C. M., & Watkins, R. (2008). Runaway and Pregnant: Risk Factors Associated with Pregnancy in a National Sample of Runaway/Homeless Female Adolescents. *Journal of Adolescent Health*, 43(2), 125–132.
- Tindall, A., Lavy, C., Steinlechner, C., Mkandawire, N., & Chimangeni, S. (2007). Surgical facilities available at district hospitals in Malawi. *Malawi Medical Journal*, 19(1), 28-29.
- Trivedi, M. H. (2004). The Link Between Depression and Physical Symptoms. *Prim Care Companion J Clin Psychiatry*, 6, 12-16.
- Tweya, H., Gugsu, S., Hosseinipour, M., Speight, C., Ng'ambi, W., Bokosi, M., . . . Phiri, S. (2014). Understanding factors, outcomes and reasons for loss to follow-up among women in Option B+ PMTCT programme in Lilongwe, Malawi. *Tropical Medicine and International Health*, 19(11), 1360-1366.
- Udedi, M. (2016). Improving Access to Mental Health Services in Malawi. *Ministry of Health Policy Brief*.

- UNDP. (2017). *Goal 3: Good Health and Well-Being* Retrieved from <http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-3-good-health-and-well-being.html>
- UN Inter-agency Group for Child Mortality Estimation. (2017). *Levels & Trends in Child Mortality* Retrieved from http://www.childmortality.org/files_v21/download/IGME%20report%202017%20child%20mortality%20final.pdf
- UNAIDS. (2017). *Prevalence of HIV, total (% of population ages 15-49)*. Retrieved from <https://data.worldbank.org/indicator/SH.DYN.AIDS.ZS?locations=MW>
- UNAIDS/WHO. (2004). *Malawi Epidemiological Fact Sheet on HIV/AIDS and Sexually Transmitted Infections*. Retrieved from http://data.unaids.org/publications/fact-sheets01/malawi_en.pdf
- UNICEF. (2016). *The 2016 State of the World's Children Report* Retrieved from <http://data.unicef.org/resources/state-worlds-children-2016-statistical-tables/>
- USAID. (2016). *Evaluation of the Impact of Malaria Control Interventions on All-Cause Mortality in Children under Five Years of Age in Malawi*.
- Valdivia, M. (2002). Public health infrastructure and equity in the utilization of outpatient health care services in Peru. *Health Policy Plan*.
- van Ijzendoorn, M. H. (1995). Adult Attachment Representations, Parental Responsiveness, and Infant Attachment: A Meta-Analysis on the Predictive Validity of the Adult Attachment Interview *Psychological Bulletin*, 117(3), 387-403.
- Vella, S., Schwartlander, B., Sow, S. P., Eholie, S. P., & Murphy, R. L. (2012). The history of antiretroviral therapy and of its implementation in resource-limited areas of the world. *International AIDS Society Journal*, 26(10), 1231-1241.
- Wagstaff, A., & Lindelow, M. (2010). *Are Health Shocks Different? Evidence from a Multi-Shock Survey in Laos*. World Bank.
- Wagstaff, A., & Pradhan, M. (2005). *Health insurance impacts on health and nonmedical consumption in a developing country: Health insurance impacts on health and non-medical consumption in a developing country*. World Bank Policy Research Working Paper No. 3563. World Bank Group Retrieved from <https://ssrn.com/abstract=2894723>
- Walker, S., Wachs, T., Meeks Gardner, J., Lozoff, B., Wasserman, G., Pollitt, E., . . . Group, t. I. C. D. S. (2007). Child development: Risk factors for adverse outcomes in developing countries. *The Lancet*, 145-157.
- Weissman, M. M., Gammon, G. D., John, K., Merikangas, K. R., Warner, V., Prusoff, B. A., & Sholomskas, D. (1987). Children of Depressed Parents: Increased Psychopathology and Early Onset of Major Depression. *Arch Gen Psychiatry*, 44, 847-853.
- Weitof, G. R., & Rosén, M. (2005). Is perceived nervousness and anxiety a predictor of premature mortality and severe morbidity? A longitudinal follow up of the Swedish survey of living conditions. *Journal of Epidemiology & Community Health*, 59(9).
- Whitaker, D. J., & Miller, K. S. (2000). Parent-Adolescent Discussions about Sex and Condoms: Impact on Peer Influences of Sexual Behavior. *Journal of Adolescent Research*, 15(2), 251-273.
- WHO (World Health Organization). (2006). Progress on Global Access to HIV Antiretroviral Therapy: A report on “3 by 5” and Beyond.
- WHO (World Health Organization). (2007). *Infection prevention and control of epidemic- and*

- pandemic-prone acute respiratory diseases in health care*. Retrieved from http://www.who.int/csr/resources/publications/WHO_CDS_EPR_2007_6c.pdf?ua=1
- WHO (World Health Organization). (2011). *World Health indicators*. Retrieved from Geneva <http://www.who.int/countries/per/en/>
- WHO (World Health Organization). (2015). Universal health coverage (UHC).
- WHO (World Health Organization). (2016). *Country Profile: Malawi*. Retrieved from http://www.who.int/profiles_information/index.php/Malawi:Analytical_summary_-_Health_Status_and_Trends
- WHO (World Health Organization). (2016). Maternal mortality in 1990-2015: Mozambique.
- WHO (World Health Organization). (2016). Maternal mortality in 1990-2015: Tanzania.
- WHO (World Health Organization). (2016). Maternal Mortality in 1990-2015: Zambia.
- WHO (World Health Organization). (2017). *Analytical summary - Health financing system*. Retrieved From http://www.who.int/profiles_information/index.php/Malawi:Analytical_summary_-_Health_financing_system
- WHO (World Health Organization). (2017). *Country Profile: Peru*. Retrieved from <http://www.who.int/countries/per/en/>
- WHO (World Health Organization). (2017). *Depression: Fact Sheet*. Retrieved from <http://www.who.int/mediacentre/factsheets/fs369/en/>
- Wickham, M. E., Senthilselvan, A., Wild, T. C., Hogle, W. L., & Colman, I. (2015). Maternal depressive symptoms during childhood and risky adolescent health behaviors. *Pediatrics*, *135*(1), 59-67.
- Wilson, I., Huttly, S., & Fenn, B. (2006). A Case Study of Sample Design for Longitudinal Research. *International Journal of Social Research Methodology*, *9*(5), 351-365.
- Wisner, K. L., Perel, J. M., Peindl, K. S., Hanusa, B. H., Piontek, C. M., & Findling, R. L. (2004). Prevention of postpartum depression: a pilot randomized clinical trial. *Am J Psychiatry*, *161*, 1290-1292.
- Wisner, K., Perel, J., Peindl, K., Hanusa, B., Findling, R., & Rapport, D. (2001). Prevention of recurrent postpartum depression: a randomized clinical trial. *Journal of Clinical Psychiatry*, *62*, 82-86.
- Wojcicki, J., Holbrook, K., Lustig, R., Epel, E., Caughey, A., Muñoz, R., . . . Heyman, M. (2011). Chronic maternal depression is associated with reduced weight gain in latino infants from birth to 2 years of age. *PLoS One*, *6*(2), 16737.
- World Bank. (1998). *Peru: improving health care financing for the poor. Human Development Department, LAC Region*. Retrieved from Washington DC:
- World Bank. (2007). *Malawi - Poverty and Vulnerability Assessment: Investing in Our Future*. Retrieved from <https://openknowledge.worldbank.org/handle/10986/7909>
- World Bank. (2013). *Malawi - Public expenditure review. Public Expenditure Review (PER)*. Retrieved from Washington DC.
- World Bank. (2015). *Life expectancy at birth, total (years)*. Retrieved from: <http://data.worldbank.org/indicator/SP.DYN.LE00.IN>
- World Bank. (2016). *Malawi Economic Monitor, May 2016: Absorbing Shocks, Building Resilience*. Retrieved from Lilongwe, Malawi.
- World Bank. (2017). *Malawi*. Retrieved from: <https://data.worldbank.org/country/malawi>
- World Bank. (2017). *The World Bank in Peru: Overview*.
- World Happiness Report 2017. (2017). Retrieved from United Nations.

- Wright, L., & Peasgood, T. (2017). A Guide to Wellbeing Economic Evaluation. *What Works Wellbeing*.
- Wyszewianski, L. (1986). Financially Catastrophic and High Cost Cases: Definitions, Distinctions and Their Implications for Policy Formulation. *Inquiry*, 23(4), 382-394.
- Xu, K., Evans, D. B., Carrin, G., Anguilar-Rivera, A. M., Musgrove, P., & Evans, T. (2007). Protecting Households From Catastrophic Health Spending. *Health Affairs*, 26(4), 972-983.
- Xu, K., Evans, D. B., Kawabata, K., Zeramdini, R., Klavus, J., & Murray, C. J. L. (2003). Household catastrophic health expenditure: a multicountry analysis. *The Lancet*, 362, 111-117.
- Xu, K., Evans, D., & Carrin, G. (2005). *Technical Briefs for Policy-Makers*.
- Yin, W., Penrod, J., Maclean, R., Lakdawalla, D., & Philipson, T. (2012). Value of Survival Gains in Chronic Myeloid Leukemia. *American Journal of Managed Care*, 18(11), 257-264.
- Zerihun, N., Birhanu, Z., & Kebede, Y. (2013). Does Life Satisfaction Correlate with Risky Behaviors? Finding from Ethiopian Higher Education Students. *Global Journal of Research and Review*.