Title

Fertility, Sexual and Reproductive Health, and Child Health Outcomes: A Multilevel Analysis of Heterogeneity in Latin America and the Caribbean

Author
Mena Mel�ndez, Lucrecia

Publication Date
2021

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

Fertility, Sexual and Reproductive Health, and Child Health Outcomes:

A Multilevel Analysis of Heterogeneity in Latin America and the Caribbean

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Sociology

by

Lucrecia Mena Meléndez

2021

ABSTRACT OF THE DISSERTATION

Fertility, Sexual and Reproductive Health, and Child Health Outcomes:

A Multilevel Analysis of Heterogeneity in Latin America and the Caribbean

by

Lucrecia Mena Meléndez

Doctor of Philosophy in Sociology

University of California, Los Angeles, 2021

Professor Ka Yuet Liu, Chair

In the second half of the 20th century, the region of Latin America and the Caribbean experienced important sociological and demographic changes with far-reaching and long-lasting consequences. While fertility declined sharply, sexual and reproductive health gained increasing attention, and child morbidity and mortality largely improved, limited research has investigated how these processes vary across ethnoracial identity, rural-urban residence, and national origin. Using Demographic and Health Survey (DHS) data (1986–2017) for Latin America and the Caribbean, this dissertation explores heterogeneities in ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes. Across three empirical chapters, this dissertation tests these associations using a framework that is contextual, multilevel, and comparative, seeking to elucidate significant inequalities in this region.

The first empirical chapter relies on DHS data for seven countries in Latin America and the Caribbean (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru) to measure and explain rural-urban disparities in fertility for women with different levels of educational attainment. The second empirical chapter also relies on DHS data for seven countries in Latin America and the Caribbean (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru) to assess rural-urban differences in unintended pregnancies, contraceptive nonuse, and terminated pregnancies. Finally, the third empirical chapter uses DHS data for four countries in Latin America and the Caribbean (Bolivia, Colombia, Guatemala, and Peru) to explore ethnoracial differences in child under-5 mortality, stunting, wasting, and anemia.

Overall, this dissertation advances our understanding of sociological and demographic processes in a largely understudied developing region. It makes numerous important contributions to the literature: providing a holistic understanding of heterogeneities in fertility, sexual and reproductive health, and child health outcomes; measuring and explaining disparities after controlling for geographic, socioeconomic, individual, and reproductive characteristics; providing an assessment of child health disparities across ethnoracial groups; and relying on all DHS data waves for multiple countries over more than thirty years. This dissertation finds significant inequalities in fertility, sexual and reproductive health, and child health outcomes by ethnoracial identity, rural-urban residence, and national origin in the region of Latin America and the Caribbean.

The dissertation of Lucrecia Mena Meléndez is approved.

Patrick Clement Heuveline

Jennie Elizabeth Brand

Anne R Pebley

Ka Yuet Liu, Committee Chair

University of California, Los Angeles

2021

DEDICATION

Dedico esta investigación al apoyo incondicional, al amor rebalsante, al consuelo infinito y los muchos consejos personales, profesionales e intelectuales:

para mis abuelitos, mi papi, mi mami y mi hermana.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIX TABLES

LIST OF APPENDIX FIGURES

ACKNOWLEDGMENTS

I waited until the very end to write this section because it is one of the parts of my dissertation that I was very much looking forward to writing. I am sitting now, in my apartment in Los Angeles, relatively isolated for what has been twelve months since the beginning of the COVID-19 pandemic. No one could have prevented or predicted this. While we have begun swift vaccination campaigns worldwide, I am watching the news in dismay that 2.58 million people have died around the world. The extra solitude, remembrance, and silence in the last twelve months has provided the space to think deeply about the past six and a half years of my graduate school journey. Back in the fall of 2014, I traveled across the world to settle in Los Angeles and continue with my academic journey as a Ph.D. student. Even before knowing it, when I look back in time, I have been inspired by my surroundings and people around me in pursuing my lifelong goals. I recall that my fascination with social, economic, and political questions has stemmed from personal and academic experiences that have gradually shaped my understanding of these fields.

I was born and raised in El Salvador, a small, yet densely populated Central American nation, torn by civil conflict in the 1970s and 1980s and by widespread violence today. Growing up, I was consistently intrigued by the role of population dynamics in shaping culture, socialization, norms, and values, which *ex post* I regard to have sparked my academic interests. I observed the rise of small entrepreneurial activity funded by emigrant dollars, transporting people from town to town in makeshift public transportation; or the innovative construction sector penetrating the most remote rural areas in the hopes of creating homes for a fast-growing population. These experiences sparked my academic interest to continue my journey and pursue a Ph.D. in Sociology at UCLA. However, I could never have done it without the unconditional support of my stellar dissertation committee, supportive academic mentors along the way, helpful administrative staff, various inspiring academic centers, institutes, and resources at UCLA, my dear fellow graduate students, lifelong friends, and most importantly, my unconditionally loving family.

It has been a tremendous privilege to attend UCLA and to work on the culmination of this project for the past six and a half years. While the Ph.D. process has its up-and-downs, I have been surrounded by magnificent people who have truly inspired in this process of intellectual growth, professional development, and personal accomplishments. I owe tremendous gratitude to my amazingly supportive dissertation committee—Ka Yuet Liu, Patrick Heuveline, Jennie Brand, and Anne Pebley—for their invaluable advice, support, and encouragement throughout graduate school and the job search. Particularly, I owe special praise to Ka, for the innumerable hours she has spent—in-person, via email, over Skype, and now over Zoom—since day one. When I started working with Ka, I realized early on that she would be an invaluable mentor throughout this process. She has advised me on methodological issues when my multilevel models would not converge. She has given me comments on my written work throughout. She has supported me actively through a very difficult job market with the pandemic. And most importantly, she has always made herself available. I would not be here without Ka.

I am also indebted to other mentors at Elmira College—Kunihiko Imai, Martha Easton, and Robin O'Brian. They provided with knowledge, inspiration, references, and multiple other forms of support in guiding me through my academic and intellectual development before arriving at UCLA. I am thankful to have experienced prior graduate training at the Institut de hautes études internationales et du développement (IHEID) in Geneva, Switzerland. My time in Geneva gave me a taste for research and provided so many other personal and professional opportunities that inspired me to continue with further graduate work. I am also thankful to the multiple institutional and private scholarships and grants I received at Elmira College and IHEID—in particular the Hans Wilsdorf Foundation Scholarship. I would also like to thank members of the staff in the Department of Sociology at UCLA—Irina Tauber and Wendy Fujinami—who provided invaluable administrative and graduate advising support in guiding me through the graduate student experience. In my various roles teaching at UCLA, I received extensive support from Simbi Mahlanza, Dreama Rhodes, and Natalie Dickson—who helped me in every aspects of student affairs—from enrolling undergraduate students in courses to advising students on their academic decisions through the undergraduate program.

I am also extremely grateful to the Department of Sociology at UCLA for their comprehensive support throughout my graduate training. Throughout the years, the Department of Sociology supported me financially by funding my research through summer funding, academic year fellowships, covering conference expenses, and most importantly, bestowing me with the Dorothy L. Meier Dissertation Fellowship. The Department of Sociology also supported me professionally by organizing various lectures, workshops, and other sessions for academic and professional growth as well as four and half years of departmental teaching opportunities. As a Teaching Assistant, Associate, Fellow, and Instructor of Record, I have developed meaningful pedagogical experiences, helped forge the next generations of sociologists, and expanded my own substantiative expertise. I have been so inspired by hundreds of undergraduate students and I have discovered a call and respect for teaching. I cannot express how much support I have received from the Department of Sociology. I would not be here—filing this dissertation—without their support.

So many other academic centers, institutes, and resources at UCLA have been integral parts of this process. I could never have developed my research without the support of the California Center for Population Research (CCPR), their weekly seminars, workshops, and graduate proseminar were enriching and exposed me further to the field of demography and population studies. In addition, CCPR provided financial support to attend and present at multiple Population Association of America's annual conferences as well as physical space to interact with other researchers and to conduct my research. Generally, my work benefitted from generous financial support from UCLA—including the Department of Sociology, Graduate Division, and the International Institute—and other extramural funding organizations such as the George E. Jonas Foundation. I would also like acknowledge that this dissertation includes modified versions of my own work, which are currently under review, forthcoming in press, and have been previously published in peer-reviewed scholarly journals.[1,2,3]

I am duly indebted to Loanie Huynh for her unconditional emotional support and friendship through this process and to every member that shared, learned, and supported each other in our weekly Dissertation Writer's Group. I am extremely thankful for the amazing resources available to me

---

[1] A modified version of Chapter Two of this dissertation is currently under review in a peer-reviewed journal.

[2] A modified version of Chapter Three of this dissertation is forthcoming in *Women's Reproductive Health* in 2022. The reference for this publication is as follows:

Mena-Meléndez, Lucrecia. 2022. "Rural–Urban Differences in Unintended Pregnancies, Contraceptive Nonuse, and Terminated Pregnancies in Latin America and the Caribbean." *Women's Reproductive Health* 9(2), forthcoming.

[3] A modified version of Chapter Four of this dissertation was published in *SSM - Population Health* in 2020. The reference for this publication is as follows:

Mena-Meléndez, Lucrecia. 2020. "Ethnoracial child health inequalities in Latin America: Multilevel evidence from Bolivia, Colombia, Guatemala, and Peru." *SSM - Population Health* 12:100673. doi: 10.1016/j.ssmph.2020.100673.

through UCLA's Institute for Digital Research and Education (IDRE)—in my opinion, one of the most amazing resources for quantitative researchers on campus—and for the personalized coding, cleaning, and debugging statistical support from Andy Lin and Johnny Lin. I am thankful to the UCLA Center for the Advancement of Teaching for their Teaching Assistant Boot Camps, the Graduate Writing Center for organizing the Dissertation Proposal Boot Camp (Social Sciences), and the Social Science Interdepartmental Program for their Inclusive Teaching Initiative. I am also grateful for other resources on campus, including the Community Programs Office, the Arthur Ashe Student Health and Wellness Center, the Counseling and Psychological Services, the UCLA Library system, the UCLA Housing system, Graduate Division, among others.

The graduate student community at UCLA played an instrumental role in my academic and personal success. I am especially grateful to Amber Villalobos and Caitlin Ahearn for research feedback and unwavering friendship throughout my time here. I leave UCLA knowing that I made incredibly solid friendships and I look forward to lifelong personal friendships and professional relationships. I am super grateful to Amber, who I became close to while we navigated together the dissertation proposal process. Her contagious laughter, her pragmatic advice, and her constant encouragement have made an impact in my life. What began as just collegial advice rapidly grew into solid friendships and the creation of our small 'femographers' group with Caitlin. I met Caitlin through Amber and I am so extremely grateful for our friendship. Her unconditional availability, sweet advice, methodological knowledge, and baked goods have made a mark on my graduate experience. Our everyday WhatsApp chats, our inspirational quote sharing, our out-of-town girl trips, and just being able to talk to them 24/7 has made the whole difference in my making it here. I will never forget our lunches in Wolfgang Puck in Ackerman Union and I cannot wait to reunite every year at PAA and visit each other wherever we settle next with our families.

I am so happy to have met Marie Berry, just before she graduated from UCLA. My first meeting with her was so inspirational and supportive that I still remember it to this day. Despite her moving to Denver for an amazing job, Marie has always jumped at the opportunity of helping me and I will be forever grateful for this, even in the most difficult personal moments. I am also thankful to other UCLA colleagues who guided me through the various steps of this process, including but not limited to providing advice on teaching, research, advisors, and friendships—Jessica Huerta, Rebecca Kaufman, Ryan Cho, Taylor Aquino, Nathan Hoffmann, Juan Delgado, Leydy Diossa-Jimenez, Sara Johnsen, Kyle Nelson, Ashley Gromis, and Caroline Tietbohl—and MJK who supported and cheered me in a plethora of different manners in the first and most arduous years of the program.

I'm also lucky to have amazing non-academic friends, who have made this process also incredibly easier. Gabriela del Cid, Fiona Alfaro, Carolina Ávila, Cheryl Garber, Laura Fernández, Trish Santillan, Andrea Sol, and Alejandra Dueñas—I am eternally grateful for our dinners, our chats, our messages, and the time that you shared with me when I visited El Salvador or when I visited you wherever you have lived. I am grateful to my "California Family," Lizette and Gladys Sánchez and their corresponding families, who adopted me without hesitation, with open arms, and immediately made me feel as if I belonged even if I was 3,000 miles away from home. I am grateful to my cat "Mr. Donut," who has laid next to me, played with me, meowed at me, chirped at me, made me laugh, responded to my "wows," and provided endless emotional support for five years and counting. Finally, I am forever grateful to my family—Rolando Mena Guerrero, Mercedes Meléndez de Mena, Camila Mena Meléndez—and my extended families—the Mena Guerrero and Meléndez Guerrero—for their unconditional support. From an early age, my parents and grandparents instilled in me love for school and encouraged me to be the best student I could be. The lifelong support has been immeasurable; from staying up with me late at night while I finished school projects, to supporting me to travel to school-sponsored trips abroad, and waiting anxiously by my side for college decisions.

From my maternal grandparents I have learned the value of family. My grandmother—abuelita "Tita"—cared for me while my dad and mom worked. We used to walk down the block to buy "pan dulce," purchase mangos from the street vendors, and patiently taught me how to count. From my paternal grandparents—abuelitos Chico and Gladys—I learned the value of conversations. We used to visit them every afternoon after school; while my sister and I worked on homework in their dining table, my father talked to his parents or read a book—one of the thousands they had in their private home library. As I file this dissertation today, on the 11th anniversary of my father's passing, I am honoring him by achieving his lifelong goal—earning a Ph.D. From my parents and my sister—Rolando, Merce, and Cami—I have learned about hard work, to reach for my dreams, to enjoy life, and to appreciate the power of unwavering faith. Their unconditional support, love, compassion, prayers, and words of encouragement are immeasurable and I am completely certain that I would not be here without them. For this reason, this dissertation is dedicated to them.

CURRICULUM VITAE

EDUCATION

2018 **Dissertation Proposal Defense**, Advancement to Candidacy.
- *Committee:* Ka-Yuet Liu (chair), Patrick Heuveline, Jennie Brand, and Anne Pebley (Public Health)

2017 **Doctoral Field Examinations**, Social Demography & International Migration.

2016 **Master of Arts (M.A.)**, Sociology, University of California, Los Angeles, California, USA.
- *M.A. Thesis: "The documentation process of Mexican immigrants in the United States through the Consulate General of Mexico in Los Angeles, California"*
  Committee: Rubén Hernández-León (first reader), Roger Waldinger (second reader)

2014 **Master of Arts (M.A.)**, Development Studies, Institut de hautes études internationales et du développement (IHEID), Geneva, Switzerland.
Specialization: Human, Economic, and Financial Development
- *M.A. Thesis: "Hometown Associations as Sustainable Development Actors in Areas of High Migration: A Case Study of El Salvador"*
  Advisor: Slobodan Djajić

2012 **Bachelor of Arts (B.A.)**, International Studies, Political Science and Anthropology & Sociology (summa cum laude; Phi Beta Kappa), Elmira College, New York, USA.

PEER-REVIEWED PUBLICATIONS

- *Dissertation Chapter One:* "Rural-Urban Disparities in Fertility in Latin America and the Caribbean: A Blinder-Oaxaca Decomposition Analysis."
  - **Revise & Resubmit (under review)**

- *Dissertation Chapter Two:* "Rural-urban Differences in Unintended Pregnancies, Contraceptive Nonuse, and Terminated Pregnancies in Latin America and the Caribbean."
  - **Mena-Meléndez, Lucrecia. 2022. "Rural–Urban Differences in Unintended Pregnancies, Contraceptive Nonuse, and Terminated Pregnancies in Latin America and the Caribbean."** ***Women's Reproductive Health*** **9(2), forthcoming.**

- *Dissertation Chapter Three:* "Ethnoracial Child Health Inequalities in Latin America: Multilevel Evidence from Bolivia, Colombia, Guatemala, and Peru."
  - **Mena-Meléndez, Lucrecia. 2020. "Ethnoracial child health inequalities in Latin America: Multilevel evidence from Bolivia, Colombia, Guatemala, and Peru."** ***SSM - Population Health*** **12:100673. https://doi.org/10.1016/j.ssmph.2020.100673**
    - *Media Coverage:* "Conocimiento ancestral para enfrentar la pandemia (Ancestral knowledge to face the pandemic)" (By Claudia Mazzeo in SciDev.Net published on 11/09/2020; top 10 most read in 2020 in SciDev.Net, Latin America and the Caribbean)

FELLOWSHIPS, SCHOLARSHIPS & GRANTS

2020 Department of Sociology Graduate Summer Funding, UCLA ($6,000)
2019–2020 Dorothy L. Meier Dissertation Fellowship, UCLA ($20,000 stipend, $15,000 in-state tuition, and health insurance)

2018–2019	Department of Sociology Graduate Student Fellowship, UCLA ($24,000 stipend, $15,000 in-state tuition, and health insurance)
2017	Graduate Summer Research Mentorship Program, UCLA ($6,000)
2016	George E. Jonas Foundation Graduate Scholarship ($2,400)
2016	Juntos Podemos/Together We Can Spanish Infographic Scholarship, UCLA ($2,631)
2015	Juntos Podemos/Together We Can Scholarship, UCLA ($2,000)
2014–2016	Graduate Dean's Scholar Award, UCLA ($14,500)
2014–2015	Department of Sociology Graduate Student Fellowship, UCLA ($22,000 stipend, $30,000 in-state and non-resident tuition, and health insurance)
2012–2014	Hans Wilsdorf Foundation Scholarship, IHEID ($40,000 stipend and $10,000 tuition)
2012	John Parker '79 Prize in International Relations & Political Science, Elmira College ($500)
2012	The Jeanette Elizabeth Sheldon Prize in Foreign Language, Elmira College ($500)
2012	International Student Prize, Elmira College ($500)
2011	Phi Beta Kappa Prize for Sophomores, Elmira College ($500)
2011	Board of Trustees Prize, Elmira College ($500)
2011	George E. Jonas Foundation Undergraduate Scholarship ($2,500)
2009	George E. Jonas Foundation Undergraduate Scholarship ($1,250)
2009–2012	International Grant, Elmira College ($28,500 tuition)
2009–2012	Presidential Honor Scholarship, Elmira College ($60,000 tuition)

TEACHING EXPERIENCE

Teaching Fellow

2020	Introduction to Sociological Research Methods (Sociology 20, Professor Richard Andalón)
	Race and Ethnicity in American Life (Sociology 156, Professor Michael Calderón-Zaks)
	Sociology of Crime (Sociology 147A, Professor Lucrecia Mena Meléndez)
	Sociology of Deviant Behavior (Sociology 145, Professor Lucrecia Mena Meléndez)
	Contemporary Sociological Theory (Sociology 102, Professor Mark Jepson)
2019	Contemporary Sociological Theory (Sociology 102, Professor Mark Jepson)
	Sociology of Crime (Sociology 147A, Professor Lucrecia Mena Meléndez)
	Sociology of Deviant Behavior (Sociology 145, Professor Lucrecia Mena Meléndez)
	Comparative Immigration (Sociology 151, Professor Lucrecia Mena Meléndez)

Teaching Associate

2018	Comparative Immigration (Sociology 151, Professor Roger Waldinger)
	American Society (Sociology 185, Professor David Halle)
	Sociology of Crime (Sociology 147A, Professor Lucrecia Mena Meléndez)
	American Society (Sociology 185, Professor Lucrecia Mena Meléndez)
	Received Teaching Award from the Department of Sociology (Fall 2018)
2017	American Society (Sociology 185, Professor David Halle)

Teaching Assistant

2017	Comparative Immigration (Sociology 151, Professor Roger Waldinger)
	American Society (Sociology 185, Professor David Halle)
2016	Contemporary Sociological Theory (Sociology 102, Professor Mark Jepson)
	Contemporary Sociological Theory (Sociology 102, Professor Mark Jepson)
	Sociology of Crime (Sociology 147A, Professor Victoria Foreman)
2015	Introductory Sociology (Sociology 1, Professor Mark Jepson)

Reader Position

2016	Development of Sociological Research Theory (Sociology 101, Professor Juan Delgado)
	Introduction to Sociological Research Methods (Sociology 20, Professor Patrick Reilly)
	Political Sociology (Sociology 182, Professor Juan Delgado)

CHAPTER ONE: INTRODUCTION

In the second half of the 20th century, the region of Latin America and the Caribbean experienced important demographic changes with far-reaching and long-lasting consequences (Guzmán et al. 2006; Livi-Bacci 2017).[4] During this period, fertility declined sharply, sexual and reproductive health gained increasing attention, and child morbidity and mortality largely improved. These sociological and demographic processes showcased improvements in the general living conditions of women and children in the region. Despite these significant improvements, limited research has investigated how these sociological and demographic processes vary across ethnoracial groups, rural-urban residence, and national origin, which has the potential to elucidate significant inequalities in Latin America and the Caribbean.

This dissertation tests several ideas about fertility, sexual and reproductive health, and child health outcomes in Latin America and the Caribbean, using a framework that is contextual, multilevel, and comparative. Specifically, this dissertation explores not only the inequalities in fertility, sexual and reproductive health, and child health in this region, but most importantly, how they vary across ethnoracial identity, rural-urban residence, and national origin. In the remainder of this introductory chapter, I provide an overview of the case study context and explain why this is a particularly rich setting to explore these associations. Thereafter, I synthesize the three empirical chapters that comprise the main body of this dissertation. Finally, I provide insights into the significance of this research in advancing our understanding of sociological and demographic processes in this region,

[4] Throughout this dissertation, I use the United Nations Statistics Division (2013) definition of Latin America and the Caribbean, which includes 33 countries in Central and South America and the Caribbean. In this dissertation I look at several countries in this region, including Bolivia, Colombia, the Dominican Republic, Guatemala, Haiti, Honduras, and Peru.

particularly by elucidating significant inequalities across ethnoracial groups, rural-urban residence, and national origin.

Case Study Context

Several features of the Latin American and Caribbean context are distinct from other low-, lower-middle-, and upper-middle world regions that have experienced similar sociological and demographic changes in the 20th century.[5] Countries in Latin America and Caribbean share close geographic proximity, as well as centuries of shared ethnolinguistic, geopolitical, and historical legacies (Beals 1953; Inglehart and Carballo 1997). Shared similarities, particularly regarding women's status (Kishor and Neitzel 1996), social organization and stratification (Beals 1953), and cultural environment (Inglehart and Carballo 1997), allow for fairer cross-ethnoracial, within-country, and cross-country comparisons that may be more difficult in other world regions. Generally speaking, the population of Latin America and the Caribbean represents approximately 652 million people—8.7% of the world's population, has a 1.4% annual growth rate, with life expectancy of approximately 72 years, and with negative net migration of 3.4 million in the 21st century (Guzmán et al. 2006).[6]

At the country-level, countries in this region share similar pre-colonial, colonial, and post-colonial historical legacies. Their communal history goes back thousands of years ago—before the establishment of modern-day nation-states—with the development of pre-colonial languages, social

[5] The United Nations (2021) classifies countries according to their recent economic development status. The classification for countries included in this study are as follows: low-income (Haiti), lower-middle-income (Bolivia and Honduras), and upper-middle-income (Colombia, Dominican Republic, Guatemala, and Peru).

[6] The total population size including only 20 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela) is of approximately 647 million. The total population size including multiple smaller countries in the Caribbean is of 652 million (Economic Commission for Latin America and the Caribbean 2019).

organization, religion, art, culture, and technology (Lockhart and Schwartz 1983). Thereafter, this region also experienced aggressive colonization by European conquistadors—primarily the Spanish, Portuguese, and French—as they sailed to explore, conquer, and settle in the New World at the end of the 15th century. Finally, this region also underwent systematic and purposeful organized efforts to gain independence and establish newly independent states in the 17th and 19th centuries (Halperín Donghi 1993; Lockhart and Schwartz 1983). While the similarities across the region are inarguable, less is known about the inequalities that develop, exist, and persist across ethnoracial groups, rural-urban residence, and national origin, which have important implications for fertility, sexual and reproductive health, and child health outcomes in this region.

At the rural-urban level, Latin America and the Caribbean has also experienced rapid industrialization, urbanization, and economic development over the past decades. Years of these accelerated social, economic, and political processes have turned hundreds of hamlets and villages that were for centuries rural, pastoral, and agricultural, into important urban centers of manufacturing, transportation, and commerce. These rapid processes have resulted in approximately 80% of the population now living in cities and making this region the most urbanized in the developing world (UN-Habitat 2012).[7] Despite these swift transformations, Latin America and the Caribbean still experiences marked inequalities across rural-urban settings. In particular, rapid industrialization, urbanization, and economic development have resulted in massive rural-urban migration patterns. Consequentially, these population movements have increased levels of rural poverty, led to the growth of slums and non-slums and the urbanization of poverty, and deepened rural-urban inequalities in a plethora of and

[7] The number of cities in Latin America and the Caribbean has increased six-fold in the past fifty years—from 320 to 2,000 cities with at least 20,000 inhabitants. Approximately half the urban population now lives in cities with fewer than 500,000 inhabitants, but also approximately 14 percent lives in megacities of 10 million inhabitants (UN-Habitat 2012).

social, economic, and demographic outcomes (Food and Agriculture Organization of the United Nations 2018).

At the ethnoracial-level, broadly ethnicity and/or race in Latin America and the Caribbean has been substantially fluid, resulting particularly from the historical nation-building efforts to unite divided black, indigenous, white, and mixed-race populations through *mestizaje*, or racial and cultural mixing ideologies (Telles and Bailey 2013). In addition, the region shares historical institutionalization of inequalities through phenotypic markers of color-, culture-, and linguistics-coded ethnicity and/or race (Telles and Bailey 2013). Out of the 652 million people in Latin America and the Caribbean (Economic Commission for Latin America and the Caribbean 2019), most descend from three major ethnoracial groups: indigenous (40 million), direct descendants of peoples inhabiting this region when European colonizers arrived in the 15th century; afro-descendent (120 million), direct descendants of African slaves forcibly brought to the region during and after the colonial period; and Europeans, direct descendants of largely Spanish and Portuguese early settlers and later immigrants (Perreira and Telles 2014; Ribando 2005).

The total number of indigenous groups is estimated between 655-826 (Davis-Castro 2020).[8] Similarly, afro-descendent groups—although less fragmented—include black (*negro/preto*), mixed-black (*mulatto*), mixed-indigenous-black (*zambo/chino/garifuna*), and mixed-indigenous-black-white (*pardo*) groups

[8] For more information on indigenous groups in Latin America and the Caribbean, including the available data and the main challenges they face pertaining recognition, numbers, mobility, migration, mobilization, identity, poverty, vulnerability, and education, see Freire et al. (2015).

(Telles, Flores, and Urrea-Giraldo 2015).[9] Ethnoracial classifications in Latin America and the Caribbean have defined the region's demographic composition, representations of identity, assimilation processes, and changing definitions of ethnoracial classifications (Telles and Bailey 2013; Telles and Torche 2019). Both indigenous and/or afro-descendent groups have historically been placed at the bottom of the uneven class structure and racial and ethnic discrimination and exclusion continue to significantly determine their livelihoods. Compared to non-indigenous and/or non-afro-descendent groups, indigenous and afro-descendent groups suffer similar problems of economic, social, cultural and political inequality, which reproduces and perpetuates disparities in this region (Bello and Rangel 2002).

Within this context, my dissertation focuses on a key question: what is the relationship between ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes in Latin America and the Caribbean? Over the course of three empirical chapters, I explore these associations relying on Demographic and Health Survey (DHS) data between 1986–2017 for Latin America and the Caribbean.[10] **Table 1.1** provides a breakdown of the data included in each empirical chapter of this dissertation. DHS is a publicly-available, nationally-representative, pooled cross-sectional survey of women ages 15–49 collected by ICF International in collaboration with host country governments.[11] The standardized questionnaires across countries

[9] For more information on afro-descendent groups in Latin America and the Caribbean, including the main challenges they face pertaining race relations, access to services, poverty, education, and country-level distributions, see Freire et al. (2018).

[10] Since 1984, The Demographic and Health Surveys (DHS) Program has provided technical assistance to more than 400 surveys in over 90 countries, advancing global understanding of health and population trends in developing countries. Surveys are publicly available through their website: https://dhsprogram.com/

[11] ICF International, Inc. is a Fairfax, Virginia-based global advisory and digital services provider, which provides a range of services for governments and businesses, including strategic planning, management, marketing and analytics. It was

allow fairer cross-country comparisons for a wide range of socioeconomic and demographic indicators in the areas of fertility, family planning, maternal and child health, nutritional status, education, access to clean water and sanitation facilities, sexual activity, knowledge about HIV, malaria prevention and treatment, immunizations, as well as many other relevant outcomes (Corsi et al. 2012; Hill et al. 2012).

Before embarking on the empirical chapters of this dissertation, I generally illustrate the aforementioned demographic changes in the outcomes of interest (fertility, sexual and reproductive health, and child health outcomes) using Demographic and Health Survey (DHS) data (1986–2017) for Bolivia, Colombia, the Dominican Republic, Guatemala, Haiti, Honduras, and Peru. **Figure 1.1** shows Total Fertility Rates (TFRs) from 1986 to 2017 by country.[12] As this figure shows, fertility has been decreasing steadily and approaching replacement-level fertility of 2.1 children per woman in all seven countries over this period of thirty years. Since the late 1990s and early 2000s, four out of the seven countries (Colombia, Dominican Republic, Honduras, and Peru) reached TFRs at, or below, 3.0 children per woman. Out of these four countries, three (Colombia, Dominican Republic, and Peru) have since reached, or are approaching, replacement-level fertility of 2.1 children per woman. Despite steady overall declines in fertility in this region, this figure also showcases differences across countries, with some still facing TFRs over 3.0 children per woman (Bolivia, Guatemala, and Haiti).

Figure 1.2 shows sexual and reproductive health outcomes from 1986 to 2017 by rural-urban

founded in 1969 as Inner City Fund and renamed to ICF Incorporated in 1972. Since 1984, ICF International, Inc. has worked with the United States Agency for International Development (USAID) to implement the Demographic and Health Surveys (DHS) Program around the world.

[12] As the single most important indicator of fertility, the Total Fertility Rate (TFR) measures the average number of children a woman would bear if she survived through the end of the reproductive age span and experienced at each age a particular set of age-specific fertility rates (Preston, Heuveline, and Guillot 2001).

residence. Specifically, this figure visually displays differences in unintended pregnancies, contraceptive nonuse, and terminated pregnancies across rural-urban areas. Compared to women in urban areas, women in rural areas reported a higher percentage of unintended pregnancies (66% vs. 61%) and contraceptive nonuse (40% vs. 28%), but a lower percentage of terminated pregnancies (22% vs. 28%). Finally, **Figure 1.3** displays relative risks of select child health outcomes for Bolivia, Colombia, Guatemala, and Peru from 1986 to 2015 by rural-urban residence and ethnoracial identity.[13] These results show that minority ethnoracial children (indigenous and/or afro-descendent) in rural compared to urban areas have higher risk of under-5 mortality, stunting, wasting, and anemia, which showcases important inequalities across rural-urban residence as well as ethnoracial identity. The uniqueness of the Latin American and Caribbean setting provides the perfect context to study the heterogeneities in ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes, which I will describe thoroughly in the following empirical chapters.

Outline of Chapters

The present introduction discusses theoretical and methodological foundations shared across the subsequent three empirical chapters. In a practical sense, the following three empirical chapters are interrelated because they focus on the same time period (1986–2017), they address the same regional context (Latin America and the Caribbean), and they rely on the same datasets (Demographic and Health Surveys) for analyses. From the standpoint of analysis, the following three empirical chapters are also interrelated because they use a framework that is contextual, multilevel, and comparative,

[13] I calculated the risk ratios by rural-urban residence by dividing the incidence of each child health outcome (under-5 mortality, stunting, wasting, and anemia) in rural areas by those in urban areas. I did so separately across ethnoracial groups (i.e., separately for minority ethnic and/or racial children in rural-urban areas and for majority ethnic and/or racial children in rural-urban areas). For additional information on this analysis, see Chapter Four.

taking into account heterogeneities in the association of ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes. Each chapter, however, is written as a self-contained study and can be read independently.

The following second chapter, "Rural-Urban Disparities in Fertility in Latin America and the Caribbean: A Blinder-Oaxaca Decomposition Analysis,"[14] uses Demographic and Health Survey (DHS) data (1986–2017) for seven countries in Latin America and the Caribbean (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru); N(level-1) = 465,823; N(level-2) = 6,247) to measure and explain rural-urban disparities in fertility for women with different levels of educational attainment. **Figure 1.4** presents the countries included in this analysis. Chapter Two builds on well-established and extensive literature on the negative association between educational attainment and fertility around the world. Building on this literature, Chapter Two poses the following questions: First, does the relationship between educational attainment and fertility vary across rural-urban areas in Latin America and the Caribbean? Second, what are the characteristics that predict fertility and does the relationship between educational attainment and fertility by rural-urban residence vary after controlling for these characteristics? Third, if so, is this variation attributable to differences in the *composition* of the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility?

In Chapter Two, I conduct a descriptive overview of rural-urban disparities in fertility across educational attainment. Then, I conduct a multilevel analysis of characteristics that predict fertility, including an interaction between educational attainment and rural-urban residence. Finally, I conduct

[14] A modified version of this chapter is currently under review in a peer-reviewed scholarly journal.

a Blinder-Oaxaca decomposition to explore rural-urban disparities in fertility and explain whether the observed disparities are attributable to differences in the *composition* of the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility. Aligned with the structuralist and spatial diffusion schools of demography, results suggest that the association of educational attainment and fertility does vary by rural-urban residence. While fertility in this region has decreased over the past decades—especially amongst the highly educated—rural women have higher fertility than urban women at all levels of educational attainment. In addition, rural-urban disparities in fertility are attributable to differences in the *composition* of the characteristics of rural-urban women.

The third chapter, "Rural-urban Differences in Unintended Pregnancies, Contraceptive Nonuse, and Terminated Pregnancies in Latin America and the Caribbean,"[15] uses Demographic and Health Survey (DHS) data (1986–2017) for seven countries in Latin America and the Caribbean (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru) to assess sexual and reproductive health by rural-urban residence. Specifically, this chapter investigates rural-urban differences in unintended pregnancies (N(level-1) = 296,239; N(level-2) = 6,169), contraceptive nonuse (N(level-1) = 660,410; N(level-2) = 6,262), and terminated pregnancies (N(level-1) = 660,269; N(level-2) = 6,262). **Figure 1.5** presents the countries included in this analysis. Chapter Three poses the following questions: First, what is the relationship between rural-urban residence and unintended pregnancies, contraceptive nonuse, and terminated pregnancies in Latin America and the Caribbean? Second, is this relationship

[15] A modified version of this chapter is forthcoming in *Women's Reproductive Health* in 2022. The reference for this publication is as follows:

Mena-Meléndez, Lucrecia. 2022. "Rural–Urban Differences in Unintended Pregnancies, Contraceptive Nonuse, and Terminated Pregnancies in Latin America and the Caribbean." *Women's Reproductive Health* 9(2), forthcoming.

moderated by geographic, socioeconomic, individual, and reproductive factors?

To evaluate rural-urban disparities in unintended pregnancies, contraceptive nonuse, and terminated pregnancies, I conduct descriptive, relative risk, and multilevel analyses. Descriptive results and relative risk analyses indicate significant rural-urban differences for sample characteristics, sexual and reproductive outcomes, contraceptive methods, and types of terminations. Multilevel analyses suggest that rural respondents have higher risk of contraceptive nonuse, although this is reduced with household wealth. On the other hand, urban respondents have higher risk of unintended pregnancies and terminated pregnancies.

The fourth chapter, "Ethnoracial Child Health Inequalities in Latin America: Multilevel Evidence from Bolivia, Colombia, Guatemala, and Peru,"[16] uses Demographic and Health Survey (DHS) data (1986–2015) for Bolivia, Colombia, Guatemala, and Peru, to explore ethnoracial differences in child under-5 mortality (N(level-1) = 20,770; N(level-2) = 3,953), stunting (N(level-1) = 15,828; N(level-2) = 3,372), wasting (N(level-1) = 15,827; N(level-2) = 3,372), and anemia (N(level-1) = 13,294; N(level-2) = 2,474). **Figure 1.6** presents the countries included in this analysis. Chapter Four poses the following questions: First, what is the relationship between ethnicity and/or race and child under-5 mortality, stunting, wasting, and anemia in Latin America? Second, does this relationship vary across rural-urban residence and across countries? Third, is this association mediated by geographic, socioeconomic, individual, reproductive, healthcare, and nutritional factors?

---

[16] A modified version of this chapter has been published in *SSM - Population Health* in 2020.
The reference for this publication is as follows:

Mena-Meléndez, Lucrecia. 2020. "Ethnoracial child health inequalities in Latin America: Multilevel evidence from Bolivia, Colombia, Guatemala, and Peru." *SSM - Population Health* 12:100673. doi: 10.1016/j.ssmph.2020.100673.

In Chapter Four, I conduct descriptive, relative risk, and multilevel analyses. Rural-urban risk analysis suggests that indigenous and/or afro-descendent respondents have higher risk of under-5 mortality, stunting, wasting, and anemia. The same pattern is observed for cross-country risks, particularly for Bolivia and Colombia. Results from logistic multilevel regression models suggest that self-identifying as indigenous and/or afro-descendant is associated with a higher risk of child stunting and wasting, but not necessarily a higher risk of under-5 mortality and anemia, even after controlling for geographic, socioeconomic, individual, reproductive, healthcare, and nutritional factors. While previous research has largely focused on the protective role of maternal education, results from this study suggest that paternal education, as well as, individual characteristics and early reproductive decisions play a significant role in child health outcomes.

Finally, in the fifth chapter—the conclusion—I summarize the findings of the three empirical chapters that comprise this dissertation. I connect these findings back to the theoretical motivations outlined in this introduction and discuss the methodological implications of using DHS data from countries in Latin America and the Caribbean to assess heterogeneities in the associations of ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes.

Significance

Fundamentally, these three empirical chapters provide a holistic understanding of the heterogeneities in the association of ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes in Latin America and the Caribbean. This dissertation tests several ideas about fertility, sexual and reproductive health, and child health outcomes using a framework that is contextual, multilevel, and comparative. It contributes to the broader sociological and demographic literature in five specific ways. First, and most generally, it provides a holistic understanding of the aforementioned heterogeneities for a largely understudied low-, lower-middle-, and upper-middle-income region of the world. In the second half of the 20th century, this region experienced important changes with far-reaching and long-lasting consequences. While much of previous research has focused on country-level and/or cross-country effects, research from this dissertation accounts for other forms of heterogeneity—rural-urban residence and ethnoracial identity—that measure and explain inequalities in fertility, sexual and reproductive health, and child health outcomes in this region.

Second, this dissertation not only measures disparities in fertility in Latin America and the Caribbean, but also explains observed disparities by decomposing them into components and assessing whether we can attribute them to differences in the *composition* in the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility. While the Blinder-Oaxaca decomposition approach has a long methodological tradition in various literatures, it has not been applied to explain rural-urban disparities in fertility in Latin America and the Caribbean. This methodology has the advantage of providing a unified framework to consider the collective importance of a vast range of geographic-, socioeconomic-, individual-, and reproductive-related characteristics, many of which may be individually insignificant. Results from this dissertation, thus, contribute methodologically and conceptually to the literature by suggesting that the observed rural-urban disparities in fertility are attributable to differences in the *composition* of the characteristics of rural-urban women in the region.

Third, beyond merely assessing heterogeneities of fertility, sexual and reproductive health, and child health outcomes by rural-urban residence, this dissertation also controls for differences in geographic (e.g., country, rural-urban residence), socioeconomic (e.g., household wealth, years of education, occupation), and individual and reproductive (e.g., age, union status, age at-first-birth, living children, birth parity, birth interval) characteristics. While previous theoretical and empirical research in the Global South has suggested that, on average, urban women have better sexual and reproductive outcomes than rural women, results from this dissertation suggest, for example, that conditional upon geographic, socioeconomic, individual, and reproductive characteristics (particularly household wealth, years of education, and occupation), rural women may, in fact, have better sexual and reproductive health outcomes than urban women in Latin America and the Caribbean.

Fourth, this dissertation provides an empirical assessment of persistent and pronounced child health disparities across ethnic and/or racial groups in Latin America. Results suggest that women who self-identifies as indigenous and/or afro-descendant have higher risk of having children suffer from stunting and wasting. Most surprisingly, however, they do not have necessarily higher risk of child under-5 mortality and child anemia, which challenges previous research findings regarding these two particular child health outcomes. Despite extensive ethnoracial diversity in this region, scarcity in research on ethnoracial health disparities is explained by long-held beliefs that socio-economic status, rather than ethnoracial differences, structures inequality. This research, thus, sheds light on the inequalities experienced by ethnic and/or racial minority populations in Latin America and the Caribbean, particularly focused on child health outcomes as well as observed variation across and within countries. Generally speaking, it contributes significantly to the literature by documenting ethnoracial inequalities not previously studied.

Fifth, this dissertation uses Demographic and Health Survey (DHS) data (1986–2017) for multiple countries in Latin America and the Caribbean. Systematically, it relies on all survey waves—approximately 40 from seven countries (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru)—with slight variations in countries, waves, and samples included in each empirical chapter.[17] While previous researchers have studied the case of Latin America and the Caribbean, this dissertation fills multiple gaps in the literature, particularly by studying a substantial number of countries in the region and relying on sizeable sample sizes for robust empirical analyses.

For example, Chapter Two assesses disparities in fertility for women with different levels of educational attainment, which relies on data for seven countries and a sample of 465,823 women in 6,247 clusters. Chapter Three, assesses rural-urban disparities in unintended pregnancies, contraceptive nonuse, and terminated pregnancies, which relies on data for seven countries and different samples across outcomes. Specifically, 296,239 women in 6,169 clusters for unintended pregnancies, 660,410 women in 6,262 clusters for contraceptive nonuse, and 660,269 women in 6,262 clusters for terminated pregnancies. Finally, Chapter Four explores under-5 mortality, stunting, wasting, and anemia by ethnoracial identity, which relies on data for four countries and also different samples across outcomes. Specifically, 20,770 women in 3,953 clusters for under-5 mortality, 15,828 women in 3,372 clusters for stunting, 15,827 women in 3,372 clusters for wasting, and 13,294 women in 2,474 clusters for anemia.

In conclusion, this dissertation finds significant heterogeneities in fertility, sexual and reproductive

[17] Slight variations in the countries, waves, and samples included in each empirical chapter are a result of availability of data for the outcome(s) of interest and other conceptual and methodological requirements to answer the proposed research questions. More information is provided in each empirical chapter.

health, and child health outcomes by ethnoracial identity, rural-urban residence, and national origin in Latin America and the Caribbean. This dissertation clearly elucidates significant inequalities in this understudied low-, lower-middle-, and upper-middle-income region, which can inform debates about current and future population changes in other developing regions. As we witness "urban explosions" across the Global South, results from this dissertation suggest that we must pay particular attention to develop programs that target the specific needs and experiences of the urban poor. In addition, these significant inequalities can help inform the development of adequate population policies. For example, disparities in sexual and reproductive health outcomes across rural-urban areas suggest the need for tangible and pragmatic population policies to improve the sexual and reproductive health of women in both rural and urban areas in developing regions. Finally, highlighting these inequalities—particularly across ethnoracial groups—can persuade developing governments to address centuries of ethnoracial discrimination and exclusion and commit to improving the precarious conditions of ethnoracial minorities in the developing world.

TABLES

Table 1.1: Demographic and Health Survey (DHS) data included in each empirical chapter of this dissertation, by chapter, country, and year for Latin America and the Caribbean

Table 1.1: Demographic and Health Survey (DHS) data included in each empirical chapter of this dissertation, by chapter, country, and year for Latin America and the Caribbean

Country	Year	Empirical Chapters		
		Chapter Two	Chapter Three	Chapter Four
Bolivia	1989	x	x	x
	1994	x	x	x
	1998	x	x	x
	2003	x	x	x
	2008	x	x	x
Colombia	1986	x	x	x
	1990	x	x	x
	1995	x	x	x
	2000	x	x	x
	2005	x	x	x
	2010	x	x	x
	2015	x	x	x
Dominican Republic	1986	x	x	
	1991	x	x	
	1996	x	x	
	1999	x	x	
	2002	x	x	
	2007	x	x	
	2013	x	x	
Guatemala	1987	x	x	x
	1995	x	x	x
	1998-1999	x	x	x
	2014-2015	x	x	x
Haiti	1994-1995	x	x	
	2000	x	x	
	2005-2006	x	x	
	2012	x	x	
	2016-2017	x	x	
Honduras	2005-2006	x	x	
	2011-2012	x	x	
Peru	1986	x	x	x

1991-1992	**x**	**x**	**x**
1996	**x**	**x**	**x**
2000	**x**	**x**	**x**
2004-2006	**x**	**x**	**x**
2007-2008	**x**	**x**	**x**
2009	**x**	**x**	**x**
2010	**x**	**x**	**x**
2011	**x**	**x**	**x**
2012	**x**	**x**	**x**

FIGURES

Figure 1.1: Trends in Total Fertility Rates (TFRs) by country and survey year in Latin America and the Caribbean

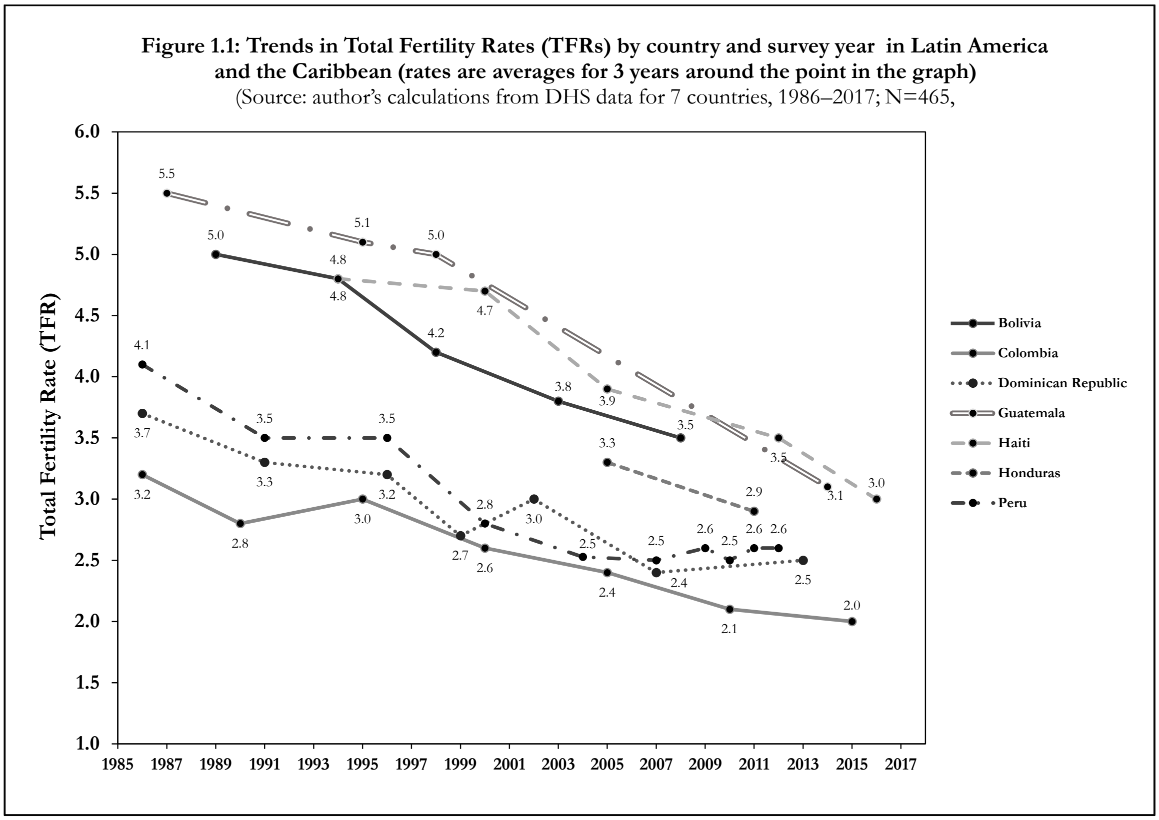


Figure 1.2: Percentage distribution of women aged 15–49 by select sexual and reproductive health outcomes and rural-urban residence in Latin America and the Caribbean

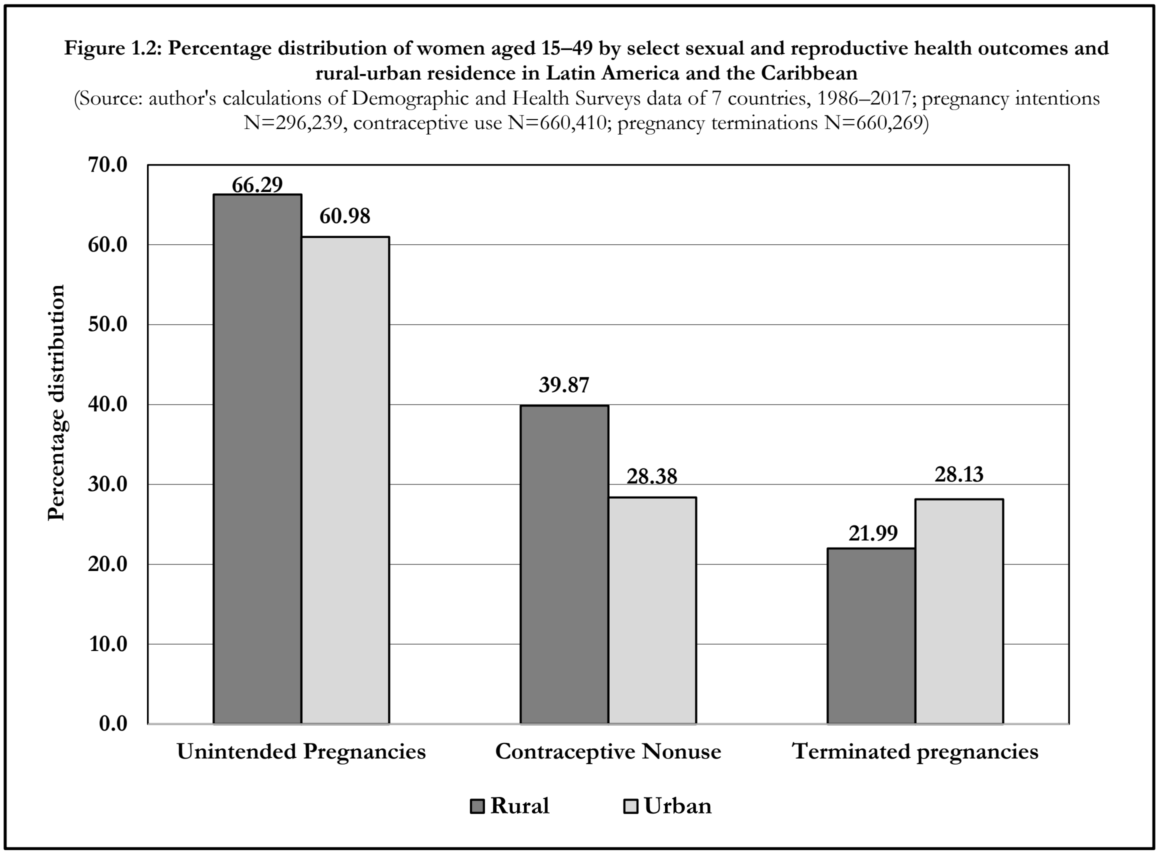


Figure 1.3: Minority-majority ethnic and/or racial relative risk of under-5 mortality, stunting, wasting, and anemia by type of residence

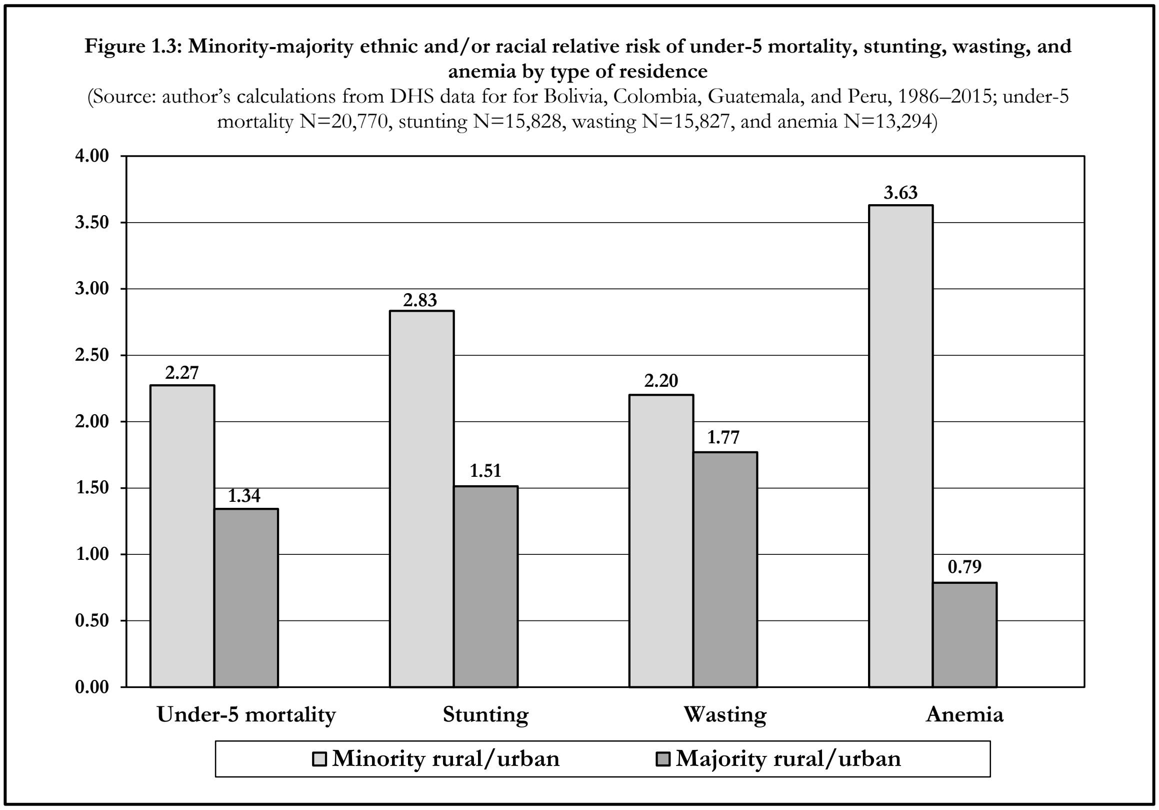
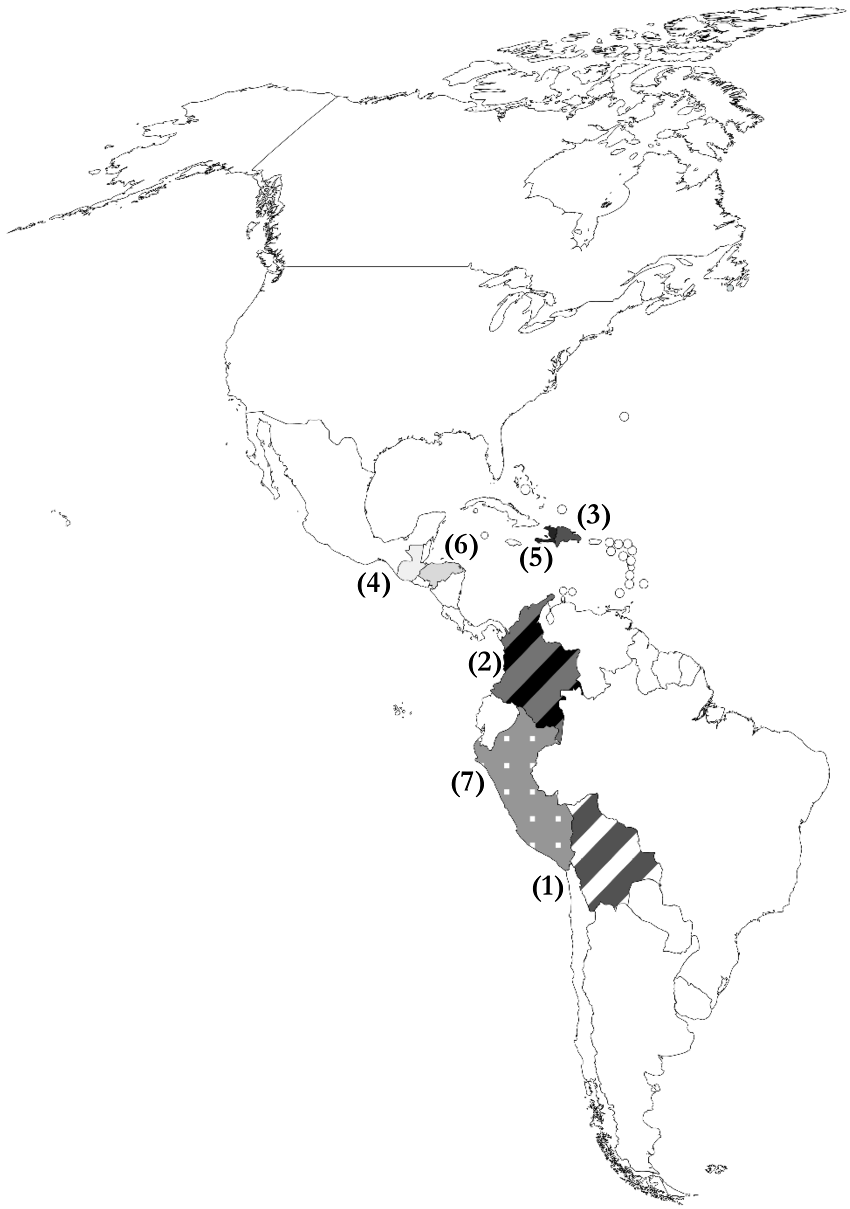
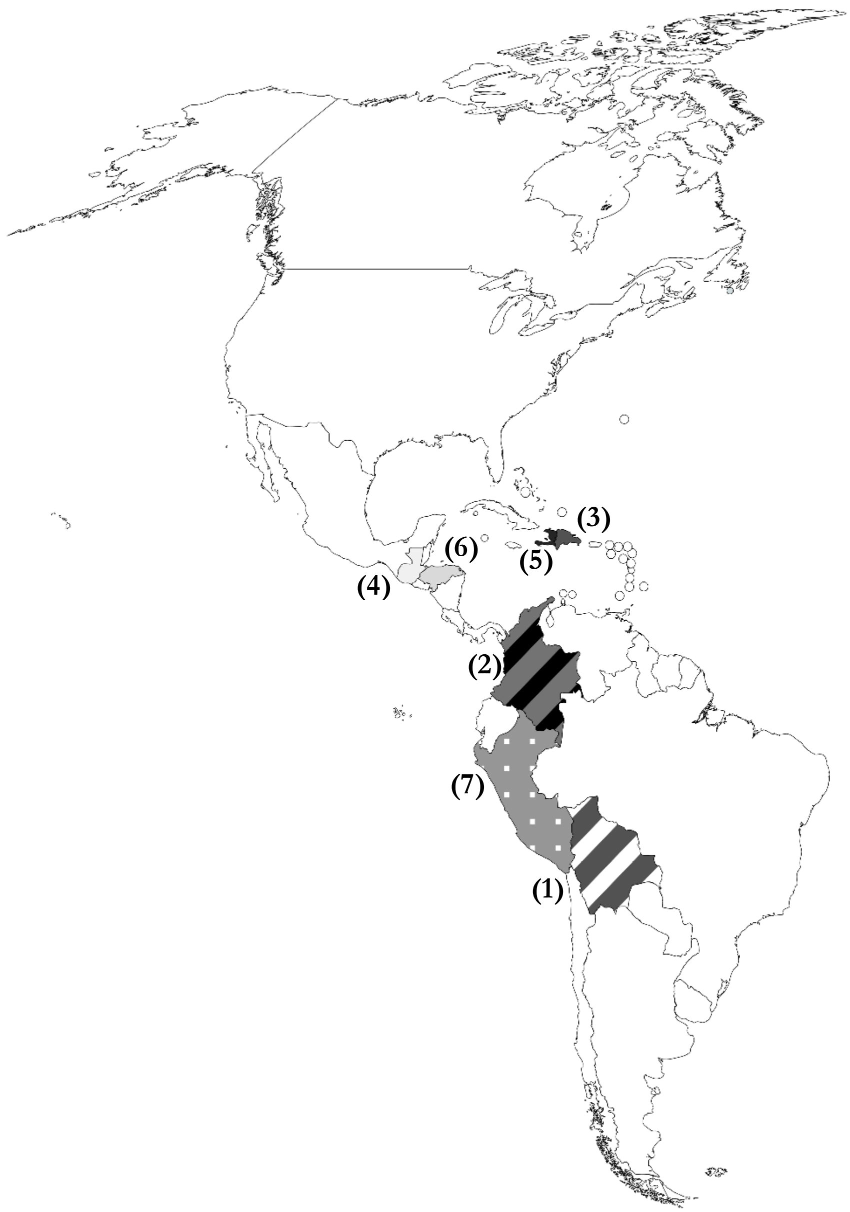


Figure 1.4: Demographic and Health Survey (DHS) data included in Chapter Two



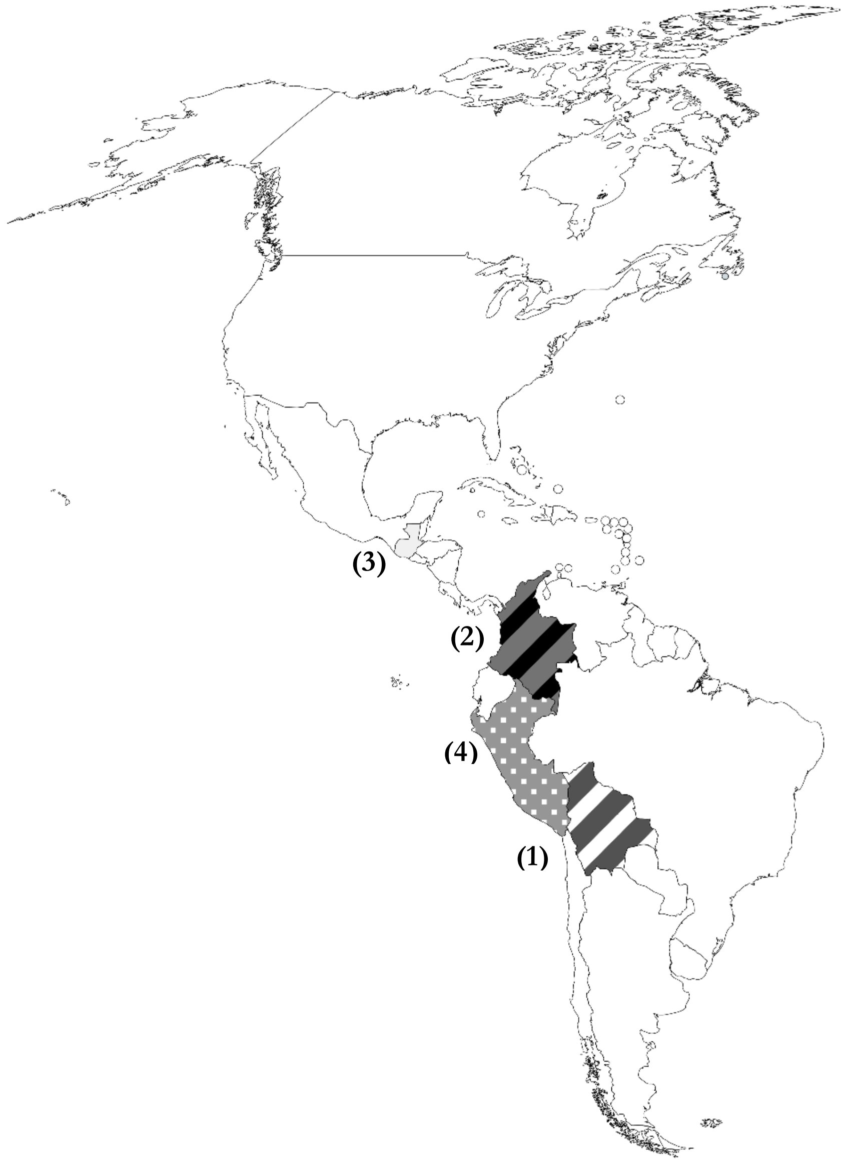
Note: (1) Bolivia, (2) Colombia, (3) Dominican Republic, (4) Guatemala, (5) Haiti, (6) Honduras, and (7) Peru

Figure 1.5: Demographic and Health Survey (DHS) data included in Chapter Three



Note: (1) Bolivia, (2) Colombia, (3) Dominican Republic, (4) Guatemala, (5) Haiti, (6) Honduras, and (7) Peru

Figure 1.6: Demographic and Health Survey (DHS) data included in Chapter Four



Note: (1) Bolivia, (2) Colombia, (3) Guatemala, and (4) Peru

CHAPTER TWO: RURAL-URBAN DISPARITIES IN FERTILITY IN LATIN AMERICA AND THE CARIBBEAN: A BLINDER-OAXACA DECOMPOSITION ANALYSIS[18]

Abstract

This study uses Demographic and Health Survey (DHS) data (1986–2017) for seven countries in Latin America and the Caribbean to measure and explain rural-urban disparities in fertility for women with different levels of educational attainment (N(level-1) = 465,823; N(level-2) = 6,247). First, I provide a descriptive overview of rural-urban disparities in fertility across educational attainment. Then, I conduct a multilevel analysis of characteristics that predict fertility, including an interaction between educational attainment and rural-urban residence. Finally, I conduct a Blinder-Oaxaca decomposition to explore rural-urban disparities in fertility and explain whether the observed disparities are attributable to differences in the *composition* of the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women. Aligned with the structuralist and spatial diffusion schools of demography, results from this analysis suggest that the association of educational attainment and fertility does vary by rural-urban residence. While fertility has decreased over the past decades—especially amongst the highly educated—rural women have higher fertility than urban women at all levels of educational attainment. In addition, rural-urban disparities in fertility are attributable to differences in the *composition* of the characteristics of rural-urban women in the region. As we witness "urban explosions" across the Global South, we must gain a better understanding of rural-urban demographic disparities to predict future demographic trends and develop adequate population and development policies.

[18] A modified version of this chapter is currently under review in a peer-reviewed scholarly journal.

Introduction

Fertility in Latin America and the Caribbean has declined sharply since the 1960s (Guzmán et al. 1996; Lee 2003; Robey, Rutstein, and Morris 1993; United Nations 2015). This decline has been attributed, at least in part, to increases in educational attainment among women (Castro Martin and Juarez 1995; Cochrane 1979; Graff 1979). Progress has been made in understanding the patterns and causes of the so-called second stage of the First Demographic Transition in Latin America and the Caribbean (de Cosio 1992; Holsinger and Kasarda 1976).[19] These earlier studies have documented that in the developing world, the relationship between female education and fertility is complex, and not necessarily linear, as the classical view argued for the developed world (Mason 1997).

The effects of education on fertility are constrained by educational differences between women, by the level of within- and across-country development (Anker 1978; Becker 1960), women's status within these societies (Gertler and Molyneaux 1994), and the institutional and the cultural environment (Martin 1995; Martin and Juarez 1995). For instance, at the onset of the fertility transition, education might in fact have a short-term positive effect on fertility, by improving nutrition and prenatal and natal care, as well as eroding traditional practices that may depress fertility (Lesthaeghe, Shah, and Page 1981; Nag et al. 1980). However, once countries reach more advanced stages of the transition (i.e., when natural fertility is replaced by at least partially controlled fertility), the positive effect of education on fertility is offset by increases in contraceptive use associated with more education (Weinberger, Lloyd, and Blanc 1989).

[19] The First Demographic Transition is a population transition from high mortality and high fertility to low mortality and low fertility (Caldwell 1976). The transition is divided into four major stages: (1) it begins with mortality decline, (2) followed by a time with reduced fertility, (3) leading to an interval of first increase, and then decrease population growth, and (4) ending with population aging (Lee 2003). Although the First Demographic Transition has been experienced across most contemporary societies, the timing of the transition has been different across regions. Latin America and the Caribbean experienced the first stage after World War II and the second stage in the mid-1960s or later (Lee 2003).

Despite extensive demographic literature on the association of educational attainment and fertility in Latin America and the Caribbean (Esteve and Florez-Paredes 2018; Martin 1995; Martin and Juarez 1995; National Research Council 1999; Rodríguez-Vignoli and Cavenaghi 2014), there has been less attention devoted to explaining how it varies across rural-urban areas. The limited research that exists for other developing regions has established that urban women have lower fertility than rural women (Dodoo and Tempenis 2009; Kulu 2013; Kuznets 1974; Lerch 2019a; Miro, Mertens, and Davis 1968; Olusanya 1969; Robinson 1961), but even less research has discussed whether the observed differences are attributable to differences in the *composition* in the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility. Given that the proportion of women with higher educational attainment has increased over time, we should expect important *compositional* changes in the population, which might influence fertility. It is also possible that women's higher educational attainment over time might be more effective in reducing fertility, which could be attributable to changes in the *effect* of educational attainment on fertility.

As urbanization increases in the global south, particularly in Latin America and the Caribbean, we must gain a better understanding of the processes of urbanization, the growth of slums and non-slums, and the increasing inequalities between rural and urban areas.[20] In this regard, measuring and explaining rural-urban disparities in fertility for women with different levels of educational attainment is not only relevant because the context of reproductive decision-making is different in rural and urban settings, but also because the spatial reallocation of the population from rural to urban areas has made huge transformations in the demographic composition of this region. With 80% of the population

[20] The number of cities in Latin America and the Caribbean has increased six-fold in the past fifty years—from 320 to 2,000 cities with at least 20,000 inhabitants. Approximately half the urban population now lives in cities with fewer than 500,000 inhabitants, but also approximately 14 percent lives in megacities of 10 million inhabitants (UN-Habitat 2012).

living in cities, Latin America and the Caribbean is the most urbanized developing region, providing with sufficient variation in rural-urban disparities for within- and across-national comparative analyses (da Cunha and Rodríguez Vignoli 2009; UN-Habitat 2012). In addition, Latin America and the Caribbean is an optimal empirical case since countries share close geographic proximity, as well as centuries of ethnolinguistic, geopolitical, and historically communal legacies. Shared similarities, particularly regarding women's status (Kishor and Neitzel 1996), social organization and stratification (Beals 1953), and cultural environment (Inglehart and Carballo 1997), allow for fairer comparisons.

Building on this research gap, in this article I use cross-sectional Demographic and Health Survey (DHS) data (1986–2017) for seven countries in Latin America and the Caribbean to measure and explain rural-urban disparities in fertility for women with different levels of educational attainment (N(level-1) = 465,823; N(level-2) = 6,247). Building on the well-established negative association between educational attainment and fertility, I hypothesize that this relationship varies across rural-urban areas in Latin America and the Caribbean, which is why we observe rural-urban disparities in fertility. I also hypothesize that this variation is attributable to differences in the *effect* of educational attainment on fertility across rural-urban areas. To test this, first, I provide a descriptive overview of rural-urban disparities in fertility for women with different levels of educational attainment. Then, I conduct a multilevel analysis of characteristics that predict fertility, including an interaction between educational attainment and rural-urban residence. Finally, I conduct a Blinder-Oaxaca decomposition to explore rural-urban disparities in fertility and explain whether the observed disparities are attributable to differences in the *composition* of the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility.

Background

Educational Attainment and Fertility

A vast array of demographic literature exists documenting the negative association between female educational attainment and fertility, the mechanisms that determine this relationship, and the fertility differentials that have evolved over time with the expansion of education (Basu 2002; Bongaarts, Mensch, and Blanc 2017; Caldwell 1980; Cochrane 1979; Lloyd and Mensch 1999). Previous research has documented that women with no or less than primary education tend to have earlier first births and higher subsequent fertility than those with primary or higher education (Jejeebhoy 1995; United Nations 1995). In simpler terms, female educational attainment postpones age at first union (marriage or cohabitation) and age at first birth, which reduces fertility over the lifetime (Esteve and Florez-Paredes 2018; National Research Council and Institute of Medicine 2005). The literature has highlighted three pathways through which female education affects women's reproductive behaviors in Latin America and the Caribbean: education being a source of knowledge and skills (Reed, Briere, and Casterline 1999), education serving as a vehicle of socioeconomic advancement and resource accumulation (Becker 1962), and education transforming attitudes and being associated with the adoption of new gender and sexual norms and values focused on equality (Caldwell 1976, 1980).

Notestein's (1953) and Thompson's (1930) work on the classic demographic transition theory attributes the decline in fertility to changes in social life, that are presumed to be caused by processes such as industrialization and urbanization. These processes have been associated with increases in educational opportunities, educational attainment, and educational enrollment in both the developed and developing world (Benavot and Riddle 1988; Clark 1961; Katz 1976; Meyer et al. 1979; Meyer, Ramirez, and Soysal 1992; Trow 1961). The sociology of education literature has explored the lifetime role of education on knowledge transmission, cognitive development, generation of wealth, and socialization processes (Davies and Macdowall 2006; Reed et al. 1999). As it pertains to fertility, schools serve to spread knowledge about contraceptive methods and reproductive behavior (Cochrane, Khan, and Osheba 1990; Hermalin 1983), as well as to socialize children based on Western family and gender values that encourage restraint fertility (Basu 2002; Caldwell 1982; Caldwell, Reddy, and Caldwell 1985).

Other demographers have explained declining fertility patterns through shifts in social values focused on individualism and self-fulfillment, which typically occur with rising affluence and secularization (Lesthaeghe 1983, 1995; Lesthaeghe and Surkyn 1988; Lesthaeghe and Wilson 1986). These changing social values result in educated women gaining new opportunities for status attainment beyond childbearing (Coleman 1990; Diamond, Newby, and Varle 1999; Easterlin and Crimmins 1985; Notestein 1953). Becker (1960) and Schultz (1973), for example, explain fertility decisions through the perceived relative costs of childrearing (Szreter, Nye, and Poppel 2003), which includes all "psychic, social and monetary costs" of fertility (Easterlin 1975, 1978; Easterlin and Crimmins 1985; Mason 1997). Scholars have argued that education serves as a vehicle of socioeconomic advancement and resource accumulation (Becker 1962). Thus, education also raises the opportunity costs of childbearing for women, which reduces their desire for children (Coleman 1990; Diamond et al. 1999; Easterlin and Crimmins 1985; Mason 1997; Notestein 1953).

More recent demographic theories explain the decline in fertility through diffusion of information and new social norms about birth control (Bongaarts and Watkins 1996; Kabeer 2001; Mason 1997; Szreter et al. 2003). Research has shown that education transforms attitudes and is associated with the adoption of new gender and sexual norms and values focused on equality (Caldwell 1976, 1980). Education provides women with the tools to make informed choices and increases their confidence to act on these choices. Education gives women control over resources and decisions in their own lives, as well as, their families (Basu 2002). In this regard, education may change fertility preferences, which can be attained through family planning and contraceptive methods (Liu and Raftery 2020). Educated women may choose to delay age at first sex and first birth, may choose to use contraception, and may play more important primary reproductive roles in decision-making, within their partnerships and households. These three pathways have varied greatly across the Latin America and the Caribbean context, and this research contributes to the literature in measuring and explaining rural-urban disparities in fertility for women with different levels of educational attainment.

Rural-Urban Disparities in Fertility

Previous research on rural-urban fertility has documented that rural fertility is higher than urban fertility in developed and developing world regions (Kulu 2013; Kuznets 1974; Robinson 1961). On one hand, the structuralist school of demography explains rural-urban fertility disparities arising from socioeconomic structural changes related to industrialization and urbanization, which originate in urban areas and only later spread to rural areas (Notestein 1953; Thompson 1930). In this regard, the sharp rural-urban differential in fertility is explained as a spatial manifestation of the different paces of socioeconomic structural changes during the transition to lower levels of fertility (Casterline 2001; Zarate 1967). The transformation from rural to urban societies changes the financial and opportunity costs of childbearing, expands expectations for higher education, provides opportunities for socioeconomic mobility, improves and expands the delivery of modern methods of family planning, and transforms sociocultural expectations for childbearing, reproductive health, and family dynamics, which contribute to the observed decline in fertility (Lerch 2019b). While the structuralist school of demography was the dominant explanation for the fertility decline in the West, researchers soon discovered that the empirical associations of these structural changes and the fertility decline were modest in strength, which led to the proposal of alternative explanations such as diffusion theories (Casterline 2001).

The spatial diffusion school of demography argues that rural-urban fertility disparities are a product of structural and ideational changes in the attitudes and behaviors regarding fertility and reproductive behavior, which originate in urban areas and spread to rural areas. The spread occurs primarily through social interactions, communication channels, and social and transport networks (Lerch 2019a, 2019b). Previous research has argued that the apparently autonomous spread of knowledge and practice of birth control, the pervasiveness of this process across socioeconomic groups, the strong patterning of decline in terms of cultural and linguistic boundaries, and the character of a single-step transition from high to low fertility provides evidence for diffusion processes (Rosero-Bixby and Casterline 1994). In this regard, the sharp rural-urban differential in fertility is explained as variation in the timing and pace of rural exposures to the values, behaviors, and technologies from urban areas (Bongaarts and Watkins 1996; Casterline 2001). At present, structural and diffusion explanations are seen as complementary, with diffusion theory adding to the larger theory of fertility decline, known together as the "blended diffusion models" (Cleland 2001).

Case Study Context

The region of Latin America and the Caribbean is a good empirical case to measure and explain rural-urban disparities in fertility for women with different levels of educational attainment. Countries in this region share close geographic proximity, as well as centuries of ethnolinguistic, geopolitical, and historically communal legacies (Beals 1953; Inglehart and Carballo 1997). Shared similarities, particularly regarding women's status (Kishor and Neitzel 1996), social organization and stratification (Beals 1953), and cultural environment (Inglehart and Carballo 1997), allow for fairer comparisons. With an estimated population of 652 million people,[21] most descend from three major ethnoracial groups: indigenous (40 million), direct descendants of peoples inhabiting this region when European colonizers arrived in the 15th century; afro-descendent (120 million), direct descendants of African slaves forcibly brought to the region during and after the colonial period; and Europeans, direct descendants of largely Spanish and Portuguese immigrants (Perreira and Telles 2014; Ribando 2005).

Latin America and the Caribbean has experienced declines in fertility since the 1960s (Guzmán et al. 1996; Lee 2003; Robey et al. 1993; United Nations 2015). **Figure 2.1A** in the Appendix presents national Total Fertility Rates (TFRs) from 1986 to 2017 by country.[22] TFRs for all seven countries have steadily declined to replacement-level fertility of 2.1 children per woman in this thirty-year period. Since the late 1990s and early 2000s, four out of the seven countries (Colombia, Dominican Republic, Honduras, and Peru) reached TFRs at, or below, 3.0 children per woman. Out of these four countries, three (Colombia, Dominican Republic, and Peru) have since reached, or are approaching, replacement-level fertility of 2.1 children per woman. While the fertility gap between countries has

---

[21] The total population size including only 20 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela) is of approximately 647 million. The total population size including multiple smaller countries in the Caribbean is of 652 million (Economic Commission for Latin America and the Caribbean 2019).

[22] As the single most important indicator of fertility, the Total Fertility Rate (TFR) measures the average number of children a woman would bear if she survived through the end of the reproductive age span and experienced at each age a particular set of age-specific fertility rates (Preston et al. 2001).

closed over survey waves, declines in fertility have not occurred uniformly across the region. For example, Colombia has experienced the fertility transition more rapidly, now facing TFRs below the replacement level of 2.1 children per woman which resemble fertility patterns in North America. On the other hand, Bolivia and Guatemala are experiencing this transition more slowly, with current TFRs still at 3.5 and 3.1 children per woman which resemble fertility patterns in North Africa.

Latin America and the Caribbean has also experienced increases in educational attainment since the 1960s (Guzmán et al. 1996; Lee 2003; Robey et al. 1993; United Nations 2015). As **Figure 2.2A** in the Appendix shows, the percentage distribution of those who completed secondary and higher education increased for all seven countries between 1986 and 2017. For example, in Peru, the distribution of women who completed secondary education increased from 21% in 1986 to 37% in 2012 and the distribution who completed higher education increased from 4% in 1986 to 17% in 2012. This has been coupled with decreases in the percentage distribution of women with no or only primary education over time and across all seven countries. The largest decrease in the distribution of women with no education was in Guatemala by 25 percentage points and the largest decrease in the distribution of women with only primary education was in Colombia by 36 percentage points. Decreases at the lower ends of the spectrum coupled with increases at the higher end showcase a shift in the distribution of female education in the region.

Since the 1950s, this region has also experienced accelerated urbanization—qualified as an "urban explosion—driven primarily by state-led industrialization impulses as well as internal migration from rural to urban areas (da Cunha and Rodríguez Vignoli 2009).[23] Over the past decades, this rural-urban shift has resulted in increases in the number of cities, the concentration of two–thirds of wealth in cities, and the increase of migration between cities, growth of secondary cities, and the emergence of mega-regions and urban corridors. All of these processes have culminated in approximately 80% of the population now living in urban areas and making this region the most urbanized in the developing world (UN-Habitat 2012). Decades of accelerated urbanization has led inevitably to huge transformations in the spatial reallocation of the population, which has attracted individuals with specific socioeconomic, educational, ethnoracial, and occupational characteristics. As urbanization continues to increase in this region (and broadly throughout the Global South), we must gain a better understanding of rural-urban disparities to predict future demographic trends and develop adequate population and development policies. In specific, we need to explain whether observed rural-urban disparities in fertility are attributable to differences in the *composition* in the characteristics of rural-urban women or in differences in the *effect* of the characteristics of rural-urban women.

Data and Methods

Data

This analysis uses pooled cross-sectional data for seven countries (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru) in Latin America and the Caribbean that participated

[23] The number of cities in Latin America and the Caribbean has increased six-fold in the past fifty years—from 320 to 2,000 cities with at least 20,000 inhabitants. Approximately half the urban population now lives in cities with fewer than 500,000 inhabitants, but also approximately 14 percent lives in megacities of 10 million inhabitants (UN-Habitat 2012).

in multiple rounds of Demographic and Health Surveys (DHS) between 1986–2017.[24] DHS is a publicly-available, nationally-representative survey of women collected by ICF International in collaboration with host country governments (ICF International 2012).[25] The standardized DHS questionnaires—across countries and waves—allow for easy comparisons for a wide range of indicators in the areas of population, sexual and reproductive health, and female empowerment. DHS uses a stratified cluster-sampling design to randomly select women ages 15–49 within clusters and households (Croft, Marshall, and Allen 2018). To account for sample selection probabilities of each household, and the response rates for households and individuals, I adjust for sample cases with sampling weights. This allows me to correct for homogeneity due to the non-simple random sample (i.e., nonindependence) and under- or over-sampling of different strata during sample selection (i.e., unequal selection probabilities) (Hahs-Vaughn et al. 2011). As a result, I can confidently estimate standard errors and unbiased parameter estimates, as well as, present population-based estimates that account for differential probability of selection into the survey.

I consider only these seven countries (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru) because they have at least two DHS survey waves available as well as the required data to run this analysis, allowing me to measure and explain rural-urban disparities in fertility for women with different levels of educational attainment. One of the primary advantages of pooling datasets together is the advantage of larger sample sizes, which on the one hand, increases the statistical

---

[24] Since 1984, The Demographic and Health Surveys (DHS) Program has provided technical assistance to more than 400 surveys in over 90 countries, advancing global understanding of health and population trends in developing countries. Surveys for Latin America and the Caribbean are publicly available through their website: https://dhsprogram.com/

[25] ICF International, Inc. is a Fairfax, Virginia-based global advisory and digital services provider, which provides a range of services for governments and businesses, including strategic planning, management, marketing and analytics. It was founded in 1969 as Inner City Fund and renamed to ICF Incorporated in 1972. Since 1984, ICF International, Inc. has worked with the United States Agency for International Development (USAID) to implement the Demographic and Health Surveys (DHS) Program around the world.

power for the analysis, and on the other hand, decreases the likelihood of a type II error—failing to detect a statistically significant association when it truly exists (Hatt and Waters 2006). Pooling datasets, thus, may decrease the noise from interviewer error, poorly worded questions, local disruptions, data entry mistakes, and sampling variability. The DHS waves I included were the following: Bolivia (1989, 1994, 1998, 2003, and 2008), Colombia (1986, 1990, 1995, 2000, 2005, 2010, and 2015), Dominican Republic (1986, 1991, 1996, 1999, 2002, 2007, and 2013), Guatemala (1987, 1995, 1998–1999, and 2014–2015), Haiti (1994–1995, 2000, 2005–2006, 2012, and 2016–2017), Honduras (2005–2006 and 2011–2012), and Peru (1986, 1991–1992, 1996, 2000, 2004–2006, 2007–2008, 2009, 2010, 2011, and 2012). My total study sample includes 465,823 women (N(level-1)) sampled from 6,247 clusters (N(level-2)). All results are weighted to account for under- and over-sampling as per DHS design.

Measurements

Outcome variable

For the descriptive analysis, I compute the total fertility rate (TFR) using birth history data and exposure for five-year age groups for the three years preceding the survey. The TFR measures the average number of births a group of women would have by the time they reach age 50 if they were to give birth at the current age-specific fertility rates (Preston, Heuveline, and Guillot 2001). For the two-level Poisson multilevel analysis and the Blinder-Oaxaca decomposition, I use a measure of number of children born to women, which ranges from 2–20 with a mean of 5.08 and a standard deviation of 2.50.

Control variables

The main control variable for this analysis is women's educational attainment. The DHS educational attainment categories are (1) no education, (2) primary, (3) secondary, and (4) higher, which correspond with standard educational attainment categories harmonized across surveys and comparable across countries and which capture critical educational transitions directly related to employment prospects and socioeconomic status. Given the strong association between different measures of education (Smith 1995), I opt for this measure for simplicity of interpretation, but I test for the robustness and sensitivity of this measure by conducting two-level Poisson multilevel analyses using other measures of educational attainment presented in the Appendix. **Table 2.2A** in the Appendix presents analysis using a measure with further breakdown of educational attainment categories ((1) no education, (2) incomplete primary, (3) complete primary, (4) incomplete secondary, (5) complete secondary, and (6) higher) and **Table 2.3A** in the Appendix presents analysis using a measure of years of education ((1) 0 years, (2) 1–3 years, (3) 4–6 years, (4) 7–9 years, and (5) 10+ years). The beta coefficients as well as the significant tests for these models are analogous to the preferred model that uses the simpler measure of educational attainment ((1) no education, (2) primary, (3) secondary, and (4) higher).

I control for a series of geographic, socioeconomic, individual, and reproductive factors of the association between rural-urban fertility by women's educational attainment. To control for differences in temporal, living, and environmental conditions, I include a categorical variable for survey year (1986–2017), a dummy variable for rural-urban residence (rural and urban), and a categorical variable for country (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru). To control for socioeconomic factors, I include a categorical variable for household wealth (poorest, poorer, middle, richer, and richest) and a categorical variable for respondent's occupation (not working, managerial, clerical, sales, agricultural, and domestic and services, manual).[26]

To control for individual and reproductive factors, I include categorical measures for women's age (under 19 years, 20–24 years, 25–34 years, and 35–49 years), union status (never married, widowed, divorced, or not living together, and married or living together), age at-first-intercourse (under 19 years, 20–24 years, 25–34 years, and 35–46 years), age at-first-birth (under 19 years, 20–24 years, 25–34 years, and 35–47 years), age at-first-marriage (under 19 years, 20–24 years, 25–34 years, and 35–47 years), birth parity (second or third and fourth or higher), birth interval (>2 years, 2–4 years, and 4+ years), and use of contraceptive method (not using modern contraceptive method and using modern contraceptive method). I also include continuous measures for marriage-to-birth interval (0–336 months) and years married (0–41 years). Finally, I include an interaction for rural-urban residence (rural and urban) and educational attainment (no education, primary, secondary, and higher) to explore rural-urban disparities in fertility by educational attainment.

Analysis

I start by providing descriptive analyses showing significant rural-urban disparities in fertility for women with different levels of educational attainment in these seven countries in Latin America and the Caribbean between 1986–2017. For the descriptive analyses, I compare the values estimated for the most recent survey with those estimated in previous surveys. On average, the first surveys occurred in 1986 and the most recent in 2017, thus giving an average interval between surveys of 31 years. Next,

[26] Household wealth is collected by DHS and represents a composite measure of a household's cumulative living standard. It is generated using principal components analysis and places individual households on a continuous scale of relative wealth. DHS separates all interviewed households into five wealth quintiles to compare the influence of wealth on various population, health and nutrition indicators (Rutstein and Johnson 2004).

I conduct a two-level Poisson multilevel analysis of characteristics that predict fertility, including an interaction between educational attainment and rural-urban residence to explore disparities in this association (N(level-1) = 465,823; N(level-2) = 6,247).[27] Drawing on previous literature, I chose a Poisson model since my outcome of interest is total children ever born—a count variable from 2–20 where 2 indicates one child and 20 indicates twenty children—whose expected value is similar to the variance (Fagbamigbe and Adebowale 2014; Poston 2002; Wang and Famoye 1997). In my multilevel model, individual women units (level-1) are nested within survey cluster units (level-2), respecting the hierarchical design of DHS data (Croft et al. 2018).

My two-level Poisson multilevel regression model includes a random intercept at the cluster-level—to capture heterogeneity among clusters—and fixed effects for all other individual-level coefficients. Compared with single-level regression analysis that assumes that all individuals are independent, this methodology accounts for the fact that individuals in the same cluster may have similar characteristics. Thus, it provides conceptual and methodological advantages; first, by estimating variance in the outcome variables due to unobserved cluster factors; and second, by partitioning the unexplained residual variance into cluster-level and individual-level variance (Bell and Jones 2015; Bingenheimer and Raudenbush 2004). More technically, multilevel models correct for clustering biases in parameter estimates, standard errors, confidence intervals, and significance tests, and also estimate robust variance and covariance of random effects (Bell, Fairbrother, and Jones 2019; Guo and Zhao 2000;

[27] The DHS surveys typically employ two-stage sampling design from an existing sample frame, generally the most recent census frame. In the first stage of selection, the primary sampling units (PSUs) are selected with probability proportional to size (PPS) within each stratum. The PSUs are typically census enumeration areas (EAS) and form the survey cluster. In the second stage, a complete household listing is conducted in each of the selected clusters. Following the listing of the households a fixed number of households is selected by equal probability systematic sampling in the selected cluster. A household respondent is interviewed first to obtain a household roster and information about the household as a unit. Eligible women and (usually) men are then interviewed. This design results in a multilevel dataset, with households, women, or men at level-1 and PSUs at level-2 (Elkasabi, Ren, and Pullum 2020).

Maas and Hox 2005). The multilevel Poisson model is specified as follows:

$$\mathbf{Poisson}_{\mathbf{fertility}_{ij}} = \beta_0 + \beta_1 \mathbf{X_{ij}} + \cdots + \beta_k \mathbf{X_k} + \mathbf{u_j} + \mathbf{e_{ij}}, \qquad \textbf{Eq. (1)}$$

where i is the level-1 (individual) unit and j is the level-2 (cluster) unit; $fertility_{ij}$ is the conditional expected number of children ever born to woman i in cluster j; β is the corresponding Poisson regression coefficients and X_{ij} are explanatory variables for woman i in cluster j; u_j is the random effect at cluster j, allowing for differential intercepts for cluster-level observations; and the error term e_{ij}, is the individual-level residual for individual i of cluster j. Thus, this equation expresses the expected count of children born to women as a linear function of the set of explanatory variables previously mentioned. The largest limitation of this methodological strategy is that I can capture associations only and not the causal effect of mother's education on fertility. To test the robustness of these results, as well as the sensitivity of the proposed model, I conduct the same analysis using Negative Binomial and Ordinal Least Squares regression models available in **Tables 2.1A-2.2A** in the Appendix. The beta coefficients, as well as the significant tests for both models, are analogous to the Poisson model. I prefer the Poisson model for this analysis because it is a common statistical methodology to study fertility since the outcome variable for this analysis is non-negative and the data obeys the Poisson distribution of equidispersion (Wang and Famoye 1997).

Finally, I conduct a Blinder-Oaxaca decomposition to explore mean outcome differences in rural-urban fertility and explain whether there is evidence of differences in the *composition* of the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women that explain disparities in fertility across rural-urban areas.[28] Decomposition techniques have been used widely in various literatures, including fertility (Jain 1981; Lindstrom and Woubalem 2003; Nisén et al. 2014; Zhou and Guo 2020), health-equity (Behrman 2020; Charasse-Pouélé and Fournier 2006; Kumar and Singh 2013; O'Donnell et al. 2008; Van de Poel and Speybroeck 2009; Wagstaff, van Doorslaer, and Watanabe 2003), and sexual and reproductive health (Fekadu et al. 2020; Worku, Tessema, and Zeleke 2015) to explain whether inequalities between groups are due to differences in the composition/characteristics of groups as opposed to differences in the rates/effects. This regression-based methodology allows me to partition the gap in rural-urban fertility into "explained" differences attributable to group characteristics ("the composition effect") and "unexplained" differences attributable to how group characteristics are associated with fertility ("the rate effect"), which together add to the overall fertility gap (Sen 2014).

The Blinder-Oaxaca decomposition is an adaptation of a standard linear regression (Blinder 1973; Oaxaca 1973) and can be understood as follows: first, I start by regressing fertility on women's characteristics (educational attainment, country, wealth, occupation, age, union status, age at-first-intercourse, age at-first-birth, age at-first-marriage, marriage-to-birth interval, years married, birth parity, birth interval, and contraceptive use) for women in rural and urban areas, where X is a vector of predictor variables and β_{rural} and β_{urban} are vectors of coefficients (Eq. (2) and Eq. (3)).

$$\overline{\textbf{Fertility}}_{\textbf{rural}} = \alpha_{\textbf{rural}} + \beta_{\textbf{rural}}\overline{\textbf{X}}_{\textbf{rural}} \qquad \textbf{Eq. (2)}$$

$$\overline{\textbf{Fertility}}_{\textbf{urban}} = \alpha_{\textbf{urban}} + \beta_{\textbf{urban}}\overline{\textbf{X}}_{\textbf{urban}} \qquad \textbf{Eq. (3)}$$

[28] Blinder-Oaxaca decomposition models were popularized by Blinder (1973) and Oaxaca (1973) to study labor-market outcomes between two groups (sex, race, etc.). Specifically, they developed models that decomposed mean differences in log wages based on linear regression models (Kim 2010).

After subtracting the two means from equations 2 and 3 and doing some rearrangement of terms, the first line of Eq. (4) gives the difference in fertility between rural and urban women that is due to differences in means (e.g., differences in distribution of the covariates, which can be thought of as "the composition effect"); the second line in Eq. (4) gives the difference in fertility between rural and urban women that is due to differences in returns (e.g., differences in the "effects" of the covariates, which can be conceptualized of as the "the rate effect"); the third line in Eq. (4) gives the difference in fertility between rural and urban women due to the interaction between the "composition effect" and the "rate effect"; and the fourth line in Eq. (4) gives the differences in fertility due to unmeasured factors.

$$\overline{\textbf{Fertility}}_{\textbf{rural}} - \overline{\textbf{Fertility}}_{\textbf{urban}} = \beta_{\textbf{urban}}(\bar{\textbf{X}}_{\textbf{rural}} - \bar{\textbf{X}}_{\textbf{urban}}) \qquad \textbf{Eq. (4)}$$

$$+ (\beta_{\textbf{rural}} - \beta_{\textbf{urban}})\,\bar{\textbf{X}}_{\textbf{rural}}$$

$$+ (\beta_{\textbf{rural}} - \beta_{\textbf{urban}})\,(\bar{\textbf{X}}_{\textbf{rural}} - \bar{\textbf{X}}_{\textbf{urban}})$$

$$+ (\alpha_{\textbf{rural}} - \alpha_{\textbf{urban}})$$

As stated earlier, DHS uses a stratified cluster-sampling design to randomly select women ages 15–49 within clusters and households (Croft et al. 2018). To account for sample selection probabilities of each household, and the response rates for households and individuals, I adjust for sample cases with sampling weights. This allows me to correct for homogeneity due to the non-simple random sample (i.e., nonindependence) and under- or over-sampling of different strata during sample selection (i.e., unequal selection probabilities) (Hahs-Vaughn et al. 2011). As a result, I can confidently estimate standard errors and unbiased parameter estimates, as well as, present population-based estimates that account for differential probability of selection into the survey (Hahs-Vaughn et al. 2011).

Results

Sample Characteristics

Table 2.1 provides descriptive statistics. In this sample, approximately 13% of all women have no education, 52% have primary education, 26% have secondary education, and 9% have higher education. In rural areas, approximately 22% of rural women have no education, 64% have primary education, 13% have secondary education, and 2% have higher education. In urban areas, approximately 6% of urban women have no education, 43% have primary education, 37% have secondary education, and 14% have higher education. Across the sample, the majority of women fall in the poorest and poorer wealth quintiles, are not currently working, are 35–49 years old, are married or living together, first had intercourse, their first birth, and their first marriage before the age of 19, had their first child 17 months after getting married, are married for an average of 20 years, report having two or three children, waited 2–4 years between births, and are using modern contraceptive methods. In this sample, 236,762 women live in rural areas and 229,061 women live in urban areas, which corresponds to a total sample size of 465,823 women.

Descriptive Summary of Fertility by Educational Attainment and Rural-Urban Residence

The objective of this chapter is to measure and explain rural-urban disparities in fertility for women with different levels of educational attainment in Latin America and the Caribbean. The first step is to provide a descriptive overview of disparities in fertility and educational attainment across rural-urban areas. **Figures 2.1–2.7** show national TFRs for all seven countries between 1986–2017 by rural-urban residence. Across all seven countries, we observe differences between rural and urban fertility throughout survey waves, suggesting that women in rural areas have higher fertility than women in urban areas across time. In 1989, rural women in Bolivia experienced a TFR of 6.6 children per woman, while urban women experienced a TFR of 4.0 children per woman. By 2008, rural women experienced a TFR of 4.9 children per woman and urban women experienced TFR of 2.8 children per woman. As observed, all seven countries have experienced decreases in TFRs in both rural and urban areas with more pronounced decreases particularly in rural areas. Despite observed declines in fertility over time, particularly in rural areas, the gap between rural and urban fertility has yet to completely close in all seven countries. On one hand, the country with the narrowest gap is the Dominican Republic. By 2013 rural women experienced a TFR of 2.6 children per woman and urban women experienced a TFR of 2.4 children per woman, a difference of 0.2 children per woman. On the other hand, the country with the widest gap is Bolivia. By 2008 rural women experienced a TFR of 4.9 children per woman and urban women experienced a TFR of 2.8 children per woman, a difference of 2.1 children per woman.

While **Figures 2.1–2.7** provide a good overview of rural-urban TFRs, this chapter is particularly interested in measuring rural-urban fertility disparities for women with different levels of educational attainment in Latin America and the Caribbean. **Figures 2.8–2.10** show national TFRs between 1986–2017 for all, rural, and urban women by educational attainment using data from the first and last survey wave in each country. **Table 2.3A** in the appendix provides the complete descriptive data used to construct these figures. Specifically, **Figure 2.8** shows national TFRs by educational attainment for all women between 1986–2017. Across all seven countries, we can observe differences in fertility by educational attainment for all women based on data from the first and the last survey waves.

While the gap between the least and most educated has decreased from the first to the last survey wave, these results indicate that women with the least education have substantially higher fertility than women with the most education. For example, in 1989, the TFR for women in Bolivia with no education was 6.4 children per woman while the TFR for woman with higher education was 2.0 children per woman, which corresponds to a gap of 4.5 children per woman. By 2008, the TFR for women in Bolivia with no education was 6.1 children per woman while the TFR for woman with higher education was 1.9 children per woman, which corresponds to a gap of 4.2 children per woman. While on average the gap in fertility for women with no and higher education has decreased across survey waves, we still observe a persistent gap even in the last survey waves.

Figure 2.9 shows national TFRs by educational attainment for women in rural areas between 1986–2017. In the context of Latin America and the Caribbean, disparities in TFRs between more and less educated women is even more substantial in rural areas. Compared to the results for all women displayed in **Figure 2.8**, women with both lower and higher educational attainment have even higher fertility in rural areas compared to all women. As can be observed, both lines displaying the TFRs for women with less and more education have moved up on the horizontal axis. In 1989, the TFR for rural women in Bolivia with no education was 6.8 children per woman while the TFR for woman with higher education was 3.3 children per woman, which corresponds to a gap of 3.5 children per woman. By 2008, the TFR for rural women in Bolivia with no education was 6.4 children per woman while the TFR for woman with higher education was 2.4 children per woman, which corresponds to a gap of 3.9 children per woman. Similar fertility disparities by educational attainment in rural areas are observed in the other six countries.

Finally, **Figure 2.10** shows national TFRs by educational attainment for women in urban areas between 1986–2017. Compared to the results for all women displayed in **Figure 2.8** and the results for rural women displayed in **Figure 2.9**, women with both lower and higher educational attainment have lower fertility in urban areas. As can be observed, the lines displaying the TFRs for women with less and more education have moved down on the horizontal axis. In 1989, the TFR for urban women in Bolivia with no education was 5.5 children per woman while the TFR for woman with higher education was 1.9 children per woman, which corresponds to a gap of 3.6 children per woman. By 2008, the TFR for urban women in Bolivia with no education was 5.6 children per woman while the TFR for woman with higher education was 1.8 children per woman, which corresponds to a gap of 3.7 children per woman. These descriptive results show substantial rural-urban disparities in fertility for women with different levels of educational attainment in Latin America and the Caribbean. Women with higher educational attainment in rural areas have higher fertility than their counterparts in urban areas. While previous research has largely focused on the protective role of female education on fertility (Castro Martin and Juarez 1995; Cochrane 1979; Graff 1979), these descriptive results suggest that education plays a less protective role on fertility for rural women compared to urban women in Latin America and the Caribbean.

Multilevel Analysis of Fertility by Educational Attainment and Rural-Urban Residence

Having established substantial rural-urban disparities in fertility for women with different levels of educational attainment in Latin America and the Caribbean, the next step is to explore the strength, direction and significance of the association between educational attainment and fertility. In addition to that, I include an interaction between rural-urban residence and educational attainment to explore if there are significant disparities in this association. **Table 2.2** provides the results of the two-level Poisson multilevel regression model for number of children born to women in Latin America and the

Caribbean between 1986–2017 (N(level-1) = 465,823; N(level-2) = 6,247).

Table 2.2 suggests that less educational attainment is associated with higher fertility. Specifically, compared to having higher education, having no education is associated with 16-percent (1−incidence rate ratio) increase in the number of children born to women (p-value<0.000), primary education is associated with 9-percent increase in the number of children born (p-value<0.000), and secondary education is associated with 1-percent increase in the number of children born (p-value<0.05). As described earlier, I also conducted two-level Poisson multilevel analyses using other measures of educational attainment, including a measure with further breakdown of educational categories presented in **Table 2.4A** in the Appendix and a measure of years of education presented in **Table 2.5A** in the Appendix. Analyses with these other measures of educational attainment do not change the direction and the significance of these associations.

Table 2.2 also present results for the interaction between rural-urban residence and educational attainment on fertility. Drawing on methodological recommendations on estimating, interpreting, and presenting nonlinear interaction effects (Mize 2019), I test for this interaction using the marginal effects statistical technique. Specifically, I use tests of second differences (whether two marginal effects are equal) to determine whether the interactional effect of rural-urban residence and educational attainment is significant. **Table 2.3** presents results for the rural-urban gap in fertility across various levels of educational attainment by comparing the predictors for women living in rural and urban areas. In addition, I test the rural-urban gap and whether the size of the rural-urban gap differs across levels of education (second differences [i.e., the test of interaction]).

Results indicate that there is a significant rural-urban gap in fertility for women with no, primary, and higher educational attainment. Testing whether the effect of rural-urban residence differs across levels of education requires a test of second differences, presented in the final column labeled "contrasts." Results suggest that the rural-urban gap in fertility is significantly larger for those with no education (1.43), primary (1.36), and higher (0.98) (all second differences $p<0.001$). Women living in rural areas report higher fertility than women living in urban areas with the same level of education and these results are significantly different across levels of education, which indicates that the association of educational attainment and fertility does vary by rural-urban residence.

These results can be viewed graphically in **Figure 2.11**, which shows that the predicted fertility by educational attainment does vary by rural-urban residence. Women with no education in rural areas have a predictive fertility of 6.05 children whereas women with no education in urban areas have a predictive fertility of 4.62 children, which corresponds with a significant gap of 1.43 children. The same is true for higher levels of educational attainment. While these results suggest substantial rural-urban disparities in fertility across all levels of educational attainment, they also suggest that the disparity is higher at lower levels of educational attainment compared to higher levels. Women with higher education in rural areas have a predictive fertility of 4.94 children whereas women with higher education in urban areas have a predictive fertility of 3.96 children, which corresponds with a significant gap of only 0.98 children. Despite this narrowing trend, the rural-urban gap in fertility has not closed, suggesting that education plays a less protective role for rural women compared to urban women in Latin America and the Caribbean.

In addition to educational attainment, the two-level Poisson multilevel regression model for fertility presented in **Table 2.2** also suggests that other geographic, socioeconomic, individual, and reproductive factors are also significantly associated with fertility. Reporting a lower household wealth, agricultural occupation, higher age, being married or living together, higher number of years married, and higher birth parity are significantly associated with higher fertility. On the other hand, reporting higher household wealth, managerial, clerical, sales, and manual occupations, living in Colombia, the Dominican Republic, Honduras, and Peru, higher age at-first-intercourse, higher age at-first-birth, higher age at-first-marriage, higher birth interval, and using modern contraceptive methods are significantly associated with lower fertility.

Blinder-Oaxaca Decomposition of Fertility by Educational Attainment and Rural-Urban Residence

The previous descriptive and multivariable analyses have shown rural-urban disparities in fertility for women with different levels of educational attainment in Latin America and the Caribbean. The next step is to conduct a Blinder-Oaxaca decomposition of fertility to explore whether the observed disparities are attributable to differences in the *composition* of the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility in Latin America and Caribbean. The Blinder-Oaxaca decomposition allows me to partition the gap in rural-urban fertility into "explained" differences in fertility attributable to group characteristics ("the composition effect") and "unexplained" differences in fertility attributable to how group characteristics are associated with fertility ("the rate effect"), which together add to the overall fertility gap (Sen 2014).

Table 2.4 presents the full results from the Blinder-Oaxaca Decomposition of mean fertility differences between women in rural and urban areas in Latin America and the Caribbean by educational attainment. Results from the top panel indicate that the predicted fertility of women in rural areas is 5.72 and the predicted fertility of women in urban areas is 4.21. This corresponds to a difference of 1.51 children between rural and urban areas, a difference that is statistically significant at p-value<0.001. To understand this difference further, the Blinder-Oaxaca analysis decomposes this 1.51 difference in fertility into three distinct components: the *composition* effect, which is the part attributable to differences in the distribution of educational, geographical, socioeconomic, individual, and reproductive female characteristics; the *rate* effect, which is the part attributable to differences in the effects of educational, geographical, socioeconomic, individual, and reproductive characteristics on fertility; and the *interaction* effect, which is the part attributable to the interaction between the *composition* effect and the *rate* effect.

Table 2.4 shows that about 101.33% $((-1.53/-1.51) * 100)$ of the mean difference in fertility between rural and urban women can be attributed to the *composition* effect, whereas the contributions of the *rate* effect of 6.44% $((-0.10/-1.51) * 100)$ and the *interaction* effect of 7.76% $((0.12/-1.51) * 100)$ are of less magnitude. These results suggest that differences in the *composition* of educational, geographical, socioeconomic, individual, and reproductive female characteristics are significantly associated with almost all differences in fertility between rural and urban women. Stated differently, if the *composition* of female characteristics were the same across rural and urban areas, fertility would be 1.53 percent-points lower for rural women.

The bottom panel of **Table 2.4** also provides a detailed report of the relative importance of each of the individual covariates that contribute to the total *composition* effect, the *rate* effect, and the *interaction* effect. As stated earlier, given that differences in the *composition* of female characteristics are associated with almost all differences in fertility between rural and urban areas, I will focus on the determinants of the *composition* effect. The covariates for educational attainment, particularly no education and secondary education, are statistically significant determinants of the *composition* effect at p-value<0.000 and p-value<0.05 respectively. The −0.08 coefficient for no education means that this category significantly contributes about 5.32% ((−0.08/−1.53) * 100) to the total *composition* effect and secondary education significantly contributes about 1.85% ((−0.03/−1.53) * 100) to the total *composition* effect. Other covariates that contribute significantly to the *composition* effect are country (Colombia and the Dominican Republic), household wealth (poorest and poorer categories), union status (married or living together), years married, birth parity (four or more children), birth interval (4+ years), and use of modern contraceptive methods. These results suggest that differences in the composition of women's educational attainment, particularly women with no education and secondary education, plays an important role in explaining differences in fertility between rural and urban areas.

Discussion and Conclusions

The region of Latin America and the Caribbean has experienced a sharp decline in fertility and an increase in educational attainment, which are coupled with accelerated urbanization since the 1950s. Despite extensive demographic literature on the association of educational attainment and fertility, less attention has been devoted to explaining how it varies across rural-urban place of residence. The limited research that exists for other developing regions has established that urban women have lower fertility than rural women, but even less research has discussed whether this observed disparity is attributable to differences in the *composition* in the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility. Given that the proportion of women with higher educational attainment has increased over time, we should expect important *compositional* changes in the population, which might influence fertility. It is also possible that women's higher educational attainment over time might be more effective in reducing fertility, which could be attributable to changes in the *effect* of educational attainment on fertility.

Building on this research gap, in this article I used cross-sectional Demographic and Health Survey (DHS) data (1986–2017) for seven countries in Latin America and the Caribbean to measure and explain rural-urban disparities in fertility for women with different levels of educational attainment. First, I provided a descriptive overview of significant rural-urban disparities in fertility for women with different levels of educational attainment. While TFRs have decreased across rural and urban areas over time, results indicate that women in rural areas continue to have higher TFR than women in urban areas, even across similar educational attainment. While previous research has largely focused on the protective role of female education on fertility, these descriptive results suggest that education plays a less protective role on fertility for rural women compared to urban women in Latin America and the Caribbean. I also conducted a multilevel analysis of characteristics that predict fertility, including an interaction between educational attainment and rural-urban residence. I tested for the rural-urban gap in fertility and whether the size of the rural-urban gap in fertility differs across educational attainment. I found that the association of educational attainment and fertility does vary by rural-urban residence, with rural women reporting higher fertility at all levels of educational attainment.

Next, I conducted a Blinder-Oaxaca decomposition to explore whether the observed fertility disparities across rural-urban areas in Latin America and the Caribbean are attributable to differences in the *composition* in the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility. Results suggest that differences in the *composition* in the characteristics of rural-urban women—particularly women's educational attainment—plays an important role in explaining differences in fertility between rural and urban areas. Given that the proportion of women with higher educational attainment has increased over time in this region, this analysis suggests that *compositional* changes in urban areas play an important role in explaining disparities in fertility across rural-urban areas.

The results presented in this chapter concur with both the structuralist school and the spatial diffusion school of demography. The structuralist school explains rural-urban fertility disparities arising from socioeconomic structural changes related to industrialization and urbanization, which originate in urban areas and only later spread to rural areas. In this regard, the accelerated "urban explosion" experienced in Latin America and the Caribbean since the 1950s has on the one hand, resulted in drastic transformations in urban areas compared to rural areas, which has decreased fertility in urban areas. Structuralist theories explain rural-urban differentials in fertility during the transition to lower levels of fertility, which are shown in the descriptive results from this study. On the other hand, this "urban explosion" has also resulted in massive rural-urban internal migration, which has given rise to the spatial reallocation of the population and the concentration of individuals with specific characteristics in urban areas. Thus, structuralist theories also explain the Blinder-Oaxaca decomposition results from this study which suggest that differences in the *composition* in the characteristics of rural-urban women play an important role in explaining differences in fertility between rural and urban areas.

The spatial diffusion school explains rural-urban fertility disparities through structural and ideational changes in the attitudes and behaviors regarding fertility and reproductive behavior, which originate in urban areas and spread to rural areas. Despite significantly less structural changes in rural areas, the descriptive results from this study show that rural areas have also experienced decreases in fertility. Thus, this may suggest that these fertility changes in rural areas are the product of the spread of attitudes and behaviors regarding fertility and reproductive behavior, which spread from urban to rural areas through social interactions, communications channels, and social and transport networks. Although the descriptive results show that fertility in rural areas is decreasing—albeit not to the levels of urban areas—diffusion theories also explain the remaining rural-urban differential as a variation in the timing and pace of rural exposures to the values, behaviors, and technologies diffused from urban areas.

This chapter contributes to the literature by measuring and explaining rural-urban disparities in fertility for women with different levels of educational attainment in Latin America and the Caribbean. Specifically, it decomposes the rural-urban fertility gap by educational attainment into components and assesses whether the observed differences in fertility are attributable to differences in the *composition* in the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility. While this approach has a long methodological tradition in various literatures, to my knowledge it has not been applied to explain rural-urban disparities in fertility for Latin America and the Caribbean. It has the advantage of providing a unified framework to consider the collective importance of a vast range of geographic-, socioeconomic-, individual-, and reproductive-related characteristics, many of which may be individually insignificant. Results from this study contribute methodologically and conceptually to the literature by suggesting that the observed rural-urban disparities in fertility are attributable to differences in the *composition* in the characteristics of rural-urban women.

Although this study makes important contributions, I acknowledge the following limitations and the need for additional research that builds on the aforementioned findings. First, this research relies on self-reported data on current as well as previous experiences (fertility, desired fertility, contraception, reproductive history, etc.) during long interviews. Thus, some of these results might be an artifact of reporting bias, whereby respondents selectively choose to share and/or fail to recall certain information about their current or previous experiences. In this regard, the direction and significance of statistical associations relies on the information that respondents selectively choose to share and/or fail to recall. This highlights the difficulty of analyzing self-reported demographic and health data through standardized national household surveys. Second, this research relies on cross-sectional data, so I am unable to evaluate how educational attainment by rural-urban areas impacts fertility over the life course and/or if there is a determinant for causation. Given that DHS data is cross-sectional, longitudinal data is needed to assess both life course and causal effects of this relationship.

Third, in an effort to make comparable analytical variables across countries and waves, I collapsed categorical responses, which may have led to the loss of significant information. However, as has been documented in the literature, one of the primary advantages of pooling datasets together is an increase in statistical power, which in turn, decreases the likelihood of errors from interviewer noise, poorly worded questions, data entry mistakes, and sampling variability. Fourth, this analysis controls for the quantity of education, but it does not account for the content, quality, and equity of education, which may endogenously influence the education-fertility relationship (Barro and Lee 1993; Smith 1995). Thus, I am unable to investigate whether content, quality, and equity creates, expands, or worsens differences across groups (Esteve and Florez-Paredes 2018). Finally, this analysis is limited to seven countries in Latin America and the Caribbean. Despite great similarities, it is important to emphasize that countries in the region also have unique cultures, histories, and trajectories, so these results cannot be blindly generalized to other countries in the region or other regions in the world. One way to assess the generalizability of these results is by replicating this analysis using other countries in the region as well as other countries from other regions.

As urbanization continues to increase in this region, and more broadly throughout the Global South, we must gain a better understanding of rural-urban disparities to predict future demographic trends and develop adequate population and development policies. My findings suggest that policy efforts to improve fertility in Latin America and the Caribbean should account for rural-urban differences, since place of residence plays a significant role in the fertility trajectories of women. Results from this study show that the mean differences in fertility between rural and urban women are attributed to differences in the *composition* of the characteristics of rural-urban women. These findings can allow policy-makers and development partners to determine needed services and whether interventions can have positive causal impact on fertility and other sexual and reproductive outcome to improve the lives of rural and urban women in the Global South. These findings, particularly, suggest that country governments and development partners must renew efforts to address the challenges faced by rural women. Specifically, the increasing urgency for programs that target the specific needs and experiences of the less educated rural residents, who continue to experience high fertility overall.

TABLES

Table 2.1: Descriptive statistics (proportions and means) of key variables by region in Latin America and the Caribbean

Table 2.1: Descriptive statistics (proportions and means) of key variables by region in Latin America and the Caribbean
(Source: author's calculations of Demographic and Health Surveys data for 7 countries, 1986–2017; N=465,823)

	All	Rural	Urban
Educational attainment			
No Education	13.09	21.66	6.26
Primary	51.99	63.89	42.50
Secondary	26.32	12.73	37.17
Higher	8.59	1.72	14.08
Geographic factors			
Country			
Bolivia	9.53	9.61	9.47
Colombia	19.62	14.08	24.04
Dominican Republic	13.64	10.00	16.55
Guatemala	3.80	5.07	2.79
Haiti	8.80	13.58	4.98
Honduras	11.07	14.29	8.50
Peru	33.53	33.36	33.67
Socioeconomic factors			
Household wealth			
Poorest	24.04	47.60	5.23
Poorer	24.27	33.59	16.83
Middle	21.29	13.11	27.81
Richer	16.96	4.26	27.09
Richest	13.45	1.44	23.03
Occupation			
Not working	27.83	13.66	14.16
Managerial	5.05	0.75	4.31
Clerical	2.15	0.27	1.88
Sales	21.53	6.92	14.61
Agricultural	17.71	15.79	1.92
Domestic and services	17.63	4.52	13.10
Manual	8.10	2.47	5.64
Individual and reproductive factors			
Age			
Under 19 years	0.34	0.18	0.16
20–24 years	3.74	1.87	1.87

25–34 years	26.98	12.16	14.83
35–49 years	68.94	30.17	38.76
Current union status			
Never married, widowed, divorced, or not living together	15.50	4.77	10.74
Married or living together	84.50	39.62	44.88
Age at-first-intercourse			
Under 19 years	82.39	38.08	44.31
20–24 years	14.90	5.54	9.37
25–34 years	2.67	0.76	1.91
35–46 years	0.03	0.01	0.02
Age at-first-birth			
Under 19 years	58.43	28.17	30.26
20–24 years	32.56	13.49	19.07
25–34 years	8.81	2.68	6.13
35–47 years	0.20	0.05	0.15
Age at-first-marriage			
Under 19 years	72.46	34.27	38.19
20–24 years	22.10	8.58	13.52
25–34 years	5.36	1.52	3.85
35–47 years	0.08	0.02	0.06
Marriage-to-birth interval	17.38	17.06	17.63
Years married	19.77	20.00	19.58
Birth parity			
Second or third	64.70	24.32	40.38
Fourth or higher	35.30	20.07	15.23
Birth interval			
<2 years	30.72	14.48	16.23
2–4 years	42.77	21.25	21.52
4+ years	26.52	8.66	17.86
Modern contraceptive method			
Using modern contraceptive method	54.35	20.38	33.97
Not using modern contraceptive method	45.65	24.01	21.64
Total sample (N)	**465,823**	**236,762**	**229,061**

Weighted using survey weights provided by DHS

Table 2.2: Results of the multilevel Poisson model for the incidence rate ratio (IRR) of number of children born to women in Latin America and the Caribbean

Table 2.2: Results of the multilevel Poisson model for the incidence rate ratio (IRR) of number of children born to women in Latin America and the Caribbean
(Source: author's calculations of Demographic and Health Surveys data for 7 countries, 1986–2017; N(level-1) = 465,823; N(level-2) = 6,247)

	IRR Coefficient		**95% C.I. Low**	**95% C.I. High**	**S.E.**
Year	**0.99**	***	0.99	0.99	0.00
Educational attainment (ref.=Higher)					
No Education	**1.16**	***	1.14	1.19	0.01
Primary	**1.09**	***	1.07	1.10	0.01
Secondary	**1.01**	*	1.00	1.03	0.01
Geographic factors					
Place of residence (ref.=Urban)					
Rural	**0.96**	***	0.94	0.98	0.01
Rural X years of education (ref.=Urban X Higher)					
Rural X No Education	**1.04**	***	1.01	1.07	0.01
Rural X Primary	**1.05**	***	1.02	1.07	0.01
Rural X Secondary	**1.03**	*	1.00	1.05	0.01
Country (ref.=Bolivia)					
Colombia	**0.82**	***	0.81	0.83	0.00
Dominican Republic	**0.83**	***	0.82	0.84	0.01
Guatemala	0.99		0.98	1.01	0.01
Haiti	1.00		0.99	1.02	0.01
Honduras	**0.95**	***	0.94	0.96	0.01
Peru	**0.89**	***	0.88	0.90	0.00
Socioeconomic factors					
Household wealth (ref.=Richest)					
Poorest	**1.36**	***	1.34	1.38	0.01
Poorer	**1.26**	***	1.24	1.27	0.01
Middle	**1.17**	***	1.15	1.18	0.01
Richer	**1.07**	***	1.06	1.08	0.01
Occupation (ref.=Not working)					
Managerial	**0.96**	***	0.95	0.97	0.01
Clerical	**0.96**	***	0.94	0.97	0.01
Sales	**0.98**	***	0.97	0.99	0.00
Agricultural	**1.01**	***	1.01	1.02	0.00
Domestic and services	0.99		0.98	1.00	0.00
Manual	**0.99**	*	0.98	1.00	0.01
Individual and reproductive factors					
Age (ref.=Under 19 years)					
20–24 years	**1.19**	***	1.17	1.21	0.01
25–34 years	**1.44**	***	1.41	1.46	0.01

35–49 years	**1.51**	***	1.48	1.54	0.02
Current union status (ref.=Never married, widowed, divorced or not living together)					
Married or living together	**1.07**	***	1.06	1.08	0.00
Age at-first-intercourse (ref.=Under 19 years)					
20–24 years	**0.98**	***	0.98	0.99	0.00
25–34 years	**0.98**	*	0.96	1.00	0.01
35–46 years	**0.91**	*	0.83	0.99	0.04
Age at-first-birth (ref.=Under 19 years)					
20–24 years	**0.95**	***	0.94	0.96	0.00
25–34 years	**0.91**	***	0.89	0.92	0.01
35–47 years	**0.81**	***	0.77	0.86	0.02
Age at-first-marriage (ref.=Under 19 years)					
20–24 years	**0.98**	***	0.97	0.99	0.01
25–34 years	**0.97**	***	0.95	0.99	0.01
35–47 years	0.97		0.90	1.05	0.04
Marriage-to-birth interval	**1.00**	***	1.00	1.00	0.00
Years married	**1.03**	***	1.02	1.03	0.00
Birth parity (ref.=Second or third)					
Fourth or higher	**1.30**	***	1.30	1.31	0.00
Birth interval (ref.=<2 years)					
2–4 years	**0.94**	***	0.94	0.94	0.00
4+ years	**0.80**	***	0.80	0.81	0.00
Contraceptive method (ref.=Not using modern contraceptive method)					
Using modern contraceptive method	**0.97**	***	0.96	0.97	0.00
Random effect (cluster-level)	0.01		0.01	0.01	0.00
N(level-1)			**465,823**		
N(level-2)			**6,247**		

Notes: * p<0.05, ** p<0.01, *** p<0.001
Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.
Weighted using transformed versions of survey weights provided by DHS

Table 2.3: Probability of additional children by region and education; marginal effects of region and differences in effects of region across educational attainment in Latin America and the Caribbean

Table 2.3: Probability of additional children by region and education; marginal effects of region and differences in effects of region across educational attainment in Latin America and the Caribbean

(Source: author's calculations of Demographic and Health Surveys data for 7 countries, 1986–2017; N(level-1) = 465,823; N(level-2) = 6,247)

Educational attainment	**Rural**	**Urban**	**Regional gap (AME of Region)**		**Contrasts**
a) No Education	6.05	4.62	**1.43**	***	c, d
b) Primary	5.68	4.32	**1.36**	***	c, d
c) Secondary	5.18	4.03	1.16		d
d) Higher	4.94	3.96	**0.98**	***	a, b, c

Notes: The "contrasts" column reports which regional gaps are significantly different across levels of education (second differences). * p<0.05, ** p<0.01, *** p<0.001, two-tailed tests. Statistically significant coefficient at p<0.05 are bolded.

Table 2.4: Mean fertility differences by rural-urban residence and educational attainment in Latin America and the Caribbean, Blinder-Oaxaca Decomposition

Table 2.4: Mean fertility differences by rural-urban residence and educational attainment in Latin America and the Caribbean, Blinder-Oaxaca Decomposition
(Source: author's calculations of Demographic and Health Surveys data for 7 countries, 1986–2017; N=465,823)

Overall Rural-Urban Difference	**Coefficient**		**S.E.**
Rural	**5.72**	***	0.02
Urban	**4.21**	***	0.02
Difference (Rural-Urban)	**-1.51**	***	0.03
Composition Effect	**-1.53**	***	0.03
Rate Effect	**-0.10**	***	0.04
Interaction Effect	**0.12**	***	0.04

Characteristics	**Composition Effect**			**Rate Effect**			**Interaction Effect**		
	Coefficient		**S.E.**	**Coefficient**		**S.E.**	**Coefficient**		**S.E.**
Women's years of education (ref.=Higher)									
No Education	**-0.08**	***	0.01	**0.06**	***	0.02	**-0.04**	***	0.01
Primary	-0.01		0.01	**0.11**	**	0.04	**-0.04**	***	0.01
Secondary	**-0.03**	*	0.01	0.01		0.01	0.02		0.02
Geographic factors									
Country (ref.=Bolivia)									
Colombia	**-0.10**	***	0.01	0.02		0.01	**0.01**	*	0.01
Dominican Republic	**-0.07**	***	0.01	**0.03**	***	0.01	**0.02**	***	0.01
Guatemala	0.00		0.00	0.00		0.00	0.00		0.00
Haiti	0.00		0.01	0.01		0.01	-0.01		0.01
Honduras	**0.01**	***	0.00	-0.01		0.01	0.00		0.00
Peru	0.00		0.01	0.03		0.02	0.00		0.00
Socioeconomic factors									
Household wealth (ref.=Richest)									
Poorest	**-0.52**	***	0.03	0.04		0.04	-0.04		0.04

Poorer	**-0.13**	***	0.01	0.04		0.02	-0.02		0.01
Middle	**0.05**	***	0.01	**0.03**	***	0.01	**0.04**	***	0.01
Richer	0.03		0.02	**0.01**	*	0.00	**0.03**	*	0.02
Occupation (ref.=Not working)									
Managerial	**-0.02**	***	0.00	**0.00**	***	0.00	**0.01**	***	0.00
Clerical	0.00		0.00	0.00		0.00	0.00		0.00
Sales	**-0.02**	***	0.00	**0.02**	**	0.01	**0.01**	**	0.00
Agricultural	-0.01		0.01	0.04		0.03	-0.03		0.02
Domestic and services	**-0.02**	***	0.01	**0.01**	*	0.01	**0.01**	*	0.01
Manual	0.00		0.00	0.00		0.00	0.00		0.00
Individual and reproductive factors									
Age (ref.=Under 19 years)									
20–24 years	**0.00**	***	0.00	0.00		0.00	0.00		0.00
25–34 years	**0.00**	*	0.00	**0.04**	*	0.02	0.00		0.00
35–49 years	**0.01**	***	0.00	-0.01		0.06	0.00		0.00
Current union status (ref.=Widowed/divorced/not living together)									
Married/living together	**-0.04**	***	0.00	**-0.22**	***	0.04	**0.02**	***	0.00
Age at-first-intercourse (ref.=Under 19 years)									
20–24 years	**0.00**	*	0.00	0.00		0.01	0.00		0.00
25–34 years	0.00		0.00	0.00		0.00	0.00		0.00
35–46 years	0.00		0.00	0.00		0.00	0.00		0.00
Age at-first-birth (ref.=Under 19 years)									
20–24 years	**-0.01**	***	0.00	0.02		0.01	0.00		0.00
25–34 years	**-0.02**	***	0.00	0.01		0.00	**0.01**	*	0.00
35–47 years	**0.00**	*	0.00	0.00		0.00	0.00		0.00
Age at-first-marriage (ref.=Under 19 years)									
20–24 years	0.00		0.00	0.00		0.01	0.00		0.00
25–34 years	0.00		0.00	0.01		0.00	0.01		0.00
35–47 years	0.00		0.00	0.00		0.00	0.00		0.00
Marriage-to-birth interval	**-0.01**	***	0.00	**0.10**	***	0.02	**0.00**	***	0.00
Years married	**-0.07**	***	0.01	**-1.34**	***	0.08	**0.03**	***	0.00
Birth parity (ref.=Second or third)									
Fourth or higher	**-0.25**	***	0.01	**0.09**	***	0.01	**-0.03**	***	0.00
Birth interval (ref.=<2 years)									
2–4 years	**0.04**	***	0.00	**0.06**	***	0.01	**-0.01**	***	0.00

4+ years	**-0.17**	***	0.00	**0.09**	***	0.00	**0.06**	***	0.00
Contraceptive method (ref.=Not using modern contraceptive method)									
Using modern contraceptive method	**-0.06**	***	0.00	**0.15**	***	0.01	**0.05**	***	0.01
Year	0.00		0.00	**27.91**	***	9.79	0.00		0.00
Total sample (N)				**465,823**					

Notes: * p<0.05, ** p<0.01, *** p<0.001

Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.

Weighted using transformed versions of survey weights provided by DHS

FIGURES

Figure 2.1: Total Fertility Rates (TFRs) by rural-urban residence in Bolivia

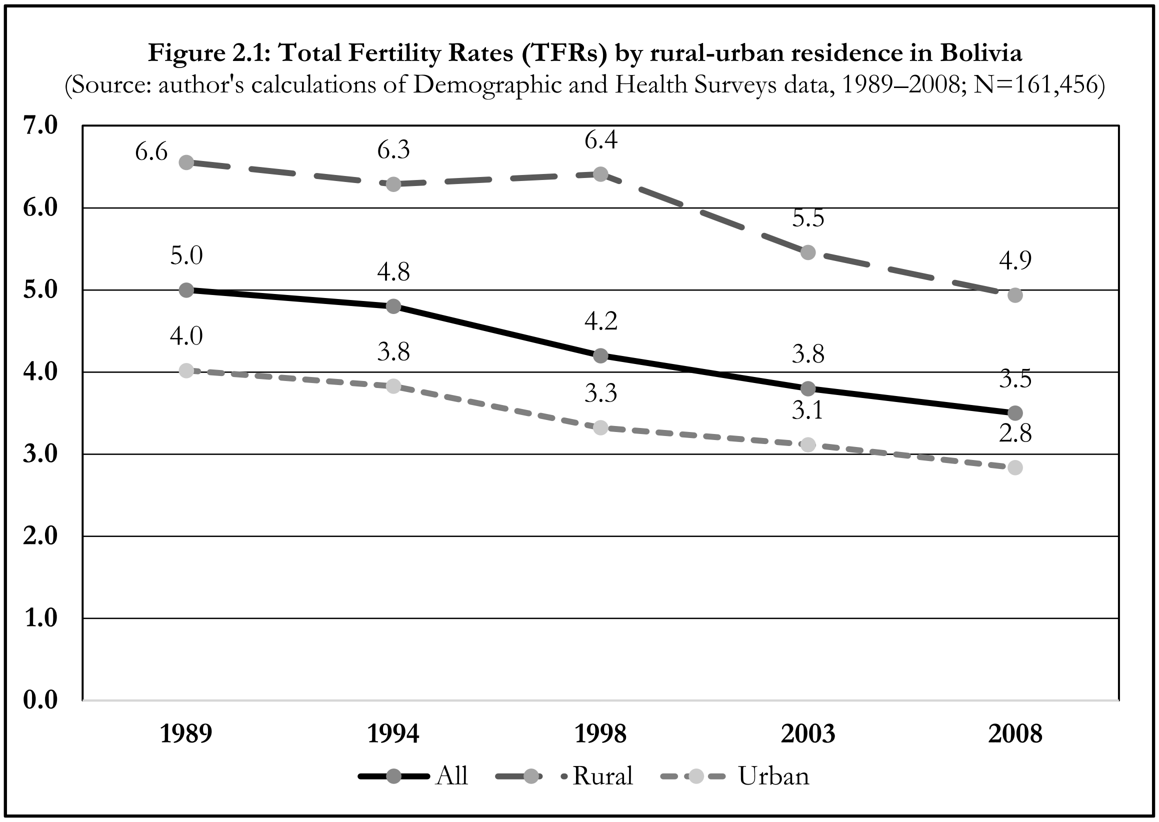


Figure 2.2: Total Fertility Rates (TFRs) by rural-urban residence in Colombia

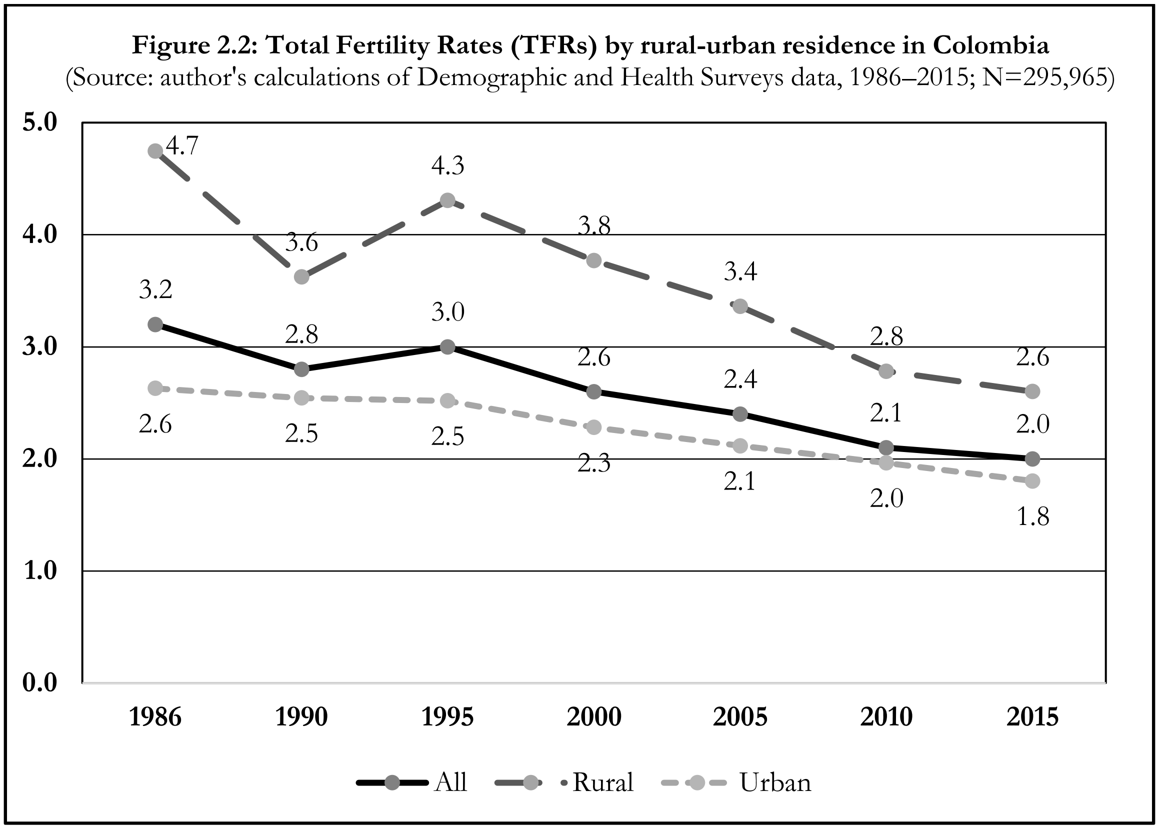


Figure 2.3: Total Fertility Rates (TFRs) by rural-urban residence in the Dominican Republic

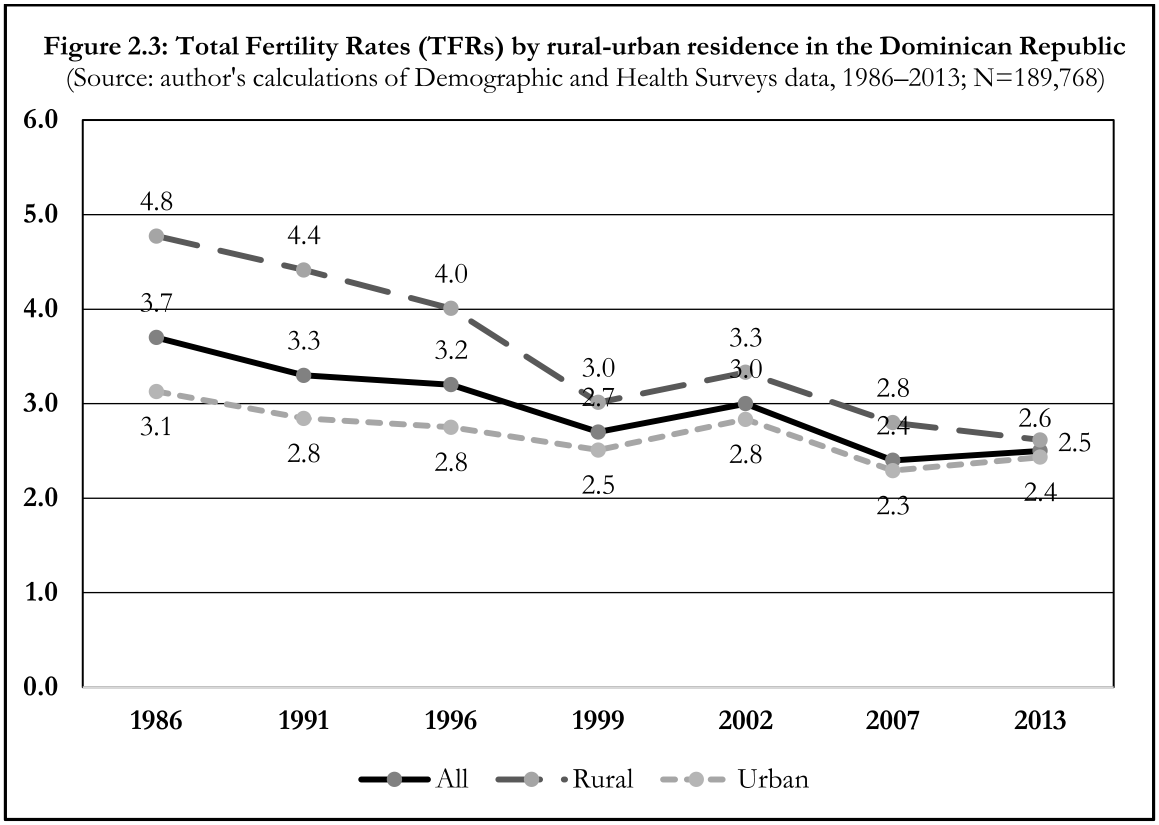


Figure 2.4: Total Fertility Rates (TFRs) by rural-urban residence in Guatemala

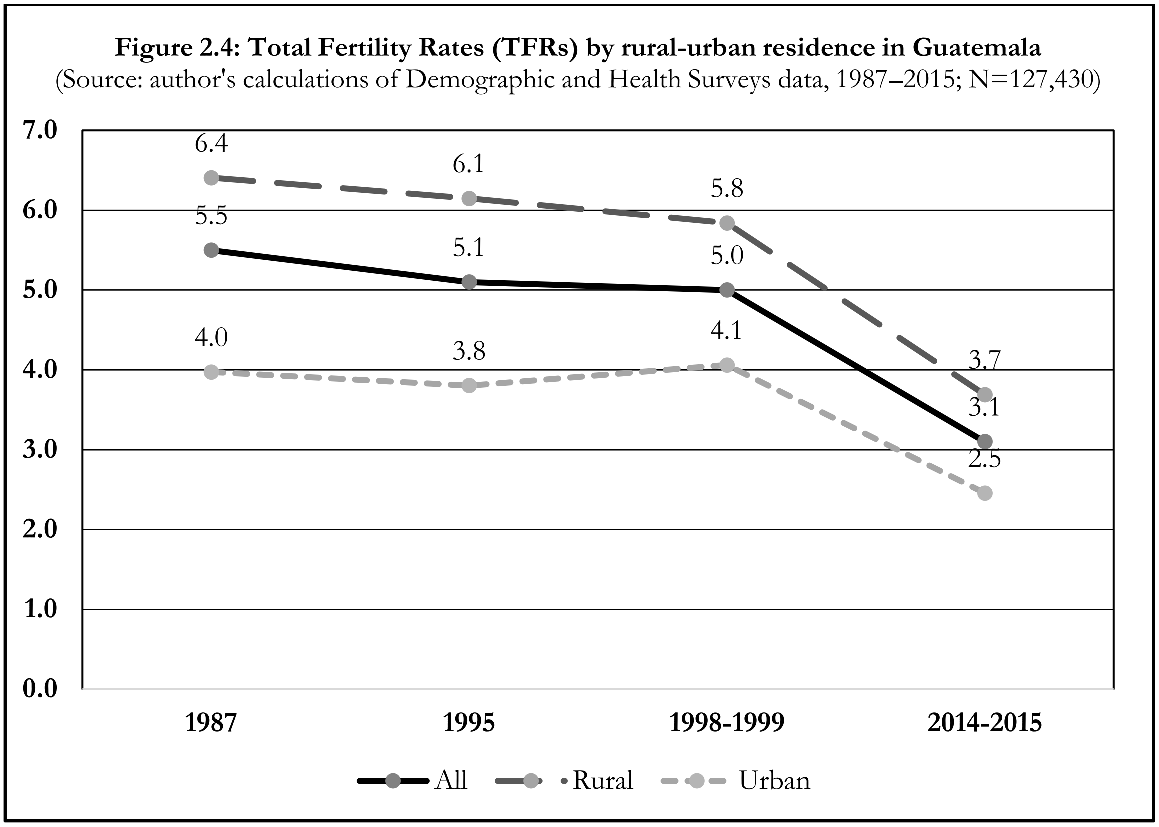


Figure 2.5: Total Fertility Rates (TFRs) by rural-urban residence in Haiti

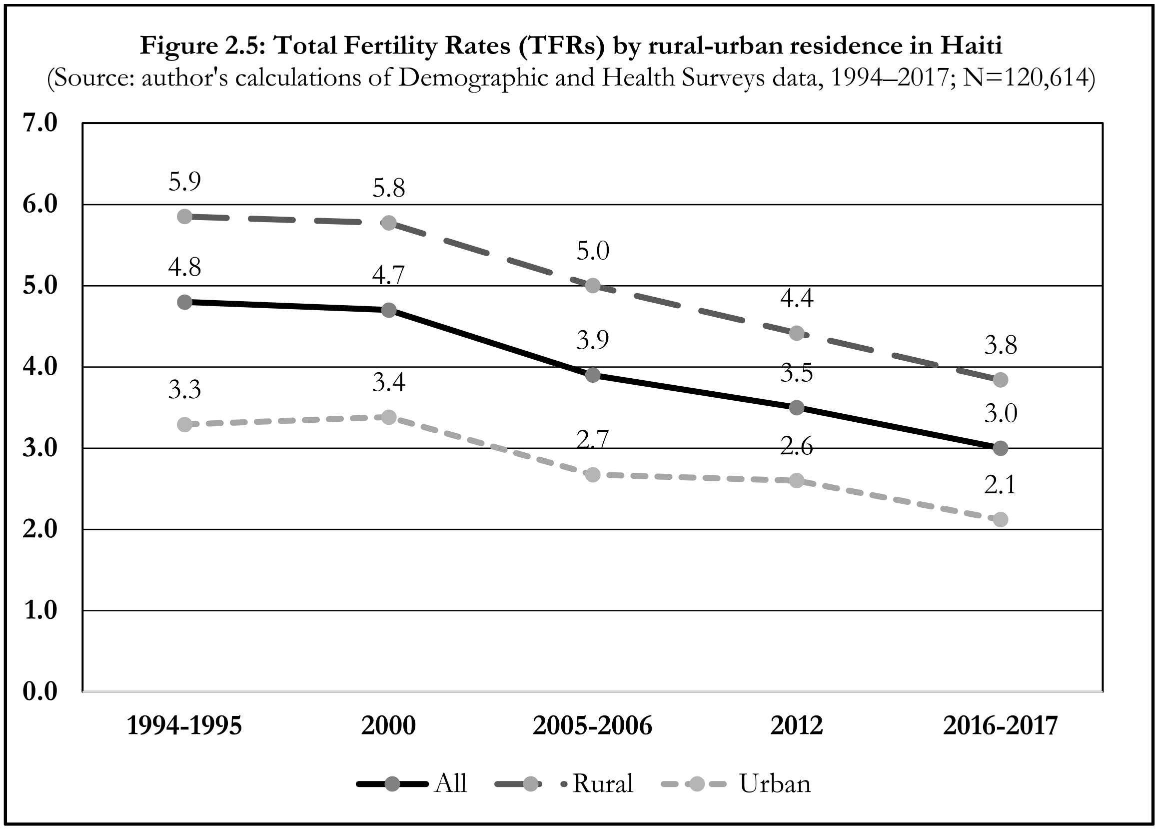


Figure 2.6: Total Fertility Rates (TFRs) by rural-urban residence in Honduras

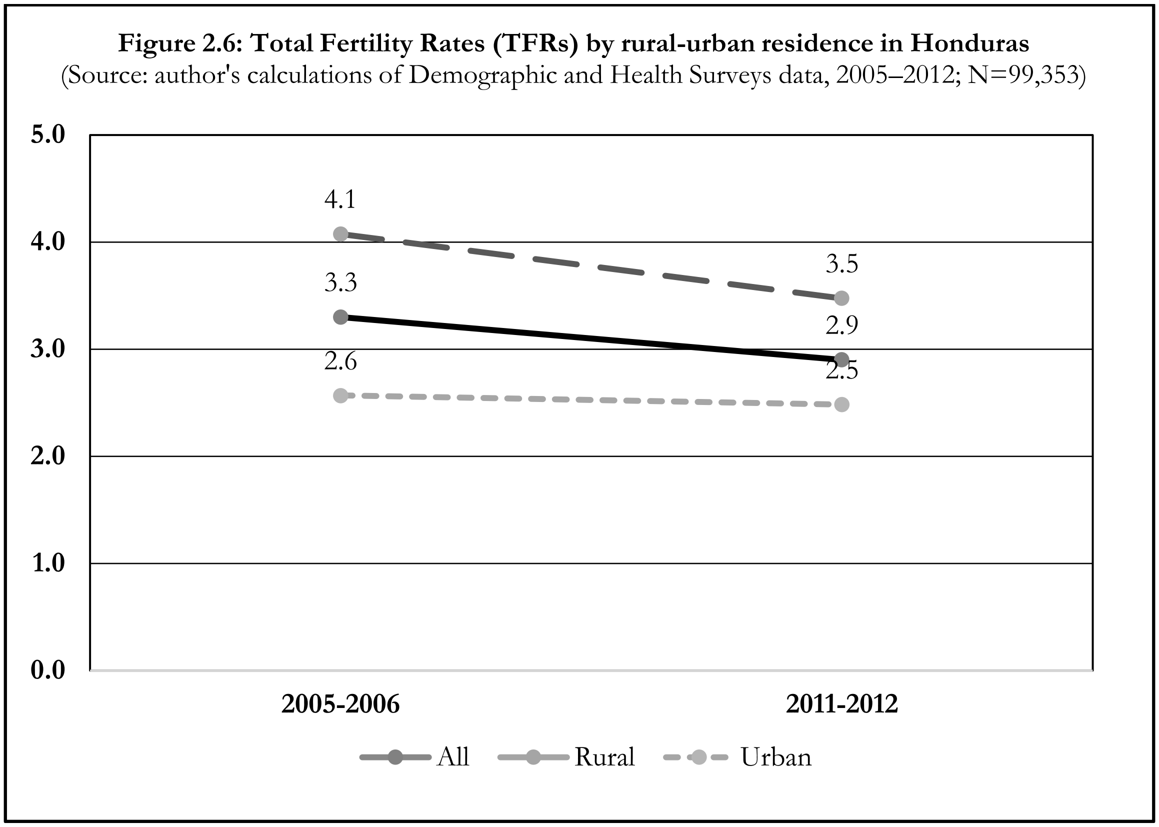


Figure 2.7: Total Fertility Rates (TFRs) by rural-urban residence in Peru

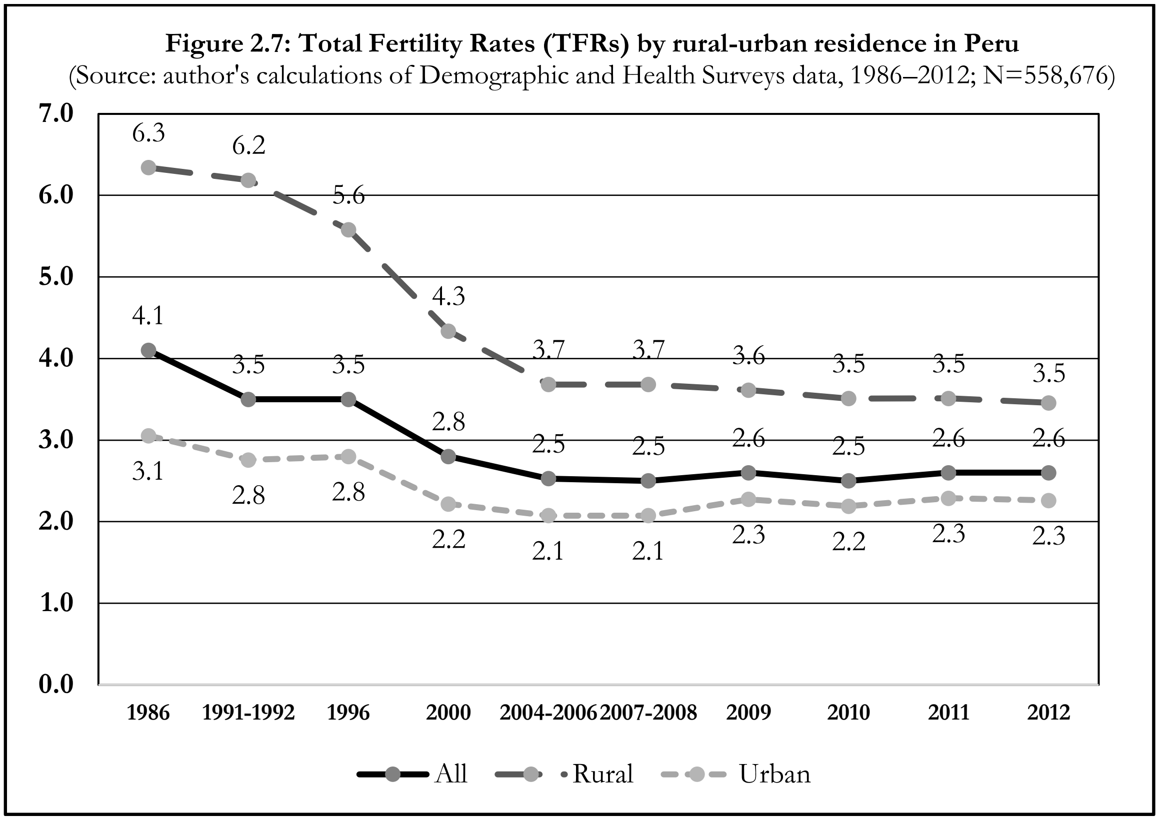


Figure 2.8: Trends in Total Fertility Rates (TFRs) by educational attainment in Latin America and the Caribbean

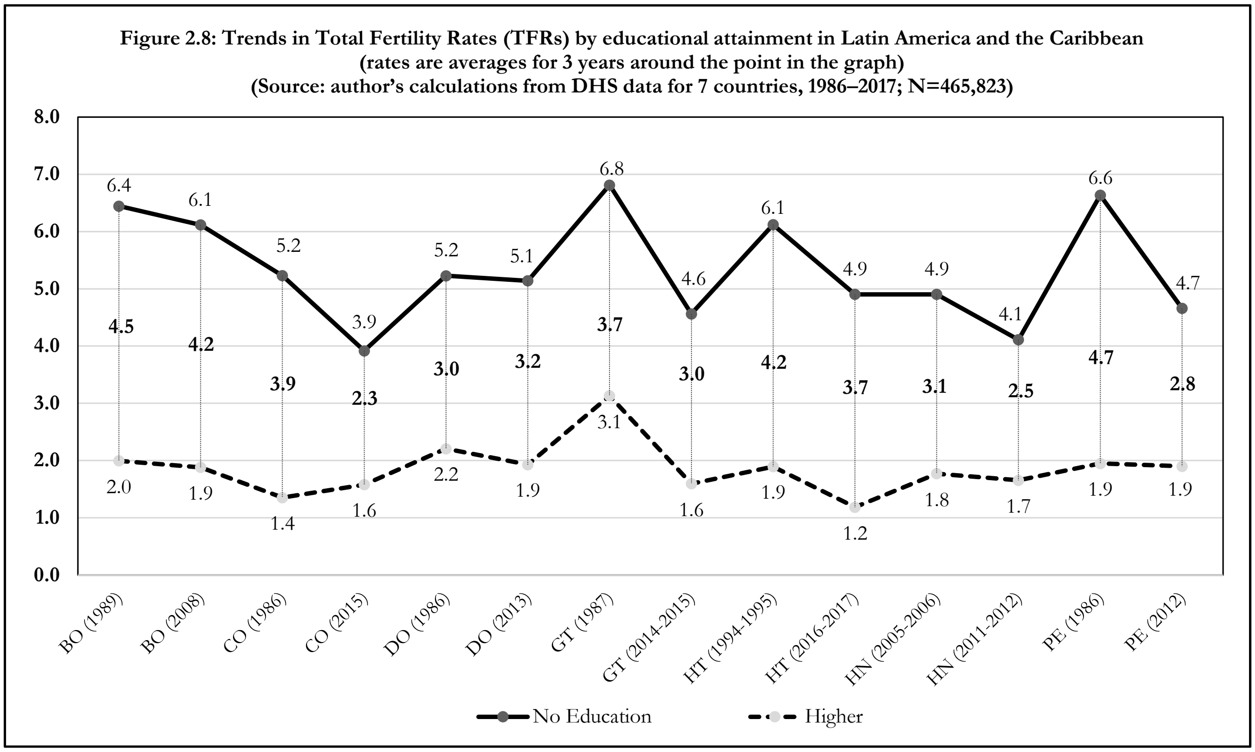


Figure 2.9: Trends in Total Fertility Rates (TFRs) by educational attainment and rural residence in Latin America and the Caribbean

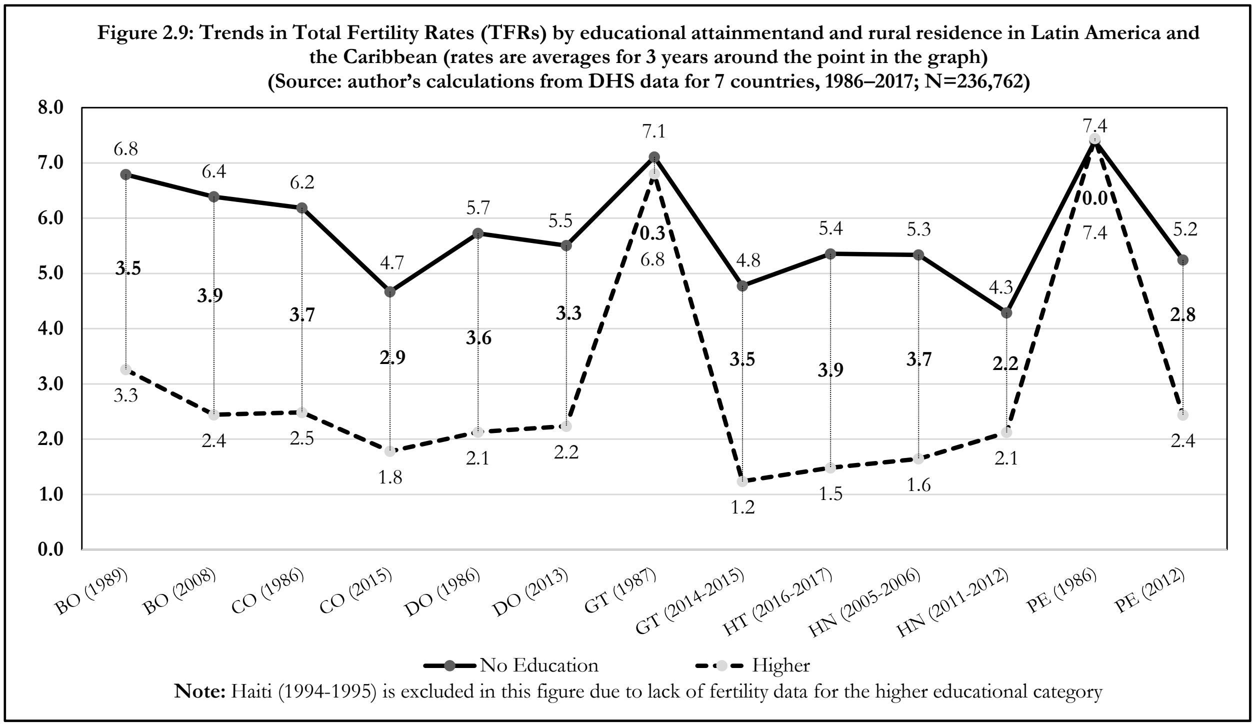


Figure 2.10: Trends in Total Fertility Rates (TFRs) by educational attainment and urban residence in Latin America and the Caribbean

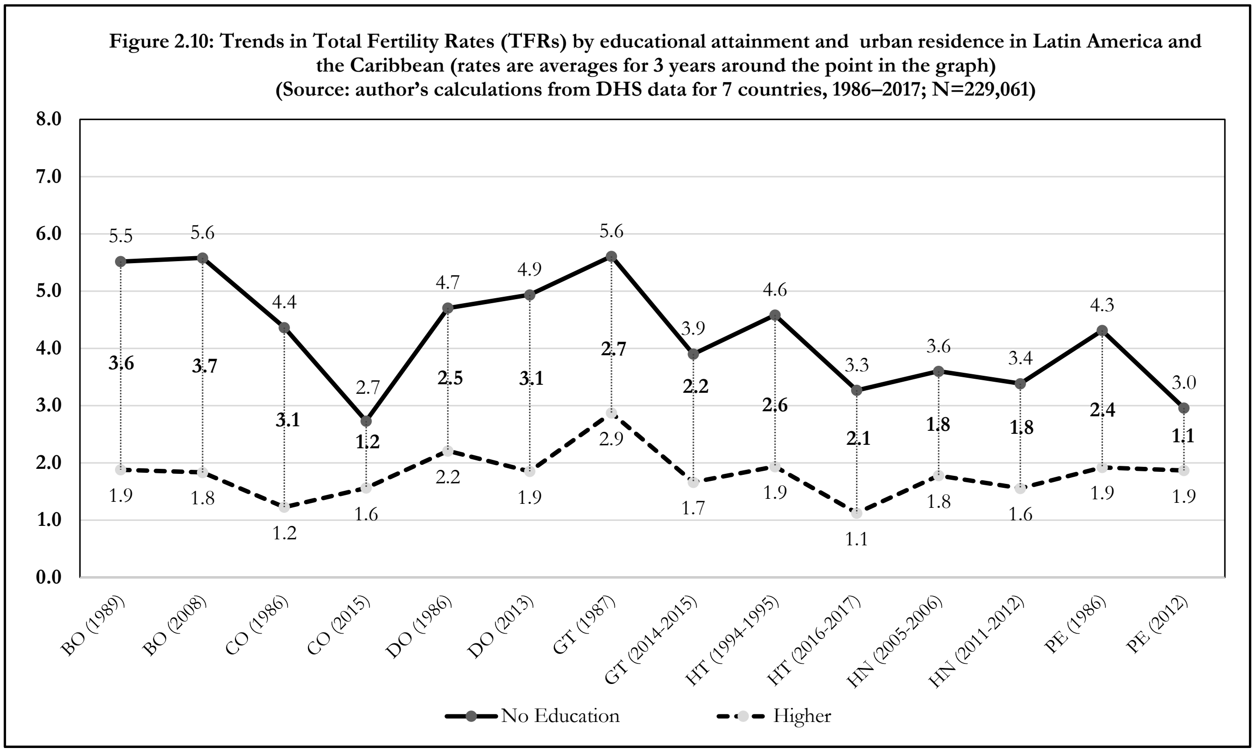
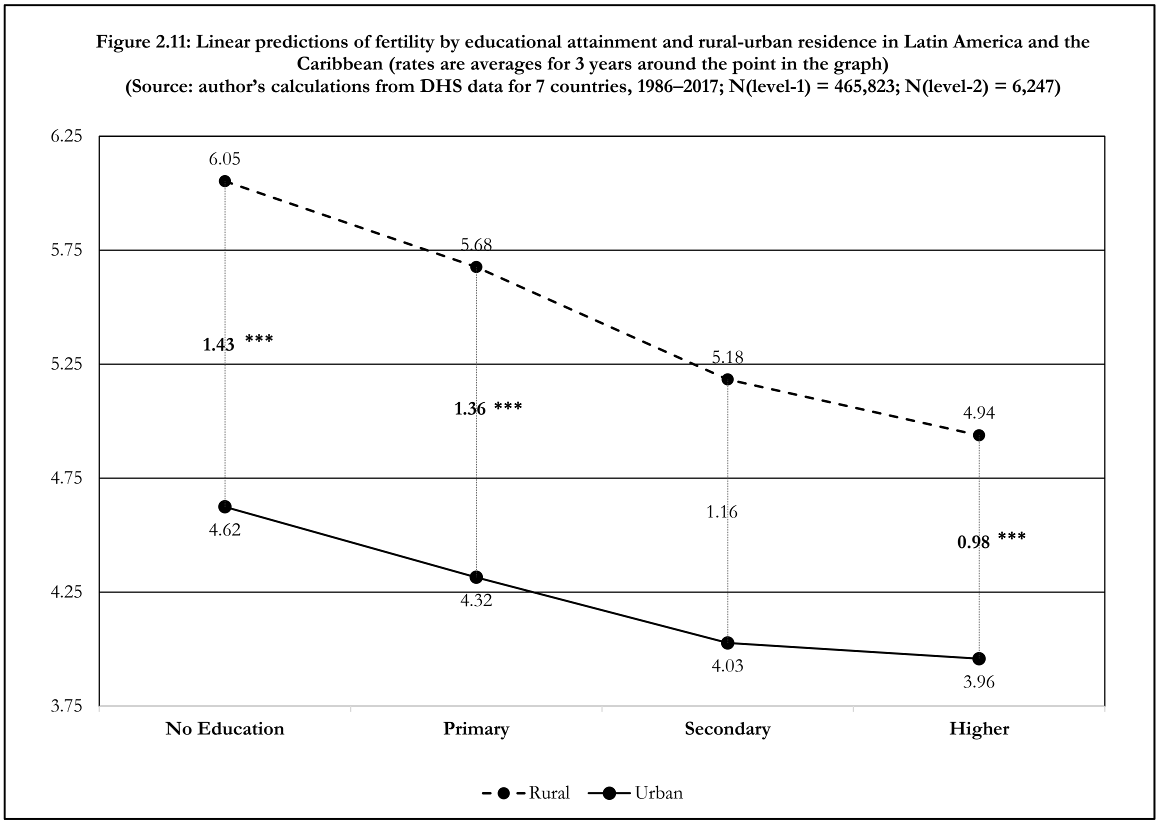


Figure 2.11: Linear predictions of fertility by educational attainment and rural-urban residence in Latin America and the Caribbean



APPENDIX: TABLES

Table 2.1A: Results of the Negative Binomial model for the incidence rate ratio (IRR) of number of children born to women in Latin America and the Caribbean

Table 2.1A: Results of the Negative Binomial model for the incidence rate ratio (IRR) of number of children born to women in Latin America and the Caribbean (Source: author's calculations of Demographic and Health Surveys data for 7 countries, 1986–2017; N(level-1) = 465,823)

	IRR Coefficient		95% C.I. Low	95% C.I. High	S.E.
Year	**0.99**	***	0.99	0.99	0.00
Educational attainment (ref.=Higher)					
No Education	**1.18**	***	1.16	1.19	0.01
Primary	**1.10**	***	1.09	1.11	0.00
Secondary	**1.02**	***	1.01	1.03	0.00
Geographic factors					
Place of residence (ref.=Urban)					
Rural	**0.96**	***	0.94	0.97	0.01
Rural X years of education (ref.=Urban X Higher)					
Rural X No Education	**1.05**	***	1.03	1.07	0.01
Rural X Primary	**1.05**	***	1.03	1.07	0.01
Rural X Secondary	**1.03**	***	1.01	1.05	0.01
Country (ref.=Bolivia)					
Colombia	**0.82**	***	0.81	0.83	0.00
Dominican Republic	**0.83**	***	0.82	0.84	0.01
Guatemala	0.99		0.98	1.01	0.01
Haiti	**1.00**	***	0.99	1.02	0.01
Honduras	**0.95**	***	0.94	0.96	0.01
Peru	**0.89**	***	0.88	0.90	0.00
Socioeconomic factors					
Household wealth (ref.=Richest)					
Poorest	**1.36**	***	1.34	1.38	0.01
Poorer	**1.26**	***	1.24	1.27	0.01
Middle	**1.17**	***	1.15	1.18	0.01
Richer	**1.07**	***	1.06	1.08	0.01
Occupation (ref.=Not working)					
Managerial	**0.96**	***	0.95	0.97	0.00
Clerical	**0.95**	***	0.94	0.96	0.01
Sales	**0.98**	***	0.97	0.98	0.00
Agricultural	**1.02**	***	1.02	1.02	0.00
Domestic and services	**0.99**	***	0.98	0.99	0.00
Manual	**0.99**	***	0.99	1.00	0.00
Individual and reproductive factors					

Age (ref.=Under 19 years)					
20–24 years	**1.19**	***	1.16	1.23	0.02
25–34 years	**1.44**	***	1.39	1.48	0.02
35–49 years	**1.52**	***	1.47	1.57	0.02
Current union status (ref.=Never married, widowed, divorced or not living together)					
Married or living together	**1.07**	***	1.07	1.08	0.00
Age at-first-intercourse (ref.=Under 19 years)					
20–24 years	**0.98**	***	0.97	0.98	0.00
25–34 years	**0.98**	***	0.96	0.99	0.01
35–46 years	0.93		0.80	1.08	0.07
Age at-first-birth (ref.=Under 19 years)					
20–24 years	**0.95**	***	0.95	0.96	0.00
25–34 years	**0.92**	***	0.91	0.93	0.00
35–47 years	**0.87**	***	0.82	0.92	0.03
Age at-first-marriage (ref.=Under 19 years)					
20–24 years	**0.99**	***	0.98	0.99	0.00
25–34 years	**0.95**	***	0.94	0.97	0.01
35–47 years	**0.88**	*	0.80	0.98	0.05
Marriage-to-birth interval	**1.00**	***	1.00	1.00	0.00
Years married	**1.03**	***	1.03	1.03	0.00
Birth parity (ref.=Second or third)					
Fourth or higher	**1.31**	***	1.31	1.32	0.00
Birth interval (ref.=<2 years)					
2–4 years	**0.93**	***	0.93	0.94	0.00
4+ years	**0.79**	***	0.79	0.80	0.00
Contraceptive method (ref.=Not using modern contraceptive method)					
Using modern contraceptive method	**0.96**	***	0.95	0.96	0.00
N(level-1)			**465,823**		

Notes: * p<0.05, ** p<0.01, *** p<0.001
Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.

Table 2.2A: Results of the Linear model for the number of children born to women in Latin America and the Caribbean

Table 2.2A: Results of the Linear model for the number of children born to women in Latin America and the Caribbean (Source: author's calculations of Demographic and Health Surveys data for 7 countries, 1986–2017; N(level-1) = 465,823)					
	Coefficient		**95% C.I. Low**	**95% C.I. High**	**S.E.**
Year	**-0.05**	***	-0.05	-0.04	0.00
Educational attainment (ref.=Higher)					
No Education	**0.48**	***	0.37	0.60	0.06
Primary	0.01		-0.04	0.07	0.03
Secondary	**-0.14**	***	-0.18	-0.09	0.02
Geographic factors					
Place of residence (ref.=Urban)					
Rural	**-0.31**	***	-0.39	-0.23	0.04
Rural X years of education (ref.=Urban X Higher)					
Rural X No Education	**0.48**	***	0.34	0.62	0.07
Rural X Primary	**0.37**	***	0.28	0.46	0.05
Rural X Secondary	**0.13**	***	0.04	0.22	0.05
Country (ref.=Bolivia)					
Colombia	**-0.94**	***	-1.01	-0.87	0.03
Dominican Republic	**-0.88**	***	-0.95	-0.81	0.04
Guatemala	-0.07		-0.17	0.02	0.05
Haiti	0.01		-0.07	0.10	0.04
Honduras	**-0.20**	***	-0.27	-0.12	0.04
Peru	**-0.62**	***	-0.69	-0.55	0.03
Socioeconomic factors					
Household wealth (ref.=Richest)					
Poorest	**1.41**	***	1.35	1.48	0.03
Poorer	**1.01**	***	0.96	1.07	0.03
Middle	**0.66**	***	0.61	0.70	0.03
Richer	**0.30**	***	0.26	0.34	0.02
Occupation (ref.=Not working)					
Managerial	**-0.16**	***	-0.22	-0.11	0.03
Clerical	**-0.09**	***	-0.15	-0.03	0.03
Sales	**-0.10**	***	-0.14	-0.05	0.02
Agricultural	**0.14**	***	0.09	0.20	0.03
Domestic and services	**-0.08**	***	-0.12	-0.03	0.02
Manual	**-0.07**	**	-0.13	-0.01	0.03
Individual and reproductive factors					
Age (ref.=Under 19 years)					
20–24 years	**0.35**	***	0.29	0.41	0.03
25–34 years	**0.71**	***	0.65	0.78	0.04

35–49 years	**0.79**	***	0.70	0.89	0.05
Current union status (ref.=Never married, widowed, divorced or not living together)					
Married or living together	**0.36**	***	0.32	0.40	0.02
Age at-first-intercourse (ref.=Under 19 years)					
20–24 years	**-0.09**	***	-0.14	-0.05	0.02
25–34 years	**-0.14**	***	-0.21	-0.07	0.03
35–46 years	-0.22		-0.46	0.03	0.13
Age at-first-birth (ref.=Under 19 years)					
20–24 years	**-0.27**	***	-0.31	-0.23	0.02
25–34 years	**-0.35**	***	-0.42	-0.28	0.04
35–47 years	**-0.44**	***	-0.64	-0.24	0.10
Age at-first-marriage (ref.=Under 19 years)					
20–24 years	-0.02		-0.07	0.03	0.03
25–34 years	0.03		-0.05	0.11	0.04
35–47 years	0.04		-0.20	0.29	0.13
Marriage-to-birth interval	**-0.01**	***	-0.01	-0.01	0.00
Years married	**0.13**	***	0.12	0.13	0.00
Birth parity (ref.=Second or third)					
Fourth or higher	**1.54**	***	1.52	1.56	0.01
Birth interval (ref.=<2 years)					
2–4 years	**-0.33**	***	-0.36	-0.31	0.01
4+ years	**-1.04**	***	-1.07	-1.02	0.01
Contraceptive method (ref.=Not using modern contraceptive method)					
Using modern contraceptive method	**-0.21**	***	-0.24	-0.18	0.02
N(level-1)		**465,823**			

Notes: * p<0.05, ** p<0.01, *** p<0.001
Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.

Table 2.3A: Total Fertility Rates (TFRs) by educational attainment, rural-urban residence, country, and survey year in Latin America and the Caribbean

Table 2.3A: Total Fertility Rates (TFRs) by educational attainment, rural-urban residence, country, and survey year in Latin America and the Caribbean (rates are averages for 3 years around the survey year)
(Source: author's calculations of Demographic and Health Surveys data for 7 countries, 1986–2017; N=465,823)

			All					Rural					Urban				
Country	Year	TFR*	Educational Attainment				Difference ≥10 & 0	Educational Attainment				Difference ≥10 & 0	Educational Attainment				Difference ≥10 & 0
		All	No Education	Primary	Secondary	Higher		No Education	Primary	Secondary	Higher		No Education	Primary	Secondary	Higher	
Bolivia	1989	5.0	6.4	6.0	3.7	2.0	4.5	6.8	6.6	4.7	3.3	3.5	5.5	5.3	3.4	1.9	3.6
	1994	4.8	6.5	6.1	3.4	2.1	4.3	6.5	6.7	4.6	2.1	4.4	6.6	5.4	3.2	2.1	4.4
	1998	4.2	7.1	5.7	3.3	2.2	5.0	7.5	6.6	4.6	4.1	3.5	6.2	4.9	3.1	2.1	4.1
	2003	3.8	6.8	4.9	2.7	2.1	4.7	7.4	5.6	3.6	2.6	4.8	5.2	4.2	2.6	2.0	3.1
	2008	3.5	6.1	4.7	3.0	1.9	4.2	6.4	5.4	3.8	2.4	3.9	5.6	4.0	2.9	1.8	3.7
Colombia	1986	3.2	5.2	3.9	2.5	1.4	3.9	6.2	4.9	4.2	2.5	3.7	4.4	3.3	2.3	1.2	3.1
	1990	2.8	4.8	3.5	2.4	1.5	3.3	5.5	4.0	2.2	0.7	4.8	4.2	3.1	2.4	1.5	2.7
	1995	3.0	5.0	3.8	2.6	1.8	3.1	5.6	4.5	3.5	3.0	2.6	3.9	3.2	2.5	1.8	2.1
	2000	2.6	4.0	3.6	2.4	1.5	2.5	4.5	4.2	3.1	1.1	3.4	3.5	3.1	2.3	1.5	2.0
	2005	2.4	4.5	3.4	2.4	1.4	3.0	4.8	3.8	2.9	2.0	2.8	4.1	3.1	2.3	1.4	2.7
	2010	2.1	4.3	3.2	2.3	1.4	2.9	5.3	3.3	2.6	1.8	3.5	3.2	3.2	2.2	1.4	1.8
	2015	2.0	3.9	3.0	2.1	1.6	2.3	4.7	3.2	2.5	1.8	2.9	2.7	2.8	2.0	1.6	1.2
Dominican Republic	1986	3.7	5.2	4.2	2.9	2.2	3.0	5.7	5.1	2.9	2.1	3.6	4.7	3.6	2.9	2.2	2.5
	1991	3.3	5.2	3.8	2.8	2.5	2.6	6.4	4.3	3.6	3.9	2.5	3.3	3.4	2.6	2.4	0.8
	1996	3.2	5.0	3.7	2.6	1.9	3.1	6.0	4.0	3.2	2.9	3.1	3.3	3.4	2.5	1.9	1.5
	1999	2.7	2.2	3.5	2.5	1.3	0.9	1.1	3.5	3.0	1.1	-0.1	4.3	3.6	2.4	1.3	3.0
	2002	3.0	4.5	3.6	2.7	2.2	2.3	4.9	3.9	2.8	2.2	2.7	4.1	3.5	2.7	2.2	1.9
	2007	2.4	3.9	3.0	2.4	1.8	2.2	4.7	3.3	2.6	1.8	2.8	3.3	2.8	2.4	1.8	1.5
	2013	2.5	5.1	3.2	2.5	1.9	3.2	5.5	3.2	2.4	2.2	3.3	4.9	3.2	2.5	1.9	3.1
Guatemala	1987	5.5	6.8	5.1	2.7	3.1	3.7	7.1	5.8	2.7	6.8	0.3	5.6	4.1	2.6	2.9	2.7
	1995	5.1	7.1	5.1	2.7	1.8	5.3	7.4	5.7	2.6	(na)	7.4	6.1	4.4	2.7	1.7	4.4
	1998-1999	5.0	6.8	5.2	3.0	2.8	4.0	7.0	5.9	2.7	2.6	7.0	6.3	4.3	3.1	2.9	3.3
	2014-2015	3.1	4.6	3.5	2.4	1.6	3.0	4.8	3.8	2.7	1.2	4.8	3.9	3.0	2.2	1.7	2.2
Haiti	1994-1995	4.8	6.1	4.8	2.5	1.9	4.2	6.6	5.9	3.6	(na)	6.6	4.6	3.7	2.3	1.9	2.6
	2000	4.7	6.1	5.3	2.8	2.0	4.1	6.6	6.1	3.8	(na)	6.6	4.7	4.3	2.5	2.2	2.4
	2005-2006	3.9	5.9	4.3	2.5	1.8	4.1	6.5	5.0	3.2	1.4	6.5	3.9	3.3	2.2	2.1	1.8
	2012	3.5	5.4	4.3	2.7	1.9	3.5	5.9	4.8	3.5	2.0	5.9	3.9	3.6	2.2	1.9	2.0
	2016-2017	3.0	4.9	4.1	2.4	1.2	3.7	5.4	4.6	2.8	1.5	5.4	3.3	3.0	2.1	1.1	2.1
Honduras	2005-2006	3.3	4.9	3.8	2.2	1.8	3.1	5.3	4.2	2.9	1.6	3.7	3.6	3.2	2.1	1.8	1.8
	2011-2012	2.9	4.1	3.5	2.5	1.7	2.5	4.3	4.2	2.7	2.1	2.2	3.4	3.1	2.5	1.6	1.8

Peru	1986	4.1	6.6	5.0	3.1	1.9	4.7	7.4	6.1	4.1	7.4	0.0	4.3	3.9	3.0	1.9	2.4
	1991-1992	3.5	7.0	5.1	3.1	1.9	5.1	7.8	6.5	4.7	3.3	4.5	5.4	3.9	2.9	1.8	3.6
	1996	3.5	6.9	5.0	3.0	2.1	4.8	7.3	5.9	4.0	3.0	4.2	5.9	4.0	2.8	2.1	3.9
	2000	2.8	5.1	4.1	2.4	1.8	3.3	5.5	4.8	3.0	3.0	2.4	3.3	3.0	2.3	1.7	1.5
	2004-2006	2.5	4.6	3.7	2.5	1.6	2.9	4.8	4.1	3.2	2.0	2.8	3.6	3.1	2.3	1.6	2.0
	2007-2008	2.5	4.6	3.7	2.5	1.6	2.9	4.8	4.1	3.2	2.0	2.8	3.6	3.1	2.3	1.6	2.0
	2009	2.6	4.4	3.6	2.6	1.9	2.5	5.2	4.0	3.2	2.5	2.7	2.4	3.2	2.4	1.9	0.6
	2010	2.5	3.6	3.7	2.6	1.7	1.9	4.3	4.1	3.0	3.0	1.3	2.3	3.2	2.5	1.6	0.7
	2011	2.6	3.8	3.7	2.7	1.8	2.0	4.1	4.0	3.1	2.3	1.8	3.3	3.3	2.6	1.8	1.5
	2012	2.6	4.7	3.5	2.6	1.9	2.8	5.2	3.9	3.1	2.4	2.8	3.0	3.0	2.5	1.9	1.1

Notes: *Total fertility rate for the three years preceding the survey for age group 15-49 expressed per woman

Table 2.4A: Results of the multilevel Poisson model for the incidence rate ratio (IRR) of number of children born to women in Latin America and the Caribbean

Table 2.4A: Results of the multilevel Poisson model for the incidence rate ratio (IRR) of number of children born to women in Latin America and the Caribbean
(Source: author's calculations of Demographic and Health Surveys data for 7 countries, 1986–2017; N(level-1) = 465,823; N(level-2) = 6,247)

	IRR Coefficient		95% C.I. Low	95% C.I. High	S.E.
Educational attainment (ref.=Higher)					
No Education	**1.18**	***	1.16	1.20	0.01
Incomplete Primary	**1.11**	***	1.09	1.13	0.01
Complete Primary	**1.06**	***	1.05	1.08	0.01
Incomplete Secondary	**1.04**	***	1.02	1.05	0.01
Complete Secondary	0.99		0.98	1.01	0.01
Geographic factors					
Place of residence (ref.=Urban)					
Rural	**0.97**	***	0.94	0.99	0.01
Rural X years of education (ref.=Urban X Higher)					
Rural X No Education	**1.04**	***	1.01	1.07	0.01
Rural X Incomplete Primary	**1.05**	***	1.02	1.07	0.01
Rural X Complete Primary	1.01		0.99	1.04	0.01
Rural X Incomplete Secondary	1.02		1.00	1.05	0.01
Rural X Complete Secondary	1.01		0.99	1.04	0.01
Country (ref.=Bolivia)					
Colombia	**0.83**	***	0.82	0.84	0.00
Dominican Republic	**0.83**	***	0.82	0.84	0.01
Guatemala	0.99		0.98	1.01	0.01
Haiti	1.00		0.99	1.02	0.01
Honduras	**0.96**	***	0.95	0.97	0.01
Peru	**0.89**	***	0.89	0.90	0.00
Socioeconomic factors					
Household wealth (ref.=Richest)					
Poorest	**1.34**	***	1.33	1.36	0.01
Poorer	**1.25**	***	1.23	1.26	0.01
Middle	**1.16**	***	1.15	1.17	0.01
Richer	**1.07**	***	1.06	1.08	0.01
Occupation (ref.=Not working)					
Managerial	**0.97**	***	0.95	0.98	0.01
Clerical	**0.97**	***	0.95	0.98	0.01
Sales	**0.98**	***	0.98	0.99	0.00
Agricultural	**1.01**	***	1.00	1.02	0.00
Domestic and services	0.99		0.98	1.00	0.00
Manual	0.99		0.98	1.00	0.01
Individual and reproductive factors					

Age (ref.=Under 19 years)					
20–24 years	**1.19**	***	1.17	1.22	0.01
25–34 years	**1.45**	***	1.42	1.47	0.01
35–49 years	**1.52**	***	1.49	1.56	0.02
Current union status (ref.=Never married, widowed, divorced or not living together)					
Married or living together	**1.07**	***	1.06	1.08	0.00
Age at-first-intercourse (ref.=Under 19 years)					
20–24 years	**0.99**	***	0.98	1.00	0.00
25–34 years	0.98		0.96	1.00	0.01
35–46 years	**0.90**	*	0.83	0.99	0.04
Age at-first-birth (ref.=Under 19 years)					
20–24 years	**0.95**	***	0.94	0.96	0.00
25–34 years	**0.91**	***	0.90	0.92	0.01
35–47 years	**0.81**	***	0.77	0.86	0.02
Age at-first-marriage (ref.=Under 19 years)					
20–24 years	**0.98**	***	0.97	0.99	0.01
25–34 years	**0.96**	***	0.95	0.98	0.01
35–47 years	0.97		0.90	1.06	0.04
Marriage-to-birth interval	**1.00**	***	1.00	1.00	0.00
Years married	**1.02**	***	1.02	1.03	0.00
Birth parity (ref.=Second or third)					
Fourth or higher	**1.30**	***	1.30	1.31	0.00
Birth interval (ref.=<2 years)					
2–4 years	**0.94**	***	0.94	0.94	0.00
4+ years	**0.81**	***	0.80	0.81	0.00
Contraceptive method (ref.=Not using modern contraceptive method)					
Using modern contraceptive method	**0.97**	***	0.96	0.97	0.00
Year	**0.99**	***	0.99	0.99	0.00
Random effect (cluster-level)	0.01		0.01	0.01	0.00
N(level-1)		**465,823**			
N(level-2)		**6,247**			

Notes: * p<0.05, ** p<0.01, *** p<0.001

Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.

Weighted using transformed versions of survey weights provided by DHS

Table 2.5A: Results of the multilevel Poisson model for the incidence rate ratio (IRR) of number of children born to women in Latin America and the Caribbean

Table 2.5A: Results of the multilevel Poisson model for the incidence rate ratio (IRR) of number of children born to women in Latin America and the Caribbean
(Source: author's calculations of Demographic and Health Surveys data on 7 countries, 1986–2017; N(level-1) = 465,823; N(level-2) = 6,247)

	IRR Coefficient		95% C.I. Low	95% C.I. High	S.E.
Years of education (ref.=10+ years)					
0 years	**1.17**	***	1.15	1.19	0.01
1–3 years	**1.13**	***	1.11	1.14	0.01
4–6 years	**1.07**	***	1.06	1.09	0.01
7–9 years	**1.04**	***	1.03	1.05	0.01
Geographic factors					
Place of residence (ref.=Urban)					
Rural	0.99		0.97	1.00	0.01
Rural X years of education (ref.=Urban X 10+ years)					
Rural X 0 years	**1.02**	*	1.00	1.04	0.01
Rural X 1–3 years	**1.02**	**	1.00	1.04	0.01
Rural X 4–6 years	1.01		0.99	1.03	0.01
Rural X 7–9 years	0.99		0.97	1.01	0.01
Country (ref.=Bolivia)					
Colombia	**0.81**	***	0.80	0.82	0.00
Dominican Republic	**0.83**	***	0.82	0.84	0.01
Guatemala	**0.98**	***	0.96	0.99	0.01
Haiti	0.99		0.98	1.01	0.01
Honduras	**0.94**	***	0.93	0.96	0.01
Peru	**0.89**	***	0.88	0.90	0.00
Socioeconomic factors					
Household wealth (ref.=Richest)					
Poorest	**1.34**	***	1.32	1.36	0.01
Poorer	**1.25**	***	1.23	1.26	0.01
Middle	**1.16**	***	1.15	1.17	0.01
Richer	**1.07**	***	1.06	1.08	0.01
Occupation (ref.=Not working)					
Managerial	**0.96**	***	0.95	0.97	0.01
Clerical	**0.96**	***	0.95	0.98	0.01
Sales	**0.98**	***	0.98	0.99	0.00
Agricultural	**1.01**	***	1.00	1.02	0.00
Domestic and services	0.99		0.98	1.00	0.00
Manual	0.99		0.98	1.00	0.01
Individual and reproductive factors					
Age (ref.=Under 19 years)					
20–24 years	**1.19**	***	1.17	1.22	0.01
25–34 years	**1.44**	***	1.41	1.47	0.01

35–49 years	**1.51**	***	1.48	1.55	0.02
Current union status (ref.=Never married, widowed, divorced or not living together)					
Married or living together	**1.07**	***	1.06	1.08	0.00
Age at-first-intercourse (ref.=Under 19 years)					
20–24 years	**0.99**	***	0.98	1.00	0.00
25–34 years	**0.98**	*	0.96	1.00	0.01
35–46 years	**0.91**	*	0.83	0.99	0.04
Age at-first-birth (ref.=Under 19 years)					
20–24 years	**0.95**	***	0.94	0.96	0.00
25–34 years	**0.91**	***	0.89	0.92	0.01
35–47 years	**0.81**	***	0.77	0.86	0.02
Age at-first-marriage (ref.=Under 19 years)					
20–24 years	**0.98**	***	0.97	0.99	0.01
25–34 years	**0.96**	***	0.95	0.98	0.01
35–47 years	0.97		0.90	1.05	0.04
Marriage-to-birth interval	**1.00**	***	1.00	1.00	0.00
Years married	**1.02**	***	1.02	1.03	0.00
Birth parity (ref.=Second or third)					
Fourth or higher	**1.30**	***	1.30	1.31	0.00
Birth interval (ref.=<2 years)					
2–4 years	**0.94**	***	0.94	0.94	0.00
4+ years	**0.81**	***	0.80	0.81	0.00
Contraceptive method (ref.=Not using modern contraceptive method)					
Using modern contraceptive method	**0.97**	***	0.96	0.97	0.00
Year	**0.99**	***	0.99	0.99	0.00
Random effect (cluster-level)	0.01		0.01	0.01	0.00
N(level-1)			**465,823**		
N(level-2)			**6,247**		

Notes: * p<0.05, ** p<0.01, *** p<0.001
Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.
Weighted using transformed versions of survey weights provided by DHS

APPENDIX: FIGURES

Figure 2.1A: Trends in Total Fertility Rates (TFRs) by country and survey year in Latin America and the Caribbean

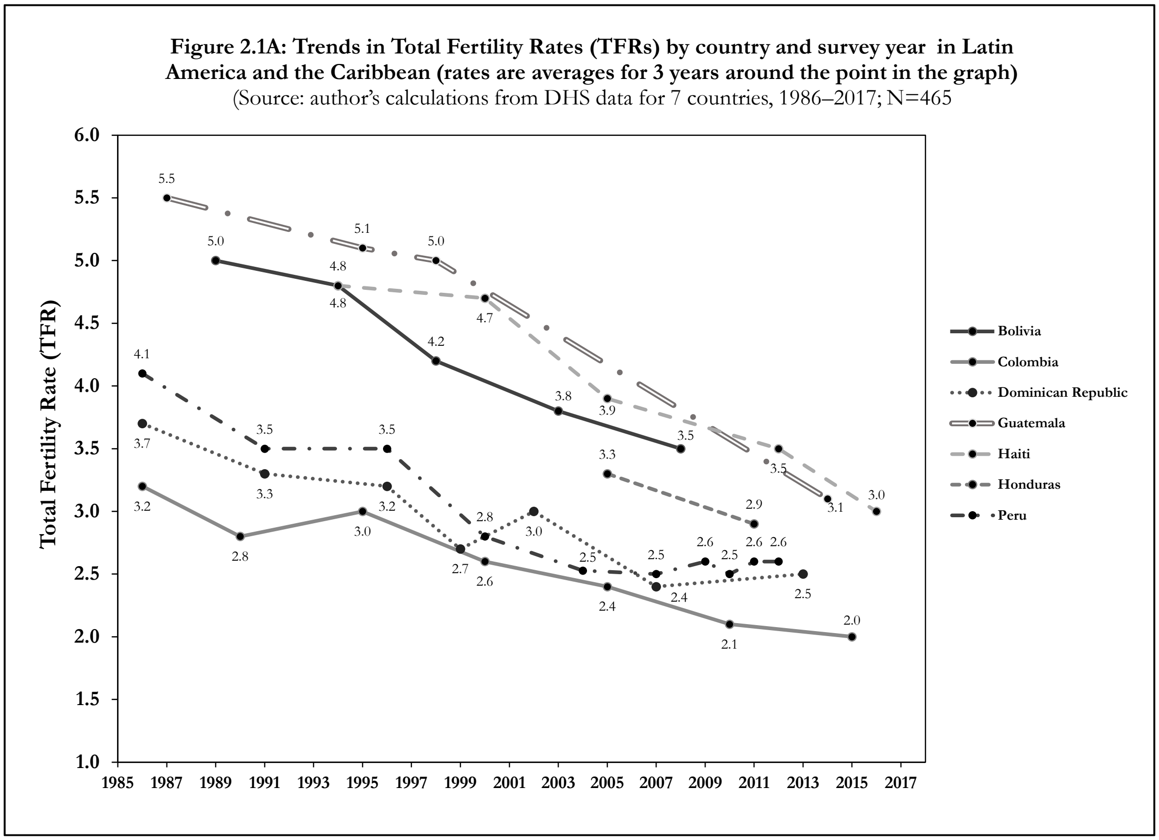
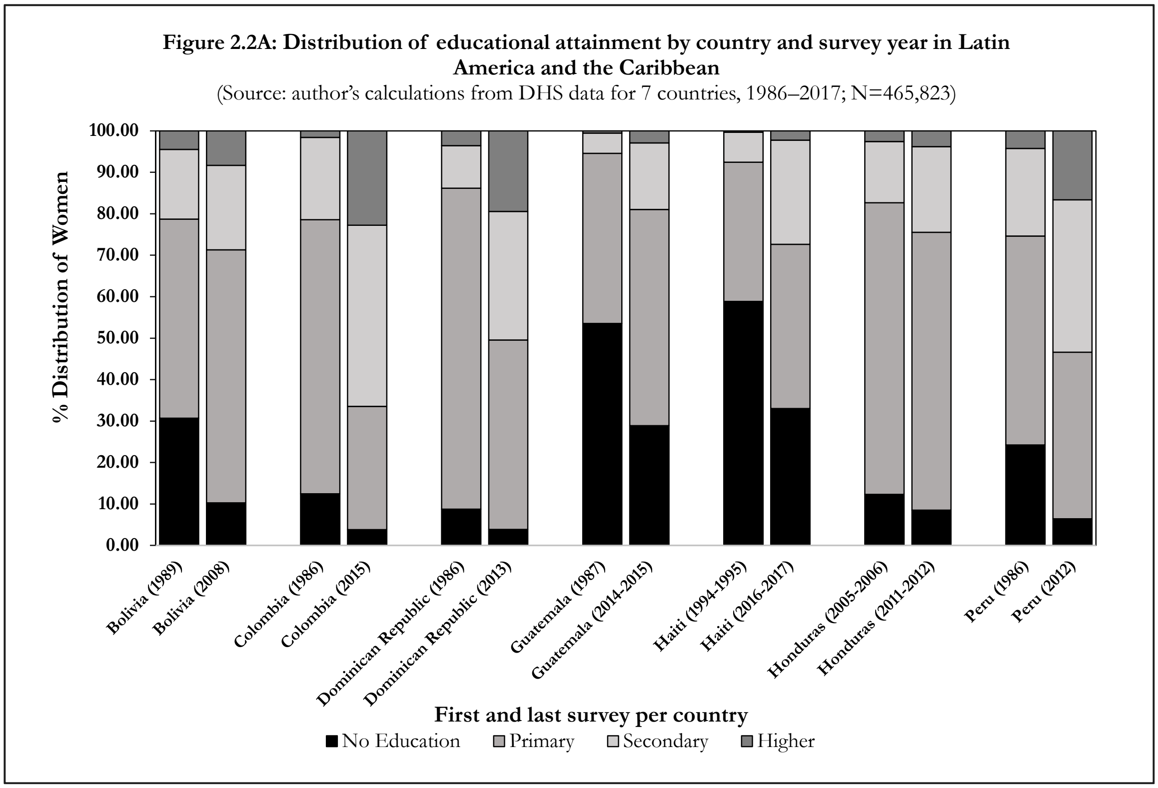


Figure 2.2A: Distribution of educational attainment by country and survey year in Latin America and the Caribbean



CHAPTER THREE: RURAL-URBAN DIFFERENCES IN UNINTENDED PREGNANCIES, CONTRACEPTIVE NONUSE, AND TERMINATED PREGNANCIES IN LATIN AMERICA AND THE CARIBBEAN[29]

Abstract

Using Demographic and Health Survey (DHS) data (1986–2017) for Bolivia, Colombia, the Dominican Republic, Guatemala, Haiti, Honduras, and Peru, this chapter presents analysis of rural-urban disparities in sexual and reproductive health in Latin America and the Caribbean. To evaluate rural-urban disparities in unintended pregnancies (N(level-1) = 296,239; N(level-2) = 6,169), contraceptive nonuse (N(level-1) = 660,410; N(level-2) = 6,262), and terminated pregnancies (N(level-1) = 660,269; N(level-2) = 6,262), I conduct descriptive, relative risk, and multilevel analyses. I control for a series of geographic, socioeconomic, individual, and reproductive factors to assess the association between rural-urban residence and sexual and reproductive health. Descriptive results and relative risk analyses indicate significant rural-urban differences for sample characteristics, sexual and reproductive health outcomes, contraceptive methods, and types of terminations. Multilevel analyses suggest that rural respondents have higher risk of contraceptive nonuse, although this is reduced with household wealth. On the other hand, urban respondents have higher risk of unintended pregnancies and terminated pregnancies. My findings imply that policy efforts to improve sexual and reproductive health in Latin America and the Caribbean, should take into account rural-urban differences, since place of residence plays a role in the risk of these outcomes. In addition, this should be accompanied

[29] A modified version of this chapter is forthcoming in *Women's Reproductive Health* in 2022. The reference for this publication is as follows:
Mena-Meléndez, Lucrecia. 2022. "Rural–Urban Differences in Unintended Pregnancies, Contraceptive Nonuse, and Terminated Pregnancies in Latin America and the Caribbean." *Women's Reproductive Health* 9(2), forthcoming.

by consideration of individual and household characteristics, since rural-urban differences in sexual and reproductive health are at least partly explained by differences in the levels of these proximal factors. These findings suggest the need for programs that target the urban poor, especially as this population continues to rapidly grow in developing countries.

Introduction

Between 2010–2014, unintended pregnancies accounted for 44% of pregnancies around the world, with a rate of 62 unintended pregnancies per 1,000 women aged 15–44 (Bearak et al. 2018). While unintended pregnancies have generally decreased worldwide (–17%) in the past three decades, including developing regions like Africa (–17%) and Asia (–20%), the region of Latin America and the Caribbean has experienced the smallest decrease (–7%) (Bearak et al. 2018). Between 2010–2014, this region had the highest rate of unintended pregnancies of any world region—96 per 1,000 women aged 15–44 (Bearak et al. 2018). According to established definitions, *intended* pregnancies are defined as those that are conceived when a baby is desired; whereas, *unintended* pregnancies include both those that are *unwanted* (e.g., a baby is not wanted at any time) and those that are *mistimed* (e.g., a baby is wanted eventually, but not until a later time). Both mistimed and intended pregnancies are considered *wanted* (Kaufmann, Morris, and Spitz 1997).

Previous research has documented that unintended pregnancies are associated with adverse health outcomes (Zuehlke 2009). While some unintended pregnancies may eventually become wanted, many do not, and may result in undesired consequences for both mothers and children. In the developing world, unintended pregnancies are associated with subsequent maternal morbidity, unsafe abortions, maternal mortality, inadequate or delayed initiation of pre-natal care, malnutrition, smoking and drinking during pregnancy, vertical transmission of HIV to children, premature birth, lack of breast-feeding, and mental illness for both mothers and children (Bearak et al. 2018; Claridge and Chaviano 2013; Finer and Zolna 2011; Messer et al. 2005; Prada, Biddlecom, and Singh 2011; Shah et al. 2011; World Health Organization 2019). With an estimated 88 million unintended pregnancies per year in developing countries (Bearak et al. 2018), eliminating the occurrence of unintended pregnancies could prevent approximately one-fourth of all maternal deaths (Upadhyay and Robey 1999).

Unintended pregnancies occur as a result of ineffective, inconsistent, incorrect, or nonuse, as well as, unmet need of family planning methods (Centers for Disease Control and Prevention 2015). The mechanisms through which this occurs is through poor knowledge and misconceptions of contraceptive use (Williamson et al. 2009), contraceptive failure (Darroch and Singh 2013), shortage in contraceptive supplies (Darroch 2013), coerced contraceptive decision-making (Miller et al. 2010), inconsistent and incorrect condom use (Christofides et al. 2014), and lack of knowledge of emergency contraception (Aziken, Okonta, and Ande 2003; Myer et al. 2007). If used effectively, consistently, and correctly, family planning methods may decrease unintended pregnancies by helping space pregnancies, delay pregnancies in young girls with higher health risks due to early childbearing, prevent pregnancies among older women with higher health risks due to late childbearing, and give women more choices and control over their education, employment, and community involvement (Upadhyay and Robey 1999; World Health Organization 2019).

A major consequence of unintended pregnancies are pregnancy terminations, which if induced are associated with adverse maternal and child health outcomes (Atrash and Rowland Hogue 1990). In many developing countries, women do not have access to safely performed terminations, as a result of lack of medical care, as well as, legal restrictions placed upon the procedure. With an annual rate of 44 abortions per 1,000 women aged 15–44, Latin America and the Caribbean has the highest abortion rate worldwide (Singh et al. 2018) even though more than 97% of reproductive-aged women live in countries with restrictive abortion laws (Guttmacher Institute 2018).[30] Thus, most women have to rely on clandestine abortions, which are frequently unsafe (e.g., incomplete abortion, uterine perforation, excessive hemorrhage, peritonitis, septic or hemorrhagic shock, traumatic or chemical lesion, and toxic reactions to products ingested or placed in the genitals).[31] In 2014, unsafe abortions were responsible for at least 10% of all maternal deaths in the region (Guttmacher Institute 2018). In addition, unsafe abortions have medium and long-term health (e.g., upper genital tract infections, complications for sexual life, chronic pelvic pain, infertility, and ectopic pregnancies) and social consequences (e.g., family disruption and different forms of ostracism) for women and families (Guttmacher Institute 2018; Hatt and Waters 2006; Singh et al. 2018).

Rural-Urban Disparities in Sexual and Reproductive Health

Sexual and reproductive outcomes vary significantly across rural-urban areas and across world regions. Research suggests, that on average, urban women have better sexual and reproductive health outcomes than rural women (Lurie et al. 2008; Mberu et al. 2014). The assumption is that living in urban areas changes the financial and opportunity costs of childbearing, expands expectations for higher education, provides opportunities for socioeconomic mobility, improves and expands the delivery of

[30] In Latin America and the Caribbean, abortion is not permitted for any reason in six countries (Dominican Republic, El Salvador, Haiti, Honduras, Nicaragua, Suriname), allowed almost exclusively to save the woman's life in nine countries (Antigua and Barbuda, Brazil, Chile, Dominica, Guatemala, Mexico, Panama, Paraguay, Venezuela), and offered in limited exceptional cases for rape (Brazil, Chile, Mexico, Panama) and grave fetal anomaly (Chile, Panama, almost half of the states of Mexico). For more information on the state of abortions in Latin America and the Caribbean, see research by the Guttmacher Institute (2018).

[31] For more research on unsafe and clandestine abortions in Latin America and the Caribbean, see Paxman et al. (1993), Strickler et al. (2001), and Palma et al. (2006).

modern family planning methods, and transforms sociocultural expectations for childbearing, reproductive health, and family dynamics, which contribute to the observed rural-urban disparities in sexual and reproductive health (Lerch 2019b; Mmari and Astone 2014). However, rural-urban comparisons alone, which often rely on mean levels of outcomes of interest, ignore variations in other characteristics (Van de Poel, O'Donnell, and Van Doorslaer 2007).

The disparity observed may derive from differences in other geographic (e.g., country, rural-urban residence), socioeconomic (e.g., household wealth, years of education, occupation), and individual and reproductive (e.g., age, union status, age at-first-birth, living children, birth parity, birth interval) characteristics. In addition, sexual and reproductive health outcomes vary across developing regions, although limited empirical research has assessed rural-urban differences in sexual and reproductive outcomes in Latin America and the Caribbean. Despite policy-makers' and researchers' focus on rural disadvantages (mostly in Africa and Asia), assessing the role of proximal determinants to rural-urban differences in Latin America and the Caribbean could shed light on more effective and efficient resource allocation for sexual and reproductive programs.

Case Study Context

The region of Latin America and the Caribbean is a good empirical case to measure and explain rural-urban disparities in sexual and reproductive health because countries in this region share close geographic proximity, as well as centuries of ethnolinguistic, geopolitical, and historically communal legacies (Beals 1953; Inglehart and Carballo 1997). Shared similarities, particularly regarding women's status (Kishor and Neitzel 1996), social organization and stratification (Beals 1953), and cultural environment (Inglehart and Carballo 1997), allow for fairer cross-national and cross-regional comparisons. With an estimated population of 652 million people,[32] most descend from three major ethnoracial groups: indigenous (40 million), direct descendants of peoples inhabiting this region when European colonizers arrived in the 15th century; afro-descendent (120 million), direct descendants of African slaves forcibly brought to the region during and after the colonial period; and Europeans, direct descendants of largely Spanish and Portuguese immigrants (Perreira and Telles 2014; Ribando 2005).

The region of Latin America and the Caribbean has also experienced accelerated urbanization since the 1950s—qualified as an "urban explosion"—which has been driven primarily by state-led industrialization impulses as well as internal migration from rural to urban areas (da Cunha and Rodríguez Vignoli 2009).[33] Over the past decades, this rural-urban shift has resulted in an increase in the number of cities, the concentration of two–thirds of wealth in cities, and the increase of migration between cities, growth of secondary cities, and the emergence of mega-regions and urban corridors. All of these processes, have culminated in approximately 80% of the population now living in urban areas, which makes Latin America and the Caribbean the most urbanized region in the developing world (UN-Habitat 2012). Decades of these processes have led inevitably to huge transformations in the spatial reallocation of the population, which has attracted individuals with specific socioeconomic, educational, ethnoracial, and occupational characteristics. As urbanization continues to increase in this region and throughout the Global South, we must gain a better understanding of rural-urban disparities to predict future demographic trends and develop adequate population policies.

[32] The total population size including only 20 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela) is of approximately 647 million. The total population size including multiple smaller countries in the Caribbean is of 652 million (Economic Commission for Latin America and the Caribbean 2019).

[33] The number of cities in Latin America and the Caribbean has increased six-fold in the past fifty years—from 320 to 2,000 cities with at least 20,000 inhabitants. Approximately half the urban population now lives in cities with fewer than 500,000 inhabitants, but also approximately 14 percent lives in megacities of 10 million inhabitants (UN-Habitat 2012).

To address the aforementioned research gaps, this analysis uses Demographic and Health Surveys (DHS) data (1986–2017) for seven countries (Bolivia, Colombia, the Dominican Republic, Guatemala, Haiti, Honduras, and Peru) in Latin America and the Caribbean. This analysis provides an empirical assessment of rural-urban disparities in sexual and reproductive health in Latin America and the Caribbean and uses the most recent data. I hypothesize that sexual and reproductive health will vary across rural-urban areas, with rural areas experiencing higher prevalence of negative sexual and reproductive health compared to urban areas. In addition, I hypothesize that this relationship will be moderated by certain proximate factors across rural-urban areas: geographic, socioeconomic, individual, and reproductive. To test this, first, I present percentage distributions for pregnancy intentions, contraceptive methods, and pregnancy terminations by rural-urban place of residence. Second, I provide percentage distributions of modern and folk contraceptive methods, as well as, type of pregnancy terminations by rural-urban place of residence. Third, I present relative risks of unintended pregnancies, contraceptive nonuse, and pregnancy terminations by rural-urban place of residence. Finally, I conduct multilevel logistic models predicting unintended pregnancies (N(level-1) = 296,239; N(level-2) = 6,169), contraceptive nonuse (N(level-1) = 660,410; N(level-2) = 6,262), and terminated pregnancies (N(level-1) = 660,269; N(level-2) = 6,262) for these countries in Latin America and the Caribbean.

Data and Methods

Data

This analysis uses pooled cross-sectional data for seven countries (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru) in Latin America and the Caribbean that participated in multiple rounds of the Demographic and Health Surveys (DHS) between 1986 and 2017.[34] DHS is a publicly-available, nationally-representative survey of women collected by ICF International in collaboration with host country governments (ICF International 2012).[35] The standardized DHS questionnaires, across developing countries, and across multiple waves, allow for easy comparisons for a wide range of indicators in the areas of population, sexual and reproductive health, and female empowerment. DHS uses a stratified cluster-sampling design to randomly select women ages 15–49 within clusters and households (Croft et al. 2018). To account for sample selection probabilities of each household, and the response rates for households and individuals. I adjust for sample cases with sampling weights. This allows me to correct for homogeneity due to the non-simple random sample (i.e., nonindependence) and under- or over-sampling of different strata during sample selection (i.e., unequal selection probabilities) (Hahs-Vaughn et al. 2011). As a result, I can confidently estimate standard errors and unbiased parameter estimates, as well as, present population-based estimates that account for differential probability of selection into the survey (Hahs-Vaughn et al. 2011).

I considered only these seven countries (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru) because they have at least two DHS survey waves as well as data on sexual and reproductive health, allowing for a comprehensive empirical analysis. One of the primary advantages of pooling datasets together is the advantage of larger sample sizes, which one the hand, increases the statistical power for the analysis, and on the other hand, decreases the likelihood of a type II error—

[34] Since 1984, The Demographic and Health Surveys (DHS) Program has provided technical assistance to more than 400 surveys in over 90 countries, advancing global understanding of health and population trends in developing countries. Surveys for Latin America and the Caribbean are publicly available through their website: https://dhsprogram.com/

[35] ICF International, Inc. is a Fairfax, Virginia-based global advisory and digital services provider, which provides a range of services for governments and businesses, including strategic planning, management, marketing and analytics. It was founded in 1969 as Inner City Fund and renamed to ICF Incorporated in 1972. Since 1984, ICF International, Inc. has worked with the United States Agency for International Development (USAID) to implement the Demographic and Health Surveys (DHS) Program across the world.

failing to detect a statistically significant association when it truly exists (Hatt and Waters 2006). Pooling datasets, thus, may decrease the noise from interviewer error, poorly worded questions, local disruptions, data entry mistakes, and sampling variability. The DHS waves I included were the following: Bolivia (1989, 1994, 1998, 2003, and 2008), Colombia (1986, 1990, 1995, 2000, 2005, 2010, and 2015), Dominican Republic (1986, 1991, 1996, 1999, 2002, 2007, and 2013), Guatemala (1987, 1995, 1998–1999, and 2014–2015), Haiti (1994–1995, 2000, 2005–2006, 2012, and 2016–2017), Honduras (2005–2006 and 2011–2012), and Peru (1986, 1991–1992, 1996, 2000, 2004–2006, 2007–2008, 2009, 2010, 2011, and 2012). For some outcomes, not all women in the combined data sets have available data, so the number of women included in each analysis is different for each outcome. My analysis, thus, includes separate samples for unintended pregnancies (N(level-1) = 296,239; N(level-2) = 6,169), contraceptive nonuse (N(level-1) = 660,410; N(level-2) = 6,262), and terminated pregnancies (N(level-1) = 660,269; N(level-2) = 6,262). All results are weighted to account for under- and over-sampling as per DHS design.

Measurements

Outcome Variables

In this study, the sexual and reproductive health outcomes of interest are: unintended pregnancies, contraceptive nonuse, and terminated pregnancies. First, pregnancy intention measures whether a woman wanted/wants their previous and/or current pregnancy or did/does not. According to the established definition, an unintended pregnancy represents a pregnancy that is either wanted earlier or later than occurred (mistimed) or not wanted at any time (unwanted) (Centers for Disease Control and Prevention 2015). In the survey, the possible responses to this question were: "then," "later," and "not at all," which I coded into a dichotomous outcome variable according to this established definition. In response to pregnancy intentions, responses as "later, not at all" were coded as 'unintended' and in this analysis coded as one (1). On the other hand, responses as "then" were coded as 'intended' and in this analysis coded as zero (0).

Second, contraceptive use measures whether a woman is currently using a contraceptive method or not. In the survey, the possible answers to this question were: "using modern method," "using traditional method," "non-user intends to," and "non-user does not intend to", which I coded into a dichotomous outcome variable. In response to contraceptive use, responses as "using modern method, using traditional method" were coded as 'using contraceptive method' and in this analysis coded as one (1). Modern contraceptive methods included: the pill, IUD, injection, diaphragm, Norplant™ or implants, condom, female condom, foam and jelly, female sterilization, male sterilization, other contraceptive methods, and country-specific contraceptive methods. Traditional or folk contraceptive methods included: lactational amenorrhea, periodic abstinence (rhythm), and withdrawal. On the other hand, responses as "non-user intends to, non-user does not intend to" were coded as 'not using contraceptive method' and in this analysis coded as zero (0).

Third, terminated pregnancies measure whether a woman has ever had a spontaneous termination (e.g., miscarriage, still-birth, extrauterine pregnancy, fetal intrauterine death, other termination) or an induced termination (e.g., abortion). In the survey, the possible responses to this question were: "yes" and "no." In response to terminated pregnancies, responses as "yes, have had a pregnancy terminate in an abortion, miscarriage, still-birth, or other" were coded as "yes, have had a terminated pregnancy" and in this analysis coded as one (1). On the other hand, responses as "never had a pregnancy terminate in an abortion, miscarriage, still-birth, or other" and in this analysis coded as zero (0). I constructed these dichotomous outcomes with respect to definitions in the literature and used multiple variables that in the surveys were originally continuous and/or categorical. I relied on dichotomization because it has been identified as an optimal specification for a variables' strongest effects (Koenig et al. 1990; Palloni et al. 2009), it simplifies the presentation of results and produces meaningful findings for a wide audience (Farrington and Loeber 2000), and it is the measurement of choice in the study of medical outcomes with distinct clinical significance (Guo and Zhao 2000; Ragland 1992). I also created dichotomous variables that broke down all terminations into spontaneous terminations (e.g., miscarriage, still-birth, extrauterine pregnancy, fetal intrauterine death, other termination) and induced terminations (e.g., abortion) and ran additional analysis presented in **Table 3.2A** in the Appendix.

Independent Variables

I controlled for a series of geographic, socioeconomic, individual, and reproductive factors of the association between rural-urban residence and sexual and reproductive health outcomes. To control for differences in temporal, living, and environmental conditions, I included a categorical variable for survey year (1986–2017), a dummy variable for type of residence (rural and urban) and an interaction for type of residence (rural and urban) and household wealth (poorest, poorer, middle, richer, and richest). To control for socioeconomic factors, I included a categorical variable for household wealth (poorest, poorer, middle, richer, and richest), an interval scale for years of education (0 years, 1–3 years, 4–6 years, 7–9 years, and 10+ years), and a categorical variable for respondent's occupation (not working, managerial, clerical, sales, agricultural, domestic and other services, and manual labor).[36] To

[36] Household wealth is collected by DHS and represents a composite measure of a household's cumulative living standard. It is generated using principal components analysis and places individual households on a continuous scale of relative wealth. DHS separates all interviewed households into five wealth quintiles to compare the influence of wealth on various population, health and nutrition indicators (Rutstein and Johnson 2004).

control for individual and reproductive factors, I included categorical measures for women's age (15–19 years, 20–24 years, 25–34 years, and 35–49 years), union status (never married, married or living together, and widowed, divorced, or not living together), age at-first-birth (8–14 years, 15–19 years, 20–34 years, and 35+ years), number of living children (0, 1–2, 3–4, and 5+), birth parity (first, second or third, and fourth or higher), and birth interval (>2 years, 2–4 years, and 4+ years).

Analysis

To assess the direction, strength, and significance of the association between rural-urban residence and sexual and reproductive health outcomes, I used a two–level multilevel logistic approach, whereby individual woman units (level-1) are nested within survey cluster units (level-2), with respect to the hierarchical design of DHS data (Croft et al. 2018).[37] My multilevel logistic models included a random intercept at the cluster-level—to capture heterogeneity among clusters—and fixed effects for all other individual-level coefficients. Compared with single-level regression analysis that assumes that all individuals are independent, this methodology accounts for the fact that individuals in the same cluster may have similar characteristics. Thus, it provides conceptual and methodological advantages: first, by estimating variance in the outcome variables due to unobserved cluster factors; and second, by partitioning the unexplained residual variance into cluster-level and individual-level variance (Bell and Jones 2015; Bingenheimer and Raudenbush 2004). More technically, multilevel models correct for clustering biases in parameter estimates, standard errors, confidence intervals, and significance tests,

[37] DHS surveys typically employ two-stage sampling design from an existing sample frame, generally the most recent census frame. In the first stage of selection, the primary sampling units (PSUs) are selected with probability proportional to size (PPS) within each stratum. The PSUs are typically census enumeration areas (EAS) and form the survey cluster. In the second stage, a complete household listing is conducted in each of the selected clusters. Following the listing of the households a fixed number of households is selected by equal probability systematic sampling in the selected cluster. A household respondent is interviewed first to obtain a household roster and information about the household as a unit. Eligible women and (usually) men are then interviewed. This design results in a multilevel dataset, with households, women, or men at level-1 and PSUs at level-2 (Elkasabi et al. 2020).

and also estimate robust variance and covariance of random effects (Bell et al. 2019; Guo and Zhao 2000; Maas and Hox 2005). I chose a logistic approach because my dependent variables are all dichotomous. The models are as follows:

$$\mathbf{log}\left[\frac{\mathbf{P_{ij}}}{\mathbf{1-P_{ij}}}\right] = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{X_{ij}} + \cdots + \boldsymbol{\beta_k}\mathbf{X_k} + \boldsymbol{u_j} + \mathbf{e_{ij}}, \qquad \textbf{Eq. (1)}$$

where i is the level-1 (individual) unit and j is the level-2 (cluster) unit; $P_{ij}/(1-P_{ij})$ is the probability of the binary sexual and reproductive health outcome Y_{ij} (1) unintended pregnancy, (2) contraceptive nonuse, (3) terminated pregnancy, for woman i in cluster j; I define the probability of the response equal to one as $P_{ij} = Pr\,(Y_{ij} = 1)$ and let P_{ij} be modeled using a logit link function; β is the corresponding fixed coefficient and X_{ij} is an explanatory variable for woman i in cluster j; u_j is the random effect at cluster j, which allows for differential intercepts for cluster-level observations; and the error term, e_{ij}, is the individual-level residual for individual i of cluster j, which represents unmeasured individual random factors. Thus, this equation expresses the log of the odds of experiencing an unintended pregnancy, contraceptive nonuse, and a terminated pregnancy, as a linear function of the set of explanatory variables previously mentioned.

Results

Sample Characteristics

Table 3.1 provides descriptive statistics of sample characteristics by rural-urban place of residence. Overall, descriptive results indicate significant differences by rural-urban place of residence. For pregnancy intentions, approximately 54% of respondents lived in rural areas and 46% of respondents lived in urban areas. The majority of women in this sample live in Peru (30%), followed by Colombia (16%), and Bolivia (13%). Compared to urban women, the majority of rural women reported the poorest levels of wealth (54% vs. 7%); a minority of rural women reported the richest levels of wealth (1% vs. 17%). Compared to urban women, more rural women reported having zero years of education (25% vs. 7%) and fewer reported having 10+ years of education (7% vs. 38%). Rural women were employed primarily in agriculture (34%), sales (15%), domestic and other services (8%), or were unemployed (36%). Urban women were employed primarily in sales (25%), domestic and other services (21%), or were unemployed (32%). Women's age, union status, and age at-first-birth, were fairly similar across rural-urban areas; most women were 25–35 and 35–49 years old, married or living together, and had given birth for the first time before age 19. Compared to urban women, more rural women had five and more living children (55% vs. 28%), had four or more pregnancies that resulted in a birth (45% vs. 26%), and waited 2–4 years between births. The same descriptive patterns were observed for the other two outcomes: contraceptive use and pregnancy terminations.

Descriptive Summary of Sexual and Reproductive Health Outcomes by Rural-Urban Residence

Figure 3.1 provides percentage distributions for unintended pregnancies, contraceptive nonuse, and terminated pregnancies for women aged 15–49 by rural-urban place of residence. Results indicate differences in the distribution of these outcomes by rural-urban residence. Women in rural areas reported a slightly higher percentage of unintended pregnancies (66%) compared to women in urban areas (61%). In addition, women in rural areas reported higher contraceptive nonuse (40%) compared to women in urban areas (28%). Finally, women in rural areas reported a lower rate of terminated pregnancies (22%) compared to women in urban areas (28%). Detailed results, including a more comprehensive breakdown of these distributions across rural-urban areas are presented in **Table 3.1A** in the Appendix.

Contraceptive Use

We observe rural-urban discrepancies in contraceptive use and type of contraceptive methods used, presented as percentage distributions for women aged 15–49 in **Table 3.2**. Across the whole sample, the most commonly used modern contraceptive methods were: female sterilization (30%), injection (10%), the pill (5%), condoms (4%), and IUDs (3%). Approximately 46% of women in rural areas reported using a modern method, as compared to 61% of women in urban areas. There were fewer rural-urban discrepancies in the type of modern method used. That is, rural and urban women who reported using a modern method relied on very similar methods, regardless of rural-urban residence. Across rural-urban residence, the most common modern methods were female sterilization (22% vs. 37%), injections (13% vs. 7%), and the pill (5% vs. 5%). As expected, there were rural-urban discrepancies in traditional or folk contraceptive method use; approximately 14% of women in rural areas reported using a traditional or folk method as compared to 10% of women in urban areas. The most commonly used traditional or folk contraceptive methods were: periodic abstinence (8%), withdrawal (4%), and lactational amenorrhea (<1%). Results for the entire sample are also presented visually in **Figure 3.1A** in the Appendix.

Pregnancy Terminations

Figures 3.2-3.4 provide a breakdown for all, rural, and urban women aged 15–49 by type of pregnancy termination. Overall, a smaller percentage of women in rural areas reported experiencing a termination compared to urban women (32% vs. 38%). Among all women, the most common types of terminations were miscarriages (20%), other terminations (5%), abortions (5%), fetal intrauterine deaths (4%), and extrauterine pregnancies (<1%). The distribution of the types of terminations is similar across place of residence, with just slight variations in the most common terminations in each area. Compared to urban women, rural women reported a slightly higher percentage of fetal intrauterine deaths (5% vs. 4%); compared to rural women, urban women reported higher percentages of miscarriages (21% vs. 19%), abortions (5% vs. 4%), extrauterine pregnancies (1% vs. <1%), and other forms of termination (7% vs. 4%).

Multilevel Analysis of Sexual and Reproductive Health Outcomes by Rural-Urban Residence

Figure 3.5 provides proportions, absolute differences, and relative risks of unintended pregnancies, contraceptive nonuse, and terminated pregnancies for women aged 15–49 by rural-urban place of residence. Results suggest significant differences in the rural-urban rates for the three outcomes with rural women having 1.09 times higher risk of experiencing an unintended pregnancy and 1.40 times higher risk of contraceptive nonuse, but 0.78 times lower risk of experiencing a pregnancy termination compared to urban women. **Table 3.3** presents the results of the multilevel logistic models that predict unintended pregnancies (N(level-1) = 296,239; N(level-2) = 6,169), contraceptive nonuse (N(level-1) = 660,410; N(level-2) = 6,262), and terminated pregnancies (N(level-1) = 660,269; N(level-2) = 6,262) for Bolivia, Colombia, the Dominican Republic, Guatemala, Haiti, Honduras, and Peru, between 1986 and 2017. **Table 3.2A** in the Appendix presents the results of the multilevel logistic model predicting spontaneous terminations (e.g., miscarriage, still-birth, extrauterine pregnancy, fetal intrauterine death, other termination) and induced terminations (e.g., abortion).

Unintended pregnancies

Living in rural areas, as compared to urban areas, is associated with 15% lower odds (1–odds ratio) of experiencing an unintended pregnancy, after controlling for other geographic, socioeconomic, individual, and reproductive factors (p-value<0.05). Reporting more wealth and living in a rural area is even more protective (i.e., more risk-reducing) for unintended pregnancies than reporting less wealth and living in an urban area, but this association does not provide a statistically significant protection on unintended pregnancies in the model (p-value>0.05). In general—and surprisingly—respondents with more education; employed in agriculture and domestic and other services; younger at-first-birth; and with higher birth parity have higher risk of unintended pregnancies. On the other hand, respondents with more wealth; are older; married or living together; and higher birth spacing have lower risk of unintended pregnancies.

Contraceptive nonuse

Living in rural areas, as compared to urban areas, is associated with 8% greater odds (1–odds ratio) of contraceptive nonuse, after controlling for other geographic, socioeconomic, individual, and reproductive factors, but this association is not significant in the model (p-value>0.05). Like the results for unintended pregnancies, reporting more wealth and living in a rural area is more protective (more risk-reducing) for contraceptive nonuse, as compared to reporting less wealth and living in an urban area, but this association does not provide a statistically significant protection on contraceptive nonuse in the model (p-value>0.05). In general, respondents who are younger; had four or more pregnancies that resulted in a birth; and lower birth spacing have higher risk of contraceptive nonuse. On the other hand, respondents with more wealth; with more education; employed in managerial, clerical, sales, agricultural, domestic and other services, and manual labor; older in age; married or living together; and with living children have lower risk of contraceptive nonuse.

Terminated pregnancies

Living in rural areas, as compared to urban areas, is associated with 25% lower odds (1–odds ratio) of experiencing a pregnancy termination, after controlling for other geographic, socioeconomic, individual, and reproductive factors (p-value<0.001). In the case of pregnancy terminations, the interaction of rural residence and wealth does not provide a statistically significant protection on pregnancy terminations in the model (p-value>0.05). In general, respondents with more education; employed in managerial, clerical, sales, domestic and other services, and manual labor; older in age; married or living together; with higher birth parity; and with higher birth spacing have higher risk of experiencing a pregnancy termination due to a miscarriage, abortion, or still-birth. On the other hand, respondents employed in agriculture; and younger at-first-birth have lower risk of experiencing a pregnancy termination due to a miscarriage, abortion, or still-birth.

Discussion and Conclusions

As in previous studies (Ali, Cleland, and Shah 2003; Ameyaw et al. 2019; Callahan and Becker 2014), multiple results from this analysis suggest significant differences in sexual and reproductive health outcomes across rural-urban areas. The risk-ratios suggest that respondents in rural areas have higher risk of unintended pregnancies and contraceptive nonuse, whereas respondents in urban areas have higher risk of pregnancy terminations. After controlling for geographic, socioeconomic, individual, and reproductive factors in the multilevel logistic models, the association of rural-urban residence and these sexual and reproductive health outcomes—unintended pregnancies, contraceptive nonuse, and terminated pregnancies—is surprisingly different than initially hypothesized. Compared to urban women, rural women have lower odds of experiencing an unintended pregnancy and a pregnancy termination.

The results from the present study make three important contributions to the literature. First, they provide an empirical assessment of persistent and pronounced rural-urban disparities in sexual and reproductive health. Whereas previous research has mainly focused on country-level (McNamee 2009; Prada et al. 2011) and/or cross-country effects (Ali and Cleland 2005; Bearak et al. 2018; Blanc et al. 2009; Hindin and O. Fatusi 2009; Singh, Sedgh, and Hussain 2010), I identified and contributed to understanding rural-urban effects. Second, I assessed rural-urban disparities in sexual and reproductive health in the context of Latin America and the Caribbean, a largely understudied developing region with high levels of unintended pregnancies, contraceptive nonuse, and terminated pregnancies, as well as a context of high urbanization. Finally, beyond rural-urban comparisons alone, which often rely on mean levels of outcomes and ignore variations that account for other population characteristics, I was able to quantify the extent to which the rural-urban gap in sexual and reproductive health outcomes is explained by differences in geographic (e.g., country, rural-urban residence), socioeconomic (e.g., household wealth, years of education, occupation), and individual and reproductive (e.g., age, union status, age at-first-birth, living children, birth parity, birth interval) characteristics.

Previous theoretical and empirical research in the Global South has suggested that, on average, urban women have better sexual and reproductive health outcomes than rural women (Lurie et al. 2008; Mberu et al. 2014). However, the results of this study suggest that, conditional upon geographic, socioeconomic, and individual and reproductive characteristics (particularly household wealth, years of education, and occupation), rural women may, in fact, have better sexual and reproductive health outcomes than urban women in Latin America and the Caribbean. Rapid industrialization coupled with high levels of inequality have led to the proliferation and growth of urban slums, which are characterized by overcrowding, social and economic marginalization, poor environmental conditions, insecurity, poverty, and limited basic social services (Mberu et al. 2014). This may explain the reversal of the urban advantage found in the present study: women in urban areas face worse sexual and reproductive health outcomes. Some studies in other developing regions have yielded similar results (Mberu et al. 2014; Mmari and Astone 2014; Van de Poel et al. 2007), which raises the importance of renewing focus on addressing the challenges of sexual and reproductive health faced by the urban poor. As the size of this population grows worldwide, there is an increasing urgency to develop programs that target the specific needs and experiences of poor urban women in the Global South.

The results of this chapter confirm findings from other developing regions (Mberu et al. 2014; Mmari and Astone 2014; Van de Poel et al. 2007), but I need to highlight a few important limitations. First, the analysis relied on self-reported sexual and reproductive health data, so the direction and significance of statistical associations relies on the information that respondents selectively choose to share and/or failed to recall. For example, respondents might have selectively chosen to share and/or failed to recall certain information about current or previous experiences. Questions about pregnancy intentions, accurate contraceptive histories, and terminated pregnancies require respondents to recall details that may have occurred months or years before, which may prove difficult during long interviews. In addition, some details might be too painful to relate to a stranger (e.g., still-birth) or memories may change over time (e.g., an unintended pregnancy might be later recalled as wanted).

Second, my research relied on cross-sectional data, so I am unable to evaluate the causality of rural-urban residence on sexual and reproductive health outcomes and/or the life course effects on women. Third, in an effort to make comparable analytical variables across countries and waves, I collapsed survey and wave–specific categorical responses into standard categories, which may have led to the loss of important information. However, pooling datasets together has the advantage of increasing the statistical power of the analysis as well as decrease the noise from interviewer error, poorly worded questions, local disruptions, data entry mistakes, and sampling variability. Fourth, I am unable to control for country- and period-specific characteristics not collected by DHS and that may explain rural-urban discrepancies in sexual and reproductive health outcomes (e.g., when contraception methods were introduced in each country, respondent's religion and religious beliefs, political affiliations). Fifth, because of limited data, I am not able to separately predict spontaneous terminations (e.g., miscarriage, still-birth, extrauterine pregnancy, fetal intrauterine death, other termination) and induced terminations (e.g., abortion) for all seven countries. Finally, this analysis is limited to seven countries in Latin America and the Caribbean. Although countries in this region share many similarities discussed previously, they also have unique cultures, histories, and trajectories, so these results may not be blindly generalizable to other countries in the region and/or to other countries in other regions in the world.

Drawing on these limitations, more research is needed to fully assess the relationship between rural-urban residence and sexual and reproductive health outcomes in Latin America and the Caribbean as well as other regions in the Global South. To assess generalizability, determine causal mechanisms, and address the life course effects on women, future research needs to rely on additional cross-sectional and longitudinal data. To provide a more comprehensive picture of the unique experiences of diverse sub-groups in rural-urban areas, future research should also look at differences across ethnoracial groups, religion and religious views, political affiliation, and other country-specific factors that I am unable to account for using DHS data. Finally, future research should further deconstruct terminations into spontaneous terminations (e.g., miscarriage, still-birth, extrauterine pregnancy, fetal intrauterine death, other termination) and induced terminations (e.g., abortion) since there could be interesting rural-urban differences that need to be highlighted.

Despite these limitations, my findings suggest that policy efforts to improve sexual and reproductive health in Latin America and the Caribbean should account for rural-urban differences because place of residence plays a role in the risk of these outcomes. In addition, such efforts should also be accompanied by consideration of geographic, socioeconomic, individual, and reproductive characteristics that partly explain rural-urban differences in sexual and reproductive health. As the population of urban areas grows in the Global South, particularly in this region, national governments and their development partners must gain a better understanding of processes of urbanization, the growth of urban slums and non-slums, and the urbanization of poverty to provide services that improve the lives of urban dwellers in the Global South. These findings suggest that governments and their development partners must renew efforts to address the challenges faced by the urban poor. Specifically, the increasing urgency for programs that target the specific needs and experiences of the urban poor, which is becoming more necessary as the size of this population grows in developing countries.

TABLES

Table 3.1: Percentage distribution of women aged 15–49 by selected characteristics and rural-urban residence in Latin America and the Caribbean

Table 3.1: Percentage distribution of women aged 15–49 by selected characteristics and rural-urban residence in Latin America and the Caribbean
(Source: author's calculations of Demographic and Health Surveys data of 7 countries, 1986–2017)

	Pregnancy Intention			Contraceptive Use			Pregnancy Termination		
Characteristic	**Rural**	**Urban**	**All**	**Rural**	**Urban**	**All**	**Rural**	**Urban**	**All**
Geographic factors									
Place of residence (Rural/Urban/All)	53.56	46.44	100.00	45.58	54.42	100.00	45.58	54.42	100.00
Country									
Bolivia	13.05	12.49	12.79	10.61	9.66	10.09	10.61	9.66	10.09
Colombia	11.68	21.20	16.10	14.45	25.41	20.41	14.45	25.42	20.42
Dominican Republic	7.00	14.94	10.69	9.79	16.55	13.47	9.78	16.54	13.46
Guatemala	9.24	4.60	7.08	8.95	4.18	6.36	8.96	4.18	6.36
Haiti	16.08	6.92	11.83	13.53	5.16	8.97	13.53	5.16	8.98
Honduras	14.03	8.90	11.65	13.68	8.18	10.68	13.68	8.18	10.68
Peru	28.93	30.94	29.86	28.98	30.86	30.01	28.99	30.87	30.01
Socioeconomic factors									
Household wealth									
Poorest	54.35	7.33	32.51	47.93	5.44	24.81	47.94	5.44	24.81
Poorer	30.80	20.15	25.86	32.90	17.16	24.33	32.90	17.16	24.33
Middle	10.53	30.15	19.64	13.19	27.86	21.17	13.19	27.86	21.18
Richer	3.23	24.98	13.33	4.50	27.19	16.85	4.50	27.18	16.84
Richest	1.09	17.39	8.66	1.47	22.35	12.84	1.47	22.36	12.84
Years of education									

0 years	25.48	6.94	16.87	24.99	7.30	15.36	24.99	7.30	15.36
1–3 years	28.64	13.17	21.45	29.55	14.36	21.28	29.55	14.36	21.29
4–6 years	30.77	24.57	27.89	30.04	25.19	27.40	30.04	25.20	27.40
7–9 years	8.00	17.75	12.53	8.03	17.52	13.20	8.03	17.51	13.19
10+ years	7.12	37.57	21.26	7.39	35.62	22.76	7.40	35.63	22.76
Occupation									
Not working	36.18	31.67	34.08	32.09	25.19	28.34	32.09	25.19	28.34
Managerial	1.13	6.23	3.49	1.60	7.46	4.79	1.60	7.46	4.79
Clerical	0.44	3.26	1.75	0.56	3.32	2.06	0.56	3.32	2.06
Sales	14.94	24.73	19.49	15.58	26.01	21.25	15.58	26.01	21.25
Agricultural	34.44	3.43	20.04	33.97	3.42	17.34	33.97	3.42	17.34
Domestic and services	8.09	20.90	14.04	10.29	24.32	17.93	10.29	24.32	17.93
Manual	4.78	9.80	7.11	5.90	10.28	8.29	5.90	10.29	8.28
Individual and reproductive factors									
Age									
15–19	0.82	0.77	0.80	0.42	0.29	0.35	0.42	0.29	0.35
20–24	8.08	9.01	8.51	4.24	3.48	3.83	4.25	3.49	3.83
25–34	41.25	49.14	44.91	27.26	26.86	27.04	27.25	26.86	27.04
35–49	49.86	41.07	45.78	68.08	69.37	68.78	68.09	69.37	68.78
Current union status									
Never married	1.13	1.50	1.30	1.02	1.21	1.12	1.02	1.21	1.12
Married or living together	91.95	84.84	88.65	88.36	79.20	83.38	88.36	79.21	83.38
Widowed, divorced, or not living together	6.92	13.66	10.05	10.62	19.59	15.50	10.62	19.58	15.50
Age at-first-birth									
Under 19	64.97	56.76	61.16	64.59	56.51	60.19	64.59	56.50	60.19
20–24	29.20	32.54	30.75	29.66	33.18	31.58	29.66	33.18	31.58
25–34	5.73	10.38	7.89	5.66	10.09	8.07	5.66	10.09	8.07
35–49	0.11	0.32	0.20	0.09	0.23	0.16	0.09	0.23	0.16
Number of living children									
0 children	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.03	0.03
1–2 children	12.16	25.41	18.31	10.92	22.13	17.02	10.92	22.13	17.02
3–4 children	32.73	46.25	39.01	34.30	48.86	42.22	34.29	48.86	42.22
≥5 children	55.07	28.30	42.64	54.75	28.98	40.73	54.75	28.98	40.73
Birth parity									
Second or third	55.11	73.72	63.75	54.62	72.29	64.23	54.62	72.29	64.23

Fourth or higher	44.89	26.28	36.25	45.38	27.71	35.77	45.38	27.71	35.77
Birth interval									
>2 years	29.35	23.76	26.76	32.02	28.41	30.05	32.01	28.41	30.05
2–4 years	48.92	38.51	44.09	47.80	38.67	42.83	47.80	38.67	42.83
4+ years	21.73	37.72	29.16	20.19	32.92	27.12	20.19	32.92	27.12
N(level-1)	**174,974**	**121,265**	**296,239**	**342,058**	**318,352**	**660,410**	**341,985**	**318,284**	**660,269**

Table 3.2: Percentage distribution of women aged 15–49 by contraceptive use and contraceptive method and rural-urban residence in Latin America and the Caribbean

Table 3.2: Percentage distribution of women aged 15–49 by contraceptive use and contraceptive method and rural-urban residence in Latin America and the Caribbean
(Source: author's calculations of Demographic and Health Surveys data on 7 countries, 1986–2017)

Characteristic	Rural	Urban	All
Not using any contraceptive method	**39.87**	**28.38**	**33.62**
Using any contraceptive method	**60.12**	**71.62**	**66.37**
Any modern method	**45.91**	**61.21**	**54.23**
Pill	4.51	5.33	4.96
IUD	2.05	4.44	3.35
Injection	12.54	7.42	9.75
Diaphragm	(na)	0.00	0.00
Norplant™ or implants	0.71	0.50	0.60
Condom	2.22	4.85	3.65
Female condom	0.00	0.00	0.00
Foam and jelly	0.03	0.17	0.10
Female sterilization	22.38	36.89	30.27
Male sterilization	0.27	0.94	0.63
Other methods	0.95	0.47	0.69
Country-specific	0.25	0.20	0.23
Any traditional or folk method	**14.21**	**10.41**	**12.14**
Lactational amenorrhea	0.55	0.29	0.41
Periodic abstinence (rhythm)	9.19	6.65	7.81
Withdrawal	4.47	3.47	3.92
N(level-1)	**342,058**	**318,352**	**660,410**

Table 3.3: Results of multilevel logistic models for the odds of unintended pregnancies, contraceptive nonuse, and terminated pregnancies in Latin America and the Caribbean

Table 3.3: Results of multilevel logistic models for the odds of unintended pregnancies, contraceptive nonuse, and terminated pregnancies in Latin America and the Caribbean
(Source: author's calculations of Demographic and Health Surveys data of 7 countries, 1986–2017)

	Unintended Pregnancy					Contraceptive Nonuse					Terminated Pregnancies				
Variables	Coefficient (Odds Ratio)		95% C.I. Low	95% C.I. High	S.E.	Coefficient (Odds Ratio)		95% C.I. Low	95% C.I. High	S.E.	Coefficient (Odds Ratio)		95% C.I. Low	95% C.I. High	S.E.
Year	0.99		0.99	1.00	0.00	**0.97**	***	0.97	0.98	0.00	**1.01**	*	1.00	1.01	0.00
Geographic factors															
Country (ref.=Bolivia)															
Colombia	**0.64**	***	0.56	0.72	0.04	**0.21**	***	0.19	0.23	0.01	1.05		0.96	1.14	0.05
Dominican Republic	**0.42**	***	0.37	0.49	0.03	**0.19**	***	0.17	0.21	0.01	**1.24**	***	1.13	1.37	0.06
Guatemala	**0.27**	***	0.23	0.32	0.02	**0.72**	***	0.64	0.81	0.04	**0.70**	***	0.62	0.79	0.04
Haiti	**0.55**	***	0.48	0.65	0.04	**2.39**	***	2.14	2.68	0.14	**0.76**	***	0.68	0.85	0.04
Honduras	**0.39**	***	0.35	0.45	0.03	**0.39**	***	0.35	0.43	0.02	0.96		0.88	1.06	0.05
Peru	**0.81**	***	0.71	0.91	0.05	**0.52**	***	0.48	0.57	0.02	**0.83**	***	0.76	0.90	0.04
Place of residence (ref.=Urban)															
Rural	**0.85**	*	0.74	0.99	0.06	1.08		0.95	1.22	0.07	**0.75**	***	0.67	0.84	0.05
Rural x Household wealth (ref.=Urban x Poorest)															
Rural x poorer	1.01		0.84	1.21	0.09	0.88		0.77	1.02	0.06	1.12		0.98	1.27	0.07
Rural x middle	0.91		0.76	1.08	0.08	0.90		0.78	1.04	0.07	1.09		0.94	1.27	0.08
Rural x richer	0.99		0.80	1.24	0.11	0.96		0.81	1.14	0.08	1.04		0.88	1.24	0.09
Rural x richest	1.31		0.96	1.80	0.21	0.96		0.77	1.20	0.11	1.03		0.83	1.27	0.11
Socioeconomic factors															
Household wealth (ref.=Poorest)															
Poorer	1.04		0.89	1.23	0.09	**0.81**	***	0.71	0.92	0.05	0.91		0.81	1.03	0.05
Middle	1.05		0.90	1.22	0.08	**0.71**	***	0.62	0.80	0.05	0.93		0.83	1.05	0.06
Richer	0.89		0.76	1.04	0.07	**0.66**	***	0.58	0.74	0.04	0.97		0.86	1.10	0.06
Richest	**0.73**	***	0.61	0.87	0.06	**0.67**	***	0.59	0.76	0.04	0.99		0.87	1.13	0.07
Years of education (ref.=0 years)															
1–3 years	**1.11**	*	1.02	1.21	0.05	**0.74**	***	0.70	0.78	0.02	1.03		0.96	1.10	0.03
4–6 years	**1.17**	***	1.08	1.28	0.05	**0.63**	***	0.60	0.67	0.02	1.00		0.94	1.06	0.03

7–9 years	**1.17**	***	1.05	1.30	0.06	**0.57**	***	0.53	0.62	0.02	**1.13**	***	1.05	1.22	0.04
10+ years	**1.23**	***	1.11	1.38	0.07	**0.50**	***	0.46	0.54	0.02	**1.10**	**	1.02	1.19	0.04
Occupation (ref.=Not working)															
Managerial	0.93		0.82	1.05	0.06	**0.78**	***	0.71	0.86	0.04	**1.17**	***	1.07	1.28	0.05
Clerical	1.15		0.96	1.36	0.10	**0.73**	***	0.64	0.83	0.05	**1.15**	**	1.03	1.28	0.06
Sales	1.05		0.97	1.13	0.04	**0.92**	***	0.87	0.97	0.02	**1.15**	***	1.09	1.21	0.03
Agricultural	**1.31**	***	1.21	1.42	0.05	**0.89**	***	0.84	0.95	0.03	**0.91**	***	0.85	0.96	0.03
Domestic and services	**1.19**	***	1.09	1.30	0.05	**0.82**	***	0.78	0.88	0.03	**1.15**	***	1.09	1.22	0.03
Manual	1.10		0.98	1.23	0.06	**0.79**	***	0.74	0.85	0.03	**1.09**	*	1.01	1.17	0.04
Individual and reproductive factors															
Age (ref.=15–19 years)															
20–24 years	**0.63**	***	0.53	0.74	0.05	**0.78**	***	0.67	0.92	0.06	**1.89**	***	1.42	2.51	0.27
25–34 years	**0.35**	***	0.29	0.41	0.03	**0.52**	***	0.45	0.60	0.04	**2.85**	***	2.17	3.75	0.40
35–49 years	**0.29**	***	0.24	0.35	0.03	**0.58**	***	0.50	0.68	0.05	**3.88**	***	2.95	5.11	0.54
Current union status (ref.=Never married)															
Married or living together	**0.38**	***	0.32	0.45	0.03	**0.19**	***	0.17	0.22	0.01	**1.93**	***	1.58	2.34	0.19
Widowed, divorced, or not living together	**0.59**	***	0.49	0.72	0.06	0.92		0.81	1.04	0.06	**1.83**	***	1.49	2.23	0.19
Age at-first-birth (ref.=15–19 years)															
20–24 years	**1.10**	***	1.03	1.16	0.03	**1.12**	***	1.07	1.16	0.02	**0.89**	***	0.85	0.92	0.02
25–34 years	**1.12**	**	1.03	1.23	0.05	**1.24**	***	1.17	1.32	0.04	**0.91**	***	0.86	0.97	0.03
35–47 years	0.72		0.48	1.08	0.15	1.30		0.96	1.75	0.20	1.00		0.75	1.31	0.14
Number of living children (ref.=0 children)															
1–2 children	0.58		0.11	3.02	0.49	**0.35**	*	0.13	0.93	0.17	0.60		0.27	1.32	0.24
3–4 children	1.28		0.24	6.67	1.08	**0.25**	***	0.09	0.66	0.12	0.61		0.28	1.35	0.25
≥5 children	2.65		0.51	13.83	2.23	**0.31**	*	0.12	0.83	0.16	0.68		0.31	1.50	0.27
Birth parity (ref.=Second or third)															
Fourth or higher	**1.23**	***	1.21	1.26	0.01	**1.08**	***	1.07	1.10	0.01	**1.03**	***	1.01	1.05	0.01
Birth interval (ref.=>2 years)															
2–4 years	**0.84**	***	0.82	0.87	0.01	**1.07**	***	1.05	1.10	0.01	**1.08**	***	1.05	1.10	0.01
4+ years	**0.56**	***	0.54	0.58	0.01	**1.10**	***	1.07	1.13	0.02	**1.20**	***	1.17	1.23	0.02
Random effect (cluster-level)	0.68		0.63	0.73	0.02	0.49		0.46	0.52	0.02	0.44		0.41	0.47	0.01
N(level-1)			**296,239**					**660,410**					**660,269**		
N(level-2)			**6,169**					**6,262**					**6,262**		

Notes: * p<0.05, ** p<0.01, *** p<0.001
Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.
Weighted using transformed versions of survey weights provided by DHS

FIGURES

Figure 3.1: Percentage distribution of women aged 15–49 by select sexual and reproductive health outcomes and rural-urban residence in Latin America and the Caribbean

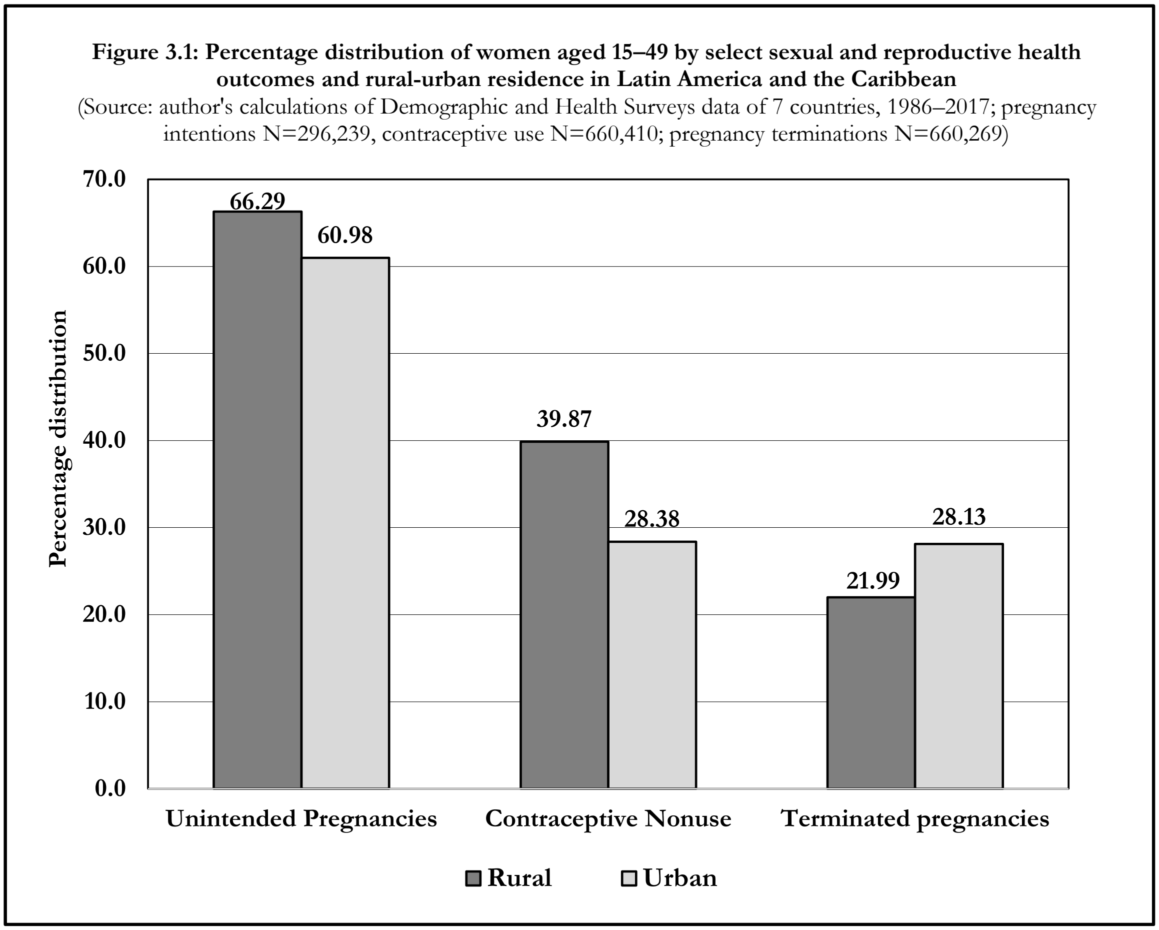


Figure 3.2: Percentage distribution of all women aged 15–49 by type of pregnancy termination in Latin America and the Caribbean

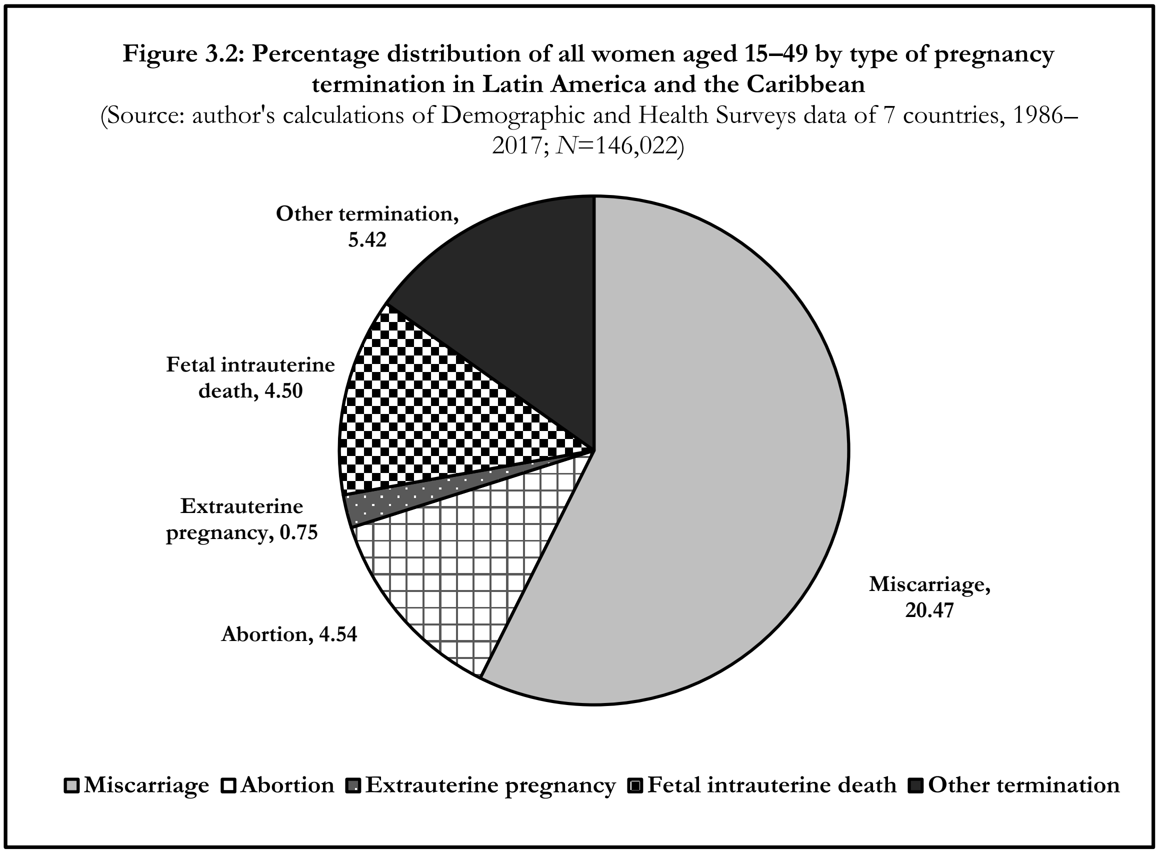


Figure 3.3: Percentage distribution of rural women aged 15–49 by type of pregnancy termination in Latin America and the Caribbean

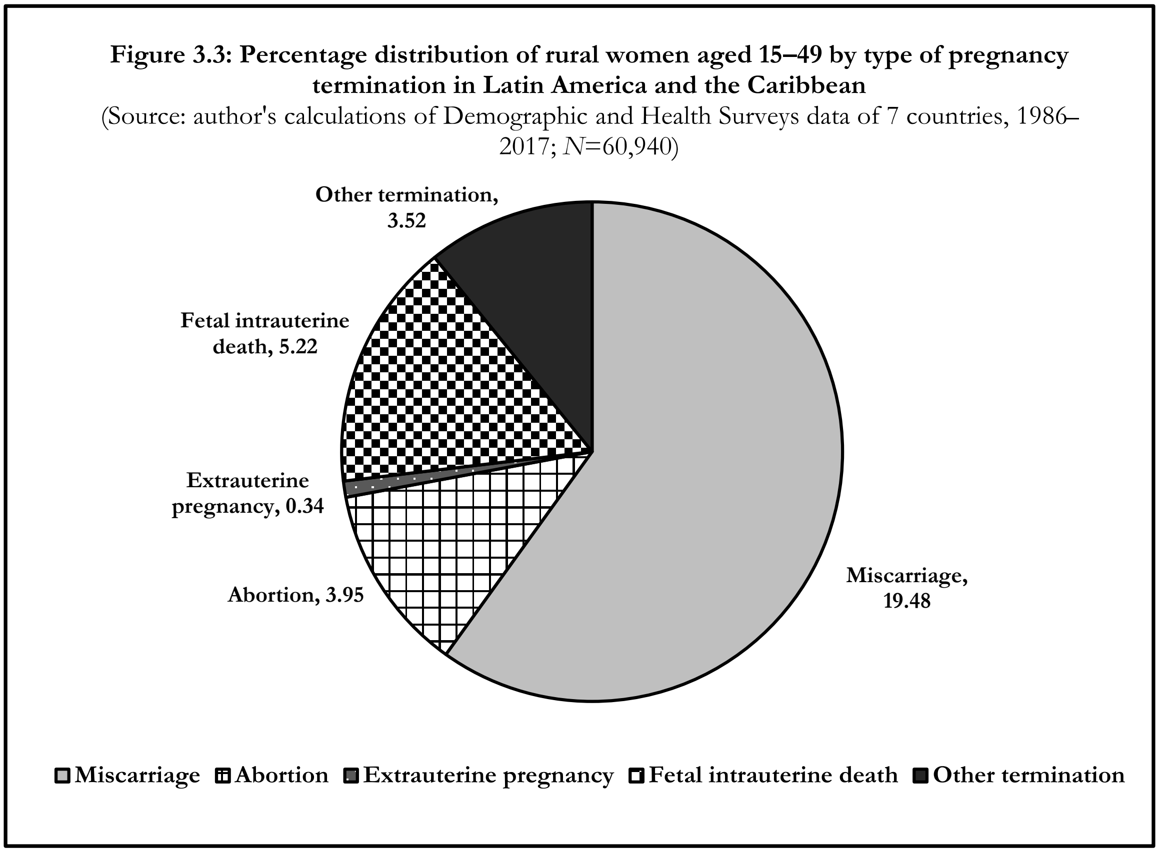


Figure 3.4: Percentage distribution of urban women aged 15–49 by type of pregnancy termination in Latin America and the Caribbean

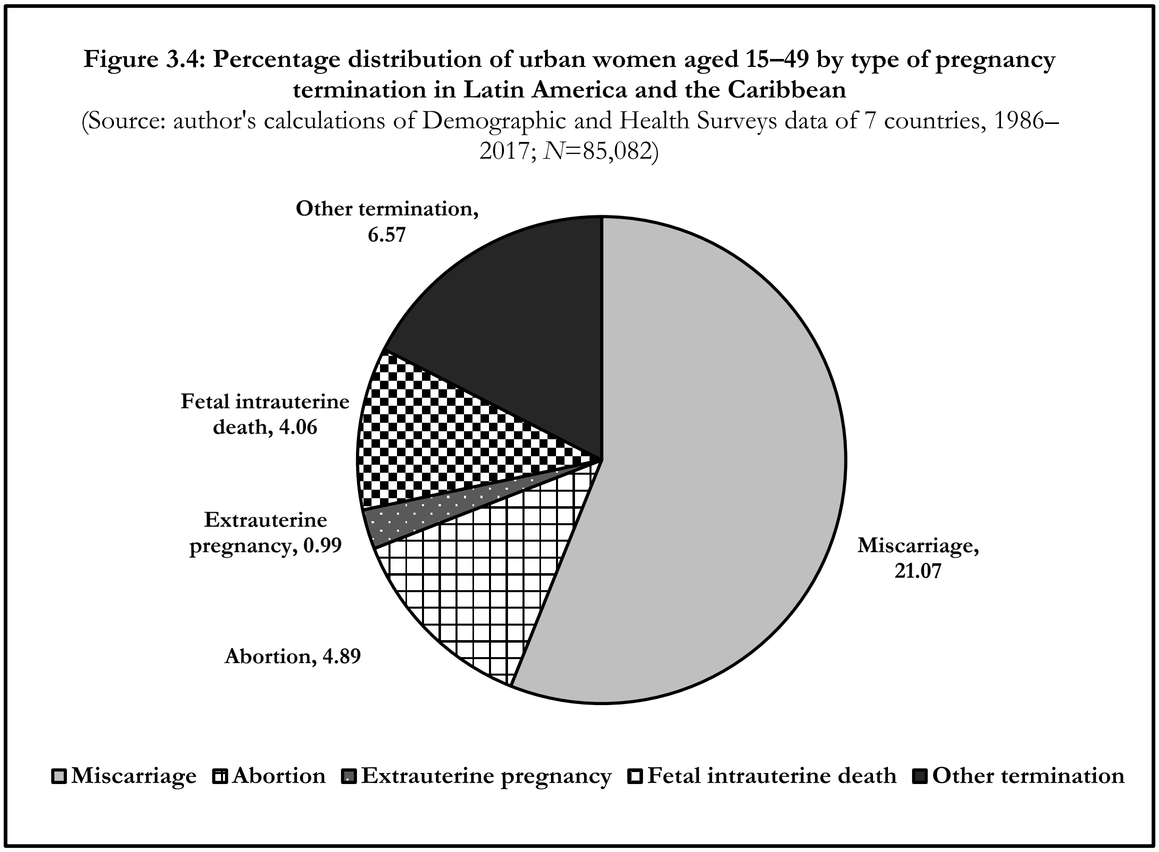
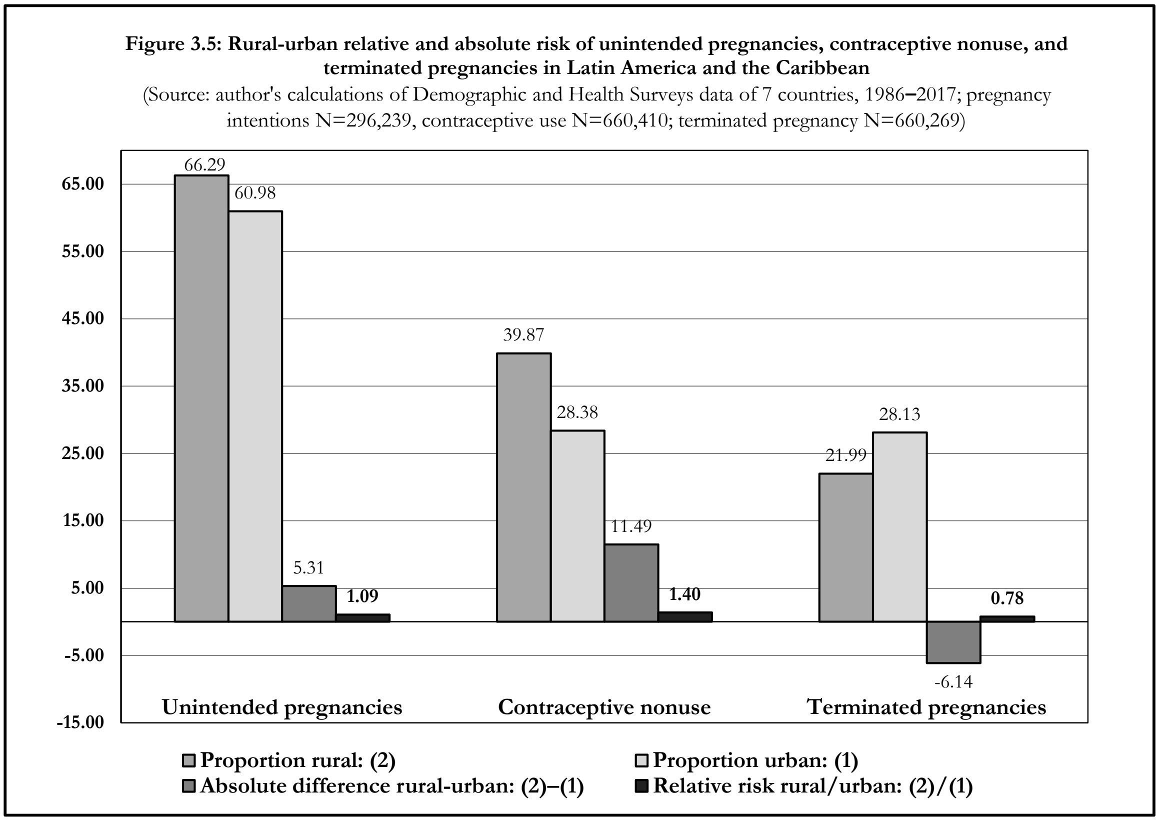


Figure 3.5: Rural-urban relative and absolute risk of unintended pregnancies, contraceptive nonuse, and terminated pregnancies in Latin America and the Caribbean



APPENDIX: TABLES

Table 3.1A: Percentage distribution of women aged 15–49 by select sexual and reproductive health outcomes and rural-urban residence in Latin America and the Caribbean

Table 3.1A: Percentage distribution of women aged 15–49 by select sexual and reproductive health outcomes and rural-urban residence in Latin America and the Caribbean
(Source: author's calculations of Demographic and Health Surveys data of 7 countries, 1986–2017)

Characteristic	Rural	Urban	All
<u>**Pregnancy intention**</u>			
Intended	33.71	39.01	36.17
Unintended	66.29	60.98	63.83
Mistimed	14.60	18.81	16.56
Unwanted	51.69	42.17	47.27
N(level-1)	**174,974**	**121,265**	**296,239**
<u>**Contraceptive use**</u>			
Currently using contraceptive method	60.13	71.62	66.38
Not currently using contraceptive method	39.87	28.38	33.62
N(level-1)	**342,058**	**318,352**	**660,410**
<u>**Pregnancy termination**</u>			
Pregnancy terminated in an abortion, miscarriage, still-birth, or other form of termination	21.99	28.13	25.33
Never had pregnancy terminated in an abortion, miscarriage, still-birth, or other form of termination	78.01	71.87	74.67
N(level-1)	**341,985**	**318,284**	**660,269**

Table 3.2A: Results of multilevel logistic models for the odds of induced abortions and spontaneous abortions in Latin America and the Caribbean

Table 3.2A: Results of multilevel logistic models for the odds of induced abortions and spontaneous abortions in Latin America and the Caribbean
(Source: author's calculations of Demographic and Health Surveys data of 7 countries, 1986–2017)

	Induced Abortion					Spontaneous Abortion				
Variables	**Coefficient (Odds Ratio)**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coefficient (Odds Ratio)**		**95% C.I. Low**	**95% C.I. High**	**S.E.**
Year	**1.07**	***	1.05	1.09	0.01	**1.08**	***	1.08	1.09	0.00
Geographic factors										
Country (ref.=Bolivia)										
Colombia	1.03		0.81	1.31	0.13	**0.40**	***	0.36	0.44	0.02
Dominican Republic	(na)		(na)	(na)	(na)	(na)		(na)	(na)	(na)
Guatemala	(na)		(na)	(na)	(na)	(na)		(na)	(na)	(na)
Haiti	**0.14**	***	0.10	0.19	0.02	**0.08**	***	0.07	0.10	0.01
Honduras	(na)		(na)	(na)	(na)	(na)		(na)	(na)	(na)
Peru	(na)		(na)	(na)	(na)	(na)		(na)	(na)	(na)
Place of residence (ref.=Urban)										
Rural	**0.62**	*	0.42	0.92	0.12	**0.77**	***	0.64	0.92	0.07
Rural x Household wealth *(ref.=Urban x Poorest)*										
Rural x poorer	**2.18**	***	1.36	3.49	0.52	1.02		0.83	1.26	0.11
Rural x middle	0.97		0.47	1.99	0.36	1.04		0.81	1.35	0.14
Rural x richer	**2.47**	*	1.09	5.62	1.04	1.36		0.96	1.92	0.24
Rural x richest	**3.88**	***	1.55	9.72	1.82	0.92		0.53	1.58	0.25
Socioeconomic factors										
Household wealth (ref.=Poorest)										
Poorer	**0.61**	***	0.43	0.87	0.11	0.93		0.78	1.11	0.08
Middle	0.76		0.53	1.09	0.14	0.89		0.75	1.07	0.08

Richer	**0.65**	*	0.44	0.94	0.12	0.96		0.80	1.15	0.09
Richest	0.75		0.50	1.13	0.16	1.04		0.86	1.26	0.10
Years of education (ref.=0 years)										
1–3 years	1.33		0.99	1.79	0.20	1.00		0.89	1.14	0.06
4–6 years	1.30		0.97	1.74	0.19	1.09		0.97	1.22	0.07
7–9 years	**1.44**	*	1.04	1.97	0.23	**1.19**	***	1.05	1.36	0.08
10+ years	**1.40**	*	1.02	1.92	0.23	1.13		0.99	1.29	0.08
Occupation (ref.=Not working)										
Managerial	0.89		0.57	1.38	0.20	**1.37**	***	1.16	1.62	0.12
Clerical	0.98		0.67	1.46	0.20	**1.29**	***	1.08	1.53	**0.11**
Sales	**1.44**	***	1.11	1.86	0.19	**1.31**	***	1.19	1.45	**0.07**
Agricultural	0.81		0.57	1.14	0.14	1.09		0.96	1.23	0.07
Domestic and services	**1.27**	*	1.00	1.62	0.16	**1.31**	***	1.18	1.45	0.07
Manual	1.02		0.72	1.45	0.18	**1.36**	***	1.19	1.55	0.09
Individual and reproductive factors										
Age (ref.=15–19 years)										
20–24 years	1.31		0.57	3.02	0.56	**2.06**	***	1.29	3.27	0.49
25–34 years	1.86		0.83	4.17	0.77	**3.60**	***	2.29	5.66	0.83
35–49 years	2.10		0.94	4.70	0.86	**4.61**	***	2.93	7.25	1.07
Current union status (ref.=Never married)										
Married or living together	**1.99**	**	1.17	3.39	0.54	**2.15**	***	1.67	2.76	0.27
Widowed, divorced, or not living together	**2.49**	***	1.45	4.30	0.69	**1.98**	***	1.53	2.55	0.26
Age at-first-birth (ref.=15–19 years)										
20–24 years	**0.77**	***	0.65	0.91	0.07	**0.93**	*	0.87	0.99	0.03
25–34 years	0.92		0.71	1.18	0.12	0.94		0.85	1.05	0.05
35–47 years	**2.61**	*	1.01	6.71	1.26	1.41		0.94	2.09	0.28
Number of living children (ref.=0 children)										
1–2 children	1.53		0.16	14.47	1.75	1.64		0.47	5.80	1.06
3–4 children	1.82		0.19	17.09	2.08	1.68		0.48	5.89	1.07
≥5 children	1.76		0.19	16.66	2.02	1.70		0.48	6.01	1.10
Birth parity (ref.=Second or third)										
Fourth or higher	**1.07**	*	1.01	1.14	0.03	1.00		0.98	1.03	0.01
Birth interval (ref.=>2 years)										
2–4 years	**1.12**	**	1.03	1.23	0.05	**1.05**	*	1.01	1.09	0.02
4+ years	**1.18**	***	1.07	1.30	0.06	**1.17**	***	1.12	1.23	0.03

Random effect (cluster-level)	4.26	3.92	4.63	0.18	0.80	0.75	0.85	0.03
N(level-1)		**256,392**				**256,392**		
N(level-2)		**5,484**				**5,484**		

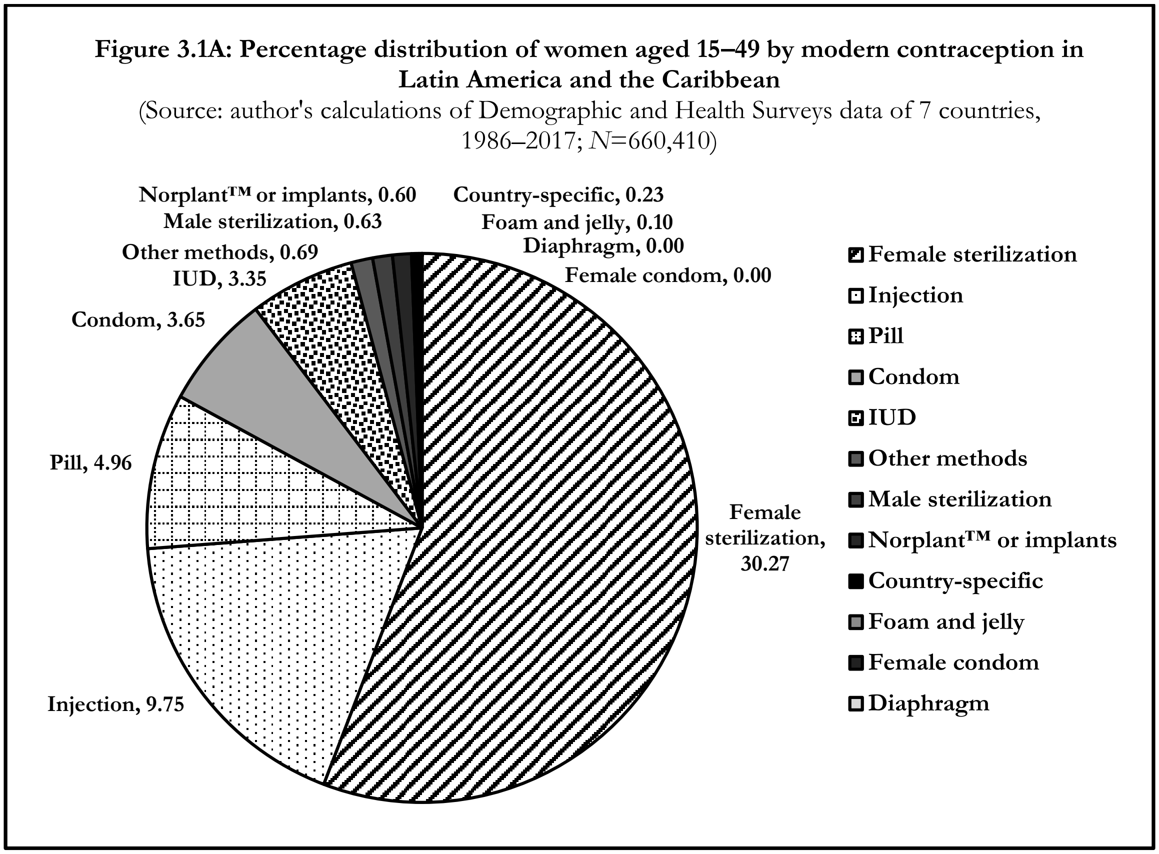
Notes: * p<0.05, ** p<0.01, *** p<0.001

Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.

Weighted using transformed versions of survey weights provided by DHS

APPENDIX: FIGURES

Figure 3.1A: Percentage distribution of women aged 15–49 by modern contraception in Latin America and the Caribbean



CHAPTER FOUR: ETHNORACIAL CHILD HEALTH INEQUALITIES IN LATIN AMERICA: MULTILEVEL EVIDENCE FROM BOLIVIA, COLOMBIA, GUATEMALA, AND PERU[38,39]

Abstract

Using Demographic and Health Survey (DHS) data (1986–2015) for Bolivia, Colombia, Guatemala, and Peru, this chapter explores the relationship between self-identifying as indigenous and/or afro-descendant on under-5 mortality (N(level-1) = 20,770; N(level-2) = 3,953), stunting (N(level-1) = 15,828; N(level-2) = 3,372), wasting (N(level-1) = 15,827; N(level-2) = 3,372), and anemia (N(level-1) = 13,294; N(level-2) = 2,474). Rural-urban risk analysis suggests that indigenous and/or afro-descendent respondents have higher risk of under-5 mortality, stunting, wasting, and anemia. The same pattern is observed for cross-country risks, particularly for Bolivia and Colombia. Results from logistic multilevel regression models suggest that, even after controlling for geographic, socioeconomic, individual, reproductive, healthcare, and nutritional variables, self-identifying as indigenous and/or afro-descendant is associated with a higher risk of child stunting and wasting, but not necessarily a higher risk of under-5 mortality and anemia. While previous research has largely focused on the protective role of maternal education, results from this study suggest that paternal education, as well as, individual characteristics and early reproductive decisions, play a significant role in child health outcomes. My findings imply that efforts to improve child health in Latin America

---

[38] A modified version of this chapter has been published in *SSM - Population Health* in 2020. The reference for this publication is as follows:

Mena-Meléndez, Lucrecia. 2020. "Ethnoracial child health inequalities in Latin America: Multilevel evidence from Bolivia, Colombia, Guatemala, and Peru." *SSM - Population Health* 12:100673. doi: 10.1016/j.ssmph.2020.100673.

should account for ethnicity and/or race, since minority ethnoracial groups have higher risk of childhood morbidity in the region. In addition, these efforts should accompany education for both fathers and mothers, as well as, information about the effects of reproductive decisions on their children's health.

Introduction

Throughout history, the region of Latin America has been characterized as one of the most ethnically and racially heterogeneous regions of the world. With an estimated population of 652 million people,[40] most descend from three major ethnoracial groups: indigenous (40 million), direct descendants of peoples inhabiting this region when European colonizers arrived in the 15th century; afro-descendent (120 million), direct descendants of Africans slaves forcibly brought to the region during and after the colonial period; and Europeans, direct descendants of largely Spanish and Portuguese immigrants (Perreira and Telles 2014; Ribando 2005). Drawing from complex colonial and nation-building histories from the 15th century, Latin America has experienced substantial variation in the trajectories of ethnoracial groups, which has defined the region's demographic composition, representations of identity, assimilation processes, and changing definitions of ethnoracial classifications (Telles and Bailey 2013; Telles and Torche 2019). Unlike ethnicity and race elsewhere, ethnoracial classifications in Latin America have been substantially fluid, resulting particularly from the historical nation-building efforts to unite, divided black, indigenous, white, and mixed-race populations through *mestizaje*, or racial and cultural mixing ideologies (Telles and Bailey 2013).

[40] The total population size including only 20 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela) is of approximately 647 million. The total population size including multiple smaller countries in the Caribbean is of 652 million (Economic Commission for Latin America and the Caribbean 2019).

However, indigenous and/or afro-descendent groups in Latin America are extremely diverse, characterized by variety of cultures, identities, languages, traditions, faiths, and beliefs. The total number of indigenous groups is estimated between 655-826 (Davis-Castro 2020) and afro-descendent groups—although less fragmented—include black (*negro/preto*), mixed-black (*mulatto*), mixed-indigenous-black (*zambo/chino/garifuna*), and mixed-indigenous-black-white (*pardo*) groups (Telles et al. 2015).[41,42] Despite this diversity, both indigenous and/or afro-descendent groups have historically been placed similarly at the bottom of the uneven class structure and racial and ethnic discrimination and exclusion continue to significantly determine their livelihoods. Indigenous and afro-descendent people suffer similar problems of economic, social, cultural and political inequality, compared to non-indigenous and/or non-afro-descendent groups, which reproduces and perpetuates socioeconomic, educational, health, and political inequities (Bello and Rangel 2002). Despite this, little is known about ethnicity and/or race and child health outcomes in this region, particularly, in terms of the variation across and within countries. In Latin America, scarcity in research on ethnoracial health disparities is explained by long-held beliefs that socio-economic status, rather than ethnoracial differences, structure inequality (Telles 2006).

Theories on the social determinants of health have argued that the social status of ethnicity and race, as a "social rather than genetic" entity, contributes to disparities in risk exposure, access to resources, and health outcomes (Zuberi 2001). Through underlying social and demographic processes, ethnicity

[41] For more information on indigenous groups in Latin America and the Caribbean, including the available data and the main challenges they face pertaining recognition, numbers, mobility, migration, mobilization, identity, poverty, vulnerability, and education, see Freire et al. (2015).

[42] For more information on afro-descendent groups in Latin America and the Caribbean, including the main challenges they face pertaining race relations, access to services, poverty, education, and country-level distributions, see Freire et al. (2018).

and race contribute to differences in health that disadvantage ethnoracial minorities. Literature on the United States has documented persistent and pronounced health disparities between and within ethnoracial groups, with these groups experiencing earlier mortality, higher morbidity, and worse overall health (Vega and Rumbaut 1991; Williams and Sternthal 2010). The limited empirical research that does exist for Latin America has documented that indigenous and/or afro-descendent groups fare worse in terms of mortality and morbidity compared to non-indigenous and/or non-afro-descendent groups (Casas, Dachs, and Bambas 2001). For indigenous groups, infant mortality is 3.5 times higher in Panama (Flores and Mojica 1992), life expectancy is 29 years lower for men and 27 years lower for women in Honduras (Rivas 1993), child mortality is more than 2.5 times higher in Mexico, maternal mortality is 83% higher in Guatemala (Pan American Health Organization 1997), and morbidity is two times higher in Bolivia (Suárez-Berenguela 1999).

Latin America is a good empirical case to study these relationships because countries in this region share close geographic proximity, as well as centuries of ethnolinguistic, geopolitical, and historically communal legacies (Beals 1953; Inglehart and Carballo 1997). Also, across countries, the historical configurations of boundaries of identity through national *mestizaje* projects, as well as the historical institutionalization of inequality through phenotypic markers of color-, culture-, and linguistics-coded ethnicity and/or race are quite similar (Telles and Bailey 2013). This allows for fairer comparisons of health inequalities among and between ethnoracial minority groups. Building on this research gap, I use Demographic and Health Survey (DHS) data (1986–2015) for Bolivia, Colombia, Guatemala, and Peru to explore the relationship between ethnicity and/or race and under-5 mortality, stunting, wasting, and anemia among children. First, I describe relative risks by ethnicity and/or race and across urban-rural regions. Second, I conduct logistic multilevel regression models to evaluate the association of ethnicity and/or race and child health outcomes. Finally, I demonstrate the extent to which certain proximate factors—geographic, socioeconomic, individual, reproductive, healthcare, and nutrition—may moderate the association.

Data and Methods

Data

This analysis uses pooled cross-sectional data for four countries (Bolivia, Colombia, Guatemala, and Peru) in Latin America and the Caribbean that participated in multiple rounds of the Demographic and Health Surveys (DHS) between 1986 and 2015.[43] DHS is a publicly-available, nationally-representative survey of women, collected by ICF International in collaboration with host country governments (ICF International 2012).[44] The standardized DHS questionnaires, across countries and waves, allow for easy comparisons for a wide range of indicators in the areas of population, health, and nutrition. DHS uses a stratified cluster-sampling design to randomly select women ages 15–49 within households and clusters (Croft et al. 2018). To account for homogeneity due to the non-simple random sample (i.e., nonindependence) and under- or over-sampling of different strata during sample selection (i.e., unequal selection probabilities), I adjust for sample cases with sampling weights (Hahs-Vaughn et al. 2011). As a result, I can confidently estimate standard errors and unbiased parameter estimates, as well as, present population-based estimates that account for differential probability of

[43] Since 1984, The Demographic and Health Surveys (DHS) Program has provided technical assistance to more than 400 surveys in over 90 countries, advancing global understanding of health and population trends in developing countries. Surveys for Latin America and the Caribbean are publicly available through their web site: https://dhsprogram.com/

[44] ICF International, Inc. is a Fairfax, Virginia-based global advisory and digital services provider, which provides a range of services for governments and businesses, including strategic planning, management, marketing and analytics. It was founded in 1969 as Inner City Fund and renamed to ICF Incorporated in 1972. Since 1984, ICF International, Inc. has worked with the United States Agency for International Development (USAID) to implement the Demographic and Health Surveys (DHS) Program across the world.

selection into the survey.

The DHS waves I included were the following: Bolivia (1989, 1994, 1998, 2003, and 2008), Colombia (1986, 1990, 1995, 2000, 2005, 2010, and 2015), Guatemala (1987, 1995, 1998–1999, and 2014–2015), and Peru (1986, 1991–1992, 1996, 2000, 2004–2006, 2007–2008, 2009, 2010, 2011, and 2012). I include these four countries because they have substantial ethnic and/or racial minority populations (Montenegro and Stephens 2006), particularly in this dataset (i.e. Bolivia: 64.53%; Colombia: 86.61%; Guatemala: 57.15%; Peru: 17.01%). One of the primary advantages of pooling datasets together is the advantage of larger sample sizes, which one the hand, increases the statistical power for the analysis, and on the other hand, decreases the likelihood of a type II error—failing to detect a statistically significant association when it truly exist (Hatt and Waters 2006). Pooling datasets, thus, may decrease the noise from interviewer error, poorly worded questions, local disruptions, data entry mistakes, and sampling variability. For some outcomes, not all women have available data (stunting and wasting not available for Bolivia and anemia not available for Colombia), so each outcome is different. My total samples are: under-5 mortality (N(level-1) = 20,770; N(level-2) = 3,953), stunting (N(level-1) = 15,828; N(level-2) = 3,372), wasting (N(level-1) = 15,827; N(level-2) = 3,372), and anemia (N(level-1) = 13,294; N(level-2) = 2,474).

Measurements

Outcome Variables

The child health outcomes of interest are under-5 mortality, stunting, wasting, and anemia. Under-5 mortality indicates whether or not a woman has ever had a child die between the ages of 0–60 months.

Stunting indicates whether or not a child's height-for-age Z-scores (HAZ) fall more than two standard deviations below the median height-for-age curve (World Health Organization 2006). Wasting indicates whether or not a child's weight-for-height Z-scores (WHZ) fall more than two standard deviations below the median weight-for-height curve (World Health Organization 2006). Finally, anemia (collected using HemoCue portable hemoglobin meters) indicates whether or not a child's blood hemoglobin level is less than 11 grams per deciliter (g/dl) (World Health Organization 2011). I constructed these dichotomous outcomes respecting clinical thresholds and using multiple variables that were originally continuous and/or categorical in the surveys. Dichotomization has been identified as optimal for a variable's strongest effects and simplifying the presentation of results for a wider audience (Farrington and Loeber 2000).

Independent Variables

Ethnicity and/or race is measured as a dichotomous variable, indicating whether or not a mother identifies as indigenous and/or afro-descendant. I used the language spoken at home as proxy for indigenous and/or afro-descendant self-identification (Afro-descendant, Aymara, Quechua, Guarani, Garifuna, Maya, and Xinca), which has been the primary marker of ethnoracial identity used in the past (Telles and Torche 2019). While other research ideally recommends using multiple self-identified measures—interviewer-ascribed phenotypic classifications—as well as multiple sub-categories of race and ethnicity (Perreira and Telles 2014; Telles et al. 2015), DHS data does not collect measures of race and ethnicity to create multiple sub-categories with sufficient statistical power for this analysis, so I followed previous precedent for dichotomization (Psacharopoulos and Patrinos 1994).

I controlled for several other factors that potentially confound my analyses. Maternal education is the single most important factor in explaining differentials in child health outcomes (Caldwell 1979; Young, Edmonston, and Andes 1983). I include it in an interval scale (0, 1–3, 4–6, 7–9, and ≥10 years), but also conducted initial analyses with both categorical or continuous measures, which do not change the direction or the significance of the associations. To control for differences in temporal, living, and environmental conditions, I include a categorical variable for survey year (1986–2015), a dummy variable for type of residence (rural and urban), and a categorical variable for country (Bolivia, Colombia, Guatemala, and Peru). To control for individual, partner, and household characteristics, I include a categorical variable for household wealth (poorest, poorer, middle, richer, and richest) and continuous variables for partner's education (0–23) and maternal age (13–49).[45] Finally, to control for reproductive behavior, I control for maternal age at-first-birth (15–19, 20–34, and 35+), birth parity (first, second or third, and fourth or higher children), and birth interval (>2, 2–4, and 4+).

I constructed socioeconomic and healthcare indices to assess how household environment, prenatal care, postnatal maternal care, and postnatal child care moderate the relationship between ethnicity and/or race and child health outcomes.[46] First, I selected variables that seemed to measure the underlying construct. All variables were coded as dichotomous (yes/no) and ranked by ascending order. Then, I performed tetrachoric factor analysis—the preferred method to describe variability for dichotomous measures—to determine how well each set of variables factored together, omitting obvious outliers. The household environment index measures the presence of consumer durables in

[45] Household wealth is collected by DHS and represents a composite measure of a household's cumulative living standard. It is generated using principal components analysis and places individual households on a continuous scale of relative wealth. DHS separates all interviewed households into five wealth quintiles to compare the influence of wealth on various population, health and nutrition indicators (Rutstein and Johnson 2004).

[46] For more information on the uses of factor analysis in the development of composite indices for subsequent analyses in social research, see Alwin (1973).

a household (radio, television, telephone, refrigerator, bicycle, motorcycle, and car), as well as, overall living conditions (electricity and non-dirt floor). The prenatal care index includes receiving any prenatal care, prenatal care from a skilled professional, first prenatal care visit within 6 months, and 4+ prenatal care visits during pregnancy. The postnatal care mother index includes receiving any postnatal care from a skilled professional, postnatal care within 24 hours of delivery, and postnatal check within 2 days of delivery. Finally, the postnatal care child index includes receiving any postnatal care from a skilled professional, postnatal care within 24 hours of birth, and postnatal check within 2 days of birth. **Table 4.1** shows sample proportions, factor loadings, and Cronbach's alphas (α) for the indices. Internal reliability of the four measures is above the $\alpha \geq 0.70$ threshold used in the social sciences (Nunnally and Bernstein 1994).

Finally, to control for child nutrition, I constructed three main dichotomous feeding indicators for infants and young children: Minimum Dietary Diversity (MDD), Minimum Meal Frequency (MMF), and Minimum Acceptable Diet (MAD) (World Health Organization 2008). MDD measures whether a child is fed from 4 or more food groups (grains, roots and tubers, legumes and nuts, dairy products, flesh foods, eggs, vitamin-A rich fruits and vegetables, and other fruits and vegetables). MMF measures whether a child is fed solid, semi-solid, or soft foods (including milk feeds for non-breastfed children) the minimum number of times or more (2 times for breastfed infants 6–8 months, 3 times for breastfed children 9–23 months, 4 times for non-breastfed children 6–23 months). Finally, MAD measures whether a child receives a minimum acceptable diet (at least 2 milk feedings, MDD, and MMF).

Analysis

I use a two-level multilevel logit approach, whereby individual women units (level-1) are nested within survey cluster units (level-2), respecting the hierarchical design of DHS data.[47] My multilevel logit models include a random intercept at the cluster-level—to capture heterogeneity among clusters—and fixed effects for all other individual-level coefficients. Compared with single-level regression analysis that assumes that all individuals are independent, this methodology accounts for the fact that individuals in the same cluster may have similar characteristics. More technically, multilevel models correct for biases in parameter estimates, standard errors, confidence intervals, and significance tests, resulting from clustering, and estimate robust variance and covariance of random effects (Guo and Zhao 2000). I chose a logit approach because my dependent variables are dichotomous:

$$\log\left[\frac{P_{ij}}{1-P_{ij}}\right] = \beta_0 + \beta_1 X_{ij} + \cdots + \beta_k X_k + u_j + e_{ij}, \qquad \text{Eq. (1)}$$

where i is the level-1 (individual) unit and j is the level-2 (cluster) unit; $P_{ij}/(1-P_{ij})$ is the probability of the binary child health outcome Y_{ij} under-5 mortality, stunting, wasting, anemia for woman i in cluster j; I define the probability of the response equal to one as $P_{ij} = \Pr(Y_{ij} = 1)$ and let P_{ij} be modeled using a logit link function; β is the corresponding fixed coefficient and X_{ij} is an explanatory variable for woman i in cluster j; u_j is the random effect at cluster j, allowing for differential intercepts for cluster-level observations; and the error term, e_{ij}, is the individual-level residual for individual i of

[47] The DHS surveys typically employ two-stage sampling design from an existing sample frame, generally the most recent census frame. In the first stage of selection, the primary sampling units (PSUs) are selected with probability proportional to size (PPS) within each stratum. The PSUs are typically census enumeration areas (EAS) and form the survey cluster. In the second stage, a complete household listing is conducted in each of the selected clusters. Following the listing of the households a fixed number of households is selected by equal probability systematic sampling in the selected cluster. A household respondent is interviewed first to obtain a household roster and information about the household as a unit. Eligible women and (usually) men are then interviewed. This design results in a multilevel dataset, with households, women, or men at level-1 and PSUs at level-2 (Elkasabi et al. 2020).

cluster j. Thus, this equation expresses the log of the odds of child mortality, stunting, wasting, and anemia, as a linear function of the set of explanatory variables previously mentioned.

The multilevel logistic models were estimated in two stages. First, I estimated a baseline model with ethnicity and/or race to observe the association of this factor with the risk of each outcome, in the absence of other associations. In this baseline model, the ethnicity and/or race coefficient served as a basis of comparison to measure whether the introduction of other factors—in subsequent models—moderated the ethnoracial effect. I assessed this in two manners: first, how the magnitude of the ethnoracial coefficient changed with the introduction of other factors, and second, how the statistical significance of the ethnoracial coefficient changed as well. Second, I estimated subsequent models by adding geographic, socioeconomic, individual, reproductive, healthcare, and nutritional controls, to see how the effect of ethnicity and/or race is moderated, until a full model was assessed including all variables and controls.

Results

Sample Characteristics

Table 4.2 provides descriptive statistics. Approximately 13% of children died before 5, 27% of children are stunted, 6% of children are wasted, and 59% of children have anemia. On average, 45% of women live in rural areas and 56% in urban areas. In addition, 35% of women self-identify as indigenous and/or afro-descendant and 66% self-identify as non-indigenous and/or non-afro-descendant. Maternal education is still low, with approximately 8% of mothers reporting zero years of education, 15% 1–3 years, 27% 4–6 years, 14% 7–9 years, and 37% 10+ years. Pertaining to other control variables, on average husbands' report 8 years of education and respondents are 30 years old. Approximately, 54% of women gave birth between ages 15–19, 46% between 20–34, and 0.42% at 35 and above. In addition, 66% of women bore their second or third child and 34% their fourth or more child. Finally, 14% waited less than two years between births, 37% two and four years, and 49% more than four years.

Descriptive Summary of Child Health Outcomes by Ethnoracial Identity

Table 4.3 presents rural-urban proportions and absolute differences and **Figure 4.1** also presents relative risks of under-5 mortality, stunting, wasting, and anemia, by indigenous and/or afro-descendent self-identification. Respondents who self-identify as indigenous and/or afro-descendant, and who live in rural areas compared to urban areas, have 2.27-times higher risk of under-5 mortality, 2.83-times higher risk of stunting, 2.20-times higher risk of wasting, and 3.63-times higher risk of anemia. While the risk is also high for non-indigenous and/or non-afro-descendant respondents in rural areas, it is much lower than that of indigenous and/or afro-descendant respondents. The same analysis was conducted for countries, which is available in **Table 4.1A** and **Figures 4.1A-4.4A** in the Appendix.

Multilevel Analysis of Child Health Outcomes by Ethnoracial Identity

Under-5 Mortality

Table 4.4 presents the odds ratio results of the multilevel logit models predicting under-5 mortality for children in Bolivia, Colombia, Guatemala, and Peru between 1986 and 2015 (N(level-1) = 20,770; N(level-2) = 3,953). Model 1 includes only the underlying factor of interest—ethnicity and/or race—

and temporal and geographic controls. Self-identifying as indigenous and/or afro-descendant is associated with increasing risk of under-5 mortality, but the association is not significant throughout the models (p-value>0.05). Conversely, living in a rural area, compared with an urban area, is associated with 117-percent greater odds (1–exponent of the log odds) of under-5 mortality (p-value<0.000), but this association loses significance across the models. Results also indicate heterogeneity in the association between ethnicity and/or race and under-5 mortality across countries. Living in Colombia, Guatemala, or Peru, is more protective (more risk-reducing) for under-5 mortality than living in Bolivia.

The interaction between ethnicity and/or race and rural-urban residence is associated with 155-percent greater odds of under-5 mortality for indigenous and/or afro-descendant respondents in rural areas, but the effect loses significance across the models. Subsequent models (Models 2-5) control for additional proximate factors—socioeconomic, individual, reproductive, healthcare, and nutrition—which present similar findings to the baseline model. Socioeconomic factors, such as mother's education, plays a significant protective role in diminishing the risk of under-5 mortality (Model 2), but the strength weakens with the introduction of individual and reproductive factors (Model 3). Other controls are also initially protective, but lose significance with the introduction of individual and reproductive factors (Model 3). Unexpectedly, results indicate that healthcare and nutritional factors are not protective of under-5 mortality (Models 4–5).

Stunting

Table 4.5 presents the odds ratio results of the multilevel logit models predicting stunting for children in Colombia, Guatemala, and Peru between 1986 and 2015 (N(level-1) = 15,828; N(level-2) = 3,372).

Self-identifying as indigenous and/or afro-descendant is associated with a higher risk of stunting, which remains significant throughout the models (Models 1–5). Even after accounting for all proximate factors, indigenous and/or afro-descendent women have 62-percent greater odds of having a child stunted, than non-indigenous and/or non-afro-descendent mothers (p-value<0.000). Across the models, living in a rural area, living in Guatemala or Peru (compared to Colombia), lower maternal education, and higher parity are associated with higher risk of stunting (Models 2–4). Surprisingly, the interaction between ethnicity and/or race and rural-urban residence is associated with higher risk of stunting for non-indigenous and/or non-afro-descendant respondents living in rural areas (Models 1–5). Generally, household wealth, household environment, husband's education, and higher birth interval are associated with lower risk of stunting (Models 2–5). Like under-5 mortality, healthcare factors do not play a protective role for stunting, but nutritional factors do. However, while MAD is associated with lower risk of stunting, MDD and MMF are counterintuitively associated with higher risk (Model 5).

Wasting

Table 4.6 presents the odds ratio results of the multilevel logit models predicting wasting for children in Colombia, Guatemala, and Peru between 1986 and 2015 (N(level-1) = 15,827; N(level-2) = 3,372). Like stunting, self-identifying as indigenous and/or afro-descendant is associated with higher risk of wasting, which remains significant throughout the models (Models 1–5). Compared to stunting, however, indigenous and/or afro-descendent self-identification has 1.5-times stronger effect on wasting, that is, 158-percent greater odds of having a child wasted (p-value<0.000). While living in a rural area is initially associated with higher risk of wasting, the association loses significance with the introduction of socioeconomic factors (Model 2). Like stunting, the interaction between ethnicity and/or race and rural-urban residence is associated with higher risk of wasting for indigenous and/or afro-descendant respondents living in urban areas (Models 1–5). Also, living in Guatemala or Peru (compared to Colombia), lower maternal education, and higher parity are associated with higher risk of wasting (Models 2–3). On the other hand, household wealth, household environment, husband's education, birth interval, and maternal postnatal care are associated with lower risk of wasting (Models 2–5). In contrast to stunting, nutritional factors are not significantly associated with wasting (Model 5).

Anemia

Table 4.7 presents the odds ratio results of the multilevel logit models predicting anemia in children in Bolivia, Guatemala, and Peru between 1986 and 2015 (N(level-1) = 13,294; N(level-2) = 2,474). Like under-5 mortality, self-identifying as indigenous and/or afro-descendant is not significantly associated with anemia throughout the models (p-value>0.05). While living in a rural area is initially associated with higher risk of anemia, the association reverses with the introduction of socioeconomic factors and becomes protective (Models 2–5). For the first time in this analysis, country of residence does not play a protective role for anemia (Models 1–5) and the interaction between ethnicity and/or race and rural-urban residence is associated with a lower risk of anemia for non-indigenous and/or non-afro-descendant respondents in rural areas (Models 1–5). Maternal education, household wealth, and mother's age are associated with lower risk of anemia (Models 2–3). Surprisingly, child postnatal care is associated with a higher risk of anemia (Models 4–5), as are maternal age-at-first-birth and birth parity (Models 3–5). Similarly, to stunting, nutritional factors play a counterintuitive role. While MMF is associated with lower risk of anemia, MDD and MAD are associated with a higher risk (Model 5).

Discussion and Conclusions

This analysis used DHS data (1986–2015) for Bolivia, Colombia, Guatemala, and Peru to explore the multilevel relationship between self-identifying as indigenous and/or afro-descendant and child health outcomes. I tested for the moderating effects of geographic, socioeconomic, individual, reproductive, healthcare, and nutritional variables. This chapter made two important contributions to the literature. First, it provided an empirical assessment of persistent and pronounced child health disparities across ethnic and/or racial groups in Latin America. In concurrence with past studies, I found that self-identifying as indigenous and/or afro-descendant is associated with higher risk of stunting and wasting (Casas et al. 2001; Giuffrida et al. 2007). Most surprisingly, however, under-5 mortality and anemia are not, which challenges previous research on these two specific child health outcomes (Kuang-Yao Pan, Erlien, and Bilsborrow 2010; Psacharopoulos and Patrinos 1994).

With previous research documenting that indigenous and afro-descendent people suffer higher levels of poverty and marginalization, precarious and difficult employment conditions, higher levels of illiteracy, lower access to formal education, worse overall health, and limited political participation and representation, my findings imply that efforts to improve child health in Latin America should account for ethnicity and/or race. This research showed that minority ethnoracial groups, such as indigenous and/or afro-descendent, have higher risk of childhood morbidity than do non-minority ethnoracial groups in the region. As pressure increases to improve children's health, as well as, to address ethnoracial health inequities in the developing world, it is increasingly important to truly understand this relationship given severe resource constraints. In addition, these efforts should also accompany education for both fathers and mothers, as well as, information about the effects of reproductive decisions on their children's health.

Second, this analysis assessed heterogeneity of this relationship across and within countries in Latin America. While previous research has mainly focused on country-level effects (Frost, Forste, and Haas 2005; Jokisch and McSweeney 2011) and/or cross-country effects (Hatt and Waters 2006; Heaton et al. 2005), I also identified and contributed to understand the cross-regional effects (Van de Poel et al. 2007). In concurrence with past studies, multiple results in this chapter suggested significant cross-country and rural-urban differences. Self-identifying as indigenous and/or afro-descendent and residing in an urban area slightly protects from stunting and wasting, but does not protect from under-5 mortality and anemia. These results contradict previous research that has documented worse overall health outcomes for minority children (Shin 2007).

Consistent with previous research, maternal education maintained a strong effect on all four health outcomes, even after controlling for all other variables (Frost et al. 2005). However, socioeconomic variables did not have the same strong effect documented in the literature (Van de Poel et al. 2007). As has been documented in other regions, paternal education (Breierova and Duflo 2004; Semba et al. 2008), as well as, individual characteristics and reproductive decisions (Heaton et al. 2005), played a more significant role in child health outcomes. Paternal education may in fact be important because fathers are often more educated than mothers in developing countries and given their higher status, may have more decision-making power regarding their children's health (Aslam and Kingdon 2012). Finally, prenatal, postnatal, and child feeding practices had mixed associations with child health outcomes in this region (De Onis et al. 2006; Ruel and Menon 2002).

Although this chapter made a substantial set of contributions to understanding child health outcomes in Latin America, I acknowledge the following limitations and the need for future research that builds on these findings. First, this research relied on self-reported data. Thus, some of these results might be an artifact of reporting bias, whereby respondents selectively chose to share and/or failed to recall certain information about current or previous experiences. For example, the variable I constructed for ethnicity and/or race relies exclusively on self-reported language spoken at home, which may be a conservative measure given that some individuals who self-identify as indigenous and/or afro-descendent no longer speak the associated languages While ideally, I should have used multiple self-identifying, interviewer-ascribed, and multiple sub-categories of race and ethnicity, DHS data does not collect these measures so I was forced to collapse both indigenous and/or afro-descendent self-identification into one variable.

Second, this research relied on cross-sectional data, so I was unable to evaluate how self-identifying as indigenous and/or afro-descendant impacts child health over the life course and/or any other forms of causality. Third, in an effort to make comparable analytical variables across countries and waves, I collapsed categorical responses, which may have led to the loss of significant information. However, as has been documented, one of the primary advantages of pooling datasets together is an increase in statistical power, which in turn, decreases the likelihood of errors from interviewer noise, poorly worded questions, data entry mistakes, and sampling variability. Finally, this analysis is limited to four countries in Latin America. Despite having the largest populations of indigenous and/or afro-descendant groups, it is important to emphasize that countries in the region also have unique cultures, histories, and trajectories, so these results cannot be blindly generalized to other countries in the region and to other countries in other regions.

More research is needed to fully assess the relationship between ethnicity and/or race and child health outcomes in Latin America. To assess generalizability and discuss causal mechanisms, we need additional cross-sectional and longitudinal data using novel indicators. In addition, to provide a more comprehensive picture of the unique experiences of diverse sub-groups of indigenous and/or afro-descendent groups, we need multiple self-identifying measures as well as interviewer-ascribed phenotypic classifications of race and ethnicity. Despite these limitations, results from this study clearly suggests that indigenous and/or afro-descendent respondents have higher risk of stunting and wasting in Latin America. In addition, while most research has previously focused on the protective role of maternal education, results from this study suggest that paternal education, individual characteristics, and reproductive decisions play significant roles in child health outcomes. Given centuries of discrimination and exclusion, as well as, large populations of indigenous and/or afro-descendent groups in Latin America, we need to further study, understand, and assess the relationship between ethnoracial self-identification and child health outcomes to improve the precarious conditions of ethnoracial minorities in the region.

TABLES

Table 4.1: Description of variables included in indices by outcome

Table 4.1: Description of variables included in indices by outcome (Source: author's calculations of Demographic and Health Surveys data for Bolivia, Colombia, Guatemala, and Peru, 1986–2015)

Measure	Sample proportion	Factor loading	α
Household environment index			
Own a radio	0.78	0.34	
Own a television	6.78	0.93	
Own a telephone	0.17	0.78	
Own a refrigerator	0.37	0.90	
Own a bicycle	0.29	0.30	**0.73**
Own a motorcycle	0.12	0.49	
Own a car	0.08	0.59	
Has electricity	0.75	0.90	
Has nondirt floor	0.63	0.76	
Prenatal care index			
Received any prenatal care	0.15	0.84	
Received prenatal care from a skilled provider	0.40	0.20	**0.89**
Received prenatal care in the first 6 months of pregnancy	0.94	0.65	
Received four or more prenatal care visits	0.73	1.00	
Postnatal care mother index			
Received postnatal care within 24 hours	0.05	0.98	
Received postnatal care within 2 days	0.08	1.00	**0.92**
Received postnatal care from a doctor or nurse	0.07	0.98	
Postnatal care child index			
Received postnatal care within 24 hours	0.18	1.00	
Received postnatal care within 2 days	0.20	1.00	**0.98**
Received postnatal care from a doctor or nurse	0.19	1.00	

Table 4.2: Descriptive statistics (proportions and means) of key variables by outcome

Table 4.2: Descriptive statistics (proportions and means) of key variables by outcome (Source: author's calculations of Demographic and Health Surveys data for Bolivia, Colombia, Guatemala, and Peru, 1986–2015)

Measure	Under-5 Mortality	Stunting	Wasting	Anemia	Average
Total sample (unweighted *N*)	**20,770**	**15,828**	**15,827**	**13,294**	
	12.63	26.69	6.44	59.33	
Main independent variables					
Ethnicity and/or race					
Indigenous and/or afro-descendant	38.08	37.37	37.37	25.03	34.46
Non-indigenous and/or non-afro-descendant	61.92	62.63	62.63	74.97	65.54
Country					
Bolivia	27.23	.	.	67.90	23.78
Colombia	5.94	12.37	3.57	.	5.47
Guatemala	12.05	43.60	11.93	47.76	28.84
Peru	12.12	25.86	5.56	62.65	26.55
Type of residence					
Rural	43.63	43.71	43.71	46.95	44.50
Urban	56.37	56.29	56.29	53.05	55.50
Individual and socioeconomic variables					
Years of education					
0 years	7.31	7.26	7.26	8.47	7.58
1–3 years	14.96	14.36	14.36	15.62	14.83
4–6 years	26.29	26.34	26.34	26.91	26.47
7–9 years	14.29	14.57	14.57	13.90	14.33
10+ years	37.14	37.46	37.46	35.10	36.79
Household wealth					
Poorest	25.40	25.60	25.60	24.64	25.31
Poorer	24.85	25.42	25.42	25.69	25.35
Middle	21.45	21.28	21.28	21.48	21.37
Richer	17.04	16.59	16.59	16.90	16.78
Richest	11.27	11.12	11.12	11.29	11.20
Household environment index	0.59	0.62	0.62	0.56	0.60
Husband's education	8.57	8.51	8.51	8.06	8.41
Respondent's age	30.08	30.03	30.03	30.30	30.11
Reproductive variables					
Age at first birth					
15-19	53.38	54.13	54.13	53.68	53.83
20-34	46.15	45.44	45.44	45.96	45.75
35+	0.47	0.42	0.42	0.36	0.42
Birth parity					
Second or third	65.22	67.00	67.00	63.58	65.70
Fourth or higher	34.78	33.00	33.00	36.42	34.30
Birth interval					

>2 years	14.15	13.36	13.36	13.44	13.58
2-4 years	37.82	36.31	36.31	38.06	37.13
4+ years	48.02	50.32	50.32	48.50	49.29
Healthcare variables					
Prenatal care index	1.41	1.42	1.42	1.42	1.42
Postnatal care mother index	0.10	0.12	0.12	0.15	0.12
Postnatal care child index	0.41	0.48	0.48	0.56	0.48
Nutritional variables					
Minimum dietary diversity (MDD)	54.20	61.32	61.31	58.61	58.86
Minimum meal frequency (MMF)	21.58	23.16	23.16	21.94	22.46
Minimum acceptable diet (MAD)	4.12	4.76	4.76	4.79	4.61

Table 4.3: Minority-majority ethnic and/or racial relative risk of under-5 mortality, stunting, wasting, and anemia by type of residence

Table 4.3: Minority-majority ethnic and/or racial relative risk of under-5 mortality, stunting, wasting, and anemia by type of residence
(Source: author's calculations of Demographic and Health Surveys data for Bolivia, Colombia, Guatemala, and Peru, 1986–2015; under-5 mortality N=20,770, stunting N=15,828; wasting N=15,827, and anemia N=13,294)

Ethnicity and/or race	**Minority ethnic and/or racial group**				**Majority ethnic and/or racial group**			
	Proportion outcome		**Absolute difference**	**Relative risk**	**Proportion outcome**		**Absolute difference**	**Relative risk**
Measure	Urban	Rural	Rural-urban	Minority rural/urban	Urban	Rural	Rural–urban	Majority rural/urban
	(1)	(2)	(2)-(1)	(2)/(1)	(3)	(4)	(4)-(3)	(4)/(3)
Under-5 mortality	12.16	27.65	15.49	2.27	25.69	34.50	8.81	1.34
Stunting	9.68	27.43	17.75	2.83	25.03	37.86	12.83	1.51
Wasting	13.68	30.12	16.44	2.20	20.29	35.90	15.61	1.77
Anemia	5.65	20.51	14.86	3.63	41.33	32.51	-8.82	0.79

Note: For the purpose of simplification, minority group is defined as indigenous and/or afro-descendant and majority group as non-indigenous and/or non-afro-descendant

Table 4.4: Results of multilevel logit models for the odds of under-5 mortality in Latin America

Table 4.4: Results of multilevel logit models for the odds of under-5 mortality in Latin America
(Source: author's calculations of Demographic and Health Surveys data for Bolivia, Colombia, Guatemala, and Peru, 1986–2015; N(level-1) = 20,770; N(level-2) = 3,953)

	Model 1					Model 2					Model 3					Model 4					Model 5				
Variables	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**
Year	**0.942**	***	0.917	0.968	0.013	**0.932**	***	0.907	0.959	0.013	**0.941**	***	0.914	0.968	0.014	**0.944**	***	0.917	0.972	0.014	**0.945**	***	0.917	0.973	0.014
Ethnicity and/or race																									
Indigenous and/or afro-descendant *(ref.=Not ethnic)*	1.175		0.903	1.528	0.158	1.149		0.887	1.487	0.151	1.069		0.821	1.391	0.144	1.061		0.815	1.382	0.143	1.060		0.814	1.381	0.143
Geographic factors																									
Region (ref.=Urban)																									
Rural	**2.170**	***	1.831	2.573	0.189	1.042		0.849	1.280	0.109	1.053		0.847	1.308	0.117	1.045		0.842	1.297	0.115	1.043		0.841	1.295	0.115
Country (ref.=Bolivia)																									
Colombia	**0.237**	***	0.177	0.318	0.035	**0.273**	***	0.201	0.370	0.042	**0.341**	***	0.247	0.469	0.056	**0.333**	***	0.241	0.460	0.055	**0.338**	***	0.242	0.472	0.058
Guatemala	**0.543**	***	0.380	0.776	0.099	**0.482**	***	0.333	0.696	0.091	**0.602**	**	0.408	0.887	0.119	**0.588**	**	0.389	0.889	0.124	**0.591**	**	0.387	0.902	0.127
Peru	**0.479**	***	0.380	0.604	0.057	**0.574**	***	0.455	0.725	0.068	**0.535**	***	0.419	0.683	0.067	**0.549**	***	0.421	0.715	0.074	**0.557**	***	0.424	0.731	0.077
Ethnicity x Type of residence *(ref.=Not ethnic x Urban)*																									
Not ethnic x rural	**2.170**	***	1.831	2.573	0.189	1.042		0.849	1.280	0.109	1.053		0.847	1.308	0.117	1.045		0.842	1.297	0.115	1.043		0.841	1.295	0.115
Ethnic x urban	1.175		0.903	1.528	0.158	1.149		0.887	1.487	0.151	1.069		0.821	1.391	0.144	1.061		0.815	1.382	0.143	1.060		0.814	1.381	0.143
Ethnic x rural	**2.552**	***	2.107	3.091	0.249	1.205		0.972	1.492	0.132	1.184		0.946	1.483	0.136	1.179		0.942	1.477	0.135	1.175		0.938	1.470	0.135
Socioeconomic factors																									
Mother's education (ref.=10+ years)																									
0 years						**3.793**	***	2.865	5.023	0.543	**1.467**	*	1.069	2.012	0.237	**1.466**	*	1.069	2.012	0.237	**1.457**	*	1.062	1.999	0.235
1–3 years						**2.852**	***	2.229	3.648	0.358	**1.417**	**	1.084	1.853	0.194	**1.414**	**	1.082	1.849	0.193	**1.407**	**	1.076	1.839	0.192
4–6 years						**2.060**	***	1.665	2.548	0.224	**1.304**	*	1.033	1.645	0.155	**1.301**	*	1.031	1.641	0.154	**1.298**	*	1.029	1.638	0.154
7–9 years						**1.774**	***	1.387	2.268	0.223	**1.436**	**	1.086	1.899	0.205	**1.436**	**	1.086	1.898	0.204	**1.434**	**	1.086	1.894	0.204
Household wealth index						**0.839**	***	0.761	0.925	0.042	0.904		0.814	1.004	0.048	0.905		0.814	1.005	0.049	0.907		0.816	1.007	0.049
Household environment index						1.168		0.847	1.612	0.192	0.968		0.702	1.334	0.159	0.975		0.705	1.347	0.161	0.977		0.707	1.350	0.161
Husband's education						**0.953**	***	0.934	0.972	0.009	0.981		0.961	1.001	0.010	0.981		0.961	1.001	0.010	0.981		0.961	1.002	0.010
Individual and reproductive factors																									
Respondent's age											**1.054**	***	1.038	1.071	0.008	**1.054**	***	1.038	1.071	0.008	**1.054**	***	1.038	1.071	0.008
Age at first birth											**0.607**	***	0.519	0.709	0.048	**0.607**	***	0.519	0.709	0.048	**0.607**	***	0.519	0.710	0.048
Birth parity											**4.057**	***	3.310	4.973	0.421	**4.051**	***	3.304	4.967	0.421	**4.035**	***	3.292	4.945	0.419
Birth interval											**0.679**	***	0.604	0.763	0.040	**0.680**	***	0.605	0.764	0.040	**0.679**	***	0.604	0.763	0.041
Healthcare factors																									
Prenatal care index																0.883		0.535	1.457	0.226	0.884		0.536	1.457	0.225
Postnatal care mother index																0.985		0.745	1.302	0.140	0.984		0.745	1.301	0.140
Postnatal care child index																0.935		0.755	1.158	0.102	0.938		0.756	1.163	0.103
Nutritional factors																									
Minimum dietary diversity (MDD)																					0.979		0.835	1.147	0.079
Minimum meal frequency (MMF)																					0.880		0.721	1.075	0.090
Minimum acceptable diet (MAD)																					1.118		0.761	1.642	0.219
Random effect (cluster-level)	0.725		0.599	0.878	0.071	0.658		0.532	0.814	0.071	0.744		0.596	0.928	0.084	0.744		0.596	0.928	0.084	0.742		0.595	0.924	0.083
N(level-1)	**20,770**					**20,770**					**20,770**					**20,770**					**20,770**				
N(level-2)	**3,953**					**3,953**					**3,953**					**3,953**					**3,953**				

Notes: * p<0.05, ** p<0.01, *** p<0.001. Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.

Table 4.5: Results of multilevel logit models for the odds of stunting in Latin America

Table 4.5: Results of multilevel logit models for the odds of stunting in Latin America
(Source: author's calculations of Demographic and Health Surveys data for Colombia, Guatemala, and Peru, 1986–2015; N(level-1) = 15,828; N(level-2) = 3,372)

	Model 1					Model 2					Model 3					Model 4					Model 5				
Variables	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**
Year	**0.953**	***	0.926	0.980	0.014	**0.947**	***	0.921	0.974	0.014	**0.950**	***	0.924	0.977	0.014	**0.951**	***	0.924	0.979	0.014	**0.952**	***	0.925	0.980	0.014
Ethnicity and/or race																									
Indigenous and/or afro-descendant *(ref.=Not ethnic)*	**1.580**	***	1.247	2.003	0.191	**1.580**	***	1.252	1.993	0.187	**1.562**	***	1.237	1.971	0.186	**1.580**	***	1.249	1.997	0.189	**1.622**	***	1.280	2.055	0.196
Geographic factors																									
Region (ref.=Urban)																									
Rural	**3.073**	***	2.629	3.591	0.245	**1.263**	**	1.055	1.513	0.116	**1.267**	**	1.056	1.519	0.117	**1.264**	**	1.054	1.517	0.118	**1.281**	**	1.068	1.538	0.119
Country (ref.=Colombia)																									
Guatemala	**6.621**	***	5.261	8.333	0.777	**5.696**	***	4.398	7.377	0.752	**5.564**	***	4.288	7.220	0.740	**6.423**	***	4.745	8.694	0.992	**6.708**	***	4.936	9.115	1.050
Peru	**2.991**	***	2.415	3.705	0.327	**2.804**	***	2.251	3.494	0.314	**2.772**	***	2.221	3.459	0.313	**2.892**	***	2.239	3.734	0.377	**2.917**	***	2.253	3.776	0.384
Ethnicity x Type of residence *(ref.=Not ethnic x Urban)*																									
Not ethnic x rural	**3.073**	***	2.629	3.591	0.245	**1.263**	**	1.055	1.513	0.116	**1.267**	**	1.056	1.519	0.117	**1.264**	**	1.054	1.517	0.118	**1.281**	**	1.068	1.538	0.119
Ethnic x urban	**1.580**	***	1.247	2.003	0.191	**1.580**	***	1.252	1.993	0.187	**1.562**	***	1.237	1.971	0.186	**1.580**	***	1.249	1.997	0.189	**1.622**	***	1.280	2.055	0.196
Ethnic x rural	**2.784**	***	2.309	3.357	0.266	1.184		0.973	1.442	0.119	1.184		0.972	1.441	0.119	1.192		0.978	1.452	0.120	1.210		0.992	1.476	0.123
Socioeconomic factors																									
Mother's education (ref.=10+ years)																									
0 years						**2.362**	***	1.836	3.039	0.304	**2.178**	***	1.676	2.831	0.291	**2.166**	***	1.666	2.816	0.290	**2.234**	***	1.716	2.910	0.301
1–3 years						**1.966**	***	1.593	2.426	0.211	**1.875**	***	1.501	2.344	0.213	**1.869**	***	1.494	2.337	0.213	**1.920**	***	1.533	2.404	0.220
4–6 years						**1.692**	***	1.418	2.020	0.153	**1.669**	***	1.387	2.009	0.158	**1.676**	***	1.393	2.018	0.159	**1.683**	***	1.396	2.028	0.160
7–9 years						**1.263**	**	1.040	1.535	0.125	**1.279**	**	1.046	1.565	0.132	**1.283**	**	1.049	1.569	0.132	**1.293**	**	1.057	1.582	0.133
Household wealth index						**0.817**	***	0.751	0.889	0.035	**0.828**	***	0.759	0.902	0.036	**0.831**	***	0.762	0.906	0.036	0.822		0.754	0.896	0.036
Household environment index						**0.564**	***	0.432	0.736	0.077	**0.582**	***	0.446	0.761	0.079	**0.589**	***	0.451	0.770	0.081	0.569		0.434	0.745	0.078
Husband's education						**0.969**	***	0.952	0.985	0.008	**0.972**	***	0.955	0.988	0.008	**0.972**	***	0.955	0.988	0.008	0.971		0.954	0.987	0.009
Individual and reproductive factors																									
Respondent's age											1.008		0.996	1.021	0.007	1.008		0.996	1.021	0.007	1.005		0.992	1.018	0.007
Age at first birth											1.059		0.924	1.214	0.074	1.060		0.925	1.215	0.074	1.071		0.934	1.228	0.075
Birth parity											1.192		1.019	1.394	0.095	**1.189**	*	1.016	1.391	0.095	**1.235**	***	1.055	1.446	0.099
Birth interval											**0.779**	***	0.716	0.847	0.033	**0.780**	***	0.718	0.849	0.033	**0.787**	***	0.724	0.856	0.034
Healthcare factors																									
Prenatal care index																1.201		0.735	1.962	0.301	1.196		0.728	1.965	0.303
Postnatal care mother index																0.784		0.599	1.028	0.108	0.801		0.612	1.050	0.110
Postnatal care child index																0.957		0.800	1.146	0.088	0.946		0.790	1.133	0.087
Nutritional factors																									
Minimum dietary diversity (MDD)																					**1.425**	***	1.260	1.610	0.089
Minimum meal frequency (MMF)																					**1.202**	*	1.029	1.404	0.095
Minimum acceptable diet (MAD)																					**0.478**	***	0.343	0.668	0.081
Random effect (cluster-level)	0.793		0.664	0.948	0.072	0.763		0.630	0.925	0.075	0.763		0.628	0.926	0.076	0.760		0.626	0.922	0.075	0.768		0.631	0.935	0.077
N(level-1)	**15,828**					**15,828**					**15,828**					**15,828**					**15,828**				
N(level-2)	**3,372**					**3,372**					**3,372**					**3,372**					**3,372**				

Notes: * p<0.05, ** p<0.01, *** p<0.001. Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.

Table 4.6: Results of multilevel logit models for the odds of wasting in Latin America

Table 4.6: Results of multilevel logit models for the odds of wasting in Latin America
(Source: author's calculations of Demographic and Health Surveys data for Colombia, Guatemala, and Peru, 1986–2015; N(level-1) = 15,827; N(level-2) = 3,372)

	Model 1					Model 2					Model 3					Model 4					Model 5				
Variables	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**
Year	0.986		0.943	1.031	0.023	0.981		0.936	1.028	0.023	0.985		0.939	1.033	0.024	0.990		0.942	1.039	0.025	0.990		0.943	1.040	0.025
Ethnicity and/or race																									
Indigenous and/or afro-descendant *(ref.=Not ethnic)*	**2.511**	***	1.729	3.646	0.478	**2.559**	***	1.798	3.642	0.461	**2.519**	***	1.762	3.600	0.459	**2.562**	***	1.784	3.681	0.474	**2.578**	***	1.794	3.704	0.477
Geographic factors																									
Region (ref.=Urban)																									
Rural	**2.786**	***	2.172	3.574	0.354	1.089		0.819	1.448	0.158	1.097		0.823	1.463	0.161	1.082		0.810	1.447	0.160	1.085		0.812	1.450	0.160
Country (ref.=Colombia)																									
Guatemala	**4.038**	***	2.845	5.730	0.721	**3.160**	***	2.116	4.721	0.647	**3.169**	***	2.110	4.759	0.658	**3.903**	***	2.480	6.141	0.903	**3.904**	***	2.476	6.155	0.907
Peru	**2.428**	***	1.722	3.424	0.426	**2.211**	***	1.551	3.151	0.400	**2.030**	***	1.415	2.913	0.374	**2.326**	***	1.537	3.520	0.492	**2.331**	***	1.540	3.529	0.493
Ethnicity x Type of residence *(ref.=Not ethnic x Urban)*																									
Not ethnic x rural	**2.786**	***	2.172	3.574	0.354	1.089		0.819	1.448	0.158	1.097		0.823	1.463	0.161	1.082		0.810	1.447	0.160	1.085		0.812	1.450	0.160
Ethnic x urban	**2.511**	***	1.729	3.646	0.478	**2.559**	***	1.798	3.642	0.461	**2.519**	***	1.762	3.600	0.459	**2.562**	***	1.784	3.681	0.474	**2.578**	***	1.794	3.704	0.477
Ethnic x rural	**3.208**	***	2.394	4.300	0.479	1.339		0.994	1.803	0.204	1.329		0.985	1.795	0.204	1.332		0.985	1.801	0.205	1.340		0.991	1.811	0.206
Socioeconomic factors																									
Mother's education (ref.=10+ years)																									
0 years						**2.547**	***	1.742	3.724	0.493	**2.026**	***	1.337	3.070	0.430	**2.018**	***	1.329	3.064	0.430	**2.027**	***	1.335	3.078	0.432
1–3 years						**1.688**	***	1.206	2.362	0.289	**1.457**	*	1.024	2.074	0.263	**1.455**	*	1.019	2.078	0.265	**1.460**	*	1.022	2.086	0.266
4–6 years						**1.495**	**	1.099	2.036	0.235	**1.408**	*	1.019	1.946	0.233	**1.427**	*	1.028	1.980	0.238	**1.422**	*	1.025	1.975	0.238
7–9 years						1.236		0.871	1.754	0.221	1.258		0.882	1.795	0.228	1.270		0.889	1.814	0.231	1.271		0.889	1.817	0.232
Household wealth index						**0.796**	***	0.700	0.906	0.053	**0.803**	***	0.706	0.913	0.053	**0.809**	***	0.711	0.921	0.053	**0.809**	***	0.712	0.920	0.053
Household environment index						**0.568**	***	0.374	0.862	0.121	**0.564**	***	0.368	0.862	0.122	**0.578**	**	0.376	0.889	0.127	**0.572**	**	0.373	0.879	0.125
Husband's education						**0.956**	***	0.930	0.982	0.013	**0.965**	**	0.938	0.992	0.014	**0.965**	**	0.938	0.992	0.014	**0.965**	**	0.938	0.992	0.014
Individual and reproductive factors																									
Respondent's age											**1.025**	**	1.005	1.045	0.010	**1.025**	**	1.005	1.045	0.010	**1.024**	**	1.004	1.045	0.010
Age at first birth											1.005		0.819	1.235	0.105	1.009		0.821	1.240	0.106	1.009		0.821	1.240	0.106
Birth parity											**1.360**	**	1.067	1.733	0.168	**1.356**	**	1.064	1.729	0.168	**1.370**	**	1.074	1.747	0.170
Birth interval											**0.801**	***	0.701	0.915	0.054	**0.806**	***	0.704	0.921	0.055	**0.806**	***	0.705	0.922	0.055
Healthcare factors																									
Prenatal care index																2.109		0.923	4.819	0.889	2.125		0.930	4.852	0.895
Postnatal care mother index																**0.678**	*	0.463	0.994	0.132	**0.685**	*	0.467	1.004	0.134
Postnatal care child index																0.852		0.640	1.135	0.124	0.849		0.637	1.130	0.124
Nutritional factors																									
Minimum dietary diversity (MDD)																					1.114		0.931	1.333	0.102
Minimum meal frequency (MMF)																					0.992		0.748	1.317	0.143
Minimum acceptable diet (MAD)																					0.744		0.421	1.315	0.216
Random effect (cluster-level)	0.777		0.586	1.030	0.112	0.692		0.493	0.971	0.120	0.706		0.505	0.985	0.120	0.709		0.508	0.991	0.121	0.705		0.504	0.987	0.121
N(level-1)	**15,827**					**15,827**					**15,827**					**15,827**					**15,827**				
N(level-2)	**3,372**					**3,372**					**3,372**					**3,372**					**3,372**				

Notes: * $p<0.05$, ** $p<0.01$, *** $p<0.001$. Statistically significant coefficient at $p<0.05$ are bolded. Reference category is given in parentheses.

Table 4.7: Results of multilevel logit models for the odds of anemia in Latin America

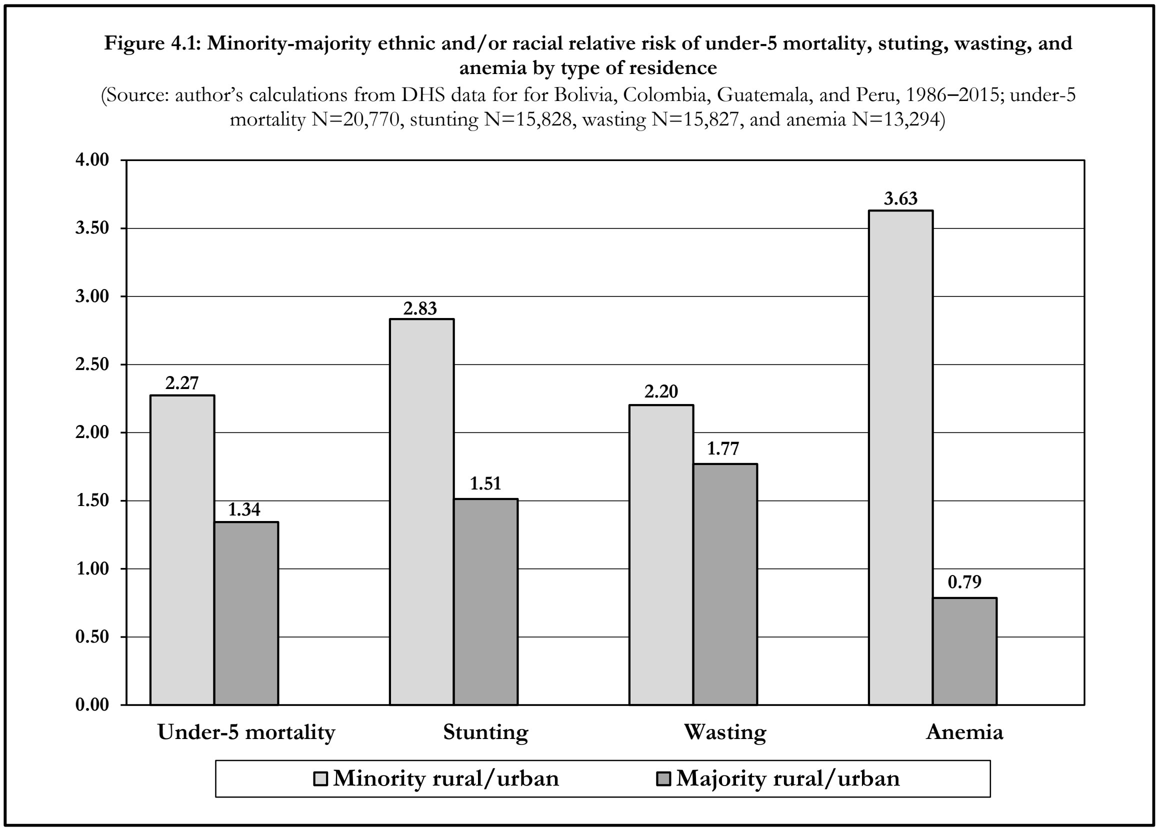
Table 4.7: Results of multilevel logit models for the odds of anemia in Latin America
(Source: author's calculations of Demographic and Health Surveys data for Bolivia, Guatemala, and Peru, 1986–2015; N(level-1) = 13,294; N(level-2) = 2,474)

	Model 1					Model 2					Model 3					Model 4					Model 5				
Variables	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**	**Coef.**		**95% C.I. Low**	**95% C.I. High**	**S.E.**
Year	**0.941**	***	0.915	0.967	0.013	**0.931**	***	0.904	0.958	0.014	**0.935**	***	0.909	0.962	0.014	**0.929**	***	0.902	0.956	0.014	**0.931**	***	0.904	0.958	0.014
Ethnicity and/or race																									
Indigenous and/or afro-descendant *(ref.=Not ethnic)*	0.888		0.705	1.118	0.104	0.872		0.690	1.102	0.104	0.877		0.693	1.110	0.105	0.890		0.701	1.129	0.108	0.885		0.698	1.121	0.107
Geographic factors																									
Region (ref.=Urban)																									
Rural	**1.231**	***	1.068	1.417	0.089	**0.806**	**	0.684	0.949	0.067	**0.809**	**	0.687	0.952	0.067	**0.820**	**	0.697	0.966	0.068	**0.813**	**	0.691	0.957	0.068
Country (ref.=Bolivia)																									
Guatemala	0.702		0.470	1.048	0.143	0.783		0.521	1.176	0.163	0.739		0.491	1.113	0.154	0.767		0.501	1.174	0.167	0.679		0.440	1.049	0.151
Peru	1.081		0.785	1.488	0.176	1.162		0.841	1.605	0.191	1.231		0.888	1.706	0.205	1.123		0.799	1.577	0.195	1.031		0.725	1.464	0.185
Ethnicity x Type of residence *(ref.=Not ethnic x Urban)*																									
Not ethnic x rural	**1.231**	***	1.068	1.417	0.089	**0.806**	**	0.684	0.949	0.067	**0.809**	**	0.687	0.952	0.067	**0.820**	**	0.697	0.966	0.068	**0.813**	**	0.691	0.957	0.068
Ethnic x urban	0.888		0.705	1.118	0.104	0.872		0.690	1.102	0.104	0.877		0.693	1.110	0.105	0.890		0.701	1.129	0.108	0.885		0.698	1.121	0.107
Ethnic x rural	**1.698**	***	1.431	2.015	0.148	1.126		0.930	1.365	0.110	1.126		0.929	1.366	0.111	1.142		0.940	1.389	0.114	1.118		0.920	1.359	0.111
Socioeconomic factors																									
Mother's education (ref.=10+ years)																									
0 years						1.243		0.977	1.583	0.153	**1.323**	*	1.028	1.701	0.170	**1.329**	*	1.032	1.711	0.171	**1.344**	*	1.044	1.730	0.173
1–3 years						**1.339**	***	1.082	1.658	0.146	**1.376**	***	1.102	1.718	0.156	**1.388**	***	1.112	1.733	0.157	**1.390**	***	1.114	1.734	0.157
4–6 years						**1.249**	**	1.055	1.478	0.107	**1.253**	**	1.052	1.492	0.112	**1.262**	***	1.060	1.503	0.112	**1.270**	***	1.065	1.515	0.114
7–9 years						1.180		0.979	1.424	0.113	1.167		0.964	1.414	0.114	1.171		0.966	1.418	0.115	1.163		0.959	1.411	0.115
Household wealth index						**0.840**	***	0.773	0.913	0.036	**0.860**	***	0.791	0.936	0.037	**0.860**	***	0.790	0.936	0.037	**0.859**	***	0.789	0.935	0.037
Household environment index						1.039		0.792	1.363	0.144	1.083		0.825	1.421	0.150	1.061		0.808	1.394	0.148	1.062		0.809	1.393	0.147
Husband's education						0.990		0.971	1.009	0.010	0.989		0.970	1.008	0.010	0.990		0.971	1.008	0.010	0.991		0.973	1.010	0.010
Individual and reproductive factors																									
Respondent's age											**0.970**	***	0.957	0.983	0.007	**0.970**	***	0.957	0.983	0.007	**0.969**	***	0.956	0.982	0.007
Age at first birth											**1.208**	***	1.061	1.375	0.080	**1.208**	***	1.061	1.375	0.080	**1.206**	***	1.058	1.374	0.080
Birth parity											**1.307**	***	1.110	1.539	0.109	**1.313**	***	1.115	1.546	0.109	**1.310**	***	1.112	1.543	0.109
Birth interval											0.952		0.874	1.037	0.042	0.950		0.872	1.035	0.042	0.948		0.870	1.034	0.042
Healthcare factors																									
Prenatal care index																0.867		0.520	1.446	0.226	0.879		0.526	1.468	0.230
Postnatal care mother index																1.062		0.841	1.341	0.126	1.031		0.818	1.299	0.122
Postnatal care child index																**1.212**	*	1.012	1.451	0.112	**1.206**	*	1.007	1.445	0.111
Nutritional factors																									
Minimum dietary diversity (MDD)																					**1.152**	*	1.015	1.307	0.074
Minimum meal frequency (MMF)																					**0.693**	***	0.596	0.807	0.054
Minimum acceptable diet (MAD)																					**1.955**	***	1.451	2.632	0.297
Random effect (cluster-level)	0.697		0.581	0.836	0.065	0.670		0.556	0.807	0.064	0.672		0.558	0.809	0.064	0.676		0.561	0.814	0.064	0.669		0.555	0.807	0.064
N(level-1)	**13,294**					**13,294**					**13,294**					**13,294**					**13,294**				
N(level-2)	**2,474**					**2,474**					**2,474**					**2,474**					**2,474**				

Notes: * p<0.05, ** p<0.01, *** p<0.001. Statistically significant coefficient at p<0.05 are bolded. Reference category is given in parentheses.

FIGURES

Figure 4.1: Minority-majority ethnic and/or racial relative risk of under-5 mortality, stunting, wasting, and anemia by type of residence



APPENDIX: TABLES

Table 4.1A: Minority-majority ethnic and/or racial proportions, absolute differences, and relative risks of under-5 mortality, stunting, wasting, and anemia by country

Table 4.1A: Minority-majority ethnic and/or racial proportions, absolute differences, and relative risks of under-5 mortality, stunting, wasting, and anemia by country
(Source: author's calculations of Demographic and Health Surveys data for Bolivia, Colombia, Guatemala, and Peru, 1986–2015; under-5 mortality N=20,770, stunting N=15,828; wasting N=15,827, and anemia N=13,294)

Country	**Bolivia**				**Colombia**			
	Proportion outcome		**Absolute difference**	**Relative risk**	**Proportion outcome**		**Absolute difference**	**Relative risk**
Ethnicity and/or race	Majority ethnic and/or racial group	Minority ethnic and/or racial group	Minority-majority ethnic and/or racial group	Minority/majority ethnic and/or racial group	Majority ethnic and/or racial group	Minority ethnic and/or racial group	Minority-majority ethnic and/or racial group	Minority/majority ethnic and/or racial group
Measure	(1)	(2)	(2)-(1)	(2)/(1)	(3)	(4)	(4)-(3)	(4)/(3)
Under-5 mortality	44.57	55.43	10.86	**1.24**	24.51	75.49	50.98	**3.08**
Stunting	.	.	.	.	28.78	71.22	42.44	**2.47**
Wasting	.	.	.	.	24.67	75.33	50.66	**3.05**
Anemia	35.53	64.47	28.94	**1.81**	.	.	.	.
Country	**Guatemala**				**Peru**			
	Proportion outcome		**Absolute difference**	**Relative risk**	**Proportion outcome**		**Absolute difference**	**Relative risk**
Ethnicity and/or race	Majority ethnic and/or racial group	Minority ethnic and/or racial group	Minority-majority ethnic and/or racial group	Minority/majority ethnic and/or racial group	Majority ethnic and/or racial group	Minority ethnic and/or racial group	Minority-majority ethnic and/or racial group	Minority/majority ethnic and/or racial group

Measure	(5)	(6)	(6)-(5)	(6)/(5)	(7)	(8)	(8)-(7)	(8)/(7)
Under-5 mortality	52.45	47.55	-4.90	**0.91**	72.05	27.95	-44.10	**0.39**
Stunting	58.14	41.86	-16.28	**0.72**	71.25	28.75	-42.50	**0.40**
Wasting	54.08	45.92	-8.16	**0.85**	65.13	34.87	-30.26	**0.54**
Anemia	46.15	53.85	7.70	**1.17**	82.76	17.24	-65.52	**0.21**

Note: For the purpose of simplification, minority group is defined as indigenous and/or afro-descendant and majority group as non-indigenous and/or non-afro-descendant

APPENDIX: FIGURES

Figure 4.1A: Minority-majority ethnic and/or racial proportions and absolute differences in select child health outcomes in Bolivia

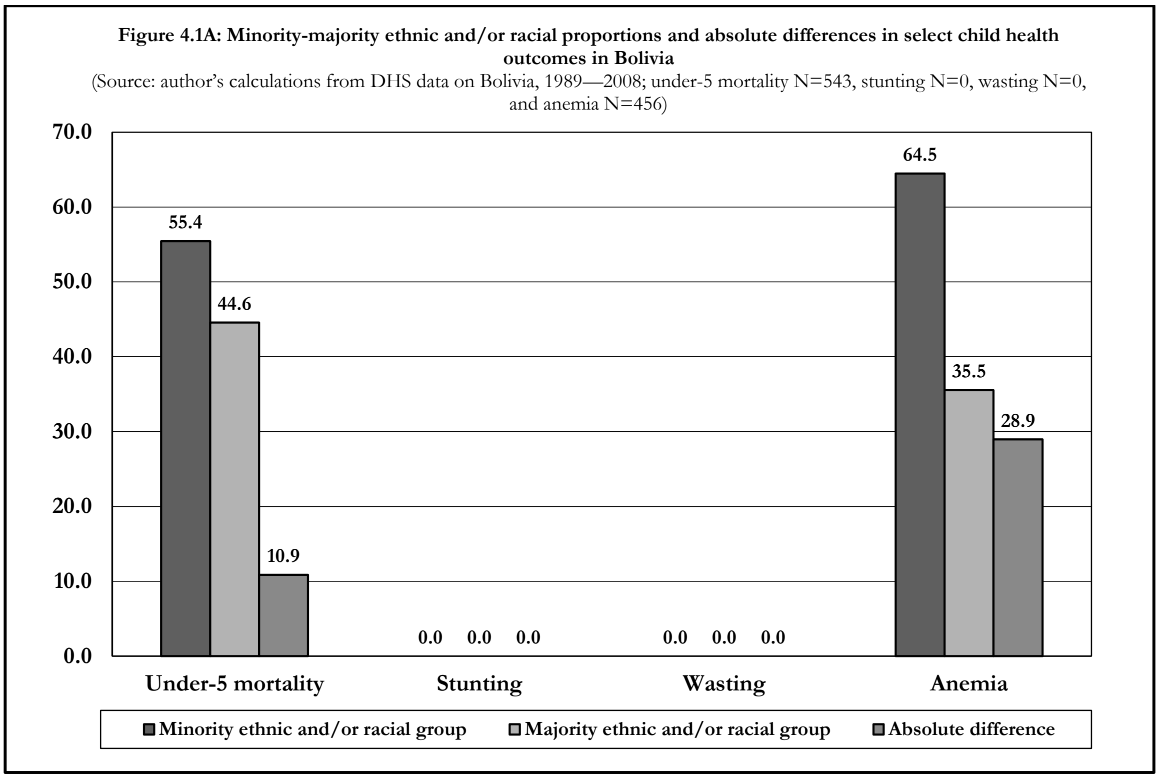


Figure 4.2A: Minority-majority ethnic and/or racial proportions and absolute differences in select child health outcomes in Colombia

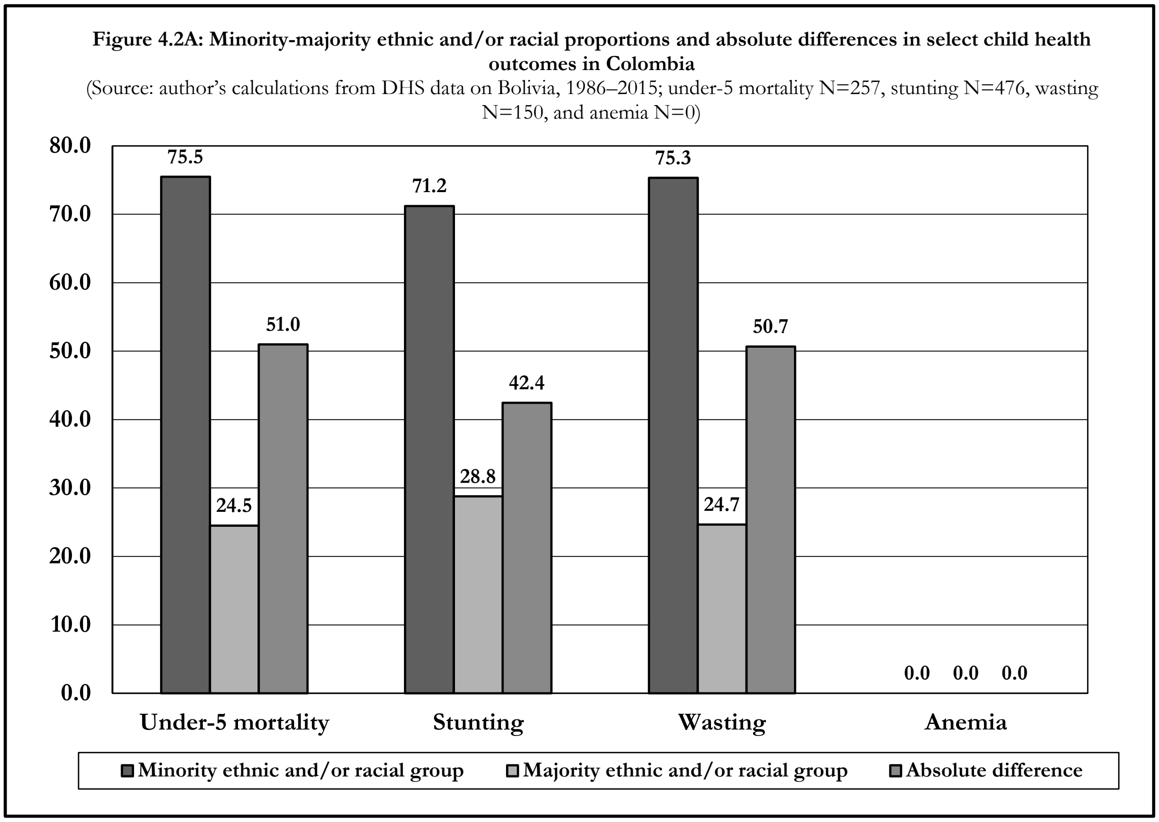


Figure 4.3A: Minority-majority ethnic and/or racial proportions and absolute differences in select child health outcomes in Guatemala

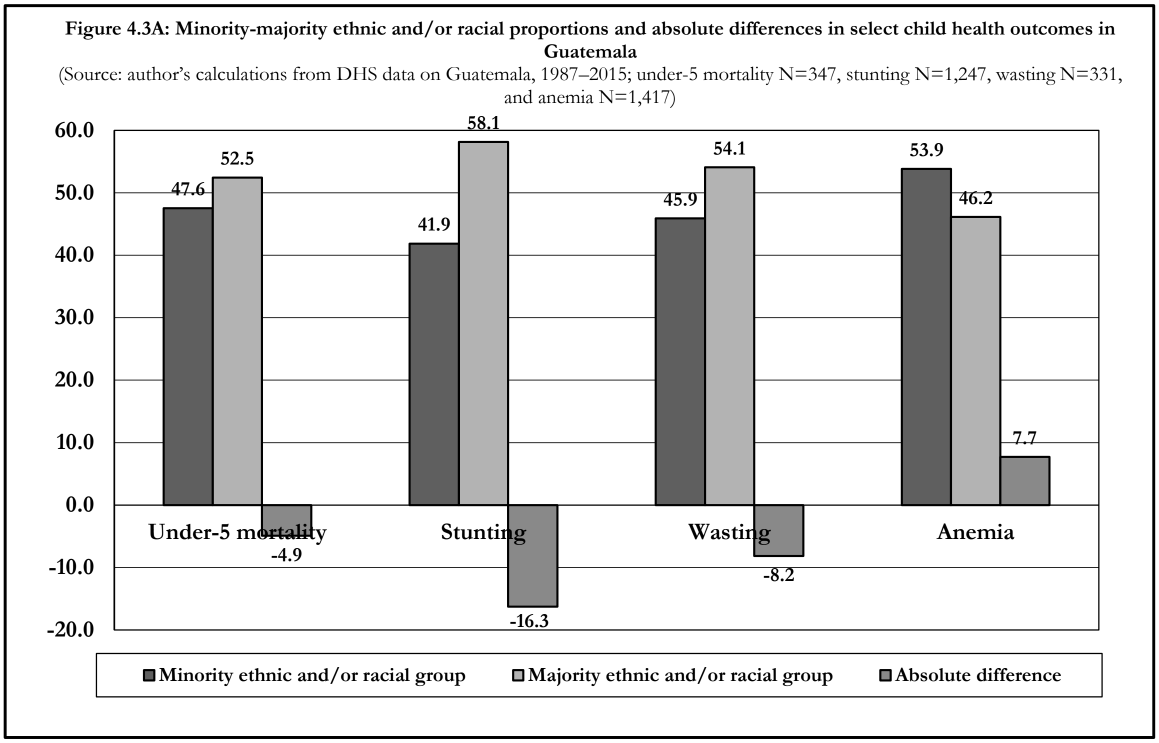
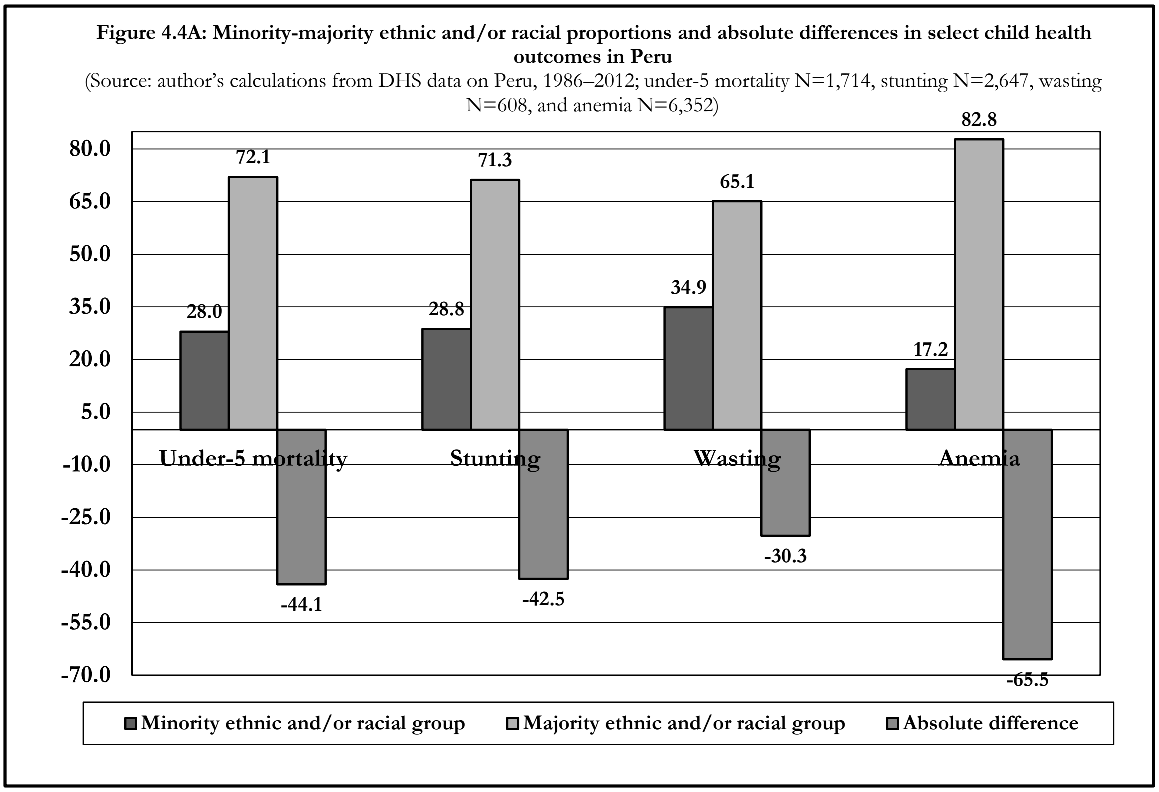


Figure 4.4A: Minority-majority ethnic and/or racial proportions and absolute differences in select child health outcomes in Peru



CHAPTER FIVE: CONCLUSION

This dissertation tested several ideas about fertility, sexual and reproductive health, and child health outcomes in Latin America and the Caribbean, using a framework that was contextual, multilevel, and comparative. Specifically, it explored the heterogeneities in the association of ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes. This dissertation focused on a key question: what is the relationship between ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes in Latin America and the Caribbean? Over the course of three empirical chapters, I explored these relationships using Demographic and Health Survey (DHS) data (1986–2017) for seven countries in Latin America and the Caribbean. In the remainder of this concluding chapter, I synthesize the three empirical chapters comprising the main body of this dissertation. In addition, I provide insights into the significance of this research in advancing our understanding of sociological and demographic processes in this region, particularly by elucidating significant inequalities across ethnoracial groups, rural-urban residence, and national origin.

Generally, this dissertation finds significant inequalities in fertility, sexual and reproductive health, and child health outcomes by ethnoracial identity, rural-urban residence, and national origin in Latin America and the Caribbean. In Chapter Two, I used Demographic and Health Survey (DHS) data (1986–2017) for seven countries in Latin America and the Caribbean (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru) to measure and explain rural-urban disparities in fertility for women with different levels of educational attainment (N(level-1) = 465,823; N(level-2) = 6,247). First, I provided a descriptive overview of rural-urban fertility for women with different levels of educational attainment. While fertility has decreased across rural and urban areas over time, descriptive results from this chapter indicated that rural women continue to have higher fertility than urban women at all levels of educational attainment. While previous research has largely focused on the protective role of female education on fertility, these descriptive results suggested that education plays a less protective role on fertility for rural women compared to urban women in Latin America and the Caribbean.

I also conducted multilevel analysis of characteristics that predict fertility, including an interaction between educational attainment and rural-urban residence. I tested for the rural-urban gap in fertility and whether the size of this gap differed across educational attainment. I found that the association of educational attainment and fertility does vary by rural-urban residence with rural women reporting higher fertility at all levels of educational attainment. Next, I conducted a Blinder-Oaxaca decomposition to explore whether the observed fertility disparities across rural-urban areas are attributable to differences in the *composition* in the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility. Results suggested that differences in the *composition* in the characteristics of rural-urban women—particularly women's educational attainment—play an important role in explaining differences in fertility between rural and urban areas in Latin America and the Caribbean. Given that the proportion of women with higher educational attainment has increased over time in this region, this analysis suggested that *compositional* changes in urban areas compared to rural areas play an important role in explaining disparities in fertility.

In Chapter Three, I used Demographic and Health Survey (DHS) data (1986–2017) for seven countries in Latin America and the Caribbean (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru) to assess rural-urban disparities in unintended pregnancies (N(level-1) = 296,239; N(level-2) = 6,169), contraceptive nonuse (N(level-1) = 660,410; N(level-2) = 6,262), and terminated pregnancies (N(level-1) = 660,269; N(level-2) = 6,262). First, I provided a descriptive overview of rural-urban sexual and reproductive health and also conducted relative risk analyses. Descriptive results and relative risk analyses indicated significant rural-urban differences for sample characteristics, sexual and reproductive health outcomes, contraceptive methods, and types of terminations. I also conducted multilevel analysis of characteristics that predict unintended pregnancies, contraceptive nonuse, and terminated pregnancies, controlling for a series of geographic, socioeconomic, individual, and reproductive factors. Multilevel analyses suggested that rural respondents have higher risk of contraceptive nonuse, although this is reduced with household wealth. On the other hand, urban respondents have higher risk of unintended pregnancies and terminated pregnancies. These results suggested that sexual and reproductive health does vary by rural-urban residence in Latin America and the Caribbean.

Finally, in Chapter Four I used DHS data (1986–2015) for four countries in Latin America and the Caribbean (Bolivia, Colombia, Guatemala, and Peru) to explore ethnoracial differences in under-5 mortality (N(level-1) = 20,770; N(level-2) = 3,953), stunting (N(level-1) = 15,828; N(level-2) = 3,372), wasting (N(level-1) = 15,827; N(level-2) = 3,372), and anemia (N(level-1) = 13,294; N(level-2) = 2,474). First, I described relative risks by ethnicity and/or race and across urban-rural regions. Rural-urban risk analysis suggested that indigenous and/or afro-descendent respondents have higher risk of under-5 mortality, stunting, wasting, and anemia. The same pattern is observed for cross-country risks, particularly for Bolivia and Colombia. Second, I conducted logistic multilevel regression models to evaluate the association of ethnicity and/or race and child health outcomes. Finally, I demonstrate the extent to which certain proximate factors—geographic, socioeconomic, individual, reproductive, healthcare, and nutrition—may moderate the association. Results from logistic multilevel regression models suggested that, even after controlling for geographic, socioeconomic, individual, reproductive, healthcare, and nutritional variables, self-identifying as indigenous and/or afro-descendant is associated with a higher risk of child stunting and wasting, but not necessarily a higher risk of under-5 mortality and anemia.

These three empirical chapters made several substantial contributions to how sociologists and social demographers understand the heterogeneities in the associations of ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes in Latin America and the Caribbean. In what follows, I draw on the findings of these three empirical chapters to highlight five overarching contributions to the broader sociological and demographic literature. First, and most generally, this dissertation provided a holistic understanding of the heterogeneities of ethnoracial identity, rural-urban residence, and national origin on fertility, sexual and reproductive health, and child health outcomes. In the second half of the 20th century, this region experienced important sociological and demographic changes with far-reaching and long-lasting consequences. While much of previous research has focused on country-level and/or cross-country effects, research from this study accounted for other forms of heterogeneity—rural-urban residence and ethnoracial identity—which explain inequalities in fertility, sexual and reproductive health, and child health outcomes in this region.

Second, this dissertation not only measured disparities in fertility in Latin America and the Caribbean, but also explained observed disparities by decomposing them into components and explaining whether the observed inequalities are attributable to differences in the *composition* in the characteristics of rural-urban women or differences in the *effect* of the characteristics of rural-urban women on fertility. While this approach has a long methodological tradition in various literatures, it has not been applied to explain rural-urban disparities in fertility in Latin America and the Caribbean. This methodology has the advantage of providing a unified framework to consider the collective importance of a vast range of geographic-, socioeconomic-, individual-, and reproductive-related characteristics, many of which may be individually insignificant. Results from this dissertation, thus, contributed methodologically and conceptually to the literature by suggesting that the observed rural-urban disparities in fertility are attributable to differences in the *composition* in the characteristics of rural-urban women in Latin America and the Caribbean.

Third, beyond merely assessing heterogeneities of fertility, sexual and reproductive health, and child health outcomes by ethnoracial identity, rural-urban residence, and national origin, I also controlled for differences in geographic (e.g., country, rural-urban residence), socioeconomic (e.g., household wealth, years of education, occupation), and individual and reproductive (e.g., age, union status, age at-first-birth, living children, birth parity, birth interval) characteristics. For example, while previous theoretical and empirical research in the Global South has suggested that, on average, urban women have better sexual and reproductive outcomes than rural women, my results suggested for example, that conditional upon geographic, socioeconomic, individual, and reproductive characteristics (particularly household wealth, years of education, and occupation), rural women may, in fact, have better sexual and reproductive health outcomes than urban women. As the size of urban centers grow worldwide, these results, thus, raise the importance of renewing efforts in addressing the challenges of sexual and reproductive health faced by the urban poor.

Fourth, I provided an empirical assessment of persistent and pronounced child health disparities across ethnic and/or racial groups in Latin America. I found that women who self-identified as indigenous and/or afro-descendant have higher risk of children suffering from stunting and wasting. Most surprisingly, however, they did not necessarily have higher risk of child under-5 mortality or anemia, which challenges previous research findings regarding these two particular outcomes. Despite extensive ethnoracial diversity in this region, scarcity in research on ethnoracial health disparities is explained by long-held beliefs that socio-economic status, rather than ethnoracial differences, structure inequality. This research, thus, shed light on the inequalities experienced by ethnic and/or racial minority populations in Latin America and the Caribbean, particularly focused on child health outcomes as well as observed variation across and within countries. Generally speaking, it contributed significantly to the literature by documenting ethnoracial inequalities not previously studied.

Fifth, this dissertation used Demographic and Health Survey (DHS) data (1986–2017) for multiple countries in Latin America and the Caribbean. Specifically, it relied on all survey waves—approximately 40 waves for seven countries (Bolivia, Colombia, Dominican Republic, Guatemala, Haiti, Honduras, and Peru)—with slight variations in countries, waves, and samples included across each empirical chapter. While previous researchers have studied the case of Latin America and the Caribbean, this dissertation filled multiple gaps in the literature, particularly by analyzing data for a considerable number of countries in the region and relying on substantial sample sizes for robust empirical analyses. For example, Chapter Two assessed disparities in fertility for women with different levels of educational attainment, which relied on a sample of 465,823 women in 6,247 clusters. Chapter Three, assessed rural-urban disparities in unintended pregnancies, contraceptive nonuse, and terminated pregnancies, which relied on different samples across outcomes. Specifically, 296,239 women in 6,169 clusters for unintended pregnancies, 660,410 women in 6,262 clusters for contraceptive nonuse, and 660,269 women in 6,262 clusters for terminated pregnancies. Finally, Chapter Four explored ethnoracial differences in under-5 mortality, stunting, wasting, and anemia, which also relied on different samples across outcomes. Specifically, 20,770 women in 3,953 clusters for under-5 mortality, 15,828 women in 3,372 clusters for stunting, 15,827 women in 3,372 clusters for wasting, and 13,294 women in 2,474 clusters for anemia.

In conclusion, this dissertation finds significant heterogeneities in fertility, sexual and reproductive health, and child health outcomes by ethnoracial identity, rural-urban residence, and national origin in Latin America and the Caribbean. This dissertation clearly elucidates significant inequalities in this understudied low-, lower-middle-, and upper-middle-income world region, which can inform debates about current and future population changes. As we witness "urban explosions" across the Global South, results from this dissertation suggest that we must pay particular attention to develop programs that target the specific needs and experiences of the urban poor. In addition, illuminating these results can help inform the development of adequate population policies for this region and for other developing regions. For example, disparities in sexual and reproductive health outcomes across rural-urban areas suggest that we have the opportunity to implement tangible and pragmatic population policies to improve the sexual and reproductive health of women in both rural and urban areas. Finally, highlighting these results—particularly the inequalities across ethnoracial groups—can persuade developing governments and their partners to address centuries of ethnoracial discrimination and exclusion and commit to improving the precarious conditions of ethnoracial minorities in the developing world.

BIBLIOGRAPHY

Ali, Mohamed M., and John Cleland. 2005. "Sexual and Reproductive Behavior among Single Women Aged 15–24 in Eight Latin American Countries: A Comparative Analysis." *Social Science & Medicine* 60(6):1175–85. doi: 10.1016/j.socscimed.2004.07.002.

Ali, Mohamed M., John Cleland, and Iqbal H. Shah. 2003. "Trends in Reproductive Behavior among Young Single Women in Colombia and Peru: 1985–1999." *Demography* 40(4):659–73. doi: 10.1353/dem.2003.0031.

Alwin, Duane F. 1973. "The Use of Factor Analysis in the Construction of Linear Composites in Social Research." *Sociological Methods & Research* 2(2):191–212. doi: 10.1177/004912417300200202.

Ameyaw, Edward Kwabena, Eugene Budu, Francis Sambah, Linus Baatiema, Francis Appiah, Abdul-Aziz Seidu, and Bright Opoku Ahinkorah. 2019. "Prevalence and Determinants of Unintended Pregnancy in Sub-Saharan Africa: A Multi-Country Analysis of Demographic and Health Surveys." *PLOS ONE* 14(8):e0220970. doi: 10.1371/journal.pone.0220970.

Anker, Richard. 1978. "An Analysis of Fertility Differentials in Developing Countries." *The Review of Economics and Statistics* 60(1):58–69. doi: 10.2307/1924333.

Aslam, Monazza, and Geeta Gandhi Kingdon. 2012. "Parental Education and Child Health—Understanding the Pathways of Impact in Pakistan." *World Development* 40(10):2014–32. doi: 10.1016/j.worlddev.2012.05.007.

Atrash, Hani K., and Carol J. Rowland Hogue. 1990. "The Effect of Pregnancy Termination on Future Reproduction." *Baillière's Clinical Obstetrics and Gynaecology* 4(2):391–405. doi: 10.1016/S0950-3552(05)80234-2.

Aziken, Michael E., Patrick I. Okonta, and Adedapo B. A. Ande. 2003. "Knowledge and Perception of Emergency Contraception among Female Nigerian Undergraduates." *International Family Planning Perspectives* 29(2):84–87. doi: 10.2307/3181062.

Barro, Robert J., and Jong-Wha Lee. 1993. "International Comparisons of Educational Attainment." *Journal of Monetary Economics* 32:363–94. doi: 10.1016/0304-3932(93)90023-9.

Basu, Alaka Malwade. 2002. "Why Does Education Lead to Lower Fertility? A Critical Review of Some of the Possibilities." *World Development* 30(10):1779–90. doi: 10.1016/S0305-750X(02)00072-4.

Beals, Ralph L. 1953. "Social Stratification in Latin America." *American Journal of Sociology* 58(4):327–39. doi: 10.1086/221169.

Bearak, Jonathan, Anna Popinchalk, Leontine Alkema, and Gilda Sedgh. 2018. "Global, Regional, and Subregional Trends in Unintended Pregnancy and Its Outcomes from 1990 to 2014:

Estimates from a Bayesian Hierarchical Model." *Lancet Global Health* 6(4):e380–89. doi: 10.1016/S2214-109X(18)30029-9.

Becker, Gary. 1960. "An Economic Analysis of Fertility." Pp. 209–40 in *Demographic and Economic Change in Developed Countries*, edited by National Bureau of Economic Research. New York, NY: Columbia University Press.

Becker, Gary S. 1962. "Investment in Human Capital: A Theoretical Analysis." *Journal of Political Economy* 70(5):9–49. doi: 10.1086/258724.

Behrman, Julia A. 2020. "Mother's Relative Educational Status and Early Childhood Height-for-Age z Scores: A Decomposition of Change Over Time." *Population Research and Policy Review* 39(1):147–73. doi: 10.1007/s11113-019-09523-4.

Bell, Andrew, Malcolm Fairbrother, and Kelvyn Jones. 2019. "Fixed and Random Effects Models: Making an Informed Choice." *Quality & Quantity* 53(2):1051–74. doi: 10.1007/s11135-018-0802-x.

Bell, Andrew, and Kelvyn Jones. 2015. "Explaining Fixed Effects: Random Effects Modeling of Time-Series Cross-Sectional and Panel Data." *Political Science Research and Methods* 3(1):133–53. doi: 10.1017/psrm.2014.7.

Bello, Álvaro, and Marta Rangel. 2002. *Equity and Exclusion in Latin America and the Caribbean: The Case of Indigenous and Afro-Descendant Peoples. CEPAL Review*. No. 76. Santiago, Chile: Economic Commission for Latin America and the Caribbean.

Benavot, Aaron, and Phyllis Riddle. 1988. "The Expansion of Primary Education, 1870-1940: Trends and Issues." *Sociology of Education* 61(3):191–210. doi: 10.2307/2112627.

Bingenheimer, Jeffrey B., and Stephen W. Raudenbush. 2004. "Statistical and Substantive Inferences in Public Health: Issues in the Application of Multilevel Models." *Annual Review of Public Health* 25(1):53–77. doi: 10.1146/annurev.publhealth.25.050503.153925.

Blanc, Ann K., Amy O. Tsui, Trevor N. Croft, and Jamie L. Trevitt. 2009. "Patterns and Trends in Adolescents' Contraceptive Use and Discontinuation in Developing Countries and Comparisons with Adult Women." *International Perspectives on Sexual and Reproductive Health* 35(2):63–71. doi: 10.1363/3506309.

Blinder, Alan S. 1973. "Wage Discrimination: Reduced Form and Structural Estimates." *The Journal of Human Resources* 8(4):436–55. doi: 10.2307/144855.

Bongaarts, John, Barbara S. Mensch, and Ann K. Blanc. 2017. "Trends in the Age at Reproductive Transitions in the Developing World: The Role of Education." *Population Studies* 71(2):139–54. doi: 10.1080/00324728.2017.1291986.

Bongaarts, John, and Susan Cotts Watkins. 1996. "Social Interactions and Contemporary Fertility Transitions." *Population and Development Review* 22(4):639–82. doi: 10.2307/2137804.

Breierova, Lucia, and Esther Duflo. 2004. *The Impact of Education on Fertility and Child Mortality: Do Fathers Really Matter Less Than Mothers?* No. 10513. Cambridge, MA: National Bureau of Economic Research.

Caldwell, John C. 1976. "Toward A Restatement of Demographic Transition Theory." *Population and Development Review* 2(3/4):321–66. doi: 10.2307/1971615.

Caldwell, John C. 1979. "Education as a Factor in Mortality Decline: An Examination of Nigerian Data." *Population Studies* 33(3):395–413. doi: 10.2307/2173888.

Caldwell, John C. 1980. "Mass Education as a Determinant of the Timing of Fertility Decline." *Population and Development Review* 6(2):225–55. doi: 10.2307/1972729.

Caldwell, John C. 1982. *Theory of Fertility Decline*. New York, NY: Academic Press.

Caldwell, John C., P. H. Reddy, and Pat Caldwell. 1985. "Educational Transition in Rural South India." *Population and Development Review* 11(1):29–51. doi: 10.2307/1973377.

Callahan, Rebecca, and Stan Becker. 2014. "Unmet Need, Intention to Use Contraceptives and Unwanted Pregnancy in Rural Bangladesh." *International Perspectives on Sexual and Reproductive Health* 40(1):4–10. doi: 10.1363/4000414.

Casas, Juan Antonio, J. Norberto W. Dachs, and Alexandra Bambas. 2001. "Health Disparities in Latin America and the Caribbean: The Role of Social and Economic Determinants." Pp. 22–49 in *Equity & Health*, *No. 8*. Washington, D.C.: Pan American Health Organization.

Casterline, John B. 2001. "Diffusion Processes and Fertility Transition: Introduction." in *Diffusion Processes and Fertility Transition: Selected Perspectives*, edited by National Research Council. Washington, D.C.: National Academy Press.

Centers for Disease Control and Prevention. 2015. "Unintended Pregnancy." Retrieved August 1, 2020 (https://www.cdc.gov/reproductivehealth/contraception/unintendedpregnancy/index.htm).

Charasse-Pouélé, Cécile, and Martin Fournier. 2006. "Health Disparities between Racial Groups in South Africa: A Decomposition Analysis." *Social Science & Medicine* 62(11):2897–2914. doi: 10.1016/j.socscimed.2005.11.020.

Christofides, Nicola J., Rachel K. Jewkes, Kristin L. Dunkle, Frances McCarty, Nwabisa Jama Shai, Mzikazi Nduna, and Claire Sterk. 2014. "Risk Factors for Unplanned and Unwanted Teenage Pregnancies Occurring Over Two Years of Follow-up among a Cohort of Young South African Women." *Global Health Action* 7(1):23719. doi: 10.3402/gha.v7.23719.

Claridge, Amy M., and Casey L. Chaviano. 2013. "Consideration of Abortion in Pregnancy: Demographic Characteristics, Mental Health, and Protective Factors." *Women & Health* 53(8):777–94. doi: 10.1080/03630242.2013.831018.

Clark, Burton. 1961. *Educating the Expert Society*. San Francisco, CA: Chandler Publishing.

Cleland, John. 2001. "Potatoes and Pills: An Overview of Innovation-Diffusion Contributions to Explanations of Fertility Decline." in *Diffusion Processes and Fertility Transition: Selected Perspectives*, edited by National Research Council. Washington, D.C.: National Academy Press.

Cochrane, Susan Hill. 1979. *Fertility and Education: What Do We Really Know? World Bank Staff Occasional Papers*. No. OCP26. Washington, D.C.: World Bank Group.

Cochrane, Susan Hill, Mehrab A. Khan, and Ibrahim K. T. Osheba. 1990. "Education, Income, and Desired Fertility in Egypt: A Revised Perspective." *Economic Development and Cultural Change* 38(2):313–39. doi: 10.1086/451795.

Coleman, James Samuel. 1990. *Foundations of Social Theory*. Cambridge, MA: Harvard University Press.

Corsi, Daniel J., Melissa Neuman, Jocelyn E. Finlay, and SV Subramanian. 2012. "Demographic and Health Surveys: A Profile." *International Journal of Epidemiology* 41(6):1602–13. doi: 10.1093/ije/dys184.

de Cosio, María Eugenia Zavala. 1992. "La Transición Demográfica En América Latina y En Europa." *Notas de Población* 56:11–32.

Croft, Trevor N., Aileen M. J. Marshall, and Courtney K. Allen. 2018. *Guide to DHS Statistics*. Rockville, MD: ICF International, Inc.

da Cunha, José Marcos P., and Jorge Rodríguez Vignoli. 2009. "Urban Growth and Mobility in Latin America." in *Demographic Transformations and Inequalities in Latin America: Historical Trends and Recent Patterns*, edited by S. Cavenaghi. Rio de Janeiro, Brazil: Mundo Digital Gráfica e Editora.

Darroch, Jacqueline E. 2013. "Trends in Contraceptive Use." *Contraception* 87(9879):259–63. doi: 10.1016/j.contraception.2012.08.029.

Darroch, Jacqueline E., and Susheela Singh. 2013. "Trends in Contraceptive Need and Use in Developing Countries in 2003, 2008, and 2012: An Analysis of National Surveys." *Lancet* 381(9879):1756–62. doi: 10.1016/S0140-6736(13)60597-8.

Davies, Maggie, and Wendy Macdowall. 2006. *Health Promotion Theory*. Berkshire, United Kingdom: Open University Press.

Davis-Castro, Carla Y. 2020. *Indigenous Peoples in Latin America: Statistical Information*. CRS Report No. R46225. U.S. Congressional Research Service.

De Onis, Mercedes, Adelheid W. Onyango, Elaine Borghi, Cutberto Garza, Hong Yang, and WHO Multicentre Growth Reference Study Group. 2006. "Comparison of the World Health Organization (WHO) Child Growth Standards and the National Center for Health

Statistics/WHO International Growth Reference: Implications for Child Health Programmes." *Public Health Nutrition* 9(7):942–47. doi: 10.1017/PHN20062005.

Diamond, Ian, Margaret Newby, and Sarah Varle. 1999. "Female Education and Fertility: Examining the Links." Pp. 23–48 in *Critical Perspectives on Schooling and Fertility in the Developing World*, edited by C. H. Bledsoe, J. B. Casterline, J. A. Johnson-Kuhn, and J. G. Haaga. Washington, D.C.: The National Academies Press.

Dodoo, F. Nii-Amoo, and Maria Tempenis. 2009. "Gender, Power, and Reproduction: Rural-Urban Differences in the Relationship Between Fertility Goals and Contraceptive Use in Kenya." *Rural Sociology* 67(1):46–70. doi: 10.1111/j.1549-0831.2002.tb00093.x.

Easterlin, Richard A. 1975. "An Economic Framework for Fertility Analysis." *Studies in Family Planning* 6(3):54–63. doi: 10.2307/1964934.

Easterlin, Richard A. 1978. "The Economics and Sociology of Fertility: A Synthesis." Pp. 57–113 in *Historical Studies of Changing Fertility*, *Quantitative Studies in History*, edited by C. Tilly. Princeton, NJ: Princeton University Press.

Easterlin, Richard A., and Eileen M. Crimmins. 1985. *The Fertility Revolution: A Demand-Supply Analysis.* Chicago, IL: University of Chicago Press.

Economic Commission for Latin America and the Caribbean. 2019. "Latin America and the Caribbean: Population Estimates and Projections." Retrieved February 1, 2020 (https://www.cepal.org/en/topics/demographic-projections/latin-america-and-caribbean-population-estimates-and-projections).

Elkasabi, Mahmoud, Ruilin Ren, and Thomas W. Pullum. 2020. *Multilevel Modeling Using DHS Surveys: A Framework to Approximate Level-Weights. DHS Methodological Reports.* No. 27. Rockville, MD: ICF International, Inc.

Esteve, Albert, and Elizabeth Florez-Paredes. 2018. "The Stability Paradox: Why Expansion of Women's Education Has Not Delayed Early Union Formation or Childbearing in Latin America." *Studies in Family Planning* 49(2):127–42. doi: 10.1111/sifp.12055.

Fagbamigbe, Adeniyi F., and Ayo S. Adebowale. 2014. "Current and Predicted Fertility Using Poisson Regression Model: Evidence from 2008 Nigerian Demographic Health Survey." *African Journal of Reproductive Health* 18(1):71–83.

Farrington, David P., and Rolf Loeber. 2000. "Some Benefits of Dichotomization in Psychiatric and Criminological Research." *Criminal Behaviour and Mental Health* 10(2):100–122. doi: 10.1002/cbm.349.

Fekadu, Gedefaw Abeje, Akinyinka O. Omigbodun, Olumuyiwa A. Roberts, and Alemayehu Worku Yalew. 2020. "Determinants of Change in Long-Acting or Permanent Contraceptives Use in Ethiopia; A Multivariate Decomposition Analysis of Data from the Ethiopian Demographic and Health Survey." *PLOS ONE* 15(2):e0227218. doi: 10.1371/journal.pone.0227218.

Finer, Lawrence B., and Mia R. Zolna. 2011. "Unintended Pregnancy in the United States: Incidence and Disparities, 2006." *Contraception* 84(5):478–85. doi: 10.1016/j.contraception.2011.07.013.

Flores, Amaris A. C., and C. J. Mojica. 1992. *Mortalidad Infantil En Panamá: Un Análisis de Sus Tendencias Derivadas Del Censo 1990*. Panama City, Panama.

Food and Agriculture Organization of the United Nations. 2018. *Panorama of Rural Poverty in Latin America and the Caribbean*. Santiago, Chile: Food and Agriculture Organization of the United Nations.

Freire, Germán Nicolas, Carolina Díaz-Bonilla, Steven Daniel Schwartz Orellana, Jorge Soler López, and Flavia Carbonari. 2018. *Afro-Descendants in Latin America: Toward a Framework of Inclusion*. Washington, D.C.: World Bank Group.

Freire, Germán Nicolas, Steven Daniel Schwartz Orellana, Melissa Zumaeta Aurazo, Rita Damasceno Costa, Jonna Maria Lundvall, Martha Celmira Viveros Mendoza, Leonardo Ramiro Lucchetti, Laura Moreno, and Liliana Do Couto Sousa. 2015. *Indigenous Latin America in the Twenty-First Century: The First Decade*. No. 98544. Washington, D.C.: World Bank Group.

Frost, Michelle Bellessa, Renata Forste, and David W. Haas. 2005. "Maternal Education and Child Nutritional Status in Bolivia: Finding the Links." *Social Science & Medicine* 60(2):395–407. doi: 10.1016/j.socscimed.2004.05.010.

Gertler, Paul J., and John W. Molyneaux. 1994. "How Economic Development and Family Planning Programs Combined to Reduce Indonesian Fertility." *Demography* 31(1):33–63. doi: 10.2307/2061907.

Giuffrida, Antonio, Raquel Bernal, Mauricio Cárdenas, Ashu Handa, Antonio J. Trujillo, John A. Vernon, Laura Rodriguez Wong, Gustavo Angeles, David Mayer-Foulkes, and Carlos Larrea. 2007. *Racial and Ethnic Disparities in Health in Latin America and The Caribbean*. Washington, D.C.: Inter-American Development Bank.

Guo, Guang, and Hongxin Zhao. 2000. "Multilevel Modeling for Binary Data." *Annual Review of Sociology* 26(1):441–62. doi: 10.1146/annurev.soc.26.1.441.

Guttmacher Institute. 2018. *Abortion in Latin America and the Caribbean*. New York, NY: Guttmacher Institute.

Guzmán, José Miguel, Jorge Rodríguez, Jorge Martínez, Juan Manuel Contreras, and Daniela González. 2006. "The Demography of Latin America and the Caribbean since 1950." *Population* 61(5):519–620. doi: 10.3917/pope.605.0519.

Guzmán, Jose Miguel, Susheela Singh, German Rodríguez, and Edith A. Pantelides, eds. 1996. *The Fertility Transition in Latin America*. Oxford, United Kingdom: Oxford University Press.

Hahs-Vaughn, Debbie L., Christine M. McWayne, Rebecca J. Bulotsky-Shearer, Xiaoli Wen, and Ann-Marie Faria. 2011. "Methodological Considerations in Using Complex Survey Data: An

Applied Example with the Head Start Family and Child Experiences Survey." *Evaluation Review* 35(3):269–303. doi: 10.1177/0193841X11412071.

Halperín Donghi, Tulio. 1993. *The Contemporary History of Latin America.* edited by J. C. Chasteen. Durham, NC: Duke University Press.

Hatt, Laurel E., and Hugh R. Waters. 2006. "Determinants of Child Morbidity in Latin America: A Pooled Analysis of Interactions between Parental Education and Economic Status." *Social Science & Medicine* 62(2):375–86. doi: 10.1016/j.socscimed.2005.06.007.

Heaton, Tim B., Renata Forste, John P. Hoffmann, and Dallan Flake. 2005. "Cross-National Variation in Family Influences on Child Health." *Social Science & Medicine* 60(1):97–108. doi: 10.1016/j.socscimed.2004.04.029.

Hermalin, Albert I. 1983. "Fertility Regulation and Its Costs: A Critical Essay in Determinants of Fertility." Pp. 1–43 in *Developing Countries.* Vol. 2, edited by R. A. Bulatao and R. D. Lee. New York, NY: Academic Press.

Hill, Kenneth, Danzhen You, Mie Inoue, and Mikkel Z. Oestergaard. 2012. "Child Mortality Estimation: Accelerated Progress in Reducing Global Child Mortality, 1990–2010." *PLOS Medicine* 9(8):e1001303. doi: 10.1371/journal.pmed.1001303.

Hindin, Michelle J., and Adesegun O. Fatusi. 2009. "Adolescent Sexual and Reproductive Health in Developing Countries: An Overview of Trends and Interventions." *International Perspectives on Sexual and Reproductive Health* 35(2):58–62. doi: 10.1363/3505809.

Holsinger, Donald B., and John D. Kasarda. 1976. "Education and Human Fertility: Sociological Perspectives." Pp. 154–81 in *Population and Development: The Search for Selective Interventions*, edited by R. C. Ridker. Baltimore, MD: Johns Hopkins University Press.

ICF International. 2012. *Demographic and Health Survey Sampling and Household Listing Manual. MEASURE DHS*. Calverton, MD: ICF International, Inc.

Inglehart, Ronald, and Marita Carballo. 1997. "Does Latin America Exist? (And Is There a Confucian Culture?): A Global Analysis of Cross-Cultural Differences." *PS: Political Science and Politics* 30(1):34–47. doi: 10.2307/420668.

Jain, Anrudh K. 1981. "The Effect of Female Education on Fertility: A Simple Explanation." *Demography* 18(4):577–95. doi: 10.2307/2060948.

Jejeebhoy, Shireen J. 1995. *Women's Education, Autonomy, and Reproductive Behaviour: Experience from Developing Countries.* New York, NY: Oxford University Press.

Jokisch, Brad D., and Kendra McSweeney. 2011. "Assessing the Potential of Indigenous-Run Demographic/Health Surveys: The 2005 Shuar Survey, Ecuador." *Human Ecology* 39(5):683–98. doi: 10.1007/s10745-011-9419-6.

Kabeer, N. 2001. "Ideas, Economics and 'the Sociology of Supply': Explanations for Fertility Decline in Bangladesh." *Journal of Development Studies* 38(1):29–70. doi: 10.1080/00220380412331322181.

Katz, Michael B. 1976. "The Origins of Public Education: A Reassessment." *History of Education Quarterly* 16(4):381–407. doi: 10.2307/367722.

Kaufmann, R. B., L. Morris, and A. M. Spitz. 1997. "Comparison of Two Question Sequences for Assessing Pregnancy Intentions." *American Journal of Epidemiology* 145(9):810–16. doi: 10.1093/oxfordjournals.aje.a009174.

Kim, ChangHwan. 2010. "Decomposing the Change in the Wage Gap Between White and Black Men Over Time, 1980-2005: An Extension of the Blinder-Oaxaca Decomposition Method." *Sociological Methods & Research* 38(4):619–51. doi: 10.1177/0049124110366235.

Kishor, Sunita, and Katherine Neitzel. 1996. *The Status of Women: Indicators for Twenty-Five Countries.* DHS Comparative Studies No. 21. Calverton, MD: Macro International, Inc.

Koenig, Michael A., James F. Phillips, Oona M. Campbell, and Stan D'Souza. 1990. "Birth Intervals and Childhood Mortality in Rural Bangladesh." *Demography* 27(2):251–65. doi: 10.2307/2061452.

Kuang-Yao Pan, William, Christine Erlien, and Richard E. Bilsborrow. 2010. "Morbidity and Mortality Disparities among Colonist and Indigenous Populations in the Ecuadorian Amazon." *Social Science & Medicine* 70(3):401–11. doi: 10.1016/j.socscimed.2009.09.021.

Kulu, Hill. 2013. "Why Do Fertility Levels Vary between Urban and Rural Areas?" *Regional Studies* 47(6):895–912. doi: 10.1080/00343404.2011.581276.

Kumar, Abhishek, and Aditya Singh. 2013. "Decomposing the Gap in Childhood Undernutrition between Poor and Non–Poor in Urban India, 2005–06." *PLOS ONE* 8(5):e64972. doi: 10.1371/journal.pone.0064972.

Kuznets, Simon. 1974. "Rural-Urban Differences in Fertility: An International Comparison." *Proceedings of the American Philosophical Society* 118(1):30.

Lee, Ronald. 2003. "The Demographic Transition: Three Centuries of Fundamental Change." *Journal of Economic Perspectives* 17(4):167–90. doi: 10.1257/089533003772034943.

Lerch, Mathias. 2019a. "Fertility Decline in Urban and Rural Areas of Developing Countries." *Population and Development Review* 45(2):301–20. doi: 10.1111/padr.12220.

Lerch, Mathias. 2019b. "Regional Variations in the Rural-Urban Fertility Gradient in the Global South" edited by B. Lanza Queiroz. *PLOS ONE* 14(7):e0219624. doi: 10.1371/journal.pone.0219624.

Lesthaeghe, Ron. 1983. "A Century of Demographic and Cultural Change in Western Europe: An

Exploration of Underlying Dimensions." *Population and Development Review* 9(3):411–35. doi: 10.2307/1973316.

Lesthaeghe, Ron. 1995. "The Second Demographic Transition in Western Countries: An Interpretation." Pp. 17–62 in *Gender and Family Change in Industrialized Countries*, edited by K. O. Mason and A. M. Jensen. Oxford, United Kingdom: Clarendon Press.

Lesthaeghe, Ron, Iqbal H. Shah, and Hilary J. Page. 1981. "Compensating Changes in Intermediate Fertility Variables and the Onset of Marital Fertility Transition." Pp. 74–94 in *In Proceedings of the IUSSP World Conference in Manila, Philippines, 9-6 December*. Vol. 1. Liege, Belgium: Ordina Press.

Lesthaeghe, Ron, and Johan Surkyn. 1988. "Cultural Dynamics and Economic Theories of Fertility Change." *Population and Development Review* 14(1):1–45. doi: 10.2307/1972499.

Lesthaeghe, Ron, and Chris Wilson. 1986. "Modes of Production, Secularization, and the Pace of the Fertility Decline in Western Europe, 1870-1930." Pp. 261–92 in *The Decline of Fertility in Europe*, edited by A. J. Coale and S. C. Watkins. Princeton, NJ: Princeton University Press.

Lindstrom, David P., and Zewdu Woubalem. 2003. "The Demographic Components of Fertility Decline in Addis Ababa, Ethiopia: A Decomposition Analysis." *Genus* 59(3/4):147–58. doi: 10.2307/29788778.

Liu, Daphne H., and Adrian E. Raftery. 2020. "How Do Education and Family Planning Accelerate Fertility Decline?" *Population and Development Review* 46(3):409–41. doi: 10.1111/padr.12347.

Livi-Bacci, Massimo. 2017. *A Concise History of World Population*. Chichester, United Kingdom: John Wiley & Sons.

Lloyd, Cynthia B., and Barbara Mensch. 1999. "Implications of Formal Schooling for Girls' Transitions to Adulthood in Developing Countries." Pp. 80–104 in *Critical Perspectives on Schooling and Fertility in the Developing World*, edited by National Research Council. Washington, D.C.: National Academies Press.

Lockhart, James, and Stuart B. Schwartz. 1983. *Early Latin America: A History of Colonial Spanish America and Brazil*. Cambridge, United Kingdom: Cambridge University Press.

Lurie, Mark, Paul Pronyk, Emily de Moor, Adele Heyer, Guy de Bruyn, Helen Struthers, James McIntyre, Glenda Gray, Edmore Marinda, Kerstin Klipstein-Grobusch, and Neil Martinson. 2008. "Sexual Behavior and Reproductive Health among HIV-Infected Patients in Urban and Rural South Africa." *Journal of Acquired Immune Deficiency Syndromes* 47(4):484–93. doi: 10.1097/QAI.0b013e3181648de8.

Maas, Cora J. M., and Joop J. Hox. 2005. "Sufficient Sample Sizes for Multilevel Modeling." *Methodology* 1(3):86–92. doi: 10.1027/1614-2241.1.3.86.

Martin, Teresa Castro. 1995. "Women's Education and Fertility: Results from 26 Demographic and

Health Surveys." *Studies in Family Planning* 26(4):187–202. doi: 10.2307/2137845.

Martin, Teresa Castro, and Fatima Juarez. 1995. "The Impact of Women's Education on Fertility in Latin America: Searching for Explanations." *International Family Planning Perspectives* 21(2):52-57+80. doi: 10.2307/2133523.

Mason, Karen Oppenheim. 1997. "Explaining Fertility Transitions." *Demography* 34(4):443–54. doi: 10.2307/3038299.

Mberu, Blessing, Joyce Mumah, Caroline Kabiru, and Jessica Brinton. 2014. "Bringing Sexual and Reproductive Health in the Urban Contexts to the Forefront of the Development Agenda: The Case for Prioritizing the Urban Poor." *Maternal and Child Health Journal* 18(7):1572–77. doi: 10.1007/s10995-013-1414-7.

McNamee, Catherine B. 2009. "Wanted and Unwanted Fertility in Bolivia: Does Ethnicity Matter?" *International Perspectives on Sexual and Reproductive Health* 35(4):166–75. doi: 10.1363/3516609.

Messer, Lynne C., Nancy Dole, Jay S. Kaufman, and David A. Savitz. 2005. "Pregnancy Intendedness, Maternal Psychosocial Factors and Preterm Birth." *Maternal and Child Health Journal* 9(4):403–12. doi: 10.1007/s10995-005-0021-7.

Meyer, John W., Francisco O. Ramirez, and Yasemin Nuhoglu Soysal. 1992. "World Expansion of Mass Education, 1870-1980." *Sociology of Education* 65(2):128–49. doi: 10.2307/2112679.

Meyer, John W., David Tyack, Joane Nagel, and Audri Gordon. 1979. "Public Education as Nation-Building in America: Enrollments and Bureaucratization in the American States, 1870-1930." *American Journal of Sociology* 85(3):591–613. doi: 10.1086/227051.

Miller, Elizabeth, Beth Jordan, Rebecca Levenson, and Jay G. Silverman. 2010. "Reproductive Coercion: Connecting the Dots between Partner Violence and Unintended Pregnancy." *Contraception* 81(6):457–59. doi: 10.1016/j.contraception.2010.02.023.

Miro, Carmen A., Walter Mertens, and Kingsley Davis. 1968. "Influences Affecting Fertility in Urban and Rural Latin America." *The Milbank Memorial Fund Quarterly* 46(3):89–120. doi: 10.2307/3349317.

Mize, Trenton. 2019. "Best Practices for Estimating, Interpreting, and Presenting Nonlinear Interaction Effects." *Sociological Science* 6:81–117. doi: 10.15195/v6.a4.

Mmari, K., and N. Astone. 2014. "Urban Adolescent Sexual and Reproductive Health in Low-Income and Middle-Income Countries." *Archives of Disease in Childhood* 99(8):778–82. doi: 10.1136/archdischild-2013-304072.

Montenegro, Raul A., and Carolyn Stephens. 2006. "Indigenous Health in Latin America and the Caribbean." *Lancet* 367(9525):1859–69. doi: 10.1016/S0140-6736(06)68808-9.

Myer, Landon, Regina Mlobeli, Di Cooper, Jennifer Smit, and Chelsea Morroni. 2007. "Knowledge and Use of Emergency Contraception among Women in the Western Cape Province of South Africa: A Cross-Sectional Study." *BMC Women's Health* 7(14). doi: 10.1186/1472-6874-7-14.

Nag, Moni, Virginia Abernethy, Eleanor Bauwens, Carole Browner, Ron Lesthaeghe, Dana Raphael, A. Romaniuc, Larry R. Stucki, and Etienne Van De Walle. 1980. "How Modernization Can Also Increase Fertility [and Comments and Reply]." *Current Anthropology* 21(5):571–87. doi: 10.1086/202538.

National Research Council. 1999. *Critical Perspectives on Schooling and Fertility in the Developing World*. edited by C. H. Bledsoe, J. B. Casterline, J. A. Johnson-Kuhn, and J. G. Haaga. Washington, D.C.: National Academies Press.

National Research Council and Institute of Medicine. 2005. *Growing Up Global: The Changing Transitions to Adulthood in Developing Countries*. edited by C. B. Lloyd. Washington, D.C.: National Academies Press.

Nisén, Jessica, Pekka Martikainen, Karri Silventoinen, and Mikko Myrskylä. 2014. "Age-Specific Fertility by Educational Level in the Finnish Male Cohort Born 1940–1950." *Demographic Research* 31:119–36. doi: 10.4054/DemRes.2014.31.5.

Notestein, Frank W. 1953. "Economic Problems of Population Change." Pp. 13–31 in *Proceedings of the Eight International Conference of Agricultural Economics*. London, United Kingdom: Oxford University Press.

Nunnally, Jum C., and Ira H. Bernstein. 1994. *Psychometric Theory*. 3rd ed. New York, NY: McGraw-Hill.

Oaxaca, Ronald. 1973. "Male-Female Wage Differentials in Urban Labor Markets." *International Economic Review* 14(3):693–709. doi: 10.2307/2525981.

O'Donnell, Owen, Eddy van Doorslaer, Adam Wagstaff, and Magnus Lindelow. 2008. *Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation*. Washington, D.C.: World Bank Group.

Olusanya, P. O. 1969. "Rural-Urban Fertility Differentials in Western Nigeria." *Population Studies* 23(3):363–78. doi: 10.1080/00324728.1969.10405291.

Palloni, Alberto, Carolina Milesi, Robert G. White, and Alyn Turner. 2009. "Early Childhood Health, Reproduction of Economic Inequalities and the Persistence of Health and Mortality Differentials." *Social Science & Medicine* 68(9):1574–82. doi: 10.1016/j.socscimed.2009.02.009.

Palma, Yolanda, Elsa Lince, and Ricardo Raya. 2006. "Unsafe Abortion in Latin America and the Caribbean: Priorities for Research and Action." Pp. 187–207 in *Preventing Unsafe Abortion and its Consequences: Priorities for Research and Action*, edited by I. K. Warriner and I. H. Shah. New York, NY: Guttmacher Institute.

Pan American Health Organization. 1997. "Health of Indigenous Peoples." *Pan American Journal of Public Health* 2(5):357–62.

Paxman, John M., Alberto Rizo, Laura Brown, and Janie Benson. 1993. "The Clandestine Epidemic: The Practice of Unsafe Abortion in Latin America." *Studies in Family Planning* 24(4):205–26. doi: 10.2307/2939189.

Perreira, Krista M., and Edward E. Telles. 2014. "The Color of Health: Skin Color, Ethnoracial Classification, and Discrimination in the Health of Latin Americans." *Social Science & Medicine* 116:241–50. doi: 10.1016/j.socscimed.2014.05.054.

Poston, Dudley L. 2002. "The Statistical Modeling of the Fertility of Chinese Women." *Journal of Modern Applied Statistical Methods* 1(2):387–96. doi: 10.22237/jmasm/1036109160.

Prada, Elena, Ann Biddlecom, and Susheela Singh. 2011. "Induced Abortion in Colombia: New Estimates and Change between 1989 and 2008." *International Perspectives on Sexual and Reproductive Health* 37(3):114–24. doi: 10.1363/3711411.

Preston, Samuel H., Patrick Heuveline, and Michel Guillot. 2001. *Demography: Measuring and Modeling Population Processes*. Malden, MA: Blackwell Publishers.

Psacharopoulos, George, and Harry Anthony Patrinos. 1994. *Indigenous People and Poverty in Latin America: An Empirical Analysis*. Washington, D.C.: World Bank Group.

Ragland, David R. 1992. "Dichotomizing Continuous Outcome Variables: Dependence of the Magnitude of Association and Statistical Power on the Cutpoint." *Epidemiology* 3(5):434–40. doi: 10.1097/00001648-199209000-00009.

Reed, Holly E., Rona Briere, and John Casterline, eds. 1999. *The Role of Diffusion Processes in Fertility Change in Developing Countries*. Washington, D.C.: National Academies Press.

Ribando, Clare. 2005. *Afro-Latinos in Latin America and Considerations for U.S. Policy*. CRS Report No. RL32713. Washington, D.C.: U.S. Congressional Research Service.

Rivas, Ramón D. 1993. *Pueblos Indígenas y Garífuna de Honduras: Una Caracterización*. 1st ed. Tegucigalpa, Honduras: Editorial Guaymuras.

Robey, Bryant, Shea O. Rutstein, and Leo Morris. 1993. "The Fertility Decline in Developing Countries." *Scientific American* 269(6):60–67. doi: 10.1038/scientificamerican1293-60.

Robinson, Warren C. 1961. "Urban-Rural Differences in Indian Fertility." *Population Studies* 14(3):218–34. doi: 10.1080/00324728.1961.10406053.

Rodríguez-Vignoli, Jorge, and Suzana Cavenaghi. 2014. "Adolescent and Youth Fertility and Social Inequality in Latin America and the Caribbean: What Role Has Education Played?" *Genus* 70(1):1–25.

Rosero-Bixby, Luis, and John B. Casterline. 1994. "Interaction Diffusion and Fertility Transition in

Costa Rica." *Social Forces* 73(2):435–62. doi: 10.2307/2579816.

Ruel, Marie T., and Purnima Menon. 2002. "Child Feeding Practices Are Associated with Child Nutritional Status in Latin America: Innovative Uses of the Demographic and Health Surveys." *The Journal of Nutrition* 132(6):1180–87. doi: 10.1093/jn/132.6.1180.

Rutstein, Shea O., and Kiersten Johnson. 2004. *The DHS Wealth Index. DHS Comparative Reports*. No. 6. Calverton, MD: ORC Macro International, Inc.

Schultz, T. Paul. 1973. "A Preliminary Survey of Economic Analyses of Fertility." *The American Economic Review* 63(2):71–78.

Semba, Richard D., Saskia de Pee, Kai Sun, Mayang Sari, Nasima Akhter, and Martin W. Bloem. 2008. "Effect of Parental Formal Education on Risk of Child Stunting in Indonesia and Bangladesh: A Cross-Sectional Study." *Lancet* 371(9609):322–28. doi: 10.1016/S0140-6736(08)60169-5.

Sen, Bisakha. 2014. "Using the Oaxaca–Blinder Decomposition as an Empirical Tool to Analyze Racial Disparities in Obesity." *Obesity* 22(7):1750–55. doi: 10.1002/oby.20755.

Shah, Prakesh S., Taiba Balkhair, Arne Ohlsson, Joseph Beyene, Fran Scott, and Corine Frick. 2011. "Intention to Become Pregnant and Low Birth Weight and Preterm Birth: A Systematic Review." *Maternal and Child Health Journal* 15(2):205–16. doi: 10.1007/s10995-009-0546-2.

Shin, Heeju. 2007. "Child Health in Peru: Importance of Regional Variation and Community Effects on Children's Height and Weight." *Journal of Health and Social Behavior* 48(4):418–33. doi: 10.1177/002214650704800406.

Singh, Susheela, Lisa Remez, Gilda Sedgh, Lorraine Kwok, and Tsuyoshi Onda. 2018. *Abortion Worldwide 2017: Uneven Progress and Unequal Access*. New York, NY: Guttmacher Institute.

Singh, Susheela, Gilda Sedgh, and Rubina Hussain. 2010. "Unintended Pregnancy: Worldwide Levels, Trends, and Outcomes." *Studies in Family Planning* 41(4):241–50. doi: 10.1111/j.1728-4465.2010.00250.x.

Smith, Tom W. 1995. "Some Aspects of Measuring Education." *Social Science Research* 24(3):215–42. doi: 10.1006/ssre.1995.1008.

Strickler, Jennifer, Angela Heimburger, and Karen Rodriguez. 2001. "Clandestine Abortion in Latin America: A Clinic Profile." *International Family Planning Perspectives* 27(1):34–36. doi: 10.2307/2673803.

Suárez-Berenguela, Rubén M. 1999. *Health Systems Inequalities and Poverty in Latin America and the Caribbean: Trends and Policy Implications*. Washington, D.C.: Pan American Health Organization.

Szreter, Simon, Robert A. Nye, and Frans van Poppel. 2003. "Fertility and Contraception during the

Demographic Transition: Qualitative and Quantitative Approaches." *The Journal of Interdisciplinary History* 34(2):141–54. doi: 10.1162/002219503322649453.

Telles, Edward E. 2006. *Race in Another America: The Significance of Skin Color in Brazil*. Princeton, NJ: Princeton University Press.

Telles, Edward E., and Stanley Bailey. 2013. "Understanding Latin American Beliefs about Racial Inequality." *American Journal of Sociology* 118(6):1559–95. doi: 10.1086/670268.

Telles, Edward E., René D. Flores, and Fernando Urrea-Giraldo. 2015. "Pigmentocracies: Educational Inequality, Skin Color and Census Ethnoracial Identification in Eight Latin American Countries." *Research in Social Stratification and Mobility* 40:39–58. doi: 10.1016/j.rssm.2015.02.002.

Telles, Edward E., and Florencia Torche. 2019. "Varieties of Indigeneity in the Americas." *Social Forces* 97(4):1543–70. doi: 10.1093/sf/soy091.

Thompson, Warren S. 1930. *Population Problems*. New York, NY: McGraw-Hill.

Trow, Martin. 1961. "The Second Transformation of American Secondary Education." *International Journal of Comparative Sociology* 2(2):144–66. doi: 10.1163/156854261X00156.

UN-Habitat, ed. 2012. *State of Latin American and Caribbean Cities 2012: Towards a New Urban Transition*. Nairobi, Kenya: UN-Habitat.

United Nations, ed. 1995. *Women's Education and Fertility Behaviour: Recent Evidence from the Demographic and Health Surveys*. New York, NY: United Nations.

United Nations. 2015. *World Fertility Patterns 2015 – Data Booklet*. (ST/ESA/SER.A/370). New York, NY: Department of Economic and Social Affairs, Population Division.

United Nations Department of Economic and Social Affairs. 2021. *World Economic Situation and Prospects 2021*. New York, NY: United Nations.

United Nations Statistics Division. 2013. "Composition of Macro Geographical (Continental) Regions, Geographical Sub-Regions, and Selected Economic and Other Groupings." *Standard Country or Area Codes for Statistical Use*. Retrieved June 1, 2020 (https://unstats.un.org/unsd/methodology/m49/).

Upadhyay, Ushma D., and Bryant Robey. 1999. *Why Family Planning Matters. Population Report*. No. 49. Washington, D.C.: The John Hopkins University School of Public Health.

Van de Poel, Ellen, Owen O'Donnell, and Eddy Van Doorslaer. 2007. "Are Urban Children Really Healthier? Evidence from 47 Developing Countries." *Social Science & Medicine* 65(10):1986–2003. doi: 10.1016/j.socscimed.2007.06.032.

Van de Poel, Ellen, and Niko Speybroeck. 2009. "Decomposing Malnutrition Inequalities between Scheduled Castes and Tribes and the Remaining Indian Population." *Ethnicity & Health*

14(3):271–87. doi: 10.1080/13557850802609931.

Vega, William A., and Rubén G. Rumbaut. 1991. "Ethnic Minorities and Mental Health." *Annual Review of Sociology* 17:351–83. doi: 10.1146/annurev.so.17.080191.002031.

Wagstaff, Adam, Eddy van Doorslaer, and Naoko Watanabe. 2003. "On Decomposing the Causes of Health Sector Inequalities with an Application to Malnutrition Inequalities in Vietnam." *Journal of Econometrics* 112(1):207–23. doi: 10.1016/S0304-4076(02)00161-6.

Wang, Weiren, and Felix Famoye. 1997. "Modeling Household Fertility Decisions with Generalized Poisson Regression." *Journal of Population Economics* 10(3):273–83. doi: 10.1007/s001480050043.

Weinberger, Mary Beth, Cynthia Lloyd, and Ann Klimas Blanc. 1989. "Women's Education and Fertility: A Decade of Change in Four Latin American Countries." *International Family Planning Perspectives* 15(1):4-14+28. doi: 10.2307/2133273.

Williams, David R., and Michelle Sternthal. 2010. "Understanding Racial-Ethnic Disparities in Health: Sociological Contributions." *Journal of Health and Social Behavior* 51(1_suppl):S15–27. doi: 10.1177/0022146510383838.

Williamson, Lisa M., Alison Parkes, Daniel Wight, Mark Petticrew, and Graham J. Hart. 2009. "Limits to Modern Contraceptive Use among Young Women in Developing Countries: A Systematic Review of Qualitative Research." *Reproductive Health* 6(3). doi: 10.1186/1742-4755-6-3.

Worku, Abebaw Gebeyehu, Gizachew Assefa Tessema, and Atinkut Alamirrew Zeleke. 2015. "Trends of Modern Contraceptive Use among Young Married Women Based on the 2000, 2005, and 2011 Ethiopian Demographic and Health Surveys: A Multivariate Decomposition Analysis." *PLOS ONE* 10(1):e0116525. doi: 10.1371/journal.pone.0116525.

World Health Organization. 2006. *WHO Child Growth Standards: Length/Height-for-Age, Weight-for-Age, Weight-for-Length, Weight-for-Height and Body Mass Index-for-Age: Methods and Development*. Geneva, Switzerland: World Health Organization.

World Health Organization. 2008. *Indicators for Assessing Infant and Young Child Feeding Practices: Conclusions of a Consensus Meeting Held 6-8 November 2007 in Washington D.C., USA*. Washington, D.C.: World Health Organization.

World Health Organization. 2011. *Haemoglobin Concentrations for the Diagnosis of Anaemia and Assessment of Severity*. (WHO/NMH/NHD/MNM/11.1). Geneva, Switzerland: World Health Organization.

World Health Organization. 2019. *Contraception*. WHO/RHR/19.18. Geneva, Switzerland: World Health Organization.

Young, Frank W., Barry Edmonston, and Nancy Andes. 1983. "Community-Level Determinants of

Infant and Child Mortality in Peru." *Social Indicators Research* 12(1):65–81. doi: 10.1007/BF00428861.

Zarate, Alvan O. 1967. "Fertility in Urban Areas of Mexico: Implications for the Theory of the Demographic Transition." *Demography* 4(1):363–73. doi: 10.2307/2060376.

Zhou, Min, and Wei Guo. 2020. "Comparison of Second-Child Fertility Intentions between Local and Migrant Women in Urban China: A Blinder–Oaxaca Decomposition." *Journal of Ethnic and Migration Studies* 1–22. doi: 10.1080/1369183X.2020.1778456.

Zuberi, Tukufu. 2001. "One Step Back in Understanding Racial Differences in Birth Weight." *Demography* 38(4):569–71. doi: https://doi.org/10.1353/dem.2001.0041.

Zuehlke, Eric. 2009. *Reducing Unintended Pregnancy and Unsafely Performed Abortion through Contraceptive Use*. Washington, D.C.: Population Reference Bureau.