

**EXPLORING CHANGES IN THE FATHER'S ROLE AND ITS
ASSOCIATION WITH CHILD OUTCOMES IN MONGOLIA**

by

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Abstract

Background. Over the last three decades, Mongolia has experienced the effects of dramatic macro-environmental changes with implications on the lives of Mongolians. One area of concern is the influence of broader societal changes on family life and child well-being. This study explores the changing father's role and its association with child outcomes in Mongolia.

Objectives. 1) To explore patterns of father presence and engagement with children under age five between 2000 and 2013 and 2) identify whether the father's role is associated with illness and education outcomes in children aged 3-4 years in 2013.

Methods. This historical cross-sectional study analyses data from UNICEF's Multiple Indicator Cluster Surveys conducted in 2000, 2005, 2010, and 2013. The first manuscript involves a descriptive analysis of patterns in the point-prevalence of father presence and engagement over time and were described according to various demographic subgroups. Sample sizes ranged from 3547 to 6184 across four time points. The second manuscript examines the father's role and its association with acute illness and preschool attendance in 2220 children aged 3 and 4 using multivariate regression modelling.

Results. Point-prevalence of father presence ranged from 78-83% ($P_{\text{trend}} < .0001$) and engagement from 40-49% ($P_{\text{trend}} = 0.33$) between 2000 and 2013. Fluctuations varied by region of residence. In unadjusted analyses, father presence (OR=1.06; 95% CI 0.72, 1.56) and engagement (OR=1.04; 95% CI 0.95, 1.14) were not associated with acute illness in children. Unadjusted analysis showed that father engagement was associated with preschool attendance (OR=1.12; 95% CI 1.04, 1.20) but was no longer significant after adjusting for demographic factors (OR=0.95; 95% CI 0.88, 1.03). Father presence was not associated with preschool attendance in either unadjusted (OR=0.79; 95% CI 0.60, 1.04) or adjusted analyses (OR=0.91; 95% CI 0.66, 1.26).

Conclusion. Father presence fluctuated at a national and regional level in Mongolia while engagement fluctuated at a regional level from 2000-2013. Despite these fluctuations, the 2013 data suggests that the father's role is not associated with acute illness and preschool attendance in children aged 3-4. However,

we should continue to monitor changes in the father's role in Mongolia and its relationship with other child outcomes.

Co-Authorship

This thesis describes the work of Lesley Pablo that was completed in collaboration with Dr. Colleen Davison. Following a request from UNICEF Mongolia, the studies in this thesis exploring the Mongolian father's changing familial roles and its association with outcomes in preschool-aged children were conceptualized by Dr. Davison. The use of acute illness and preschool attendance as child outcomes and the subsequent study design was devised collaboratively by Dr. Davison and Lesley Pablo.

The statistical analyses, interpretation of results, preparation of manuscripts, and writing of this thesis was performed by Lesley Pablo under the guidance and supervision of Dr. Davison.

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List of Abbreviations

CI – Confidence Interval

ECDI – Early Childhood Development Index

LMIC – Low- and Middle-Income Country

MICS – Multiple Indicator Cluster Surveys

NSO – National Statistics Office of Mongolia

OR – Odds Ratio

SDG – Sustainable Development Goals

SE – Standard Error

SES – Socioeconomic Status

UN – United Nations

UNICEF – United Nations Children’s Fund

Chapter 1

Introduction

1.1 General Overview

Mongolia is a landlocked country in Asia that is currently experiencing the effects of major macro-environmental changes that began in the early 1990s (1). The country was formerly a socialist society with a centralized economy that provided many supports for Mongolians including guaranteed employment and access to healthcare (1,2). The nomadic herders also benefited from many state-provided supports for their livelihoods (1,3). In addition, household roles were explicitly gendered; men were primarily the heads of household and financial providers, and in herder households, were additionally responsible for tending to livestock (2,4). Women in households were responsible for domestic household tasks such as cooking and caring for children (2,4). However, the transition into a democracy and market economy in the 1990s coupled with the effects of climate change had impacts on livelihoods and employment across the country (1–3,5). This in turn caused shifts in traditional gender roles where some women became increasingly involved in being financial providers for the household or being more involved in more animal-husbandry tasks while some men became less of a primary provider or head of household due to the loss of livelihoods or employment (2,4). This had negative social consequences and impacts on family dynamics where more households experienced issues such as increased domestic violence or marital separation (2,6,7). In previous studies, men or fathers who experienced financial hardship were found to have poor mental health which in turn contributed towards marital conflict and poor parenting (8,9). Other households would also experience temporary separations where some household members would move towards urban areas for better access to schools while men or fathers remained with livestock (10).

Due to these conditions, an area of concern is how the shifting roles of men who are fathers may affect child outcomes within the Mongolian context. This is based on knowledge that

child health and well-being, particularly in the early years, are known to be strongly influenced by the environment and conditions of the places where children live and learn (11,12). There is also growing knowledge on the role of fathers and the impacts they have on child health and well-being. For instance, positive involvement of fathers in the lives of their children has been shown to be positively associated with cognitive skills, language skills, and social development (12–14). Lower levels of father engagement or absence has in turn been shown to be associated with outcomes such as higher aggressive and externalizing behaviour problems, stunting, and reports of poor health (15–17).

Father involvement is also associated with acute illness in children where father absence has been shown to be associated with higher odds of diarrhea and diagnosis of asthma in Western populations (18,19). Involvement is also known to be associated with preschool attendance in some developing and post-transition countries. For instance, preschool attendance was associated with father engagement in Suriname and the Dominican Republic and with higher parenting quality in transitional countries such as Tajikistan and Uzbekistan (13,20).

There is a need to further explore patterns in the Mongolian father's role over time. In addition, while the relationships between father involvement and child outcomes such as acute illness and preschool attendance has been established in other settings, there are gaps in knowledge regarding this relationship in the Mongolian context. This warrants further epidemiological study due to respiratory (e.g. pneumonia, bronchitis) and digestive (e.g. diarrhea) diseases being the leading causes of morbidity in children under five in Mongolia (21) as well as concerns regarding shifting gender roles and its impacts on school readiness in Mongolian children (Personal communication, Ulziisaikhan Sereeter, ECD Specialist at UNICEF Mongolia February 2017).

1.2 Thesis Objectives

This thesis explores the changes in the father's familial role as well as its association with child outcomes following a period of rapid macro-environmental changes in Mongolia. Included

in this thesis are two manuscripts that cover the two main objectives. The first manuscript is a descriptive analysis of changes in father presence and engagement over time between 2000 and 2013 for children under age five. It describes patterns in the father’s role at the national and regional levels and according to various demographic subgroups. The second manuscript explores the association between the father’s role and outcomes of acute illness (i.e. reports of fever, gastrointestinal, or respiratory illness) and preschool attendance in children aged 3-4 years using the most recent MICS data available for research purposes (MICS 2013). Results from these studies were expected to fill gaps in knowledge regarding the potentially shifting roles of the father as well as the influence and role of fathers as social determinants of child health in Mongolia.

1.3 Conceptual Diagrams for Thesis Objectives

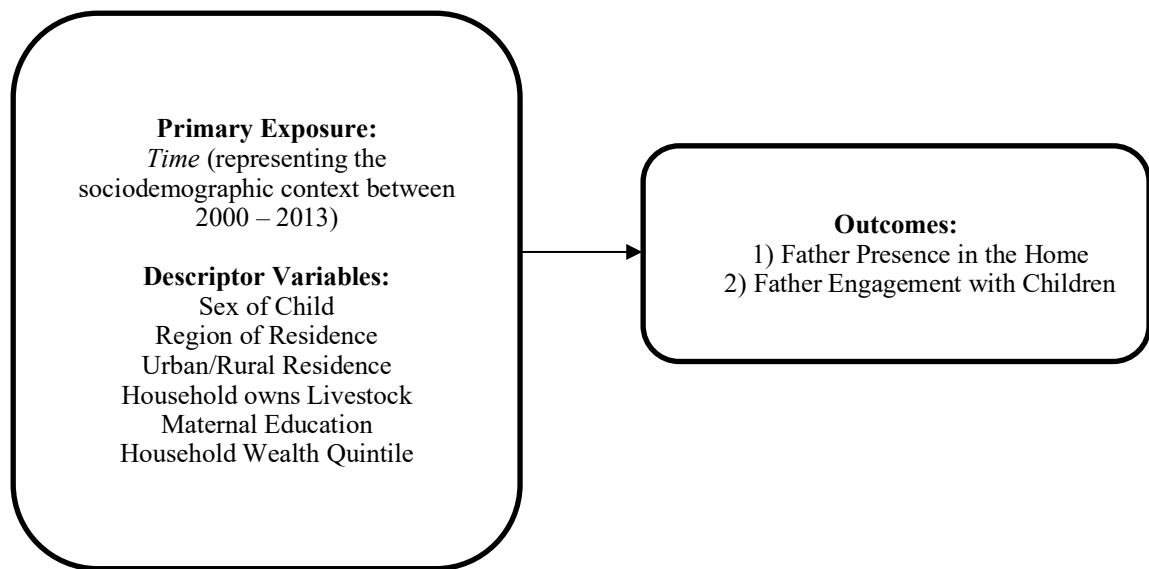


Figure 1.1 Conceptual diagram for Manuscript 1

Figure 1.1 includes variables that were considered in the analyses for objective 1. *Time* represents the sociodemographic context in Mongolia and was therefore not directly measured in the analyses. It is worth noting that all the variables may not equally be connected to father presence and father engagement (such as sex of the child). However, these variables were still

considered for both outcomes to explore patterns of father presence and engagement according to demographic subgroups.

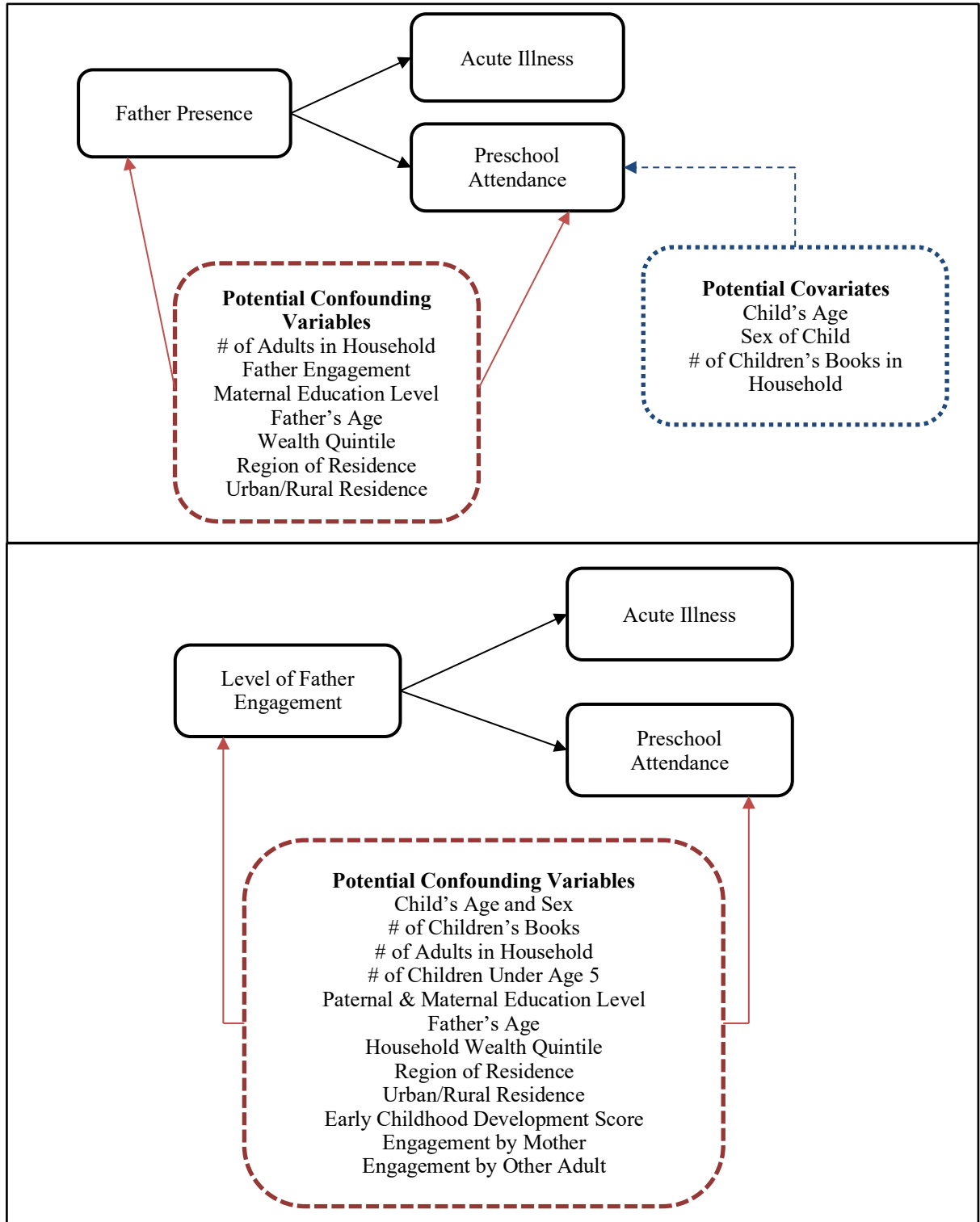


Figure 1.2 Conceptual diagrams for Manuscript 2.

Figure 1.2 only includes potential confounders and covariates for models with preschool attendance as the outcome. A similar set of potential confounders and covariates were used in models involving father presence and level of father engagement as the primary exposures. Since some variables may not be associated with both father presence and engagement, some variables such as child's sex, child's age, and number of children's books in the household were included as covariates in the father presence model while in the father engagement model, they were included as potential confounding variables.

1.4 Study Population

The studies presented in this thesis use self-reported health indicator data (mother/caregiver-reported data for children under age 5) collected through the Multiple Indicator Cluster Surveys (MICS) designed and implemented by UNICEF and the National Statistics Office of Mongolia (NSO) (22–25). These surveys collect nationally representative data at the household and individual level from men, women, and children in households across Mongolia. Both manuscripts use data collected through the 'Household Listing Questionnaire', 'Women's Questionnaire', and the 'Children Under Five Questionnaire'. The first manuscript uses data collected from the MICS 2000, 2005, 2010, and 2013 survey periods to describe changes in the father's role over time. Sample sizes of children under age five with completed questionnaires ranged from 3547 to 6184 across the four time points (22–25). The second manuscript uses data from the MICS 2013 which is currently the most recent dataset for Mongolia available for research purposes. Sample size for children aged 3-4 years with completed questionnaires was 2374 (25).

1.5 Thesis Outline

This first chapter provides a brief overview of this thesis. Chapter 2 provides background information on the dramatic climate, social, political, and economic changes that occurred in Mongolia starting in the 1990s and the impacts of these changes on traditional household gender roles. This is followed by a review of the literature regarding the unique role of fathers and the

impacts they have on various child health and developmental outcomes. Thesis rationale and objectives are also described in this chapter. Chapter 3 is the first manuscript of this thesis detailing the descriptive analyses on the changing roles of Mongolian fathers over time in the post-transition period. The following chapter is the second manuscript which explores the association between the father's role and acute illness and preschool attendance in children. Chapter 5 is the final chapter containing a summary of the findings, a discussion of the results using epidemiological concepts, the strengths and limitations of the studies, suggestions for future research directions, as well as a reflection on the study contributions towards public health knowledge in areas of child health and well-being in Mongolia.

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Chapter 2

Background & Literature Review

2.1 General Overview

This chapter will provide an overview of the environmental and socio-political context in Mongolia as well as review the literature on father involvement and child outcomes. Section 2.2 will cover the impacts of economic, political, and climate changes on livelihoods in Mongolia followed by a discussion on how these changes affected traditional gender roles and family dynamics in many households. Section 2.3 will discuss the importance of fathers for child well-being as well as the existing literature and gaps in knowledge regarding father involvement as a social determinant of child health. The remaining sections will outline the rationale and main objectives of this thesis.

2.2 Impacts of Dramatic Economic, Political, and Climate Changes in Mongolia

2.2.1 Pastoralism and Climate Change

Mongolia is a landlocked and sparsely populated country in Asia with a population of approximately 3.2 million people in 2018 (1–3). The terrain varies across the country with steppe grasslands along the centre and eastern regions, the Gobi Desert stretching along the south, forested areas in the northern region, and a few mountainous areas concentrated in the west and centre (1,3–5). In addition to the different landscapes, Mongolia experiences extreme temperatures throughout the year which can range from negative 40°C in the winter to positive 35°C in the summer (1). This commonly leads to drought periods during the dry and hot summer months while the winters are long and cold, periodically causing extreme weather events known as *dzuds* (a Mongolian term commonly used in herding communities) (5,6). Over the millennia, Mongolians adopted a nomadic pastoralist lifestyle which has been an important part of Mongolian identity and culture throughout their history (1,4,7). In the last two decades, herders

comprised about 25% - 33% of the Mongolian population (4,5,8). Since these households are nomadic in nature, it allows herders to migrate and search for pastures based on seasonal weather conditions (1,4,6). Nomadic herds are the primary source of income in pastoralist households and typically involves the tending and sustained care of domesticated animals such as cattle, camels, horses, sheep, or goats in seasonal patterns (4–6,9,10). Many herders have been economically successful due to the wide range of animal products that can be bartered and sold within and outside the country such as goat cashmere, sheep wool, animal hide, dairy products, and meat (5,6,9). Apart from mining, the agricultural industry is one of the major contributors to the Mongolian economy contributing to about 12% of the GDP in 2010 with livestock herding comprising over 80% of the agricultural output (6,7,11). Unfortunately, herding livelihoods are quite vulnerable due to the extreme climate events brought about by climate change (7,9).

While it is common for herding households to lose livestock during the winter season, *dzuds*, which are extreme winter disasters that result in higher than normal livestock mortality, are becoming more problematic (5,6,9). The different types of dzuds are briefly described in Table 2.1. Many of these conditions have become increasingly severe due to climate change as well as the unpredictable patterns of precipitation (1,4,5). In addition, droughts and dzuds typically occurred at 5-10 year intervals, however, there has been an increasing number of reports of dzuds and related livestock deaths since 1990 (4–6,9,12). According to the annual livestock census conducted by the National Statistics Office of Mongolia (NSO), five major dzuds were recorded between 1990 and 2010 with a combined estimate of 10 million livestock perishing during the 2000, 2001, and 2002 dzuds followed by an additional 10 million deaths of livestock in the 2010 dzud alone (1,6,13). Herders suffered great losses during these events compared to averages of approximately 1 million livestock deaths per year in years without dzuds (6,13). In 2010, an estimated 12 000 households lost all their livestock, leading to the loss of livelihoods in many of these households (6). Some herding households try to recover from loss while others decide to abandon their nomadic and herding livelihoods and migrate towards urban centres (6,9). While

climate change and weather events had severe impacts on herding livelihoods in Mongolia, it is important to note that these effects were also exacerbated by drastic changes in the political and economic climate that were taking place in Mongolia since the late 1900s.

2.2.2 The Political, Social, and Economic Transition

In the 13th Century, Mongolia was one of the largest empires to exist during Khan rule with land spanning from Hungary to the Pacific Ocean (1). However, the fall of the Mongolian Empire followed by a history under Chinese rule and the subsequent fight for control over Mongolia between Russia and China in the later years culminated in the State of Mongolia that exists today (1). Since Mongolia is situated between Russia and China, much of the recent Mongolian political ideologies and economic structures have been influenced by these two nations (1,3). Due to significant influences from the USSR, Mongolia was governed by a communist government with a centralized economy from 1920 to 1990 (1,14). During this period, the government provided essential services for the Mongolian population such as access to health care, education, as well as guaranteed employment (14). Kindergartens (preschools) for children as well as support for the elderly were provided to allow individuals, particularly women who would have otherwise likely taken on the caretaking roles, to participate in the work force (14,15). Herding households that were members of herding communities benefited from many state services such as improved access to education, health care, access to the economic market, as well as livelihood-related services such as transportation for herding activities, education on animal husbandry, veterinary services, emergency water and food reserves, and winter shelters (1,4,10,16).

However, in 1990, major political reform and shifts in the economic system coupled with a decline in Russian involvement led to the transition of Mongolia's society from a communist and centralized system to a multi-party democracy and market economy (1,4,10,17). This subsequently led to the dismantling of many state-provided supports such as health care, education, employment, and specific supports relied on by herding households across the country

(1,4,14,17,18). Altogether, this contributed towards an increase in poverty and unemployment in the years following this transition with national unemployment rates reaching as high as 9% in 1994 (14,17,19). This was higher than the 1994 global unemployment rate of about 5.1% (20). Unemployment rates fluctuated and gradually declined over the next few years with rates remaining steady from 2002 (3.4%) to 2008 (2.8%), followed by a sudden spike in 2009 with unemployment rates reaching as high as 11.6% in 2009 and 9.9% in 2010 (19). These unemployment rates were relatively high compared to the global rates of 5.6% in 2009 and 5.5% in 2010 (20). In addition, government focus and funding shifted towards the market economy and the booming mining industry in Mongolia (18). This made herder households face significant challenges in the post-transition period due to the lack of governance regarding land use, resource management, and herding-related infrastructure; for instance, herders faced conflict with other herders regarding trespassing and land-use, some had to compete with nearby mining companies for land and natural resources, pastures became scarce due to overgrazing and livestock overpopulation, access to markets became more challenging, and supports such as winter shelters, food and water reserves, and transportation services were very limited (1,4,6,9,10,18). These supports had previously been crucial since it helped reduce the vulnerability of herders to the impacts of climate change (18). Many rural households that lost their livelihoods or faced unemployment chose to migrate towards urban areas, particularly towards Ulaanbaatar the capital city, in search of employment and better access to health care and education, further contributing to unemployment rates in those areas (1,6,9,12,17,18,21,22).

Extreme climate change coupled with dramatic political, economic, and social shifts has led to an increase in economic insecurity and the loss of livelihoods in both the rural and urban populations in Mongolia. Unfortunately, this led to many psychological and social impacts in affected households.

2.2.3 The Changing Roles of Men

In the socialist period, roles within households were different between rural herding households and non-herding households. Despite influences from the state, herder households managed to maintain traditional roles that were explicitly gendered (23). Men were generally responsible for tending and managing livestock by preparing animal feed, feeding animals, transporting them to pastures and water, slaughtering animals for meat, and selling animal products such as wool and meat (23,24). Women were responsible for domestic tasks such as milking animals, processing dairy products, cooking, cleaning, and caring for children and the elderly (3,14,23,24). In non-herding households, roles were not as distinct since the socialist state required both men and women to participate in the workforce (14,15). This was made possible through ‘defamilialistic’ policies that focused on the provision of childcare and elderly support services to allow women to work, thereby challenging traditional gender roles (3,12,15). While these policies blurred the lines between traditional male and female roles in these households, men in general were still considered to be the head of household and the primary bread-winners (14). However, due to the dramatic climate, political, social, and economic transition that began in the 1990s, the roles of men began to change.

Since herding is a significant aspect of Mongolian identity and culture (1,4,7), this lifestyle essentially defined identities and roles particularly for rural men. However, climate change and the transitions of the 1990s threatened and even cost many households their livelihoods and in turn these identities (1,14,24). In response to increased climate vulnerability, some herder households increased the number and type of livestock owned to help account for economic instability, therefore requiring women to assist with animal husbandry in addition to performing their domestic tasks (1,9,14). Furthermore, while some households managed to maintain their pastoral livelihoods, others were not able to due to the loss of all their animals (1,6). In this case, women often found other ways to provide financial supports for the family (14). As a result, men were at times losing their traditional identity and role as herders and as the sole and primary provider for the family. Similar patterns of shifting gender roles also exist in

urban and non-herding households where both men and women experienced similar patterns of unemployment during the post-transition period (14,19). Women were increasingly becoming the primary financial providers in the household, and in addition, there was a rise in the number of female-headed households in the country (14). This is common in other areas of the world and is mainly due to unemployed men leaving the household in search for other employment opportunities, men having poor health, or an increased use of alcohol and drugs by men that may hamper their chances of, or success in, gainful employment (12,14,25,26).

Unfortunately for some families, the changes in gender roles in Mongolia had negative social consequences and impacts on family dynamics. Men who lose their traditional identities may feel helpless or lost due to challenges they face in trying to fit into a new society and their new roles (25,27). This may be particularly true for men who considered themselves primary providers in the family since a person's self-identity and behaviours can be influenced by being the family breadwinner (28,29). In more extreme cases, the post-transition period brought about an increase in poverty, alcoholism, and domestic violence, which are conditions that often occur simultaneously (3,12,14,26,30). Furthermore, alcohol abuse and perpetrators of domestic violence seem to be disproportionately higher in males than females (12,25). This may be due to men being unable to solely provide for their families, and as a result, may start behaving violently towards their partners or children due to the changing gender roles (25). In 2014, a report by the Ministry of Health showed that heavy drinking was reported for 38% of males and 10% of females in Mongolia (31). As for domestic violence, approximately 58% of surveyed Mongolian women with a current or former partner experienced a form of domestic violence from a partner in their lifetime while 35% were reported to experience violence in the past year in 2017 (30). Increase in family instability may explain the increase in divorce rates in the post-transition period where rates were consistent at 0.1 per 1000 population in the 1990s only to increase over the years from 0.6 per 1000 in 2000 to 1.7 per 1000 in 2010 (32). Despite these conditions, it is worth noting that the gender inequality index (GII) in Mongolia, which is based on female

reproductive health, empowerment, and workforce participation, has actually been shown to decrease over time during the post transition period (33,34). The GII score in Mongolia decreased from 0.501 in 1995 to 0.301 in 2017, suggesting that gender inequality in Mongolia decreased over time (33,34).

In summary, changes in livelihood and economic security had significant impacts on gendered roles and household dynamics in Mongolia. There are further concerns about how this may impact family and child outcomes in affected households.

2.2.4 Impacts of the Transition on Mongolian Families and Relationships

Mongolians traditionally live in nuclear families with a cultural belief that considers the family unit to be more important than individuals (26,35) and thus, family dynamics are an area of great interest. In the post transition period, the family unit faced threats due to loss of supports as well as increased instability in factors affecting family dynamics. While some households experience spousal separation or domestic violence, other marriages remain intact. Some households experience “temporary” separation where, for example, mothers from rural areas opt to move towards urban areas with their children in order to gain better access to schools while fathers remained with the livestock (36).

In terms of parenting, the role of mothers as the person most responsible for caring for the children has remained the same in Mongolia over time (12,14,15). This role has become increasingly important when preschool and elderly support services were no longer available, making it challenging for women to maintain employment (3,12,14,15,25). As for men who are fathers in Mongolia, little is known about how these shifting roles and identities affected parenting practices. It is possible that economic hardships may have impacted the quality of parenting by both mothers and fathers in affected households. According to the “Family Process Model of Economic Hardship” proposed by Conger and colleagues, economic instability may lead to increased levels of stress in parents with negative implications for mental well-being and the quality of their parenting (37). This is consistent with other papers where men experiencing

financial hardship or unemployment were found to have poorer mental health which in turn contributed to marital conflict and poor parenting (38,39). Conversely, it is also likely that unemployment may increase father-child interactions since they have more time to spend with their children, however, this is only beneficial if interactions are positive in nature (38).

2.3 Fathers and Their Role in the Social Determinants of Health

The early years of life are a crucial time for children in terms of their physical, socio-emotional, and cognitive development (40). Child development is known to be strongly influenced by the environment and conditions of the places where children live and learn (40,41). There is a complex relationship between factors at the individual, family, community and national levels that help shape environments and their influences on children (40,42). Key factors include, but are not limited to, the quality of parent-child interactions, household socioeconomic status (SES), parent's education attainment, access to health care, schools, and clean water, cultural beliefs, health policies, and political context (40,41,43–45). These are all different kinds of social determinants of health with parenting and family-life as key determinants (40,46).

2.3.1 Bronfenbrenner's Ecological Theory Model

Several theoretical models have been used to understand the complex relationship between father involvement and child outcomes. Bronfenbrenner's Ecological Theory Model is a framework that has often been used to depict the interaction and influence of nested ecological levels to explain child development and well-being (47,48). The model consists of the *microsystem* which involves direct interaction between children and parents or adults, the *mesosystem* that involves interaction between parents, the *exosystem* which involves the parents' relationship with other people (such as co-workers), and the *macrosystems* which are the encompassing social and environmental factors that affect the other systems (such as the definition of gender roles or the political and economic climate) (47,48). Paternal effects on child outcomes are mainly part of the microsystem where it is argued that having several adults or microsystems (ie. both parents as opposed to one) for interaction can benefit the child, provided

that these interactions and relationships as well as interactions between parents are positive (48). In addition, since mothers and fathers can exhibit different styles of interaction, children can benefit from this diversity in their microsystem interactions (48,49). For instance, in addition to playful interactions, mothers have been shown to spend more time in caregiving or nurturing activities compared to fathers while fathers themselves spend more time in playful rather than caregiving activities (50). While mothers and fathers can both engage in playful activities, scholars have suggested that fathers have unique types of playful interactions such as ‘rough-and-tumble’ play and teasing interactions that can be beneficial for child development (48,51). In addition, studies (described below) have recently shown that fathers play a unique role in shaping child outcomes.

2.3.2 Unique Contributions of the Father

The specific role of fathers in their child’s well-being can be described using the ‘positive father involvement’ construct proposed by Lamb, Pleck and colleagues (48,52). ‘Involvement’ is an umbrella term which describes whether the father is 1) *accessible* to their child and is therefore present to address the child’s needs, 2) *engaging* with their child, allowing them to identify their child’s needs and engage them in different activities, and 3) *responsible* for their child by planning and managing the needs of their child (49,52). While mothers also have influential roles, previous scholars have argued that fathers provide unique contributions to their child’s well-being. A recent meta-analysis conducted by Jeynes (53) showed that fathers’ contributions towards child well-being is generally distinct from that of the mother. In addition, the analysis also showed that fathers had a distinct association with specific measures such as psychological, social, and academic outcomes in their children (53). A similar pattern was also shown in low-income African American households where the father characteristics, such as living with the child and the provision of financial support, were shown to be associated with the quality of the home environment and language development in the child after controlling for maternal education

and age (54). Other characteristics such as parenting satisfaction and nurturing behaviours were marginally associated with cognitive and language development in the child (54).

2.3.3 The Association Between Father Involvement and Child Outcomes

There is a growing understanding of the associations between the father's role and the development and well-being of children. Father absence from the home has been shown to be associated with stunting, illness, and reports of injury and poor health in children (55–59). For instance, father absence was linked with lower height for age scores when compared to children whose fathers were present in the home in a 2013 Peruvian study (58). Compared to those who live with both biological parents, children who live in other types of family structures had higher odds of poor health (56). Having another adult in the household, such as the father, that interacts with the child in addition to the mother may also be beneficial due to increased supervision and monitoring (60,61).

Fathers also have indirect effects on their children. For instance, reviews of the literature on the role of fathers conducted by Ball and colleagues (47), Allen & Daly (55), and Marsiglio and colleagues (62) highlighted studies which showed that supporting the child's mother as well as providing financial contributions irrespective of whether the father lived within the same house as the child can also contribute towards child outcomes.

While father presence in the home can be beneficial, there may be some cases where the fathers contribute to a poor home environment (e.g. through domestic violence or substance abuse) (55,63). Therefore, it is important to also measure the quality of father-child interactions to better understand the beneficial role that fathers play in their child's life (48). In many studies, fathers have been shown to play important roles in their child's cognitive, academic, and socio-development outcomes. In 38 low- and middle-income countries (LMICs) across Africa, South America, Eastern Europe and Asia, children whose fathers exhibited moderate levels or no engagement through activities such as reading books, telling stories, naming and counting things, or playing had Early Childhood Development Index (ECDI) scores that were 0.09 SD and 0.14

SD lower than children whose father had high levels of engagement (64). The ECDI is a tool to measure child development and uses indicators of literacy-numeracy, socioemotional, physical, and learning development (65). Results from another study including data from 26 LMIC's found that father engagement in at least one learning activity was positively associated with skills in literacy and numeracy in children ($\beta=0.042$, $p<0.001$) but not with learning development ($\beta=0.001$, $p=0.87$) (41). In some Caribbean countries, father's social and cognitive engagement has been positively associated with social and literacy skills in children (66). This is consistent with another recent study on children in 42 LMICs where paternal stimulation, defined as whether the father engaged the child in activities such as reading books, telling stories, singing songs, taking them outside, playing with them, or naming and counting things with the child in the three days prior to the survey, was positively associated with children's ECDI scores ($\beta=0.071$, $SE=0.003$, $p<0.001$) (67). These investigators found that paternal stimulation had a mediating effect that explained about 10.3% ($\beta=0.010$, $p<0.001$) of the relationship between father's education level and ECDI scores (67). Additional research conducted in East Asia (including Mongolia) that used a different measure of child development showed that in Mongolia, maternal and paternal engagement did not moderate SES-related gaps in child development areas such as cognitive and socio-emotional development, literacy, and approaches to learning (44). As for other child outcomes, low levels of father engagement has been shown to be associated with higher aggressive and externalizing behaviour problems in their children (68). In contrast, supportive behaviours from the father has been positively associated with their child's emotional development (69). It has been suggested that the playful behaviours of the father, such as rough-and-tumble play and teasing, may also promote healthy emotional development in children (48,51).

Based on existing evidence, fathers seem to play several important roles through various forms of positive and healthy involvement that can influence their child's development. Fathers can help improve the quality of the home environment through their financial contributions as

well as their support of the child's mother. They may also help keep their children safe by supervising and monitoring their activities, thereby protecting them from injury or illness.

2.3.4 Father Involvement and Acute Illness

It has been established that risk factors such as contact with contaminated feces or domestic animals, unsanitary food handling, poor handwashing practices, and poor air and water quality are associated with diarrheal and respiratory diseases (65,70–72). Maternal education level and SES are also determinants of diarrheal disease in children (71). There is a growing understanding that father involvement is also associated with acute illness in children. Existing quantitative and epidemiological studies on the direct relationship between father presence, engagement, and acute illness in their children have mainly focused on populations in Western nations. One such study was conducted in England and examined the relationship between family structure and risk of illness and injury in children. The study found that children living with a mother and a stepfather had higher odds of being treated with diarrhea medicine (unadjusted OR=1.69, $p < 0.05$) compared to children living with both biological parents (73). For children living in single-parent households, the unadjusted odds of treatment was 2.03 ($p < 0.01$) (73). However, effects were no longer statistically significant once it was adjusted for variables such as child's sex, maternal education, and psychosocial stress in the household (73). Children have also be shown to be almost three times more likely to have an asthma diagnosis when unmarried parents were living apart (74). In addition, based on subjective reports regarding the child's general health, children have greater odds of reports of poor health when they live with a mother and stepfather or with a single mother (OR=1.15, SE=0.05 and OR=1.50, SE=0.05, respectively) (56). In contrast, children living in two-parent families had slightly higher reports of excellent or good health compared to children living with a single mother (57). In Mexico, after adjusting for factors such as child sex, child age, and household size, father absence was associated with higher odds of any illness (OR=1.39, SE=0.09) and diarrhea (OR=1.51, SE=0.12) in young children at the area level while at the individual level, it too was associated with higher odds of illness and

diarrhea (OR=1.27, SE=0.12 and OR=1.79, SE=0.42, respectively) (59). However, a more recent study conducted in Mexico found that father absence was not associated with reports of poor health outcomes in children after controlling for maternal and household characteristics (75). As for father engagement, higher levels of fathers engaging with their child was associated with 17% lower odds of poor child health as compared to children with lower levels of father engagement (OR=0.83, SE=0.04) (76).

2.3.5 Father Involvement and Preschool Attendance

‘School readiness’ is an important aspect of child development since attending an organized institution such as preschool helps equip children with the cognitive and socio-emotional skills that are necessary to be successful in school (77). Moreover, preschool can help facilitate the transition from a home-environment to a school environment for both the children and their parents (77). Based on previous studies, benefits of early childhood education are evident where children who attend a school readiness program were shown to have improved cognitive outcomes such as language (e.g. speaking or writing), problem-solving, and learning skills, to be more prepared for primary school, and to be more likely to complete high school (78–82). Attending preschool has also been shown to be beneficial towards child health and development since it may help alleviate the negative effects of poverty (83,84). In Mongolia, it is mandatory for children aged 6-17 years to attend school while preschool is made available for children aged 2-5 years (8,65,85,86).

There is existing knowledge on the relationship between paternal caregiving or engagement and child cognitive, socio-emotional, and academic outcomes (see Section 2.3.3), however, there seem to be gaps regarding the association between father involvement and preschool attendance particularly in Mongolia. A 2017 study conducted in the Caribbean showed that preschool attendance in children was associated with father’s cognitive engagement in Suriname ($\beta=0.05$) and with father’s social engagement in the Dominican Republic ($\beta=0.02$) and Suriname ($\beta=0.04$) (66). However, this may not be generalizable to a post-transition setting such

as Mongolia. In post-transition settings, such as in Kyrgyzstan, Tajikistan, and Uzbekistan, attending preschool was associated with higher parenting quality index (ie. higher parental/adult engagement), measured as the total number of activities through which the mother, father, or other adult in the household engaged with the child (87). By country, there was a 5.6 unit increase in parenting quality index in Kyrgyzstan (SE=0.779), 6.5 unit increase in Tajikistan (SE=0.772), and a 3.2 unit increase in Uzbekistan (SE=0.669) when children attended preschool (87). Further research into this relationship showed that the length of preschool attendance was also linked with parenting quality where each one hour increase in attendance was associated with a 0.12 unit increase in parenting quality index in Kyrgyzstan (SE=0.04), a 0.42 unit increase in Tajikistan (SE=0.06), and a 0.10 unit increase in Uzbekistan (SE=0.02) (88). However, these studies did not include Mongolia in their analyses. Other studies have explored the determinants of early childhood education attendance in transitional countries in Central Asia such as Kyrgyzstan, Kazakhstan, and Tajikistan but they did not include data from Mongolia nor did they include parental engagement as a determinant of attendance in the analyses (89–91). Despite this, these studies are amongst others that identified several familial and parent-related factors that are associated with preschool attendance in children.

2.3.6 Other Factors Associated with Preschool Attendance

Household Wealth has consistently been shown to be associated with preschool attendance in developing and transitional countries. A unit increase in household wealth index was shown to increase the probability of preschool attendance by 60% in Kazakhstan, 33% in Kyrgyzstan, 52% in Tajikistan, and 60% in Uzbekistan (89). A follow-up study also showed that having higher levels of household wealth was shown to be positively associated with preschool attendance in Kyrgyzstan (OR=1.697, SE=0.336), Kazakhstan (OR=3.139, SE=0.770), Tajikistan (OR=2.340, SE=0.479), and Uzbekistan (OR=2.224, SE=0.399) (90). This relationship is generally consistent with findings from other studies in transitional countries (87,88,91). This is

expected since families with higher wealth are more able to afford preschool services for their children (8,87,90,91).

Similar associations were shown for *maternal education*. This may be an important determinant of preschool attendance since parents with a high level of education may be more likely to see the benefits of preschool as well as provide children with positive and stimulating environments (43,64,67,92,93). Compared to mothers with lower levels of education, having a mother with a bachelor's degree or higher is associated with higher odds of preschool attendance in Georgia (OR=2.01, SE=0.55), Kyrgyzstan (OR=2.09, SE=0.47), Kazakhstan (OR=2.58, SE=0.60), Tajikistan (OR=2.23, SE=0.68), Ukraine (OR=1.39, SE=0.25), and Uzbekistan (OR=2.48, SE=0.62) (90). This too is supported by findings from other studies in transitional countries (87,89,91). Higher maternal education was also associated with increased length (in hours) of preschool attendance in Kyrgyzstan, Tajikistan, and Uzbekistan (88). While these studies did not include *paternal education*, other studies have shown that the father's education level is strongly associated with cognitive and socio-emotional outcomes in children (43,64,67). Furthermore, father's education was shown to be independently associated with ECDI in children even after controlling for mother's education level (67). Therefore, paternal education may potentially be associated with preschool attendance as well.

Urban/Rural residence has also been shown to be associated with preschool attendance in some transitional countries. Living in a rural area is associated with lower odds of preschool attendance in Georgia (OR=0.37, SE=0.14), Kyrgyzstan (OR=0.39, SE=0.10), and Tajikistan (OR=0.37, SE=0.13) (90). This is most likely due to limited access to education services in rural areas (8,90). Similarly, *region of residence* may also be associated with access to preschool attendance since it was shown to vary by region in Mongolia (8,65). For example, preschool attendance in the Western region was 57.3% while that in the Eastern region was 76.2% in 2013 (65).

Other factors that may be associated with preschool attendance include the child's age, the number of adults living in the household, the child's literacy and social skills, and the number of books in the household. In terms of *child's age*, older children had higher odds of being enrolled in preschool in Belarus (OR=2.37, SE=0.54), Ukraine (OR=1.78, SE=0.29), and Uzbekistan (OR=1.42, SE=0.21) (90). In Mongolia, a report showed that preschool attendance increased with child's age where 63% of those aged 36-47 months and 74% of those aged 48-59 months attended preschool in 2013 (65). However, this association is not consistent with other countries and studies (87,88,91). In contrast, *living with several adults* in the household was associated with lower preschool attendance in some countries and is likely due to the availability of adults, such as grandparents, to care for their children (90,92), thereby reducing the need to send children to preschool for supervisory purposes. The *child's cognitive, literacy, and social development* is also associated with preschool attendance; in the Caribbean, preschool attendance was shown to be positively associated with children's cognitive, literacy, and social skills in countries such as Belize, Guyana, and the Dominican Republic (66,94). As for the *number of children's books in the household*, it has been shown to be positively associated with other child development outcomes in some studies (66,67,94). Therefore, it may potentially be associated with preschool attendance as well. While there are studies that explored the association between parental engagement and preschool attendance in developing and transitional countries, these did not include Mongolian data in their analyses.

2.4 Rationale for Thesis

Due to the significant transitions in Mongolia in recent decades, and the potential influence of these on gender roles and family dynamics, there is rationale to study these influences. While national and regional vaccination rates in 2013 (such as for BCG, HepB, etc.) for children between 12-23 months old were mostly greater than 95% with some variation at the regional level, other acute illnesses still persist in Mongolia (65). Therefore, research on the association with acute illness would be beneficial for the Mongolian population since the leading

causes of morbidity in children under age 5 are diseases affecting the respiratory (e.g. pneumonia, bronchitis) and digestive (e.g. diarrhea) systems with a prevalence rate of about 57.3% and 8.7%, respectively, in 2014 (31). Furthermore, representatives from UNICEF Mongolia have expressed interest in research relating to changes in the father's role and the impacts this may have on school readiness in the post-transition period (Personal communication, Ulziisaikhan Sereeter, ECD Specialist at UNICEF Mongolia, February 2017). The data suggests that preschool attendance was approximately 68% in 2013 (65). Understanding the role of the father in these areas of child well-being can aid in policy-development in Mongolia. In addition, it can help contribute towards knowledge on the social determinants of child health and the issues outlined in the United Nation's Sustainable Development Goals (SDGs), such as those that highlight the need to focus on communicable diseases and access to education (95). Key targets include 3.3 which calls us to "end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases" and target 4.2 where we should "ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education" by 2030 (95). Based on the literature review, there is growing knowledge about the unique role of fathers and their contributions to child health and development outcomes. However, there are gaps in knowledge regarding changes in the father's role as well as its association with child outcomes in the Mongolian context.

The changing roles of men and fathers have been examined in other contexts such as South Africa and Colombia (96–98), however, little is known about the parenting impacts of the changes in the Mongolian father's familial role or the factors associated with these changes in the post-transition period. While the prevalence estimates of father presence and engagement in Mongolia have been established from previous reports (17,65,99,100), patterns and trends in father presence and engagement over time during the post-transition period are unknown. In addition, little is known about how these patterns vary by demographic or regional characteristics.

Therefore, this thesis includes a study that describes the trends and patterns of father's residential status and engagement during the post-transition period between 2000 and 2013. Information from these analyses may aid in hypothesis generation, hypothesis testing, and identifying future areas of research.

The association between the father's role and child-related outcomes have also been established. However, literature on the association with acute illness are based on Western populations while those on preschool education have been explored in other LMIC's and transitional countries but did not include data from Mongolia. Therefore, results from those studies may not necessarily be generalizable to Mongolian children. The second study included in this thesis explores the association between the father's role and acute illness and preschool attendance in Mongolian children using the most recently available MICS data from 2013. Results from this study can add to the growing literature on the father's role and influences of fathers as social determinants of child health within the Mongolian context.

2.5 Thesis Objectives and Hypotheses

The first objective of this thesis was to conduct a descriptive analysis of the patterns and trends in the point-prevalence of father presence for children aged 0-4 years in Mongolia across four time-points. Similarly, a descriptive analysis was performed for the point-prevalence of father engagement with their children aged 3-4 years. Patterns are described by sex of the child, region of residence, urban and rural residence, and whether the child's household owned any livestock. These analyses help describe whether the transition in Mongolia was associated with changes in the father's familial role between 2000 and 2013. It was hypothesized that father presence and engagement will fluctuate during this period.

The second objective was to explore whether there was an association between the Mongolian father's role and child-related outcomes such as acute illness and preschool attendance in children aged 3-4. This was explored using data from 2013 while controlling for demographic factors including parental education level, household wealth, and region of residence. When

compared to absent fathers or fathers with low levels of engagement, it was hypothesized that father presence and high levels of engagement would be associated with lower odds of acute illness and higher odds of preschool attendance in children.

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Table 2.1: Characteristics of the different types of dzuds (5,6,9)

White Dzud	Heavy snowfall prevents livestock from feeding on pastures
Black Dzud	Low snowfall and frigid temperatures prevent the accumulation of surface water
Iron Dzud	Temperatures rapidly fluctuate causing snow to melt and then rapidly freeze into ice, preventing livestock from grazing
Storm Dzud	Heavy snowfall and strong winds
Combined Dzud	Temperature plummets rapidly and is accompanied by deep snow
Hoofed Dzud	High densities of livestock trample on feeding pastures

Chapter 3

Patterns in Father Presence and Father Engagement in Mongolia Between 2000 and 2013

Abstract

Many households in Mongolia are facing increased livelihood and financial insecurity due to rapid social, economic, political, and climate changes. There is concern regarding the effects of a loss in livelihoods and shifting gender roles on family dynamics in these households. This historical cross-sectional study explores patterns of father presence and father engagement with children under 5 in Mongolia between 2000-2013 using Multiple Indicator Cluster Survey (MICS) data. Trend analyses were performed to explore changes in father presence and engagement from the four most recent datasets. Patterns were also explored for demographic subgroups such as region of residence, urban/rural residence, child's sex, and whether the household owned livestock. Multivariate logistic regression was also performed to adjust for potential confounding variables and covariates. The national point-prevalence of father presence fluctuated from 78-83% while father engagement fluctuated between 40-49% across the survey time-points. These fluctuations were only significant for father presence ($P_{Trend} < .0001$). The Khangai, Central, and Ulaanbaatar regions experienced significant changes in father presence ($P_{Trend} < .0001 - 0.022$) and engagement ($P_{Trend} = 0.0005 - 0.048$) while the Western region only experienced a significant change for father engagement ($P_{Trend} = 0.006$). Logistic regression showed a change in point-prevalence of father engagement between 2005 and 2010, and changes in father presence and engagement over time remained significant after controlling for other covariates such as SES. The changes in father presence and engagement in many households may be due to the economic insecurities brought about by rapid macro-environmental changes.

Introduction

Mongolia is a sparsely populated country located in a region characterized by extreme climate conditions, various geographic terrains, and temperatures that range from -40°C in the winter to about 35°C in the summer (1–6). The landscape is derived of various geographic landforms such as steppe grasslands, the Gobi Desert, and a few mountain ranges (1,2,5,6). Due to the climate conditions and geographic landscape, Mongolian pastoralists adopted a nomadic lifestyle that has been characteristic of Mongolian identity and culture for centuries (1,2). Nomadic life involves the tending and sustained care of livestock (such as cattle, camels, horses, sheep, and goats) in seasonal patterns with households migrating to different areas based on climate conditions (1,2,6). Approximately 33% of the working population are herders in the livestock sector which constitutes about 80% of all agricultural production and agriculture in turn contributing to about 12% of the national GDP (2–4,6,7). Unfortunately, the industry has faced significant challenges due to climate change as well as major social, political, and economic shifts that began in the early 1990s (1,2,6).

While it is common for herders to lose some of their livestock during the winter months, this issue significantly worsens when faced with extreme weather conditions such as droughts in summer months and *dzuds* during the winter months (1–4,6). *Dzuds* are a major threat to pastoralist livelihoods and is a Mongolian term that describes different forms of extreme winter conditions that bring extremely low temperatures and heavy snowfall or ice accumulation on grazing lands, thereby threatening the survival of livestock (1,3,4). Since 1990, Mongolia experienced five major dzud events that resulted in high livestock mortality; according to the annual livestock census conducted by the National Statistics Office of Mongolia (NSO), three consecutive dzuds between 2000 and 2002 resulted in about 10 million livestock deaths across three years (4,8). In 2010 alone, Mongolia experienced one of the most destructive dzuds in history that caused an additional 10 million livestock deaths (4,8). This was significantly higher than the typical average of around 1 million livestock deaths per year (4,8). It is estimated that 12

thousand households lost their livelihoods due to the dzud-related animal deaths in 2010 alone (4).

While the extreme climate conditions significantly affected pastoralist households, the social, economic, and political climate in Mongolia after 1990 also had negative impacts. Throughout the 1900s, Mongolia was governed by a communist government that provided employment and improved access to education and healthcare services for urban and rural populations while also providing essential supports and infrastructure for herders (1,2,9). They received benefits such as transportation for herding activities, education on animal husbandry, veterinary services, food and shelter for animals during extreme weather periods, and improved access to clean water (1,2). Herders largely benefited from these supports since it allowed them to adapt and effectively manage and protect much of their livestock during extreme weather (1,10). Starting in 1990, these supports gradually diminished since the decline in Russian involvement coupled with an economic transition and major political reform led to the transition of society from a communist system with a centralized economy to a multi-party democracy with a market-based economy (1,2,5). This led to an increased focus on the market and mining industry and decreased funding and governance in agriculture and other government supports (9,10). Due to the lack of governance regarding land use, resource management, and herding-related infrastructure, herder households especially experienced challenges; for instance, neighboring herders came into conflict over trespassing or land-use, herders lost land to mining companies, quality pasture areas became scarce due to livestock overgrazing and overpopulation, and supports such as winter shelters, access to clean water, and state-supported roads for livestock migration were no longer provided (1,4,10,11). As a result, many pastoral households lost their livelihoods and others are still struggling to adapt especially during extreme weather conditions (6). Similarly, in many non-herder households, individuals also faced limited access to healthcare and education as well as unemployment since the state no longer guaranteed employment (1,9,11). An estimated 11.6% of Mongolians were unemployed in 2009 while 9.9% were

unemployed in 2010 (12). Increased unemployment has also led to high rates of rural-urban migration of people seeking additional employment opportunities and improved access to education, healthcare services, and clean water in urban areas such as Ulaanbaatar, the capital city, where the population density has risen significantly and strained services and infrastructure (1,4,10,11,13,14). Unfortunately, these conditions had implications on gender roles and family relations in affected households.

Prior to the transition, roles within pastoralist households were distinctly divided between men and women; men were mainly responsible for tending and managing their livestock while women were responsible for domestic tasks such as milking animals, cooking, and caring for children (1,14,15). Thus, in households that relied on pastoralism as a livelihood, family roles were gendered and explicit. In both herding and non-herding households, men were generally considered to have the head of household and primary breadwinner role (9). As a result of the transition in the early 1990s, there has been a shift in roles in many households with especially dramatic changes in the masculine role (9). This has potential effects on family dynamics and relations with implications for child and adult experiences alike. There have been concerns raised by government and non-governmental organizations regarding the effects a change or loss in livelihoods may have on men who are fathers and the subsequent impacts it may have on family dynamics and child education and health outcomes in Mongolia (Personal communication, Ulziisaikhan Sereeter, ECD Specialist at UNICEF Mongolia, February 2017). This is an area of concern since the early years of life are a crucial time for children in terms of their health and development and are known to be strongly influenced by the environment and conditions around them (16–18). The complex effects of the transition on fathers, family dynamics, and child well-being can potentially be explained using Bronfenbrenner's Ecological Theory model which describes the interactions between various nested ecological systems in the child's environment to explain child outcomes (19,20). This model includes the microsystem in which the direct interaction between children and their parents sit, the mesosystem which includes interactions

between parents, and the macrosystem which includes cultural beliefs (about things such as gender roles for example) and the social, political, and economic context (19,20). It is through complex interactions within and across the systems that the transition period may subsequently affect child outcomes in Mongolia. There is a growing understanding of the role of fathers in child development and studies show evidence of relationships between father presence, positive engagement, and several child outcomes (19,21–25). While the changing roles of men and fathers have been examined in other contexts (26–28), there are currently gaps in knowledge regarding the roles of fathers within the Mongolian context and how these are changing in the post-transition period. The aim of this study was to explore these ideas by examining patterns of father presence in the home and father engagement in their young children’s lives during a period of rapid macro-environmental change in Mongolia.

Methods

A historical cross-sectional study design was used to perform separate analyses to measure patterns in father’s residential status and in father engagement in daily activities with their preschool children in Mongolia. This study protocol was approved by the Queen’s University Health Sciences & Affiliated Teaching Hospitals Research Ethics Board.

Data Source

This was a secondary analysis of data collected through several Multiple Indicator Cluster Surveys (MICS) that were designed by UNICEF and implemented by the National Statistical Office of Mongolia (NSO) at 3-5 year intervals in collaboration with UNICEF and UNFPA since 1995 (5,29–31). These surveys are used as surveillance tools to monitor progress towards global and nationwide goals in maternal and child health (such as those associated with the Millennium and Sustainable Development Goals) as well as measure the impact of the economic and political transition on women and children (5,29–31). Through these surveys, self-reported data on multiple health indicators are collected at the household and individual level through structured interviews. These surveys are broken down into several questionnaires

including one designed to collect data for children under the age of five. For each survey period, response rates for all questionnaires were greater than 90%.

Since data on father's residential status are not available in the MICS 1995 dataset, only data from the MICS 2000, 2005, 2010, and 2013 datasets were used for analysis. Similarly, for father engagement, this item was not included in all survey years and thus, only data from the MICS 2005, 2010, and 2013 datasets were used. Data from the household, women's, and children under five questionnaires were used for data on some of the potential confounders or covariates for the analysis. All questionnaires completed in each household were linked through assigned cluster and household identification codes.

Study Sample

For each survey year, a multi-stage stratified cluster sampling design was used to ensure that information on health indicators were collected from a nationally representative sample. Since the survey samples are independent from each other, sample sizes for children under five varied for each year. Only those with completed "Children Under Five" questionnaires were included in this study with resulting sample sizes as follows: MICS 2000: 6184 (5), MICS 2005: 3547 (30), MICS 2010: 3956 (31), and MICS 2013: 6054 (29). Since data on father engagement was only collected for children aged 3-4, the samples sizes for each survey year are MICS 2005: 1308, MICS 2010: 1279, and MICS 2013: 2373.

Measures

Father presence and father engagement in daily activities with their child were used as indicators of the father's familial role and were the primary outcomes measured in this study.

Information on *father presence* was available for household members aged 0-17 years and was used to determine whether the child's father was living in the household. In the "Household Listing" questionnaire, heads of household were asked whether the child's biological father was alive, and if so, whether he lived in the household at the time of the survey. As a

primary outcome, father presence was measured as the point-prevalence of children under five whose father was living in the household at the time of survey.

Data for *father engagement* was available for household members aged 3-4 years. Mother's or caretakers of the child were asked whether an adult engaged in any of the six listed activities in the three days prior to the survey and whether the adult was the child's father. Activities include whether the father 'read books or looked at picture books', 'told stories', 'sang songs', 'took the child outside the home', 'played with', or 'named, counted, or drew things' to or with their child. This outcome was dichotomized into two categorical outcomes where the *father engaged in at least 1 activity* with the child or the *father did not engage in these activities* with the child. This outcome was measured for each survey year as the point-prevalence of children aged 3-4 whose father engaged them in at least 1 activity in the three days prior to the survey. These indicators of father engagement were used under the assumption that these father-child interactions were neutral or positive in nature as information about the specific nature or quality of the activity was not available.

Other descriptor variables were used to compare outcomes for various subgroups. These included the child's sex, geographic region in Mongolia, type of residence (urban or rural), and whether the household owned any livestock. Data on these characteristics were available from the "Household" and "Children Under Five" questionnaires and were provided by the head of household or their designate (for the Household questionnaire), and the mother/caretaker of the child (for the Children Under Five questionnaire).

Time was the main exposure in this study and represents changes in the physical and socio-demographic context occurring in Mongolia. Trend analyses were performed for each outcome to identify patterns in father presence and engagement across the 3-4 survey time points.

Data Analysis

All analyses were performed using SPSS Premium Campus Edition v.24 (IBM SPSS Statistics) and SAS Studio University Edition v.9.4 (SAS Institute Inc., Cary, NC, USA). Point-

prevalence estimates for each outcome were obtained for each survey period. The Cochran-Armitage test for trend was used to measure the overall changes in father presence and father engagement as well as changes within specific demographic subgroups over the 8-13 year period. A logistic regression model was also used to further explore and control for factors that may explain changes in father presence and engagement besides temporal or contextual trends. Cases with missing values for covariates and demographic factors were excluded from analyses. Variables with missing values include sex of child (n=4), mother's or caretaker's education (n=2), and whether the household owned livestock (n=3).

Samples from the 2000 survey were designed to be self-weighting while the 2005, 2010, and 2013 survey periods were not self-weighting due to slight variations in sampling techniques at the regional level (5,29–31). To account for this, the NSO calculated and provided sample weights for each survey period. Sample weights were standardized to ensure that the weighted sample size matched the actual sample size for the respective survey periods (5,29–31). All analyses were performed using weighted samples.

Results

Demographic characteristics of the MICS sample for each survey year can be found in Table 3.1.

Trends in Father Presence

The national point-prevalence of father presence in the home at the time of the survey fluctuated between 77.8-83.3% within the 13-year period with the lowest prevalence occurring in 2005 while the highest was recorded during the 2010 and 2013 periods (Fig. 3.1 & Table 3.2). Despite the minor fluctuations, these changes were found to be statistically significant ($P_{Trend} < .0001$). Fluctuations in father presence were also identified for various demographic subgroups and were also significant within this period. These include fathers of male ($P_{Trend} = 0.0016$) and female ($P_{Trend} = 0.0068$) children, children residing in the Khangai ($P_{Trend} = 0.0142$), Central ($P_{Trend} = 0.0217$), and Ulaanbaatar ($P_{Trend} < .0001$) regions, those living in

urban ($P_{Trend} < .0001$) and rural ($P_{Trend} = 0.0001$) areas, and for children in households that own ($P_{Trend} < .0001$) and do not own ($P_{Trend} < .0001$) livestock (Table 3.2). Since it is unclear whether father presence is increasing or decreasing within this period, estimates from other survey years are required to determine the directional trend of father presence in the home.

By region, the Western region generally had the highest prevalence of father presence for all four survey periods with values ranging from 89.6-91.2% followed by the Khangai region with values ranging from 80.3-87.6% (Table 3.2). As for area of residence, children living in rural areas generally had a higher prevalence of father presence within the 13-year period with values between 83.6-87.1%.

Table 3.3 shows results from a logistic regression model that controls for various demographic factors such as region, type of residence, sex of the child, mother's education, household wealth quintile, and whether the household owns any livestock. The model shows that when considering other potentially explaining factors, prevalence of father presence in the home changed between 2000 and 2005 ($p = 0.0413$), 2000 and 2010 ($p < .0001$), and between 2000 and 2013 ($p < .0001$). Factors that are associated with father presence in the home include region of residence ($p < .0001$), mother's education ($p < .0001$), wealth quintile ($p = 0.0178$), and owning livestock ($p < .0001$).

Across the entire period, the Western region had the highest average prevalence of father presence in the home (90.4%) while the Ulaanbaatar region had the lowest (77.8%) (Fig. 3.2). In addition to Table 3.2, regions that experienced significant changes in father presence in the home are also displayed in Fig. 3.2 and include the Khangai, Central, and Ulaanbaatar regions.

Trends in Father Engagement

The national point-prevalence of father engagement in at least one activity during the three days prior to the survey fluctuated within the 8-year period (Fig. 3.1; Table 3.2). The lowest prevalence was during the 2010 survey year with a value of 40.0% while 2005 had the highest prevalence with a value of 49.1%. However, these changes were not statistically significant

($P_{Trend}=0.3299$). Despite this, there were however significant fluctuations for certain sub-populations. These include children living in the Western ($P_{Trend}=0.0062$), Central ($P_{Trend}=0.0061$), and Ulaanbaatar ($P_{Trend}=0.0005$) regions, those living in rural ($P_{Trend}<.0001$) and urban ($P_{Trend}=0.0046$) areas, as well as in those living in households that own livestock ($P_{Trend}=0.0007$). For those living in the Khangai region, fluctuations in father engagement was marginally significant ($P_{Trend}=0.0468$). Additional prevalence estimates from other survey periods are required to determine whether father engagement increased or decreased over time.

Despite the changes in national point prevalence estimates not being significant (Table 3.2), the logistic regression model shows a significant change in the prevalence of father engagement in at least one activity with their child between 2005 and 2010 ($p<.0001$) (Table 3.3). This change remained significant after adjusting for various demographic factors such as sex of the child, region and area of residence, mother's education level, wealth quintile, and ownership of livestock. This model suggests that in addition to the overall socio-demographic context, factors that may explain trends in father engagement include region of residence ($p=0.0074$), mother's education ($p<.0001$), wealth quintile ($p=0.0003$), and owning livestock ($p<.0001$).

Across the entire period, the Western (47.6%) and Khangai (47.4%) regions had the highest average prevalence of father engagement in at least one activity while the Eastern region had the lowest (37.6%) (Fig. 3.2). All regions except the Eastern region experienced significant changes in the prevalence of children whose fathers engaged them in at least one activity in the three days prior to the survey.

Discussion

This study shows that father presence as well as father engagement with their children fluctuated between the various survey periods for various demographic subgroups. Father presence in the home was shown to change significantly in the overall sample between the 2000 and 2013 survey periods and patterns were even more notable within particular demographic subgroups including families having male and those having female children, children residing in

urban areas, children whose households own and do not own livestock, as well as children living in the Ulaanbaatar and Khangai regions. Significant changes over time were found in other subgroups, however, fluctuations in point-prevalence were relatively minor and may be due to the large sample sizes. As for father engagement with their child, overall changes in point-prevalence were not significant between the 2005 and 2013 survey periods, however, logistic regression modelling showed that there was a difference in the point-prevalence of father engagement between 2005 and 2010. Notable differences were also seen at the regional level, in both urban and rural areas, as well as in households that own and do not own livestock. Changes in father presence and engagement remained significant after controlling for factors such as region of residence, urban or rural residence, sex of the child, mother's education, household wealth quintile, and livestock ownership.

Since the point-prevalence of father presence and father engagement fluctuated across the survey periods, it is possible that the changes could be due to the political, social, and climate context in Mongolia over these different periods. Mechanisms of effect may be variable. The 'Family Process Model of Economic Hardship' proposed by Conger and colleagues (32) helps to explore the mechanisms behind the impacts of the transition on parenting practices. The model emphasizes that families and parents who experience economic hardship may also face increased levels of stress and that this could have negative implications for mental health and the quality of parenting (32). Since the major transition in Mongolia negatively affected the livelihoods of many households, in turn negatively affecting family resources and levels of stress, father-child relationships may have changed due to this stress and a decline in the mental health status of the mother and/or father. In a review paper conducted by McLoyd (33) and a commissioned report by Davis & Mantler (34) men experiencing unemployment or financial stress were found to have generally poorer mental health outcomes including depression, anxiety, and poor life dissatisfaction and that these contributed to marital conflict and poor parenting. Marital conflict in particular has been shown to lead to lower rates of marital satisfaction and increases in the risk of

separation in parents (33,34). The divorce rates increased in Mongolia during the post-transition period from the consistent rate of 0.1 divorces per 1000 population in the 1990s to a sudden increase to 0.6 per 1000 in 2000 (35). These rates continued to rise with sudden increases from 2004 (0.7 per 1000 population) to 2005 (1 per 1000) as well as from 2008 (1.1 per 1000) to 2010 (1.7 per 1000) (35). The rise in divorces in 2005 may explain the decline in father presence in households in that year, particularly in Ulaanbaatar (11,35). This pattern, however, was not seen for father presence in 2010 and is likely due to the significantly high rates of marriages which increased from 9.6 per 1000 in 2005 to as high as 30.6 per 1000 in 2006 and 19.8 per 1000 in 2009 (35). It is worth noting that the sudden increase in divorce rates in 2005 and 2010 seemed to correspond with or follow the years where the GDP per capita growth decreased in Mongolia (in 2005 and 2009) as well as with the major losses in livestock in 2010 (8,36), however, more refined analyses are required to identify whether these factors are related to family structures and these separation outcomes in Mongolia. In other cases where marriages remained intact, households may have decided to live apart as a response to economic hardships where fathers or men might remain in rural areas with livestock while mothers or caretakers would take their children to urban centres for improved access to healthcare services and schools (37). There is evidence in other parts of the world that indicates that sudden poverty, adversity, and unemployment is associated with various forms of family separation that are either permanent or temporary (38–40). This pattern of separation also appears in line with the decline in father presence in Ulaanbaatar and urban regions. As for father engagement, fathers who experience either or both economic-related mental health problems and marital conflict may exhibit poorer parenting since they tend to be more hostile, less nurturant, and even abusive with their children (33,34). This may explain the marked decline in prevalence of father engagement between 2005 and 2010 which happened to coincide with the 2010 dzud event of national- and historic-scale as well as a sudden rise in unemployment in 2009 and 2010 in Mongolia (4,12). While this finding suggests that unemployment is indirectly associated with reduced father engagement, other

studies have shown that unemployment can allow fathers to interact and spend more time with their children (33), suggesting that the impacts of economic insecurity might be mixed. The impacts on children will also depend on whether the relationship between father and child is of good quality (33). In contrast, returning to employment can improve a father's mental health status, meaning that parenting quality could improve in those households if they are able to recover from economic losses (33,34). So the overall negative or positive impacts are not clear.

In addition to financial concerns, the loss in identity or household role of men may also contribute to stress or depression (33). Since animal husbandry is an important part of Mongolian culture, men in these households have traditionally adopted the gendered role as herders responsible for all matters related to herding and maintaining livestock (1,14,15). With the onset of an economic, social, and political transition as well as an increase in dzud events, the shift in men's roles may have led to helplessness or distress (14,41,42), reducing the likelihood of fathers engaging with their child. Whether the fathers in the household are stressed due to unemployment, marital issues, or a loss of meaningful role or identity, these factors may also be inter-related with substance abuse and domestic violence, issues that are of major concern in Mongolia (9,11,15,33,41,43–45). Under these conditions, fathers may be less nurturant towards their children and therefore less likely to engage in activities such as playing or singing with them.

In terms of the child's sex, slight changes in father presence over time occurred for both male and female children where father presence in 2005 was relatively low compared to the other survey years. As for father engagement, changes were also seen over time for both sexes where father engagement declined from 2005 to 2010 and then recovered in 2013. However, these changes were not statistically significant. This suggests that patterns in father presence and engagement were similar for both male and female children and is an interesting finding.

As for the regional differences in father presence and father engagement, these may be explained by several factors. For instance, census data has shown that livestock mortality in 2000,

2001, and 2010 were generally higher in the Western, Khangai, and Central regions (3,8) which roughly corresponds to the regions where the point-prevalence of father engagement decreased from 2005 to 2010 followed by slight increases from 2010 to 2013. Regional differences in livestock mortality may be due to several factors such as climate patterns characteristic of those regions, a drastic increase in the number of livestock in certain regions that may increase overgrazing, overcrowding, or disease in animals, or proximity of herder households to mining areas that may compete for land or pollute freshwater sources (1,3,4). Variations in livestock mortality may in turn correspond to loss in rural livelihoods, potentially affecting family dynamics and father-child relationships within those households. The fluctuations in father engagement may also be due to the internal migration of households across regions during the post-transition period (1,4,13,41). In addition, while the Khangai, Central, and Ulaanbaatar regions experienced significant changes in both father presence and father engagement, the Western region did not experience a statistically significant fluctuation in father presence but experienced a change in father engagement. Fathers remaining in the household across the 13-year period may be explained in part by the remoteness of communities (4,41). Due to the poor support for rural infrastructure such as paved road maintenance (1,4), people living in remote areas may find it challenging to migrate towards other areas. Therefore, regional differences in the father's role may be explained by factors such as variations in livestock mortality rates, dzud frequency, potentially different forms of internal migration between regions, and remoteness of communities.

The changing patterns in father presence and engagement over time is also evident for both urban and rural areas. Mongolia has experienced massive rates of internal migration particularly from rural to urban centers due to many rural households experiencing the loss of pastoral livelihoods and unemployment (1,4,13,41). The most notable change in these analyses was for father engagement in rural areas where there was a decrease in prevalence from 2005 to 2010. This corresponds with the dzud event of 2010 where stress related to loss of livestock,

unemployment, or of migrating to urban areas could affect the father's desire for activities such as singing, reading or playing with their child. This trend in father engagement is further reflected in households that own livestock where there was a decrease in father engagement between 2005 and 2010.

Results from the logistic regression model suggests that the mother's or caretaker's education and the wealth quintile of the household may also explain the fluctuations in father presence and engagement. Women of higher education may be more likely to marry men working in the formal sector compared to the agricultural sector (46) and their households may therefore experience more limited negative economic impact from climate change and the economic and political transition. Educated mothers or caretakers are also more likely to have stable marriages compared to those of lower education (47). As for father engagement, a previous study using MICS data has shown that maternal education is negatively associated with father engagement with their children (48). The authors postulate that highly educated mothers are likely to be the primary caregiver of the child and would naturally spend more time engaged in these activities with the child compared to the father. It is also likely that mothers practice 'maternal gatekeeping' where they may encourage or limit the frequency in which fathers engage with their children (21,49). Mothers having a high education, high SES, and high satisfaction with the father's involvement has been shown to be correlated with reduced maternal gatekeeping (49), which means that mothers are less likely to prevent father's from engaging with their children. In terms of household wealth quintile, wealthier herders may be less likely to experience livelihood loss since they have the means to reduce their risk of losing livestock (1,50). In addition, fathers in lower income settings may experience more stress during situations of livelihood insecurity and may be less likely to engage with their child while other fathers may take unemployment as an opportunity to engage with their child (33). Furthermore, it has been suggested that longer work hours for fathers may be associated with lower levels of father involvement with children (51). This means that fathers in low or high income settings with demanding jobs or long work

hours may have less time to engage with their child (51). Further research is required to better understand how these factors influence father involvement within the Mongolian context.

This study provides a descriptive account of the potential indirect effects that extreme dzud events and a major social, economic, and political transition may have on family dynamics and father-child interactions particularly within pastoralist households in Mongolia. Using population-level data of this kind, it cannot be determined if the changes noted are indeed due to impacts at the macro-environmental level, but the connections are possible. Further focused studies are required to explore the relationships and mechanisms between various economic, political, or demographic factors and father presence and engagement in different Mongolian families. Further and longer term research could also examine whether trends in father presence and engagement are increasing or decreasing overall across time in the post-transition period, and whether these patterns are distinctly different between pastoralist households and those that do not engage in nomadic pastoralism.

Strengths and Limitations

No study to date has examined changes in the father's familial role within the changing climate, social, economic, and political context of Mongolia. This study is unique since it illustrates patterns in father presence and engagement across a period of climate change and rapid transition using a nationally representative sample. Patterns identified within various demographic subgroups may help inform future research studies that can explore these patterns and relationships even further. From a public health perspective, study findings may help inform future policy development to support affected households.

Since this study involves the secondary analysis of survey data, several limitations exist and should be acknowledged. For instance, the use of survey data allows cross-sectional analysis only. This means that some indicators used in this study reflect a child or household's situation around the time of the survey but causal relationships between variables or directions of effects cannot be assumed. The dataset only provides information on whether the father was living in the

household at the time of the survey and does not specify whether the father consistently lived in the home with the child since birth. Similarly for father engagement, the questionnaire only captures whether the father engaged with their child in the three days prior to the survey but does not provide insight on whether the father is regularly engaged in those activities with the child or give information on duration or quality of these interactions.

Information bias is an additional limitation present in this study due to the use of self-reported data and the design of the survey questions. Response bias may be present in questions regarding father engagement since most respondents for the children under five questionnaires were mothers or caretakers of the child. Respondents other than the father may potentially underestimate or provide inaccurate accounts of fathers engaging with their children, particularly for fathers who do not live in the household (52). Another source of misclassification is the use of six activities as a proxy to measure father engagement in children. By limiting the types of activities, the survey does not capture other methods of interaction or engagement such as showing affection, bathing the child, feeding or eating with the child, or disciplining the child. Therefore, fathers who exhibit affection towards the child or is involved in their child's daily routine and activities may be classified as having a lack of engagement with the child if they did not participate in any of the six listed activities in the three days prior to the survey. Fathers who engage in the listed activities with the child but were not able to do so in the three days prior may also be misclassified as not engaging with their child. In addition, assumptions were made regarding the indicators of the father's role where father presence and father engagement were assumed to be positive exposures for the child, when in reality, this may not always be the case particularly when fathers are abusive or are bad role models for children. Moreover, survey questions regarding father presence or engagement were only asked for biological fathers, and therefore, does not reflect cases where the child was living with a non-biological father.

Conclusion

The point-prevalence of father presence and engagement was shown to fluctuate across a 13-year period in Mongolia. Patterns that coincide with major dzud events can be seen for various regions, by type of residence, and for households who own livestock. These patterns may be explained by stress arising from a loss or potential loss in livelihoods and shifting gender roles due to challenges in coping with extreme winter conditions as well as reduced state-provided supports from the Mongolian government after the transition. These fluctuations are of interest since father presence and engagement are increasingly being recognized as important determinants of child well-being. Findings indicate a need for further study and interventions to address the broader implications of social, economic, political, cultural, and climate changes in Mongolia and globally.

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Table 3.1 Descriptive statistics for children under age 5 with completed Children Under 5 Questionnaires

	MICS Survey Year				p-value ^a
	2000 (col %)	2005 (col %)	2010 (col %)	2013 (col %)	
Demographics					
Total Children	6184	3547	3956	6054	
Sex of Child					0.095
Male	3148 (50.9)	1841 (51.9)	1990 (50.3)	3102 (51.2)	
Female	3032 (49.0)	1706 (48.1)	1966 (49.7)	2952 (48.8)	
Missing	4	0	0	0	
Age of Child					<.0001
0	1412 (22.8)	794 (22.4)	864 (21.8)	1279 (21.1)	
1	1255 (20.3)	728 (20.5)	898 (22.7)	1168 (19.3)	
2	1192 (19.3)	714 (20.1)	872 (22.0)	1233 (20.4)	
3	1121 (18.1)	673 (19.0)	703 (17.8)	1186 (19.6)	
4	1204 (19.5)	638 (18.0)	619 (15.6)	1188 (19.6)	
# Children Aged 0-4 in Household^b					<.0001
1	3422 (55.3)	2474 (69.7)	2556 (64.6)	3868 (63.9)	
2	2441 (39.5)	963 (27.2)	1292 (32.7)	1954 (32.3)	
3	312 (5.0)	110 (3.1)	104 (2.6)	220 (3.6)	
4	8 (0.1)	0 (0.0)	4 (0.1)	12 (0.2)	
Missing	1	0	0	0	
Father's Age^c					<.0001
< 25	351 (7.6)	290 (10.5)	322 (9.7)	397 (7.9)	
25 - 34	2823 (60.8)	1640 (59.4)	1954 (58.9)	2896 (57.7)	
35 - 44	1290 (27.8)	707 (25.6)	917 (27.7)	1551 (30.9)	
45 - 54	157 (3.4)	111 (4.0)	119 (3.6)	169 (3.4)	
55 - 64	19 (0.4)	10 (0.4)	3 (0.1)	5 (0.1)	
65+	2 (0.0)	3 (0.1)	0 (0.0)	0 (0.0)	
Missing/DK	1345	658	541	901	
Mother's Marital Status					<.0001
Currently Married	4971 (83.1)	2194 (65.8)	3091 (83.2)	4459 (78.6)	
Formerly Married (Widowed, Divorced, or Separated)	739 (12.3)	290 (8.7)	189 (5.1)	249 (4.4)	
Never Married	275 (4.6)	275 (8.2)	165 (4.4)	177 (3.1)	
Living with a man/partner	0	575 (17.2)	270 (7.3)	786 (13.9)	
Missing/DK	0	76	64	87	
Mother/Caretaker's Education Level					<.0001
None	97 (1.6)	161 (4.6)	234 (5.9)	354 (5.9)	
Primary	312 (5.1)	296 (8.4)	363 (9.2)	442 (7.3)	
Lower Secondary	1641 (26.6)	894 (25.3)	818 (20.8)	934 (15.5)	
Upper Secondary	2060 (33.4)	1019 (28.8)	1030 (26.2)	1491 (24.8)	
Vocational	646 (10.5)	252 (7.1)	258 (6.5)	506 (8.4)	
College or University	1414 (22.9)	914 (25.8)	1235 (31.4)	2286 (38.0)	
Missing/DK	0	0	0	2	

Table 3.1 (continued): Descriptive statistics for children under age 5 with completed Children Under 5 Questionnaires

	MICS Survey Year				p-value ^a
	2000 (col %)	2005 (col %)	2010 (col %)	2013 (col %)	
Demographics					
Father's Education Level^c					<.0001
None	88 (1.4)	171 (5.0)	336 (8.7)	589 (10.0)	
Primary	323 (5.2)	336 (9.8)	508 (13.2)	635 (10.7)	
Lower Secondary	1551 (25.1)	902 (26.4)	896 (23.2)	1002 (16.9)	
Upper Secondary	1198 (19.4)	655 (19.2)	694 (18.0)	1067 (18.0)	
Vocational	575 (9.3)	244 (7.1)	217 (5.6)	460 (7.8)	
College or University	837 (13.5)	453 (13.2)	658 (17.1)	1258 (21.3)	
Father not living at home	961 (15.5)	658 (19.2)	541 (14.0)	901 (15.2)	
Household Wealth Quintile					
Poorest	1424 (23.0)	813 (22.9)	1213 (30.7)	1458 (24.1)	<.0001
Second	1273 (20.6)	842 (23.7)	874 (22.1)	1251 (20.7)	
Middle	1199 (19.4)	686 (19.3)	706 (17.8)	1158 (19.1)	
Fourth	1160 (18.8)	579 (16.3)	608 (15.4)	1045 (17.3)	
Richest	1128 (18.2)	627 (17.7)	555 (14.0)	1142 (18.9)	
Household Owns Livestock					
Yes	3388 (54.8)	1582 (44.6)	2063 (52.1)	2714 (44.8)	<.0001
No	2793 (45.2)	1965 (55.4)	1893 (47.9)	3340 (55.2)	
Missing	3	0	0	0	
Area of Residence					
Urban	2685 (43.4)	1840 (51.9)	1747 (44.2)	3516 (58.1)	<.0001
Rural	3499 (56.6)	1707 (48.1)	2209 (55.8)	2538 (41.9)	
Geographic Region					
Western	1186 (19.2)	676 (19.1)	956 (24.2)	947 (15.6)	<.0001
Khangai	1598 (25.8)	843 (23.8)	787 (19.9)	1247 (20.6)	
Central	1333 (21.6)	609 (17.2)	810 (20.5)	1109 (18.3)	
Eastern	575 (9.3)	378 (10.7)	709 (17.9)	769 (12.7)	
Ulaanbaatar	1492 (24.1)	1041 (29.3)	694 (17.5)	1982 (32.7)	

Percentages that do not add up to 100% are indications of 'missing' data and are due to the removal of children whose questionnaires were not listed as 'complete'. Missing values listed in the table are from children whose questionnaires were listed as 'complete'.

^a Based on chi-square test for homogeneity

^b Includes children under age 5 who did not complete the Children Under 5 Questionnaire.

^c Only includes fathers who are alive and are living with the child. Chi-square test only performed for data from 2005-2013 since father's age and education data in 2000 was only available if the father was the head of household.

Table 3.2 Overall and subgroup-specific trends in the point-prevalence of father presence and father engagement in at least 1 activity across 3-4 survey time-points

<u>Survey Year</u>	<u>Father Presence in Household n (%)</u>					<u>Father Engagement^a n (%)</u>			
	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2013</u>	<u>P trend^b</u>	<u>2005</u>	<u>2010</u>	<u>2013</u>	<u>P trend^b</u>
Characteristic									
Sex of Child									
Male	2550 (81.0)	1440 (78.2)	1650 (83.3)	2582 (83.2)	0.0016	343 (50.8)	254 (40.3)	562 (48.0)	0.2580
Female	2472 (81.5)	1319 (77.3)	1643 (83.2)	2458 (83.3)	0.0068	299 (47.2)	266 (39.8)	543 (46.5)	0.8311
Region									
Western	1075 (90.6)	605 (89.6)	553 (90.3)	824 (91.2)	0.7364	147 (58.1)	77.3 (35.8)	180 (47.4)	0.0062
Khangai	1302 (81.5)	668 (80.3)	768 (87.6)	1025 (83.1)	0.0142	173 (52.7)	122 (44.2)	228 (45.7)	0.0468
Central	1026 (77.0)	463 (76.4)	570 (77.2)	863 (81.4)	0.0217	123 (55.2)	92 (37.5)	185 (43.5)	0.0061
Eastern	455 (79.1)	284 (75.7)	236 (80.8)	358 (79.1)	0.7182	52 (36.5)	32 (32.3)	75 (41.4)	0.4089
Ulaanbaatar	1167 (78.2)	740 (69.8)	1166 (81.2)	1969 (82.0)	<.0001	149 (40.8)	197 (42.5)	437 (51.2)	0.0005
Area of Residence									
Urban	2093 (78.0)	1345 (72.5)	1863 (81.0)	2985 (80.8)	<.0001	294 (44.5)	314 (41.6)	693 (50.8)	0.0046
Rural	2932 (83.8)	1414 (83.6)	1431 (86.3)	2055 (87.1)	0.0001	349 (53.7)	206 (37.8)	412 (42.3)	<.0001
Household owns Livestock									
Yes	2887 (85.2)	1330 (84.7)	1479 (88.8)	2260 (88.8)	<.0001	336 (55.1)	220 (39.8)	476 (46.4)	0.0007
No	2135 (76.4)	1429 (72.3)	1815 (79.2)	2780 (79.2)	<.0001	306 (43.8)	301 (40.2)	629 (47.9)	0.0647
Overall Trend	5025 (81.3)	2759 (77.8)	3293 (83.3)	5040 (83.3)	<.0001	643 (49.1)	521 (40.0)	1105 (47.3)	0.3299 ^c

^a Data on father engagement only available from MICS 2005, 2010, and 2013 datasets on children aged 3 and 4. Activities include whether the father read books, told stories, named, counted, or drew things, sang songs, took outside, or played with the child in the three days prior to the survey.

^b Two-sided p-values obtained from Cochran-Armitage test for trend at a 5% level of significance

^c See Table 3 for results from the Logistic Regression Model

Table 3.3 Parameter estimates from a multivariate logistic regression model used to test for a relationship between survey period and father presence and engagement while controlling for demographic variables

Parameter	Father Presence			Father Engagement ^a		
	β	SE	p-value	β	SE	p-value
Survey Year						
2000	Ref.	-	-	-	-	-
2005	-0.1081	0.0530	0.0413	Ref.	-	-
2010	0.2516	0.0551	<.0001	-0.3908	0.0802	<.0001
2013	0.2459	0.0491	<.0001	-0.1142	0.0703	0.1044
Region	-0.0996	0.0160	<.0001	-0.0641	0.0239	0.0074
Urban/Rural Residence	0.0851	0.0591	0.1501	-0.0684	0.0886	0.4400
Sex	0.0060	0.0368	0.8697	-0.0741	0.0578	0.2000
Mother/Caretaker's Education	0.1336	0.0156	<.0001	0.1299	0.0246	<.0001
Wealth Quintile^b	0.0468	0.0198	0.0178	0.1112	0.0309	0.0003
Household owns Livestock	-0.6683	0.0539	<.0001	-0.3295	0.0799	<.0001

^a Data on father engagement only available from MICS 2005, 2010, and 2013 datasets on children aged 3 and 4. Activities include whether the father read books, told stories, named, counted, or drew things, sang songs, took outside, or played with the child in the three days prior to the survey.

^b Obtained from principal components analysis using information on household assets, dwelling characteristics, water facilities, and urban/rural residence (29).

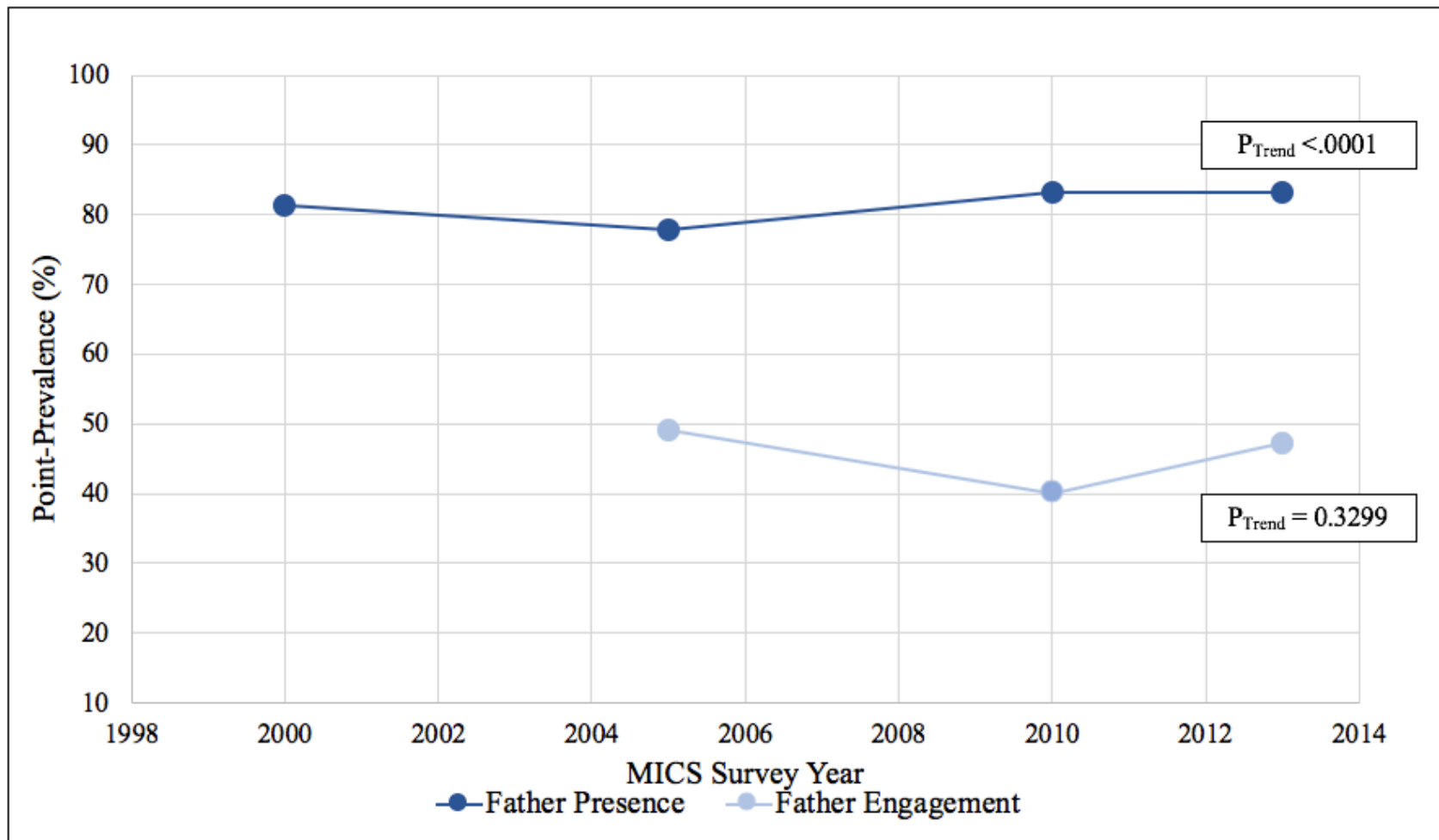


Figure 3.1 Trends in the point-prevalence of Father Presence in children under 5 and Father Engagement in children aged 3-4 in Mongolia between 2000 and 2013

Father presence indicates whether the father was living in the same household as the child at the time of the survey. Father engagement indicates whether the father engaged with their child in at least 1 activity in the three days prior to the survey.

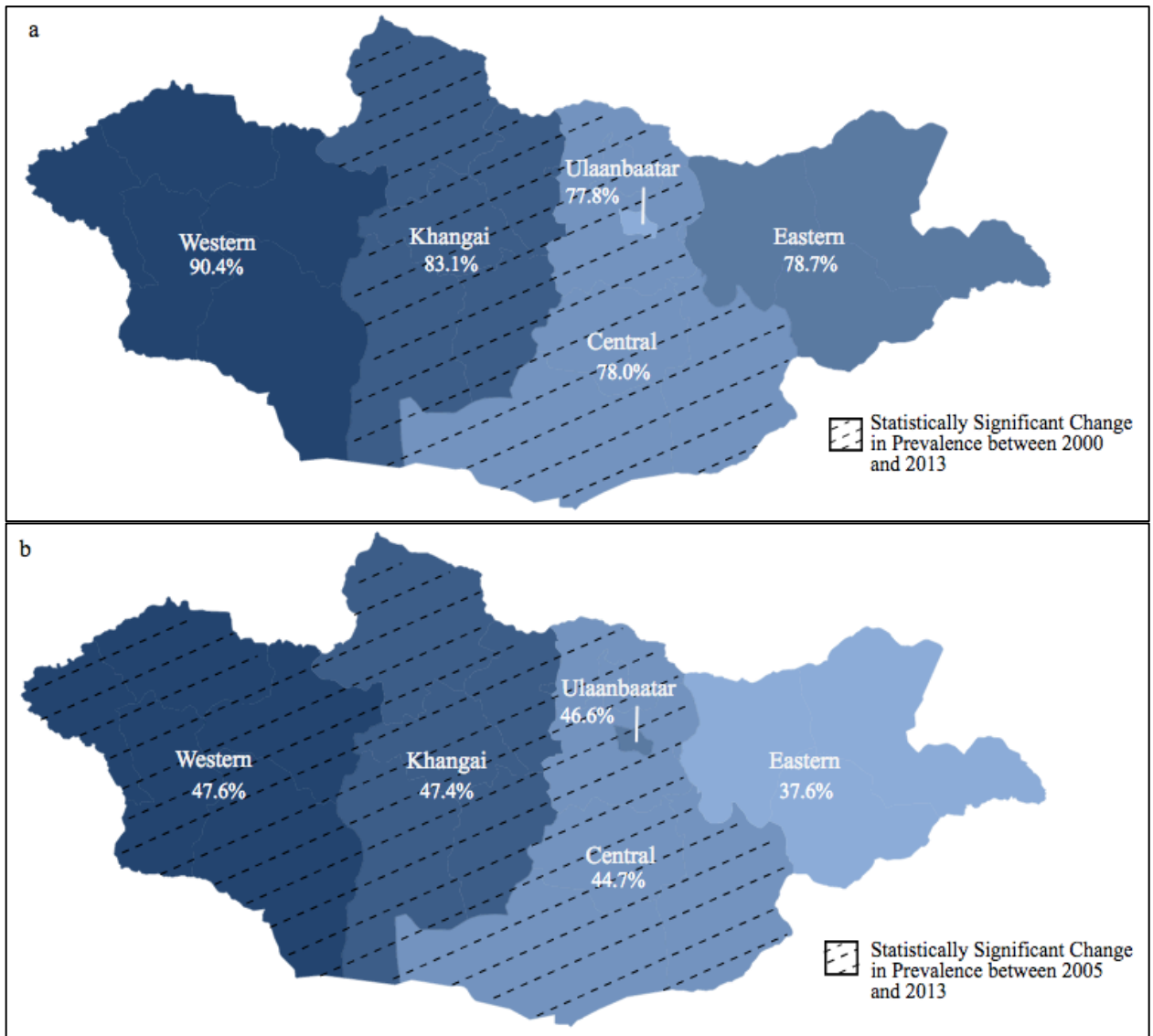


Figure 3.2 Significant changes in the point-prevalence of Father Presence (a) and Father Engagement (b) across all survey periods by region. Percentages represent the average point-prevalence of father presence and engagement across all survey periods (2000 – 2013) in Mongolia.

Chapter 4

Father Presence, Father Engagement, and Child Outcomes in Mongolia

Abstract

Over the last few decades, Mongolia has experienced the effects of dramatic macro-environmental changes. These changes are influencing all aspects of Mongolian society including family life. Macro-environmental changes in other parts of the world have been shown to impact gender roles and parenting. This cross-sectional study uses data for children aged 3-4 from UNICEF's 2013 Multiple Indicator Cluster Surveys to examine the association between father presence and engagement with children and child health and educational outcomes. Multivariate regression modeling with robust error estimation was employed to identify associations between father presence, father engagement, and child outcomes (fever, respiratory illness, diarrhea and preschool attendance). In unadjusted analyses, father engagement was associated with higher odds of pre-school attendance (OR=1.12; 95% CI 1.04-1.20) but not with child illness (OR=1.04; 95% CI 0.95-1.14). Father engagement was no longer associated with pre-school attendance after controlling for potentially confounding variables ($OR_{adj} = 0.95$; 95% CI 0.88-1.03). Unadjusted and adjusted analyses showed that father presence was not associated with acute illness or preschool attendance. Results also suggest that a larger proportion of children were engaged in activities by their mother than the father or other adults and that parents engage in socio-emotional rather than cognitive activities. Data from 2013 indicate that father presence and engagement were not associated with child illness or pre-school attendance. Factors such as maternal education, household wealth, and region of residence are stronger predictors of preschool attendance and should continue to be considered for promoting child health and development in Mongolia.

Introduction

Mongolia is currently experiencing the effects of climate change and a dramatic socioeconomic and political transition that has impacted many households, particularly those of nomadic pastoralist families (1–4). During the 1900s, Mongolia was governed by a socialist government which provided access to important social services such as healthcare and education for all Mongolians (1,5). Nomadic pastoralists benefited from additional services supporting their livelihoods including veterinary services and protection for livestock, water provision, and transportation for herding activities (1,2). However, in the late 1900s, a decline in Russian involvement as well as the political and socioeconomic transition from a communist society and centralized economy led to the dismantling of many state-provided supports (1,2,4–6). This was of greater concern for herder families since the change in government support coupled with increased severity of winter conditions have increasingly threatened livelihoods (1,3). Since roles in households were explicitly gendered, climate change and these political and economic transitions brought shifts in gender roles where some households saw women become increasingly involved in the outside workforce or being involved in more animal husbandry tasks (5,7–9). In other cases, men have lost their traditional livelihoods or employment, making them less of a prominent head and primary provider for the household (5,8,9). These dramatic shifts in the masculine role may potentially have effects on family dynamics and relations in the household. For instance, some men or fathers who lose their identity and familial role may feel helpless or may even create an unstable family environment through alcoholism or domestic violence (10–12). However, in other households, men who are unemployed may see this as an opportunity to spend more time with their children (13). The changing roles of men and fathers have been explored in other contexts (14–16), however, little is known about the parenting impacts of the changes in the Mongolian father’s role. Representatives from UNICEF Mongolia have voiced concerns regarding changing gender roles and tasks and their relation to child-related

outcomes in Mongolia (Personal communication, Ulziisaikhan Sereeter, ECD Specialist at UNICEF Mongolia, February 2017).

The early years of life are a crucial time for children in terms of their physical, socio-emotional, and cognitive development (17). These areas of development are known to be strongly influenced by the factors of social and physical environments (17,18). Understanding the role of the father and his influence in these areas will help contribute towards knowledge regarding factors associated with child health and well-being in Mongolia. It may also be beneficial to understand how fathers play a role in issues highlighted in the United Nation's Sustainable Development Goals (SDGs) such as those that highlight the need to focus on communicable diseases and access to education by 2030 (19). Key targets include 3.3 "end[ing] the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable disease" (19) and target 4.2 "ensur[ing] that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education" (19). An area of particular interest is early childhood education. 'School readiness' is an important aspect of child development since attending an organized institution such as preschool helps equip children with the cognitive and socio-emotional skills that are necessary to be successful in school (20). Moreover, preschool can help facilitate the transition from a home-environment to a school environment for both the children and their parents or caregivers (20). Benefits have been demonstrated in studies conducted globally where children who attend a school readiness program show improved cognitive outcomes such as language (e.g. speaking or writing), problem-solving, and learning skills, are more prepared for primary school, and are more likely to complete high school (21–25). In Mongolia, data suggests that preschool attendance was approximately 68% in 2013 (26).

Many studies involving the father have examined the father's role and its effect on cognitive, academic, and socio-development outcomes in children (27–33). For instance, high paternal stimulation and involvement is associated with improved language and literacy skills in

children (29,32). Supportive behaviours from the father has also been shown to be positively associated with their child's emotional development (30). In contrast, low levels of father engagement has been shown to be associated with higher aggressive and externalizing behaviour problems in children (34). Many other studies from developing and post-transition countries revolve around parental caregiving or engagement as well as its association with cognitive and socio-emotional outcomes in children (18,29,32,35–37) while others generally focus on early childhood education attendance without considering parental engagement as a determining factor (38,39). In terms of the association between father involvement and preschool attendance, a study involving Caribbean countries found that preschool attendance was positively associated with father's social engagement in the Dominican Republic and with father's cognitive and social engagement in Suriname (40). In post-transition settings, preschool attendance as well as the hourly length in which children attended preschool was positively associated with higher parenting quality index (i.e. the number of activities that the parents engaged in with the child) in countries such as Kyrgyzstan, Tajikistan, and Uzbekistan (41,42).

As for acute illness, research on the relationship between father involvement and risk of illness would also be beneficial since the leading causes of morbidity in Mongolian children aged 1-4 years in 2014 were diseases affecting the respiratory and digestive systems where prevalence rates were approximately 57% and 9%, respectively (43). Many studies focus on father presence as a determinant of acute illness and suggest that children who do not live with both their biological parents have greater odds of poor health, diarrhea, and asthma (28,44–46). However, studies on acute illness and physical health involve children from Western populations and mainly focus on father presence in the household (44,45,47–50).

There are no studies to date that explore the direct relationship between the father's role and outcomes such as school readiness and acute illness in children within the Mongolian context. The main objective of this study is to explore the father's role and its association with preschool attendance and acute illness in Mongolian children aged 3-4 years.

Methods

This study protocol was approved by the Queen's University Health Sciences & Affiliated Teaching Hospitals Research Ethics Board.

Data Source

This cross-sectional study uses health indicator data collected through the 2013 Mongolian Multiple Indicator Cluster Surveys (MICS) designed by UNICEF and conducted in collaboration with the National Statistical Office of Mongolia (NSO) (26). These surveys are used to collect health indicator data at 3-5 year intervals for women and children in developing nations to support efforts to monitor country- and region-specific progress towards goals in maternal and child health, such as those outlined in the Millennium Development Goals and SDGs (19,26). Self-reported data on various health indicators were collected through structured interviews at the household and individual level. Data was collected through the household, women's, and child's questionnaires. All questionnaires in each household are linked through cluster and household identification codes.

Study Sample

A multi-stage, stratified cluster sampling method was used to ensure that data was collected from a nationally representative sample of the Mongolian population (26). The mothers or caregivers of 2374 male and female children aged 3-4 completed the 'Children Under Five Questionnaire'. Children were excluded from the study if their fathers were deceased or their status was listed as 'don't know'. Children were also excluded if their fathers were their primary caretakers; these cases were excluded since the father's education may be reported as 'Father's Education' as well as 'Mother's or Caretaker's Education'. In addition, in households with more than one child aged 3 or 4, the oldest child was selected while the remaining children were excluded from analysis. For analyses on father presence, the resulting unweighted sample size for children aged 3-4 was 2220. Analyses on father engagement only included children whose fathers lived in the household and excluded those with missing data on father's education, resulting in an

unweighted sample size of 1896. Response rates for the 'Household Questionnaire' and the 'Children Under Five Questionnaire' in 2013 were greater than 90% (26).

Measures

The father's role was the primary exposure and was measured using two indicators: father presence in the home and level of father engagement. Information on father presence was available for all children under age 5 and was obtained through the 'Household Listing Questionnaire'. Heads of the household or their designate were asked whether the child's biological father was alive, and if so, whether he lived in the household at the time of the survey. Information on level of father engagement was available for all children aged 3-4 years and was obtained through the 'Children Under Five Questionnaire'. Mothers or caretakers of the child were asked whether any adult(s) aged 15 and over engaged in any of the six listed activities in the three days prior to the survey and to indicate whether the adult was the child's father. Activities include whether the father 'read books or looked at picture books', 'told stories', 'sang songs', 'took the child outside the home', 'played with', or 'named, counted, or drew things' to or with their child. These activities are indicators of cognitive and socio-emotional caregiving provided to the child by their parents (35). Similar to previous studies (29,37), the level of father engagement was determined by summing the number of activities through which the father engaged with their child, ranging from 0-6. Indicators of father engagement were used under the assumptions that each item was equally weighted with respect to their contribution to a child's cognitive and socio-emotional well-being and that father-child interactions were generally positive. Indicators of cognitive and socio-emotional engagement have been tested in a previous study by Bornstein and Putnick where the cognitive measures had a Kuder-Richardson 20 reliability score of .68 while the socio-emotional measures had a score of .64 (35). Similarly, Jeong and colleagues showed that the same measures of father engagement had good internal consistency ($\alpha=0.77$) in a study involving several LMICs (29).

Child outcomes were measured using two indicators from the Children Under Five Questionnaire: acute illness and preschool attendance. Acute illness was dichotomized into the child being ill or not ill in the two weeks prior to the survey. Mothers or caretakers were asked whether the child had diarrhea, was ill with a fever, or showed symptoms of an acute respiratory infection in the two weeks prior to the survey. A child was classified as being ill if they were reported to show any symptoms of acute illness. As for school readiness, preschool attendance was used as an indicator where respondents were asked whether the child ‘attends any organized learning or early childhood education programme’. Variables with “DK” (Don’t know) responses were recoded into “No” responses.

Other potentially confounding variables and key covariates were identified and adjusted for in the analyses based on previous studies. These include child’s age, maternal education level, paternal education level, household wealth quintile, region (Fig. 4.1) and type (urban or rural) of residence, number of children’s books in the household, and number of adults living in the household (29,35,37). Household wealth quintiles were provided in the dataset and were based on scores calculated through principal components analysis using information on household assets, dwelling characteristics, water facilities, and urban/rural residence (26). Analyses also adjusted for the early childhood development index (ECDI) score (from 0-11) and is based on the number of positive responses by the mother or caretaker to questions regarding literacy-numeracy, socio-emotional, and learning skills that have been previously validated and used in other studies (29,32,51). Questions include whether the child can recognize simple shapes, count, or get along well with others (26,32).

Data Analysis

All analyses were performed using SAS Studio University Edition v.9.4 (SAS Institute Inc., Cary, NC, USA). Unadjusted and adjusted multivariate logistic regression modelling was used to identify associations between father presence, level of father engagement, and child outcomes while accounting for potential confounding and the effects of other covariates. The

PROC LOGISTIC procedure from SAS v.9.4 was used to obtain final models through the backwards selection procedure. Variables were chosen according to a liberal cut-off value of $p < 0.15$. In order to account for the multilevel clustered nature of the data, error estimates were adjusted using the PROC SURVEYLOGISTIC procedure in SAS v.9.4. Cochran's Q test and paired t-tests were also performed to compare the involvement of adults in the household by type of activity with the child and to compare cognitive and socio-emotional engagement for each adult. Cases with missing values in any of the exposure, outcome, or covariate variables were excluded from analyses and accounted for 0.16% of all children aged 3 or 4 with complete questionnaires.

All analyses were performed using individual sample weights. The normalized weights were provided for all children under 5 to adjust for regional differences in sampling probabilities as well as for questionnaire non-response (26). Weights varied for each cluster and ranged from 0.134 to 3.1.

Results

Acute Illness

Table 4.2 shows results from unadjusted logistic regression models for father presence and acute illness as well as for level of father engagement and acute illness. Compared to children whose fathers did not live in the household at the time of the survey, children who lived with their fathers had a slightly higher odds of having an acute illness (OR_{unadj} 1.06; 95% CI 0.72, 1.56), however, this was not statistically significant. Similarly for father engagement, an increase in the level of engagement indicated slightly higher odds of acute illness in children (OR_{unadj} 1.04; 95% CI 0.95, 1.14) compared to children without engaged fathers, however, this too was not statistically significant. This suggests no statistically significant association between father presence or level of father engagement and acute illness in children in 2013.

Preschool Attendance

Table 4.2 shows results from unadjusted and adjusted logistic regression models involving father presence, level of father engagement, and preschool attendance in children aged 3-4. For father presence, bivariate analysis suggests no association between fathers living in the household and the odds of preschool attendance in children (OR_{unadj} 0.79; 95% CI 0.60, 1.04). This was similarly shown in analyses that adjusted for potentially confounding variables and key covariates (OR_{adj} 0.91; 95% CI 0.66, 1.26). As for level of father engagement, bivariate analyses suggests that higher levels of father engagement are associated with higher odds of preschool attendance (OR_{unadj} 1.12; 95% CI 1.04, 1.20), however, this association was no longer significant after adjusting for potentially confounding variables and covariates (OR_{adj} 0.95; 95% CI 0.88, 1.03).

Factors Associated with Preschool Attendance

Table 4.3 shows the variables included in the final regression models for measuring the association between father presence (M1) and engagement (M2) with preschool attendance. Notable variables from both models that are associated with preschool attendance include child's age, number of adults living in the household, mother's education level, household wealth quintile, and region of residence. Children aged 4 have higher odds of attending preschool compared to children aged 3 (OR_{M1} 1.93, 95% CI 1.55, 2.40; OR_{M2} 1.54, 95% CI 1.21, 1.97). The number of adults in the household also had an effect where a higher number of adults meant lower odds of preschool attendance (OR_{M1} 0.83, 95% CI 0.72, 0.94; OR_{M2} 0.78, 95% CI 0.67, 0.92). As for mother's education level, lower educational attainment was associated with lower odds of preschool attendance in their children. For instance, children whose mothers had a primary education level had lower odds of attending preschool compared to children whose mothers had a college or university education (OR_{M1} 0.36, 95% CI 0.23, 0.56; OR_{M2} 0.44, 95% CI 0.26, 0.74). Similarly, household wealth quintile was also associated with preschool attendance. Children living in the richest quintile had 13.5 times the odds of preschool attendance

in Model 1 and 11.4 times the odds of preschool attendance in Model 2 when compared to the odds of children from the poorest quintile (M1 95% CI 7.94, 22.82; M2 95% CI 6.24, 20.97). Preschool attendance also varied by region of residence. For example, children living in the Eastern region had 3.7 times the odds of preschool attendance in Model 1 and 5.8 times the odds of preschool attendance in Model 2 compared to the odds of children living in Ulaanbaatar (M1 95% CI 2.24, 6.22; M2 95% CI 3.28, 10.30).

In addition to these factors, Model 2 also adjusts for early childhood development index (ECDI) score and paternal education attainment. A higher development score was associated with higher odds of preschool attendance (OR 1.32, 95% CI 1.22, 1.42). Similar to maternal education attainment, children whose fathers had lower paternal education level, such as primary education, had lower odds of preschool attendance compared to children whose fathers had a college or university education (OR 0.53, 95% CI 0.31, 0.89).

Father Engagement by Type of Activity

Figure 4.2 displays the types of activities that the mother, father, and other adult over age 15 in the household engaged in with children aged 3-4 years. It can be seen that a higher proportion of children were reported to be engaged in activities by their mothers compared to fathers and other adults in the household. For each activity, results from Cochran's Q tests suggest that proportions of children aged 3-4 who were engaged in activities with adults in the household differed by the adult who engaged with them ($p < .0001$). A higher proportion of children were engaged in activities with their mothers compared to other household adults with values ranging from 29-48% for mothers, 14-35% for fathers, and from 12-25% for other household adults. Additional analyses were performed to compare the mean number of cognitive activities and mean number of socio-emotional activities engaged in by each parent. Paired t-tests suggest that both fathers and mothers had higher reports of engaging their children in socio-emotional activities compared to cognitive activities. The mean number of cognitive and socio-

emotional activities for fathers were 0.53 and 0.80 ($p < .0001$) while that of mothers were 1.10 and 1.28 ($p < .0001$), respectively.

Discussion

Using data from 2013, this study shows that father presence and father engagement with their children are not directly associated with acute illness and preschool attendance. Unadjusted results suggest an association between father engagement and preschool attendance, however, adjusted results indicate that other demographic factors are more associated with preschool attendance. Parents and adults in the household vary in terms of the amount and type of engagement with children. Mothers also had higher reports of engagement in activities with children compared to fathers and other adults in the household, while both fathers and mothers were reported to engage with children through socio-emotional activities more than cognitive activities.

Acute Illness

From this data, there does not seem to be an association between father presence, engagement, and acute illness in children. There are several complex factors that are known to contribute to the risk of diarrhea and respiratory illness in children. For instance, known risk factors for diarrhea include having an unprotected water source, regular contact with contaminated feces or domesticated animals, exposure to butchering of animals, unsanitary food handling, and poor handwashing practices, and is a concern particularly for those living in nomadic pastoralist households (52,53). While these may increase the risk of diarrhea in children, this may be attenuated by improved adult supervision. Increased supervision of the child through close proximity and keeping them in clear sight has been shown to reduce the risk of unintended injury in children (54). A similar mechanism can be applied for protecting against acute illness where engaging and interacting with children allows adults like the father to monitor what the child is touching or eating. Having an extra parent or adult in the household to supervise children can be very beneficial (55). Parents who are aware that children came into contact with animals

or dirt while engaged in activities such as playing or going outside the home may remind their child to wash their hands before eating or after defecation or they may monitor their contact with animals (such as dogs) or feces. However, this may not be completely effective if their primary water source is contaminated or if the children are fed uncooked or contaminated animal products (53). Parental supervision can similarly be applied for protecting against acute respiratory illnesses where improved supervision can help reduce the child's risk of illness. However, Ulaanbaatar is currently facing a major outdoor air pollution problem and is home to most cases of acute respiratory illness in Mongolian children (26,56). While parents may help reduce their child's risk of illness by ensuring they wear good quality face masks or wash their hands, children will continue to be at risk for diseases as long as the air pollution issue persists in Mongolia (56–59).

Preschool Attendance

Other factors seem to be more strongly associated with preschool attendance in children than father presence and engagement. For instance, similar to the results found in other studies conducted in both western and post-transition settings, children who are older are more likely to attend preschool compared to younger children (38,60,61). Living in households with several adults is associated with lower odds of preschool attendance and may be due to the availability of adult caregivers, such as grandparents, to care for the children (38,61). As expected, additional factors such as parent's education level, household wealth quintile, region, and type of residence were found to be determinants of preschool attendance in Mongolia.

Parental education level is known to be an important contributor to child development where parents with a high level of education may be more likely to see the benefits of preschool for their children as well as provide them with positive and stimulating environments (29,32,61,62). Therefore, results showing that higher levels of maternal education are associated with higher odds of preschool attendance were expected and consistent with other studies, including one performed in the post-transition countries of Georgia and Kazakhstan (38,61). In

addition, while parental education in general was shown to be positively associated with preschool attendance, this study showed that maternal education had a stronger relation to preschool attendance compared to paternal education. This was expected since maternal education is generally more strongly associated with level of early child development and parental support for learning compared to paternal education in low- and middle-income countries (32).

Household wealth quintile is also seen to play a role in preschool attendance. Preschools in Mongolia are provided without cost to families, however, parents are expected to pay out of pocket for higher quality daily meals as well as school supplies (63). These charges were found to be inequitable where low-income households were expected to pay the same fees as high-income households (63). With this current system in place, it may explain why children living in wealthier households have greater odds of attending preschool compared to those in more disadvantaged households.

Important regional differences were also found in this study, particularly when comparing attendance in Ulaanbaatar, the nation's capital city, with that in other regions. The finding that children living outside of Ulaanbaatar have higher odds of attendance compared to those living in the city was unexpected since the capital city is presumed to have improved access to education, and therefore, should translate into a higher attendance rate compared to other regions. One likely explanation for this is the fact that during the transition period, many Mongolians, including former herders, internally migrated from rural to urban areas such as Ulaanbaatar in search of employment as well as better access to health and education services (4,64,65). Today, close to half of the total Mongolian population lives in Ulaanbaatar and are thereby putting a strain on the education system in the city (63,65). A report by the World Bank explains that kindergartens in Ulaanbaatar are filled to capacity with many preschool-aged children finding themselves on long waitlists (63). This lack of access to preschool may explain why living outside of Ulaanbaatar is associated with increased enrollment in preschool (Personal communication, Dr. Enkh-Oyun

Tsogzolbaatar, Department of Epidemiology and Biostatistics, Mongolian National University of Medical Sciences, June 2019).

Types of Caregiving Activities

Results show that a larger proportion of children were engaged in the six activities with their mother compared to their father or other adults living in the household. This was expected since mothers are usually the primary caregivers of children, and in Mongolia, households typically have gendered roles where mothers are responsible for child care (8). These results are consistent with another study where mothers from LMICs in Central and Eastern Europe, South Asia, East-Asia and the Pacific, sub-Saharan Africa, the Middle East, and the Caribbean were generally reported to engage with children in activities more than the fathers (37). This may be due to fathers being less likely to engage in activities such as reading if the mother is already interacting with the child. In addition, the authors found that in households where mothers completed a high level of education, fathers were less likely to engage with children (37). One possible explanation is that more educated mothers have greater skills in childhood development type activities (62). The mothers may also have high parenting expectations and could subsequently moderate the activities between children and their fathers through a process known as ‘maternal gatekeeping’, especially when mothers deem fathers incapable of caring for children (66,67).

Study results also showed that both fathers and mothers had higher reports of engaging children through socio-emotional activities. Fathers were generally reported to engage with children by playing with them or taking them outside. This was expected since fathers have been shown to be more involved in playful rather than caretaking interactions with their child (68). Mongolian mothers having higher reports of engaging in socio-emotional compared to cognitive activities was consistent with other developing countries such as Vietnam, Yemen, and Ghana (35).

The Father's Role in Child Well-Being

While this study showed that there was no association between father presence and engagement with acute illness and preschool attendance in Mongolian children after adjusting for demographic factors, previous studies have shown that positive involvement from fathers is an important determinant in other child well-being and development outcomes. Positive father involvement has been shown to be positively associated with outcomes such as language skills, literacy skills, and emotional development in children (29,30,32). Therefore, it is important to note that the lack of a statistical association between father involvement and child outcomes (specifically acute illness and preschool attendance) should not be interpreted as evidence that fathers are not an important determinant of child health and well-being.

Limitations

This study involves the secondary analysis of survey data and there are important limitations that should be highlighted. The cross-sectional nature of this study means that only associations rather than causal inferences can be drawn. Since surveys provide a snapshot of certain indicators around the time of the survey, it may not necessarily reflect what is true for a child or household throughout the year. For example, father presence reflects whether the father lived with the child at the time of the survey only.

The use of caregiver-reported data as well as questionnaire design may introduce information bias into this study as well. Response bias may also arise from respondents of the children under five questionnaire who in most cases were the mother of the child. It is possible that mothers may underestimate or provide inaccurate accounts of whether the father engaged with the child, particularly if there is parental conflict (69). An additional source of misclassification is the use of six activities as a measure of father engagement. While these activities are indicative of father engagement, they fail to capture other forms of engagement such as feeding or bathing the child. Quality of the father-child interaction may also be a more important predictor for child outcomes and this was not effectively captured. In this study, six

activities were used to measure engagement under the assumption that father-child interactions were positive in nature. Furthermore, the question on engagement was asked for the three days prior to the survey. Fathers who typically engage with their children but did not interact with their children within those three days may be misclassified as not engaging with their child. Another potential source of misclassification of the exposure may arise from the question on engagement with children where “father engagement” is only specified for biological fathers and does not capture engagement from non-biological fathers or father-figures. In addition, while the surveys help provide some insight regarding family structures that involve the child’s biological parents (such as single-parent households), there is limited information on the specific relationship between the child and other adults in the household. For instance, it is unclear whether a child living with one biological parent is also living with a step-parent. Therefore, it is important to acknowledge that this study did not address or account for other types of family structures such as single-parent families or those in which children were living with step-parents. This an area that requires further investigation since previous studies have shown that family structures are associated with child outcomes (44,70).

There are also potential sources of misclassifications for the outcome variables used in this study. For example, it may arise from the questions regarding signs of acute illness where the child may be misclassified as having no acute illness if their mother or primary caretaker failed to recognize any symptoms. An additional source of misclassification may also rise from cases were responses to the preschool attendance or acute illness questions were “DK” (Don’t know). These cases were coded as ‘not attending preschool’ or having ‘no acute illness’ during the periods in question and there may be a chance that children who are actually attending preschool and/or who are ill are misclassified with the wrong outcome status. However, since there were only few instances of “DK” responses, this should not affect the overall effect measure.

It is also important to note that this study uses data from the MICS 2013 survey period which was the most recent dataset available at the time of the study.

Conclusion

Based on data from 2013, father presence and father engagement did not seem to be associated with preschool attendance or acute illness in preschool aged children. Instead, other factors such as maternal education, household wealth quintile, and region of residence seem to be stronger predictors of school readiness. Therefore, these factors should continue to be considered when looking to improve the health and well-being of Mongolian children. In addition, the effects of the father on other outcomes such as cognitive and socio-emotional development should continue to be monitored. Since parents were reported to generally engage children in socio-emotional rather than cognitive activities, the development and use of cognitive activities for parental use may be a future area of focus. Further studies may look at the quality of father-child relationships in households and how this may affect child health and development. Use of more comprehensive tools for measuring quality of father engagement and child development outcomes may provide more insight into the role of the father as a social determinant of child health.

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Figure 4.1 Regional Map of Mongolia

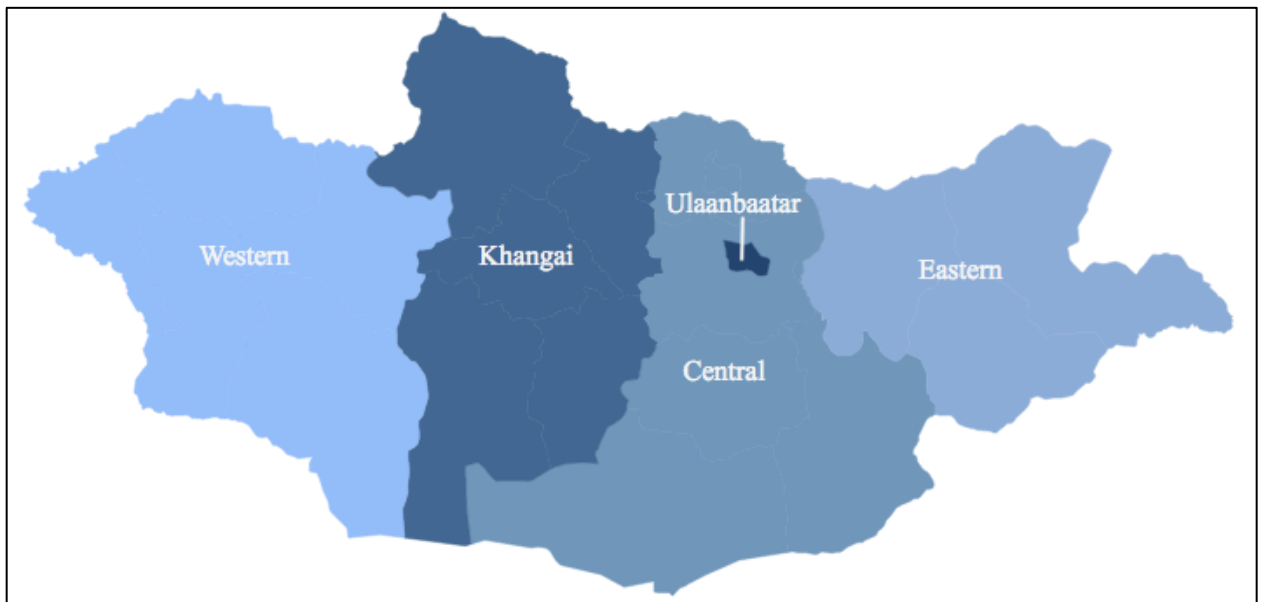


Table 4.1 Characteristics of the study population by primary exposure and outcome (unweighted)

Sample Characteristics	Father Presence		Father Engagement ^a		Acute Illness ^c		Preschool Attendance ^c	
	n	Mean (SD)/%	n	Mean (SD)/%	Yes (%)	No (%)	Yes (%)	No (%)
Total Sample	2220		1896		12.2	87.8	68.6	31.4
Child's Age (yrs)								
3	1090	49.1	937	49.4	58.4	48.2	45.8	57.4
4	1130	50.9	959	50.6	41.6	51.8	54.2	42.6
Child's Sex								
Male	1108	49.9	936	49.4	54.6	48.6	49.2	49.7
Female	1112	50.1	960	50.6	45.4	51.4	50.8	50.3
Early Childhood Development Score	-	-		6.7 (1.7)	-	-	-	-
Number of Children's Books in Household	-	-		3.8 (3.7)	-	-	-	-
Number of Adults aged 18+ in Household		2.3 (0.8)		2.3 (0.7)	-	-	-	-
Number of Children aged 0-4 in Household		1.4 (0.5)		1.4 (0.6)	-	-	-	-
Maternal Education								
None	136	6.1	116	6.1	6.5	6.1	3.8	11.1
Primary	167	7.5	151	8.0	6.9	8.1	4.4	15.8
Lower Secondary	376	16.9	327	17.2	13.4	17.8	13.6	25.2
Upper Secondary	533	24.0	466	24.6	26.4	24.3	23.8	26.2
Vocational	183	8.2	141	7.4	9.1	7.2	7.7	6.9
College/University	825	37.2	695	36.7	37.7	36.5	46.6	14.9
Paternal Education^b								
None	-	-	231	12.2	12.6	12.1	7.8	21.6
Primary	-	-	243	12.8	13.8	12.7	8.9	21.3
Lower Secondary	-	-	410	21.6	16.9	22.3	20.4	24.3
Upper Secondary	-	-	379	20.0	21.2	19.8	21.6	16.4
Vocational	-	-	186	9.8	12.1	9.5	10.8	7.7
College/University	-	-	447	23.6	23.4	23.6	30.5	8.6
Wealth Index								
Poorest	538	24.2	493	26.0	23.4	26.4	14.2	51.8
Second	471	21.2	380	20.0	23.4	19.6	19.8	20.5
Middle	434	19.6	363	19.2	17.8	19.3	22.6	11.6

Fourth	376	17.0	321	16.9	16.0	17.1	19.8	10.7
Richest	401	18.1	339	17.9	19.5	17.7	23.6	5.4
Region								
Western	366	16.5	339	17.9	16.9	18.0	15.0	24.2
Khangai	483	21.8	421	22.2	27.3	21.5	20.8	25.3
Central	413	18.6	351	18.5	16.9	18.7	19.1	17.3
Eastern	289	13.0	238	12.6	10.0	12.9	14.5	8.2
Ulaanbaatar	669	30.1	547	28.8	29.0	28.8	30.6	25.0
Urbanicity								
Urban	1249	56.3	1017	53.6	54.6	53.5	61.2	37.2
Rural	971	43.7	879	46.4	45.4	46.5	38.8	62.8

^a Only includes children whose fathers were living in the household at the time of the survey.

^b Only available for children whose fathers were living in the household at the time of the survey.

^c Total sample size is 1896. Percentage sums that do not add up to 100 are due to rounding.

Table 4.2 Odds ratio estimates from the unadjusted and adjusted analyses of the association between the father’s role and child outcomes

Exposure	n	Acute Illness			Preschool Attendance					
		Unadjusted			Unadjusted			Adjusted		
		OR	(95% CI)	p-value	OR	(95% CI)	p-value	OR	(95% CI)	p-value
Father Presence										
Yes	1880	1.06	(0.72, 1.56)	0.763	0.79	(0.60, 1.04)	0.095	0.91 ^a	(0.66, 1.26)	0.560
No	310	1.00	-		1.00	-		1.00	-	
Level of Father Engagement	1879	1.04	(0.95, 1.14)	0.392	1.12	(1.04, 1.20)	0.002	0.95 ^b	(0.88, 1.03)	0.242

Results from the final multivariate logistic regression models using survey sample weights and robust error estimates.

^a Adjusts for level of father engagement, child’s age, number of children’s books, number of adults aged 18 and over living in household, maternal education attainment, household wealth quintile, region of residence, and urban/rural residence.

^b Additionally adjusts for early childhood development score and paternal education attainment.

Table 4.3 Odds ratio estimates from the final multivariate regression models to measure the association between father presence and preschool attendance as well as level of father engagement and preschool attendance

Exposure Variables	Preschool Attendance		
	OR	(95% CI)	p-value
Model 1			
Father Presence			
Yes	0.91	(0.66, 1.26)	
No	1.00		
Other Variables			
Father Engagement	0.98	(0.91, 1.06)	
Child's Age (Years)	1.93	(1.55, 2.40)	***
Number of Children's Books in Household	1.09	(1.05, 1.13)	***
Number of Adults in Household	0.83	(0.72, 0.94)	**
Maternal Education Level			
None	0.53	(0.31, 0.91)	*
Primary	0.36	(0.23, 0.56)	***
Lower Secondary	0.51	(0.34, 0.75)	***
Upper Secondary	0.52	(0.38, 0.72)	***
Vocational	0.61	(0.40, 0.93)	*
College/University	1.00		
Wealth Quintile			
Richest	13.46	(7.94, 22.82)	***
Fourth	6.77	(4.24, 10.80)	***
Middle	6.45	(4.24, 9.81)	***
Second	4.14	(2.85, 6.02)	***
Poorest	1.00		
Region			
Western	2.57	(1.62, 4.05)	***
Khangai	2.60	(1.75, 3.85)	***
Central	2.74	(1.77, 4.22)	***
Eastern	3.73	(2.24, 6.22)	***
Ulaanbaatar	1.00		
Urban/Rural Residence			
Rural	0.96	(0.65, 1.40)	
Urban	1.00		
Model 2			
Level of Father Engagement	0.95	(0.88, 1.03)	
Other Variables			
Child's Age (Years)	1.54	(1.21, 1.97)	***
Number of Children's Books in Household	1.04	(0.99, 1.08)	
Number of Adults in Household	0.78	(0.67, 0.92)	**
Early Childhood Development Score ^a	1.32	(1.22, 1.42)	***
Maternal Education Level			
None	0.65	(0.35, 1.22)	
Primary	0.44	(0.26, 0.74)	**
Lower Secondary	0.53	(0.34, 0.83)	**
Upper Secondary	0.51	(0.36, 0.74)	***
Vocational	0.74	(0.44, 1.23)	
College/University	1.00		
Paternal Education Level			

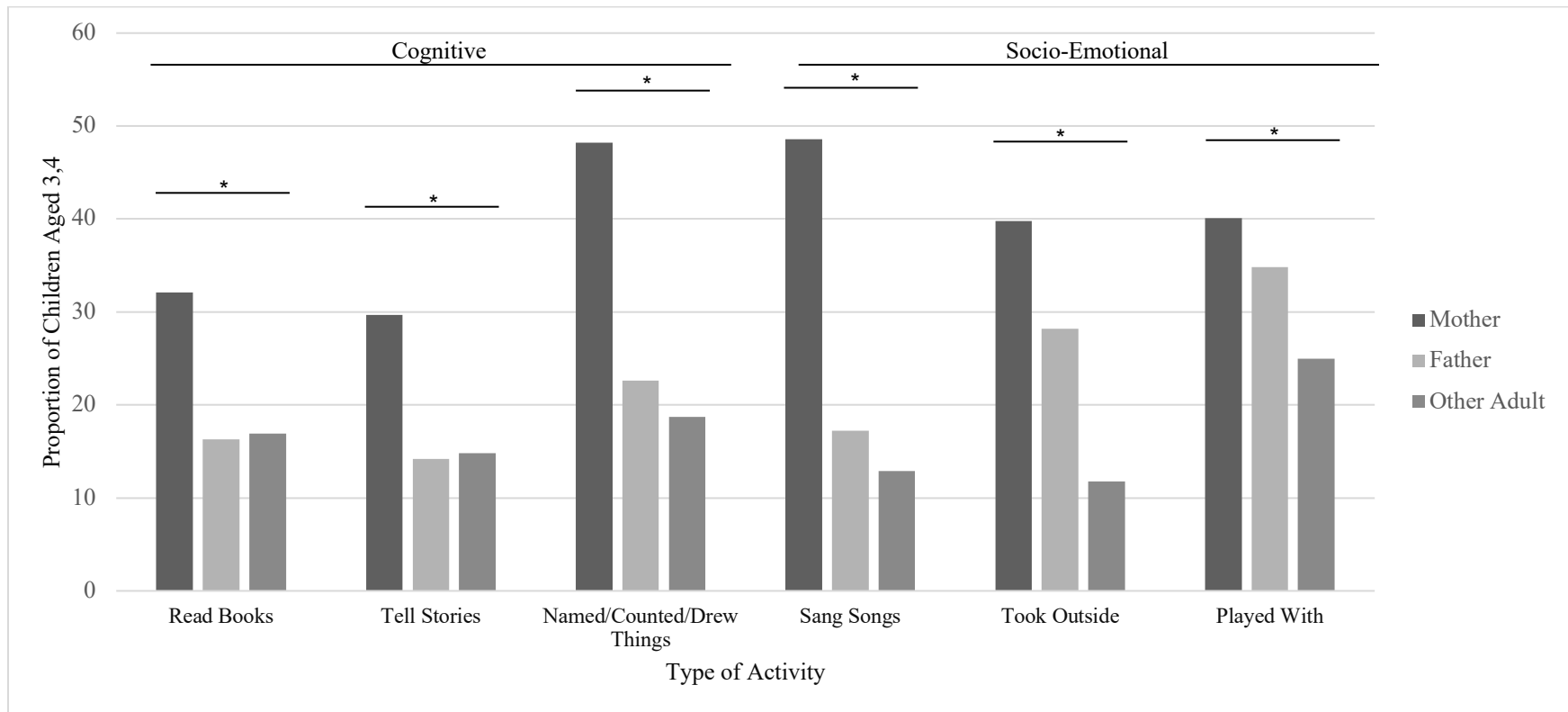
None	0.48	(0.28, 0.84)	**
Primary	0.53	(0.31, 0.89)	*
Lower Secondary	0.73	(0.45, 1.18)	
Upper Secondary	0.59	(0.38, 0.92)	*
Vocational	0.58	(0.34, 0.97)	*
College/University	1.00		
Wealth Quintile			
Richest	11.44	(6.24, 20.97)	***
Fourth	6.18	(3.65, 10.45)	***
Middle	6.96	(4.38, 11.07)	***
Second	4.09	(2.70, 6.18)	***
Poorest	1.00		
Region			
Western	3.05	(1.81, 5.16)	***
Khangai	3.15	(1.99, 4.98)	***
Central	3.00	(1.81, 4.98)	***
Eastern	5.81	(3.28, 10.30)	***
Ulaanbaatar	1.00		
Urban/Rural Residence			
Rural	0.81	(0.52, 1.25)	
Urban	1.00		

p<.05, **p<.01, *p<.001.*

Results obtained from multivariate logistic regression models using sample survey weights and robust error estimates.

^a Early childhood development index was measured as sum of positive responses/outcomes to questions regarding the child's literacy-numeracy, socio-emotional, and learning development. Scores ranged from 0-11. This was similarly performed by Jeong, McCoy, & Fink (32).

Figure 4.2 Proportion of children aged 3-4 who were engaged by a parent/adult in the three days prior to the survey by type of cognitive and socio-emotional activity



'Other adult' refers to any adult aged 15 and over who is not the child's father or mother and is a member of the household.

*p<.0001; obtained from Cochran's Q tests comparing proportions between parents/adults for each type of activities

Chapter 5

General Discussion

5.1 Summary of Findings

The main objectives of this thesis were 1) to explore changes in the father's role by describing national and regional patterns in father presence and father engagement for children across a 13-year period and 2) to identify an association between the father's role and child outcomes including acute illness and preschool attendance in Mongolia.

The first manuscript was a descriptive analysis of the father's role within the context of a dramatic climate, socioeconomic, and political transition in Mongolia. Analyses were performed using point-prevalence estimates of father presence and father engagement from UNICEF's MICS 2000, 2005, 2010, and 2013 data. The national point-prevalence of father presence fluctuated between 78-83% across a 13-year period while at the regional level, fluctuations were only significant for the Khangai, Central, and Ulaanbaatar regions. As for father engagement, point-prevalence fluctuated between 40-49% across an 8-year period, however, this was only significant at the regional level where all regions except the Eastern region experienced fluctuations. Results from multivariate logistic regression also suggest that the father's role was affected by socioeconomic, political, and climate changes present in the nation since the fluctuations in father presence and engagement over time remained significant after adjusting for demographic factors. Furthermore, factors such as region of residence, maternal education attainment, household wealth, and whether the household owns livestock also seem to be associated with the father's role.

The second manuscript explored relationships between the Mongolian father's role and outcomes in their children aged 3-4 using data collected through MICS 2013. Child outcomes that were significantly associated with the father's role at the unadjusted level were then followed up by conducting multivariate logistic regression modelling to control for potentially confounding

variables and other covariates as well as adjust for the multi-level and clustered nature of the data. Unadjusted analyses showed that father presence and engagement were not associated with odds of acute illness in children aged 3-4. While having an additional parent to monitor and supervise a child's activities through direct engagement can be beneficial, this may not provide complete protection against acute illness if children are exposed to other known risk factors such as contaminated food and water, and in the case for children living in Ulaanbaatar, exposure to air pollution (1-4). As for the odds of preschool attendance, unadjusted results suggest that it was associated with father engagement, however, this was no longer significant after controlling for demographic factors. Similar to other studies, various demographic factors were found to be stronger predictors of preschool attendance. Older children had higher odds of attending preschool compared to the odds of younger students. Those living with several adults had lower odds of preschool attendance as compared to the odds of children living with fewer adults. Higher early childhood development scores were also associated greater odds of preschool attendance. In addition, children whose parents completed a higher level of education and live in wealthier households also had greater odds of attending preschool. Preschool attendance also varied by region where children living in Ulaanbaatar have lower odds of attendance compared to other regions. The strong association between these factors and preschool attendance suggest that policy-makers should continue to target these areas in order to improve and maintain preschool attendance in children. Results also showed that a greater proportion of children were engaged in activities with their mothers as compared to fathers or other adults in the household. Furthermore, parents in general were reported to engage in more socio-emotional compared to cognitive activities. This provides insight into the types of activities that children are engaged in with their parents and can help inform future or current programs aiming to improve parental involvement in child development in Mongolia.

The first manuscript suggested that the father's familial role fluctuated between 2000 and 2013, identifying a potential area of concern in the post-transition period in Mongolia. However,

based on data from 2013, the second manuscript seems to show that father presence and father engagement was not associated with acute illness and preschool attendance in children aged 3-4. Therefore, despite the fluctuations in father presence and engagement, this may not be associated with the 2013 prevalence of acute illness or preschool attendance in children. However, previous studies have established that father involvement is an important determinant of child well-being (5–8). Therefore, despite the findings from the second manuscript, the father’s role in child outcomes should continue to be considered as an important factor for child development and health. This is crucial since the absence of an association may potentially mislead readers into thinking that fathers do not contribute towards child health and development. It is possible that within the Mongolian context, father presence and engagement may be associated with other child-related outcomes, thereby warranting further studies and monitoring of the father’s role as a social determinant of child health. In addition, other demographic factors such as maternal education attainment and household SES seem to be strong predictors of child-related outcomes, which means that fluctuations in these areas may affect child outcomes. Policy-makers should therefore continue to target these areas in order to improve the well-being of children.

5.2 Application of Epidemiological Concepts

5.2.1 Internal Validity

Internal validity describes the degree to which the measures of association presented in this study are free from bias or confounding (9). There are several potential sources of error that may threaten internal validity in this study and include various types of information bias, selection bias, publication bias, and confounding.

Information Bias

Information bias refers to error in measuring the exposure and outcome status of an individual, leading to misclassification that can in turn introduce bias into the study (9). In order to reduce this error, survey questionnaires were validated during a pilot phase before actual

survey commencement and were modified based on findings from the pilot (10–13). As for the indicators used in this thesis, the cognitive and socio-emotional measures used in the MICS were tested in a study by Bornstein and Putnick where the cognitive measures (ie. read books, tell stories, or naming, counting or drawing things) had a Kuder-Richardson 20 reliability score of .68 while the socio-emotional measures (sang songs, took outside, or played with) had a score of .64 (14). Similarly, in a study by Jeong and colleagues, measures of father engagement had good internal consistency ($\alpha=0.77$) in a sample from several LMICs (5). These measures have also been tested and validated in other settings such as Bangladesh, Nepal, and Uganda (15,16).

While the measures of father engagement have previously been shown to be fairly reliable, the questions still pose some limitations that may introduce information bias in both manuscripts due to questionnaire design. For example, use of father presence and level of father engagement as indicators of the father's familial role introduces misclassification bias in terms of exposure status. Father presence was used as one of the indicators for the father's role and identifies whether the child's biological father lived in the household. This only captures the father's residential status during the survey and may not necessarily reflect whether the child lived with their father throughout the year. This is particularly true for households where mothers from rural areas temporarily move towards urban areas with their children for better access to schools or for children who are sent to live with relatives or family friends during the school year and return home during seasonal breaks (17,18). The use of six different activities as proxies for father engagement may also introduce misclassification. The question on father engagement was based on the mother or caregiver's reports of whether the father engaged in six activities and was meant to measure support for learning in the household. However, these indicators may not necessarily capture other forms of father engagement such as showing affection towards the child, feeding or bathing them, or disciplining the child (19) which may provide more insight into the quality of the father-child relationship. Therefore, it is likely that children whose fathers did not engage with them through the six listed activities but engaged them in other forms may be

misclassified as having low levels or no father engagement, thereby underestimating the exposure status of the children. Similarly, the questions only measure father engagement in the three days prior to the survey and may also underestimate the exposure if the father regularly engages with the child but did not engage them within those three days. Moreover, the question on father engagement only collects information on the child's biological father, therefore, there is a risk of misclassification if the child was engaged by a step-father or father-figure. In addition to this, the survey questions might not capture culture-specific forms of engagement that may be unique to Mongolian parents, an issue raised in a previous study by Sun and colleagues (20). This may also introduce misclassification where children whose parents only engage with them in unique activities that are not listed in the survey may be misclassified as having no engagement with a parent.

There may also be error in classifying children according to the outcomes. For instance, a child may be misclassified as having no acute illness if the survey respondent failed to recognize any symptoms, thereby underestimating the outcome in the survey population. Similarly, there may be potential misclassification in the reporting of preschool attendance. Since the MICS is implemented during the Fall months (13), it is possible that some respondents may report that the child does not attend preschool even though they are enrolled in classes that are only offered in the Summer. There are also several types of preschools offered in Mongolia due to the logistic challenges of providing preschool services to a sparsely populated population (21). In addition to the traditional 'fixed' preschools, there are alternative forms such as mobile kindergartens or travelling teachers that are more common in remote areas (21). This may also run the risk of introducing misclassification in this study if parents report that children were not enrolled in 'fixed' preschools but were attending an alternative school. Misclassification may also occur in cases with "DK" (Don't know) responses to the preschool attendance or acute illness questions. These were recoded as 'not attending preschool' or having 'no acute illness' during the periods in question and there is a chance that children who are actually attending preschool and/or who are

ill are misclassified with the wrong outcome status. Since there were only few instances of “DK” responses, this should not affect the overall effect measures.

The use of cross-sectional and self-reported survey data also leads to the possibility of *recall or response bias* where respondents may provide inaccurate responses if they are asked to recall details from the past (9). For instance, mothers or caretakers may not recall whether their children showed any signs of sickness in the two weeks prior to the survey or they may not recall whether they or any other adult in the household engaged with the child in specific activities. There is also a potential for *social desirability bias*, a type of information error where respondents provide responses that are socially favorable. For instance, mothers or caretakers may over-report the parental level of engagement, thereby over-estimating the level of engagement with their children. Furthermore, *reporting bias* may also introduce error where mothers who are respondents may under-estimate or inaccurately report the father’s level of engagement in households where the father is absent or if there is conflict between parents (22).

Another potential source of error would be through *interviewer or observer bias* where interviewers may influence responses or record responses in ways that are systematically different (9). Fortunately, risk of this bias has been minimized in the MICS since data are collected through structured questionnaires (13). The interviews themselves are conducted by personnel who were formally trained in interview techniques as well as through field training prior to the data collection phase of the survey (13), further reducing the risk of interviewer bias in this survey.

Since these survey questions were part of a large and comprehensive study and were included in different questionnaires, it is unlikely that responses or under-reported estimates regarding the father’s role and child outcomes are systematically different in any way. However, presence of non-differential misclassification may bias effect estimates towards the null. This is a concern for this thesis since the objective was to explore whether there was an association between the father’s role and child outcomes. It is possible that errors regarding classification of

the exposure and outcome may have contributed to the lack of statistical evidence to support an association within the relationships of interest.

Selection Bias

Selection bias occurs when the study population is characteristically different from those who are not in the study (9). In the MICS, this source of error was minimized through the use of multi-level stratified cluster sampling of households to ensure that the survey population was representative of the general population (10–13). Moreover, response rates for the questionnaires were greater than 90% which further ensures that the data was collected from a representative sample (10–13). Therefore, since potential sources of selection bias have been minimized, it would not significantly affect the internal validity of the studies in this thesis.

Publication Bias

Publication bias is also a potential source of error in this study which pertains to the literature review and rationale for this thesis (9). The papers presented in the literature review regarding the association between father presence and child outcomes consistently showed evidence of the negative impacts of father absence on child health while others showed no association. It is possible that due to publication bias, studies on the benefits of father presence on child health and outcomes may not be published. This may in turn perpetuate the idea that there are many gaps in knowledge regarding the father's role and its association with acute illness and preschool attendance. It is also important to note that a fully systematic review of the literature was not performed, and therefore, it is possible that some relevant studies were not captured for the literature review section of this thesis.

An additional source of error may arise from relevant studies being published in a non-English language. It is possible that the relationships in this study have been explored elsewhere in other contexts but have only been published using local languages or journals. Failing to access and capture these studies in the literature review may also contribute to the idea that there are gaps in knowledge in the roles of fathers in these specific child outcomes. However, since

members from UNICEF-Mongolia proposed the theme of this study, it would be reasonable to assume that there are currently no Mongolian studies to date that investigated this relationship.

Confounding

Confounding bias occurs when an additional factor or variable that is not on the causal pathway alters the effect between the primary exposure and outcome (9). Potential confounders used in this thesis were identified from previous literature and were included as other variables when creating the multivariate regression models. These variables were selected into the final model using backwards elimination criteria with a liberal cut-off value of $p < 0.15$ and whether removal of the variable caused a greater than 10% change in the effect estimate. In the second manuscript, confounders that remained in the final model with father presence as the primary exposure include the child's age, number of children's books in the household, number of adults in the household, maternal education level, household wealth quintile, and region of residence. Urban and rural type of residence was forced into the model since preschool attendance rates seemed to differ between urban and rural populations (13). In addition to these variables, early childhood development index score and paternal education remained in the final model that included father engagement as the primary exposure. In the multivariate model for father presence, father's education level was not included as a potential confounder since information on education was only collected for fathers who resided in the household at the time of the survey.

Other potential covariates initially considered in the multivariate models include level of maternal engagement, level of engagement from another individual in the household aged 15 and over, sex of the child, and number of children under age 5 living in the household, however, these showed no association with preschool education and were therefore removed through the backwards elimination criteria. Father's age was also removed since it was marginally not associated with preschool attendance and did not cause a significant change in the effect estimate of the relationship of interest. Mother or caretaker's marital status was not included in the model since a previous study showed that marital status was not associated with preschool attendance in

other post-transition countries (23). Furthermore, maternal age was shown to have very little to no association with preschool attendance in post-transition countries such as Georgia and Kazakhstan (23,24), suggesting that parental age is not linked with preschool attendance. Therefore, this justifies the exclusion of mother's age from the analysis as well as the removal of the father's age variable from the final multivariate model.

Residual confounding may also be present in the second study. This may likely arise from the use of broad categories in measuring factors such as parent's education level and household wealth quintile. The measure of parent's education attainment in the surveys are based on the highest level of school that the parent attended and does not distinguish whether the parent completed that level of education. Therefore, while this study controls for education attainment, some residual confounding may exist since parents who completed one year of college/university may be different from parents who completed a college/university program. Likewise for household wealth quintile, households that are classified as being in the richest quintile but have varying degrees of the wealth score within the quintile may also be different from each other. While this study attempted to control for confounding variables to minimize bias, it is worth noting that some bias may still exist due to the nature in which covariates were categorized or measured.

5.2.2 External Validity

External validity refers to whether the results from this study can be applied or generalized to the general Mongolian population or to other populations (9). The MICS samples were drawn through multi-level stratified cluster sampling methods to ensure that the survey sample was representative of the Mongolian population. In addition, adjusted proportional sample allocation to each strata was employed to allow for reliable estimates to be drawn from each strata. For example, low population density areas such as the Eastern region were over-sampled while Ulaanbaatar, a high density area, was under-sampled to maintain the overall sample size

(13). Once the data was collected, sample weights were also calculated and included in datasets to help account for the adjusted sample allocation and questionnaire non-response. Altogether, the sampling design and use of sample weights in the analyses performed in this thesis helps ensure that the results can be generalized to all Mongolian children aged 3-4. However, due to the cross-sectional nature of the data, it is important to note that the results only reflect conditions for the months in which the data was collected. Therefore, while the results may be drawn from a representative sample population, they should be interpreted within the appropriate context.

The MICS design also allows for data to be compared between countries (13). This was made possible by providing participating countries with standardized questionnaires that can be modified and adapted to collect information relevant to those countries. The benefit for exploring this area within the Mongolian context is that these findings may be generalized to other post-transition countries (such as Kazakhstan or Kyrgyzstan) with cultural, political, or socio-demographic conditions that are similar to Mongolia. However, generalization should be done with caution since parenting practices are culturally constructed and can differ by country.

5.2.3 Causation

The main objectives of this thesis were to explore changes in the Mongolian father's role during a period of transition as well as identify whether it was associated with child outcomes within the Mongolian context. Manuscripts were exploratory in nature due to the cross-sectional study design, and therefore, the conclusions drawn from the results highlight the potential associations between exposures and outcomes of interest and not on causative relationships. However, as an exercise, this section will briefly discuss associations explored in both manuscripts using the Bradford Hill criteria for causation (9,25).

Temporality

Temporality is an important component when measuring causation in epidemiological studies since they have to ensure that the primary exposure precedes the outcome. Since both

manuscripts were based on cross-sectional surveys with data collected from the same time-point, challenges in establishing temporality were anticipated. As a result, the main objectives and subsequent interpretation of results were restricted to identifying associations rather than inferring causal relationships.

Strength of Association

Both studies involved some form of measure of association with strengths varying according to different demographic factors. In the first manuscript, a bivariate logistic regression was performed to determine whether father presence and/or father engagement differed by survey year (when compared to reference survey periods) after controlling for potentially confounding variables and covariates. Beta estimates show a weak association between the 2005 survey year and father presence while the associations were relatively strong for the 2010 and 2013 survey years when compared to 2000. Similarly, a stronger association was found for the year 2010 and father engagement while no association was found with the 2013 period when compared to the prevalence in 2005. The associations here essentially reflect the differences in point-prevalence between the reference survey year and subsequent survey periods. Stronger associations may hint at a potential causal relationship, however, these cannot be established using the data presented in this study.

As for the second manuscript, relationships that showed a potentially strong relationship include the crude associations between the father's role and preschool attendance. Although it was marginally not significant, father presence seemed to have a strong unadjusted association with preschool attendance (OR=0.79; 95% CI 0.60, 1.05; p-value = 0.09). As for father engagement, there seemed to be a strong and significant unadjusted association with preschool attendance (OR=1.12; 95% CI 1.04, 1.20; p-value=0.002). However, both these associations were weakened and were no longer statistically significant after adjusting for covariates. Due to the lack of evidence in this study to support an association, the strength of the associations cannot be used to infer causality.

Consistency

Limited studies have examined the direct association between the father's role and child outcomes in low- and middle-income post-transition settings with existing quantitative studies focusing on Western populations. Absence of an association between father presence and acute illness was inconsistent with a study in England where bivariate analyses showed that living with a step-father or in a single-parent household was associated with higher odds of a child requiring diarrhea medication (26). Similarly, the lack of an association between father engagement and acute illness was unexpected since a study in the United States found that increasing levels of father engagement was associated with slight improvements in child outcomes, namely, more engagement was associated with lower odds of reporting poor health (27). As for preschool attendance, the lack of an association with father engagement is consistent with some Caribbean countries such as Guyana and Jamaica (28). Therefore, due to the inconsistencies amongst similar studies, causation cannot be inferred from this study.

Dose-Response Relationship

In the second manuscript of this thesis, it was hypothesized that an increase in the level of father engagement would be associated with higher odds of preschool attendance in children. Similarly, a higher level of father engagement may be associated with either lower odds of illness (due to monitoring and supervision) or higher odds of illness (due to increase contact). Since data from MICS 2013 showed no association between the father's role and child outcomes after adjusting for potentially confounding variables and other covariates, a dose-response effect was not established and therefore cannot help establish any causal relationships in this study.

Biological Plausibility & Coherence

The analyses presented here are exploratory in nature and showed no association between the primary exposure and outcome, making it difficult to establish a cause and effect relationship in this study. For instance, the relationship between father engagement and acute illness is possible since fathers can supervise and monitor their child's activities by closely engaging with

them (2), which in turn may protect them from acute illnesses. Conversely, a father may also increase engagement and contact with their child if the child was recovering or being treated for an illness. Engagement with the child may also do more harm than good by potentially exposing the child to pathogens due to increased contact. While these mechanisms are coherent with the understanding of disease transmission, parenting practices, and supervision, the direction of the mechanisms behind the father's role and child outcomes as well as the benefits (or costs) of father engagement could not be established in this study. This means that interpretation of the study findings are limited to associations rather than demonstrating causative effects.

Specificity

Father engagement is known to be associated with many child outcomes including cognitive and socio-emotional development in children (5,19,28,29). In addition, there are many risk factors for gastro-intestinal and respiratory diseases such as hand-washing practices and water and air quality (3,4,30). Several determinants have also been identified for preschool attendance such as urban/rural residence, household wealth quintile, and parent's education level (23,24). Since father engagement is associated with several outcomes while acute illness and preschool attendance in children is associated with various risk factors and exposures, it poses a challenge in establishing the specific relationship between the father's role and specific child outcomes such as acute illness and preschool attendance.

Experiment

Studies exploring the relationship between the father's role and child outcomes are generally observational studies (e.g. (5,28)) where the level of exposure (ie. father presence or engagement) were not adjusted as it would be in a randomized and controlled trial study (RCT), which means that a specific causative link has yet to be established.

Analogy

Studies on some countries such as those in the Caribbean and some post-transition countries have shown that there is an association between parental engagement and preschool

attendance (28,31,32). Since this has been shown in other settings, it is possible that the same relationship may be found in the Mongolian context. However, based on recent data available, this association was not established in Mongolia.

5.2.4 Multivariate Regression Models

Binary logistic regression models were used in the analyses since the father's role in manuscript 1 and the child outcomes in manuscript 2 were binary in nature. The regression model exploring changes in father presence and engagement across the different time points did not account for the clustered nature of the data since it was mainly used to determine whether fluctuations remained significant after adjusting for potentially confounding variables and covariates. The survey design was accounted for in the second manuscript using the PROC SURVEYLOGISTIC procedure in SAS. This was chosen over multi-level models since we were only interested in exploring associations at the individual level while adjusting for the nested sample design. This procedure utilizes maximum likelihood for fitting the model and adjusts the standard error using the Taylor Series linearization method for variance estimation to account for the complex sample design (33). Based on recommendations by Hosmer and Lemeshow cited in a report for analyzing survey data (34), logistic regression was used to initially build the multivariate models by taking advantage of the backwards elimination and model-fit features of the logistic procedure as they are not available in the survey logistic procedure. Variables were also selected or removed based on whether the removal caused a 10% change in the effect estimate. Once the final models were obtained, the complex sampling design was accounted for by running the same final models through the survey logistic procedure to obtain more robust error estimates. This essentially accounts for the clustered data by widening the 95% confidence intervals for the odds ratio estimates, thereby ensuring that the estimates obtained in manuscript 2 are statistically sound and that the sample design is correctly accounted for in the analysis.

5.3 Strengths of this Thesis

One of the major strengths of this thesis is the use of data collected from a nationally representative sample of the Mongolian population through the MICS. The high response-rate, sampling design, and the use of sampling weights in the analyses allows for generalization to all Mongolian children aged 3-4. In addition, the use of the standardized MICS questionnaires allows for comparisons with other post-transition countries that are participating in the MICS program. In addition, previous studies have shown that indicators of father engagement in the questionnaire had acceptable scores in tests for internal consistency (5,14).

The studies presented in this thesis both provide unique contributions to the literature focusing on the changing roles of fathers as well as its association with child outcomes in a LMIC and post-transition setting. These studies will help fill important knowledge gaps since limited research has been conducted on the link between father presence, father engagement and acute illness and preschool attendance in children. The first manuscript provides a descriptive analysis of changing father presence and engagement across four time-points during the post-transition period. To our knowledge, this was the first study to explore and describe changes in the father's role in Mongolia. Fluctuations across the 13-year period were explored at both the national and regional level and were additionally described according to various demographic factors. This will help provide insight into fathers as a social determinant of child health and how this may be changing during the post-transition period, particularly in households with pastoralist lifestyles. The second manuscript examined whether there was an association between the father's role and child outcomes. The main goal for this manuscript was to help gain a better understanding of father presence and father engagement and the relationships with acute illness and preschool attendance in children. There did not seem to be an association between the father's role and child outcomes from the 2013 data, however, other demographic factors were identified to be strong predictors of preschool attendance. This too provides important insight into the determinants of

child outcomes, allowing policy-makers and stakeholders in Mongolia to direct their efforts to these areas when looking to improve preschool attendance in children.

An additional strength of this thesis was the methodological use of PROC SURVEYLOGISTIC to adjust the standard error estimates. This was important since households were nested within administrative units which in turn were nested within regions, therefore violating the assumption of independent observations. The survey logistic procedure helps provide more conservative effect estimates by widening the 95% confidence intervals generated from odds ratio estimates to account for the sampling design (33). This ultimately ensures that the results presented in this study were obtained using methods that appropriately accounted for clustered data.

5.4 Further Research Directions

This purpose of this thesis was to investigate changes in the father's role as well as its association with child outcomes within the Mongolian context. Since this project was exploratory in nature, findings highlighted within this paper can be used to inform future research questions that can further develop our understanding of the role of fathers and how they fit within the realm of the determinants of child health.

The first manuscript showed that father presence and engagement fluctuated between 2000 and 2013 at both the national and regional level as well as for various demographic subgroups. Future studies can explore this even further by identifying the specific mechanisms and social, political, economic, and climate factors that are driving these changes in many Mongolian households, particularly at the regional level. Furthermore, since this study was limited to using data from the 2000 to 2013 datasets, it would be worthwhile to continue monitoring the changes in the father's role by including more recent datasets. Including more recent data and more time-points can help establish any possible increasing or decreasing trends in the father's role, thereby providing information that better reflects the current conditions in

Mongolia. Ideally, data on the father's role prior to the 1990's would be useful to help compare the father's role before and after the transition occurred. Another area of interest that requires further study is the effects that the post-transition period may be having on current and former herders. Qualitative studies that can provide a better understanding of factors that are affecting family dynamics in these households would be beneficial.

As for the association of the father's role with child outcomes, the second manuscript showed no statistically significant relationship between father presence, engagement, and acute illness and preschool attendance in children after adjustment for demographic factors. It would be helpful if future studies included other forms of father engagement and involvement such as showing affection, bathing, or feeding the child (19). Since conclusions were drawn under the assumption that father-child interactions were positive, it would also be worth collecting data and exploring parent-parent dynamics and the nature of the home environment (e.g. domestic violence, substance abuse). This type of information can be useful when trying to accurately measure the association between father engagement and child well-being. In addition to measuring this relationship, this manuscript also provided a brief description of the types of activities in which children were engaging with their parents or caretakers. It would be of interest to further investigate Mongolian parents and their reported tendency to engage in more socio-emotional rather than cognitive activities with their preschool-aged children. Moreover, since this study did not address or account for other types of family structures, it would be worthwhile for future studies investigating the relation between father involvement and child outcomes in Mongolia to account for family structure in the analyses or explore how this relationship may differ according to various family types.

As for the MICS questionnaires, some improvements can help make the surveys as comprehensive as possible to gain a better understanding of the Mongolian father's role in child outcomes. For instance, including indicators of whether children are from herder households or questions regarding migratory patterns of families or fathers would be useful since these factors

should be considered when assessing patterns in father involvement at regional levels. In addition, there is a need for more refined questions regarding the caregivers and household members living with the child in the household. Since there may be different family structures in Mongolian households, questions that help identify whether a child was living with a step-parent, father-figure, or that generally identifies the type of family structure would also be beneficial since it may give more insight into the family dynamics that exist in the household. Furthermore, understanding the quality of father involvement requires additional information on the father for all children such as data on substance abuse, child discipline, and domestic violence. For instance, data on child discipline from the MICS was only available for one child in the household that was randomly selected from all children in the household aged 1-14 years old at the time of the survey (13). Due to possible sample size limitations, it would also be beneficial to collect data on all men in selected households rather than data from men in every second household.

While improvements to the MICS may help provide a better understanding on the quality of father involvement in Mongolian households, the use of cross-sectional data still imposes challenges regarding the interpretation of cross-sectional data. Qualitative studies, particularly those that can collect information about conditions in the pre-transition period in Mongolia, may be helpful in identifying and understanding changes in the father's role and how it impacted children in affected households. In addition, qualitative information may also provide more insight into the specific factors that are driving changes in father presence and engagement in the post-transition period in Mongolia.

5.5 Public Health and Policy Implications

Exploration of father presence, father engagement, and their association with acute illness and preschool attendance in children helps provide insight into the role of the father as it relates to the determinants of child outcomes in Mongolia. Other demographic factors seem to be strong

predictors of preschool attendance. These findings have major implications on public health and policies targeting child-related outcomes in Mongolia.

Trend analysis in manuscript 1 showed that father presence and engagement fluctuated between 2000 and 2013 during the post-transition period. It is likely this is associated with socio-demographic changes taking place across Mongolia. It would be highly beneficial to these families if crucial supports for herders such as transportation for seasonal migration, veterinary services, water and food provisions, winter shelters for livestock, and improved governance over pastures (17,35,36) are restored and maintained. In addition, employment assistance programs may assist those who have recently lost their livelihoods, or who are unemployed, to secure some form of employment in order to ensure financial security within their households. An additional finding that is worthy to note is that fluctuations in the father's role varied by region. Further information is required to understand these variations which can be used to inform appropriate policies.

Using data from 2013, manuscript 2 showed that there was no association between the father's role and odds of acute illness in children. This suggests that known risk factors for acute illnesses such as handwashing and food handling practices, water and air quality, as well as contact with domesticated animals should continue to be the key areas of concern in terms of reducing the risk of communicable diseases in children, particularly those in nomadic households and those living in Ulaanbaatar (4,30,37). In order to reduce risk in children within these households, programs should be designed to help reduce or address the risk factors of disease as well as encourage parents and caregivers to monitor and supervise their child's activities and behaviours. For instance, improving water and air quality, promoting proper handwashing, and providing appropriate vaccines may reduce the risk of diarrhea and respiratory illnesses in children (4,38). In addition, since supervision and monitoring of children may reduce the risk of injury (2), it may also potentially reduce the risk of illness in children. Adopting these strategies

would help reduce the transmission of diseases and may therefore reduce the annual prevalence of gastro-intestinal and respiratory illnesses in Mongolian children.

Data from manuscript 2 also showed that there was no link between the father's role and preschool attendance in children. This means that policies directed towards improving and maintaining preschool attendance should be focused on other factors such as parental education attainment, household wealth, region of residence, and number of adults in the household. For instance, higher levels of education attainment in parents are associated with higher odds of preschool attendance in children. Therefore, ensuring access to all levels of education for Mongolians throughout their life-course may help improve education attainment in current and future parents which in turn can translate into preschool enrollment in their children (21). Household wealth is also an important factor to consider since children living in the poorest quintile have lower odds of preschool attendance as compared to those in the wealthier quintiles. This highlights the need for provision of school supplies and meals at equitable and affordable costs especially since not attending preschool is linked with poor academic achievement in children from low-income households (21,39). Region of residence should also be considered in policy-making since preschool attendance and quality varied by region (21) meaning that policies and programs looking to improve preschool access and attendance rates should be designed for region-specific needs. Having many adults living in the household was also shown to lower the odds of preschool attendance, therefore it would be worthwhile to educate parents and caregivers on the importance of sending children to preschool for reasons other than simple childcare.

Programs to promote and improve parenting in fathers may also be beneficial. Providing parenting sessions to educate fathers on how to engage with their children in various types of activities were shown to improve fathers' confidence and understanding of their role in facilitating activities with their children (40). In addition, providing programs with support groups can help encourage fathers to develop and improve positive parenting behaviours (41). Based on findings from interviews with Indigenous fathers in Canada, it is noted that programs should be

designed specifically for fathers and the needs of fathers as well as provide a space in which fathers can feel comfortable to learn about parenting (42).

5.6 Conclusions

Father presence and engagement seemed to fluctuate in Mongolia between 2000 and 2013 during their period of transition. Despite these changes, data from 2013 suggests that the father's role was not associated with child outcomes such as acute illness and preschool attendance. Father involvement should still, however, be considered as an important determinant of child well-being since it may have impacts on other child outcomes in Mongolia. Furthermore, policy and decision makers should continue to consider social, environmental, and demographic factors such as health behaviours, water and air quality, parental education, household wealth, and region of residence when trying to improve the health and well-being of preschool aged children in Mongolia.

5.7 References

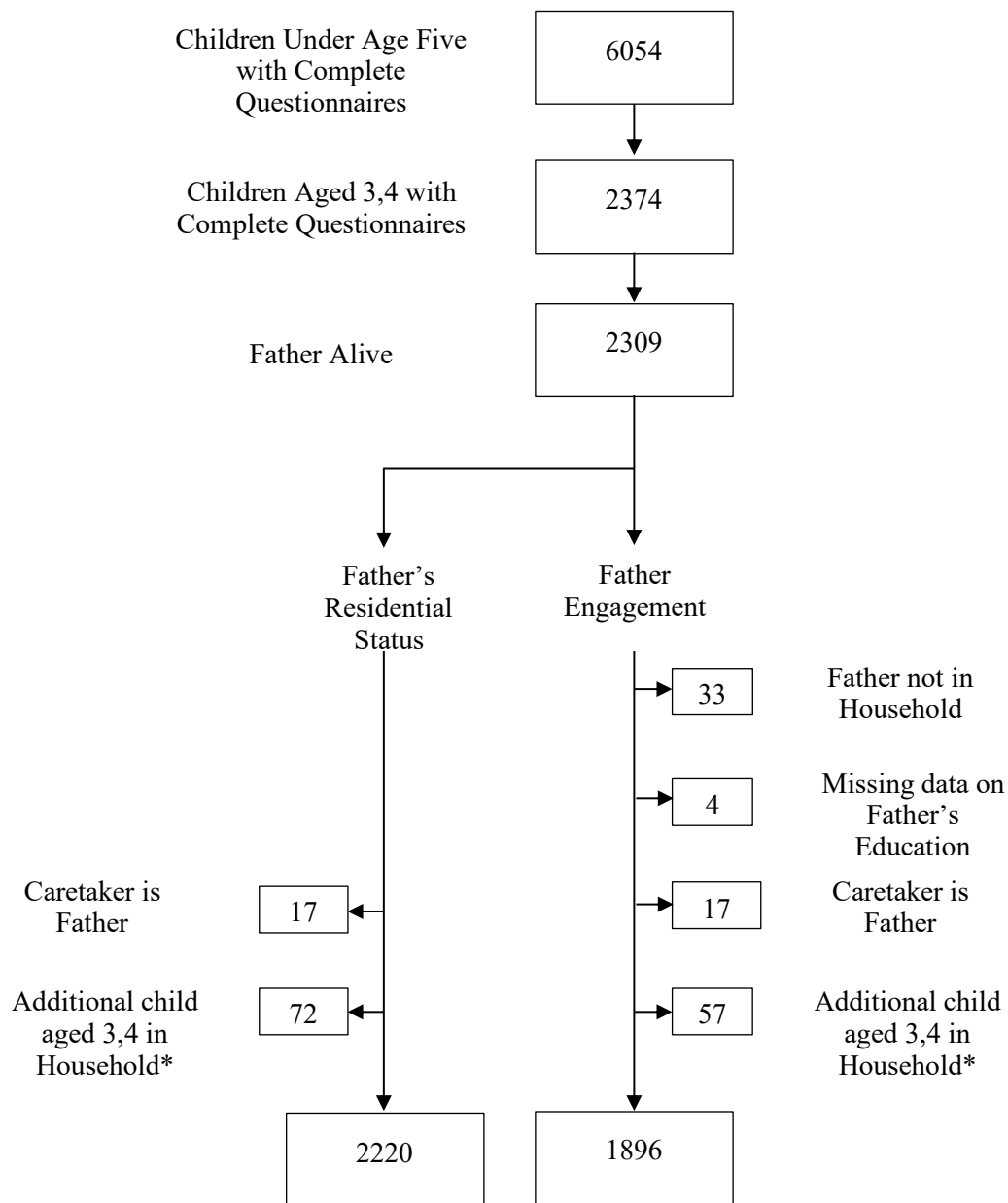
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Appendix A

Sample Size Flowchart



* Number of children excluded after selecting one child aged 3,4

Figure 5.1 Sample size flowchart for Manuscript 2

Appendix B

Survey Methodologies

Key information on survey design and methodology was obtained from the 2000, 2005, 2010, and 2013 MICS reports (1–4).

Sampling Strategy

Multi-stage, stratified cluster sampling was used for each survey period to ensure that meaningful and generalizable estimates can be drawn from survey data at the national and regional level as well as by urban or rural status. Sample size (number of households) for the national level was first calculated using key indicators such as measles immunization rate for MICS 2000, underweight prevalence in children for MICS 2005, pre-school attendance in children for MICS 2010, and prevalence of exclusive breastfeeding in infants for MICS 2013. Number of clusters for each region were then determined from these sample sizes using probability proportionate to size (PPS) for the 2000, 2005, and 2013 MICS periods and by equal allocation for the 2010 MICS period. These clusters were then further allocated to urban or rural areas within each region using PPS.

At the first stage, sampling frames for clusters were population and household registration records while the primary sampling units (PSUs) were the smallest administrative units within each region; PSUs were selected using systematic PPS. At the second stage of sampling, the sampling frames were household listings from the administrative units selected at stage one. Households (PSUs) were then sampled from the household listings using random, systematic selection.

Survey Design and Implementation

The Multiple Indicator Cluster Surveys (MICS) were created by UNICEF and have been conducted by the NSO and UNICEF Mongolia at regular 3-4 year intervals since 1995. The MICS are designed to have several questionnaires that collect self-reported information on various health indicators, particularly for women and children, and may be modified to suit the specific needs of the country. All survey periods contained the Household Questionnaire to collect household level information (e.g. age of each household member, number of household members, living conditions) as well as a Women’s Questionnaire and Children under age 5 Questionnaire to collect information on various health indicators. Number and type of questionnaires varied depending on the survey period (Table 1).

Table 1: List of questionnaires provided in each MICS period and the target respondent for each questionnaire.

MICS 2000	MICS 2005	MICS 2010	MICS 2013	Questionnaire Respondent
Household Questionnaire	Household Questionnaire	Household Questionnaire	Household Questionnaire	Head of household or designate
Women’s Questionnaire	Women’s Questionnaire	Women’s Questionnaire	Women’s Questionnaire	All individual women living in the household (aged 15-49 years)
Children under Five Questionnaire	Children under Five Questionnaire	Children under Five Questionnaire	Children under Five Questionnaire	Mothers or caretakers of all children under age 5
-	-	Questionnaire for Child aged 2-14 years	-	Mothers or caretakers of all children aged 2-14
-	-	Men’s Questionnaire	Men’s Questionnaire	All individual men living in every second household (aged 15-54 years)

Questionnaires are conducted in Mongolian and completed on paper at each household through structured interviews conducted by personnel trained by the NSO. The data would then be transferred to computers when it became available. Starting in MICS 2013, electronic tablets

were used during interviews to improve the efficiency of data collection. The datasets were then cleaned through quality control techniques employed by the NSO and were later made available for research purposes.

Sample Weights

According to the respective MICS reports, samples for each survey period were not self-weighting. This is due to differences in sampling probabilities as well as under- and over-sampling of regions based on size, and as a result, standardized sample weights were calculated and provided for all survey periods to account for these differences as well as non-response in households. Weights were provided for household as well as individual level data. All analyses in this thesis involved the use of weighted data. After applying weights, the sample distributions closely reflected the population distributions in Mongolia in 2000, 2005, 2010, and 2013 at the regional level and according to urban/rural residence (5). There were very few exceptions; for example, contrary to population proportions, there was a higher proportion of rural cases compared to urban cases in the MICS 2000 sample. Despite the few exceptions, estimates from this study can still be generalized to the Mongolian population since patterns in the sample distribution generally resembled that in the population for those time points.

Survey Response Rates

Response rates for survey questionnaires used in this thesis were generally greater than 90% for all survey time-points (Table 2). These rates are consistent with MICS conducted in other contexts such as those in Vietnam and Sudan (6,7). The MICS reports did not specify any form of compensation for the survey respondents.

Table 2: Response rates for the questionnaires used in this study.

	Questionnaire Response Rates (%) and Total Sample Size (n)		
MICS Survey	Household Questionnaire	Children’s Under 5 Questionnaire	Women’s Questionnaire
2000	100.0 (6000)	99.5 (6212)	96.0 (8603)
2005	98.3 (6325)	99.4 (3568)	92.6 (8057)
2010	98 (10 300)	96.2 (4114)	91.3 (9599)
2013	98.5 (15 028)	98.6 (6137)	94.0 (13 457)

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Appendix C

Survey Questions

Manuscript 1: Descriptive and Exposure Variables

Variables were obtained from the Household and Women’s Questionnaires (1-4). Some questions and responses varied slightly for each survey period. Items such as maternal marital status, region of residence, and parental education were recoded for consistency across survey periods.

Exposure Variables	Survey Question/Exposure Measure
Age of Father	<p>Q. HL4: Record [age] in completed years: ____ 98 = DK</p> <p>MICS 2005: HL5 MICS 2010, 2013: HL6</p>
Sex of Child	<p>Q. HL3: Is (name) male or female? 1 = Male 2 = Female</p> <p>MICS 2005, 2010, 2013: HL4</p>
Maternal Marital Status	<p>Q. CU1: Are you currently married or living with a man?</p> <p>1 = Yes 2 = No, widowed, divorced, separated 3 = No, never married</p> <p>MICS 2005: Q. MA1: Are you currently married or living together with a man as if married?</p> <p>1 = Yes, officially married 2 = Yes, unofficially married 3 = No, not in union</p> <p>MICS 2010: Q. MA1: Are you currently married or living with a partner?</p> <p>1 = Yes, currently married 2 = Yes, living with a partner 3 = No, not in union</p> <p>MICS 2013: Q. MA1: Are you currently married or living together with a man as if married?</p> <p>1 = Yes, currently married</p>

	<p>2 = Yes, living with a man 3 = No, not in union</p>
Mother's Education	<p>Q. ED16: What is the highest level of school (name) attended?</p> <p>MICS 2005: ED3 MICS 2010, 2013: ED4</p> <p>MICS 2000 responses: 2 = Primary 3 = Secondary 4 = Higher 5 = Other 9 = DK</p> <p>MICS 2005 responses: 0 = Pre-school 1 = General educational School 2 = Vocational 3 = Institute, college 4 = University 5 = Religious 6 = Non-standard curriculum 8 = DK</p> <p>MICS 2010 responses: 0 = Pre-school 1 = Secondary school 2 = Vocational Training Center 3 = University, institute, college 4 = Non-formal education programme 8 = Don't know</p> <p>MICS 2013 responses: 0 = Pre-school 2 = Secondary or non-formal education program 3 = Higher 4 = Vocational Training</p>
Father's Education	Same as Mother's Education
Geographic Region	<p>Q. HH7:</p> <p>1 = Western 2 = Khangai 3 = Central 4 = Eastern 5 = Ulaanbaatar</p>
Area of Residence (Urban or Rural)	<p>Q. HH6: Household Location</p> <p>1 = Capital city 2 = Aimag centre 3 = Soum centre 4 = Countryside/Rural</p> <p><i>Aimags</i> are provinces which represent subdivisions of Mongolia; <i>Soums</i> are subdivisions of Aimags (4)</p> <p>Codes:</p>

	<p>Urban = Capital city or Aimag centre Rural = Soum centre or Countryside</p>
Family SES	<p>Calculated as Wealth Index Quintile by the NSO based on scores derived from Principal Components Analysis. Scores were based on characteristics such as housing type and condition, source of drinking water and type of sanitary facility, availability of electricity, and household consumerables (e.g. household appliances) (4).</p> <p>1 = Poorest 2 = Second 3 = Middle 4 = Fourth 5 = Richest</p>
Number of Livestock Owned by Household	<p>Q. HI9E: Does your household own farm livestock?</p> <p>1 = U50 2 = 51 – 100 3 = 101 – 200 4 = 201 < 0 = No one</p> <p>MICS 2005: Q. HC14: How many of the following animals does this household have?</p> <p>If none, record '00'. If more than 997, record '997' If unknown, record '998'.</p> <p>Cattle: ____ Cows: ____ Bulls: ____ Horses: ____ Goats: ____ Sheep: ____ Camels: ____ Chickens: ____ Pigs: ____ Other: ____</p> <p>MICS 2010:</p> <p>Cattle: ____ Horses: ____ Goats: ____ Sheep: ____ Camels: ____ Poultry: ____ Pigs: ____ Other: ____</p> <p>MICS 2013: Cattle, milk cows, or bulls: ____ Horses, donkeys, or mules: ____ Goats: ____ Sheep: ____ Camels: ____</p>

	Chicken: ____ Pigs: ____
Number of Children Living in Household	Will identify number of children aged 0 – 17 years living in the household using the following survey question: Q. HL4 : Record [age] in completed years: ____ MICS 2005: HL5 MICS 2010, 2013: HL6

Manuscript 1: Outcome Variables

Data on father’s residential status are found in the Household Questionnaire while data on father engagement are found in the Children Under Five Questionnaire. Questions, responses, and codes vary slightly for each survey period (1-4).

MICS Survey Period	Outcome Variable	Survey Question/Outcome Measure
2000, 2005, 2010, 2013 (<i>from Household Roster/Household Listing</i>)	Father Presence	Q. HL13 : Does (child’s name)’s natural father live in this household? 1 = Yes 2 = No MICS 2005: HL12 MICS 2010, 2013: HL14
2005 (<i>from Birth Registration and Early Learning Module</i>)	Father Engagement	Q. BR8 : In the past 3 days, did you or any household member over 15 years of age engage in any of the following activities with (child’s name): <i>Circle all that apply</i> . BR8a : Read books or look at picture books with (child’s name)? BR8b : Tell stories to (child’s name)? BR8c : Sing songs with (child’s name)? BR8d : Take (child’s name) outside the home, compound, yard or enclosure? BR8e : Play with (child’s name)? BR8f : Spend time with (child’s name) naming, counting, and/or drawing things? <i>Each activity has the following response options:</i>

		<p>A = Mother B = Father X = Other Y = No one</p>
<p>2010 (<i>from Early Childhood Development Module</i>)</p>	<p>Father Engagement</p>	<p>Q. EC7: During the last 3 days, did you or any household member over 15 years of age engage in the following activities with (child's name)? <i>If yes, ask: Who engaged in this activity? Record all that apply.</i></p> <p>[A] Read books or looked at picture books with (child's name)?</p> <p>[B] Told stories to (child's name)?</p> <p>[C] Sang songs with (child's name) or lullabies to (child's name)?</p> <p>[D] Took (child's name) outside?</p> <p>[E] Played with (child's name)?</p> <p>[F] Named, counted, or drew things to or with (child's name)?</p> <p><i>Each activity has the following response options:</i> A = Mother B = Father X = Other Y = No one</p>
<p>2013 (<i>from Early Childhood Development Module</i>)</p>	<p>Father Engagement</p>	<p>Q. EC7: In the past 3 days, did you or any of your household members aged 15 or over engage in any of the following activities with (child's name): <i>If yes, probe: Who engaged in this activity with (child's name)? Circle all that apply.</i></p> <p>[A] Read books to or looked at picture books with (child's name)?</p> <p>[B] Told stories to (child's name)?</p> <p>[C] Sang songs to (child's name) or with (child's name), including lullabies?</p> <p>[D] Took (child's name) outside the home, compound, yard or enclosure?</p> <p>[E] Played with (child's name)?</p> <p>[F] Named, counted, or drew things to or with (child's name)?</p> <p><i>Each activity has the following response options:</i> A = Mother B = Father X = Other Y = No one</p>

Manuscript 2: Exposure Variables

Manuscript 2 uses data collected through MICS 2013 (4).

Exposure Variable	Survey Question/Exposure Measure
Father Presence	<p>Q. HL14: Does (child's name)'s natural father live in this household?</p> <p>1 = Yes</p> <p>2 = No</p>
Level of Father Engagement	<p>Q. EC7: In the past 3 days, did you or any of your household members aged 15 or over engage in any of the following activities with (child's name): <i>If yes, probe: Who engaged in this activity with (child's name)? Circle all that apply.</i></p> <p>[A] Read books to or looked at picture books with (child's name)?</p> <p>[B] Told stories to (child's name)?</p> <p>[C] Sang songs to (child's name) or with (child's name), including lullabies?</p> <p>[D] Took (child's name) outside the home, compound, yard or enclosure?</p> <p>[E] Played with (child's name)?</p> <p>[F] Named, counted, or drew things to or with (child's name)?</p> <p><i>Each activity has the following response options:</i></p> <p>A = Mother</p> <p>B = Father</p> <p>X = Other</p> <p>Y = No one</p>

Manuscript 2: Outcome Variables

Variables were obtained from the Children Under Five Questionnaire (4).

Outcome Variable	Survey Question/Outcome Measure
Child Illness	<p>Q. CA1: In the last two weeks, has (child's name) had diarrhoea?</p> <p>1 = Yes</p> <p>2 = No</p> <p>8 = DK</p>
	<p>Q. CA6A: In the last two weeks, has (child's name) been ill with a fever at any time?</p> <p>1 = Yes</p> <p>2 = No</p> <p>8 = DK</p>
	<p>Q. CA7: At any time in the last two weeks, has (child's name) had an illness with a cough?</p> <p>1 = Yes</p>

	<p>2 = No 8 = DK</p> <p>Q. CA8: When (child's name) had an illness with a cough, did he/she breathe faster than usual with short, rapid breaths or have difficulty breathing?</p> <p>1 = Yes 2 = No 8 = DK</p> <p>Q. CA9: Was the fast or difficult breathing due to a problem in the chest or a blocked nose?</p> <p>1 = Problem in chest only 2 = Blocked or runny nose only 3 = Both 6 = Other (specify) _____ 8 = DK</p>
Preschool Attendance	<p>Q. EC5: Does (child's name) attend any organized learning or early childhood education programme, such as a private or government facility, including kindergarten or community child care?</p> <p>1 = Yes 2 = No 8 = DK</p>

Manuscript 2: Potential Confounding Variables and Covariates

Variables were obtained from the Household and Children Under Five Questionnaires

(4).

Exposure Variables	Survey Question/Exposure Measure
Sex of Child	<p>Q. HL4: Is (name) male or female?</p> <p>1 = Male 2 = Female</p>
Child's Age	<p>Q. AG2: How old is (child's name)?</p> <p>Record age in completed years: Record '0' if less than 1 year.</p>
Father's Age	<p>Q. HL6: Record [age] in completed years: ____</p> <p>98 = DK</p>
Familial SES	<p>1 = Poorest 2 = Second 3 = Middle 4 = Fourth 5 = Richest</p>
Parental Education Level	<p>Q. ED4: What is the highest level of school (name) attended?</p> <p>0 = Pre-school 2 = Secondary or non-formal education program 3 = Higher 4 = Vocational Training</p>

Geographic Region	<p>Q. HH7:</p> <p>1 = Western 2 = Khangai 3 = Central 4 = Eastern 5 = Ulaanbaatar</p>
Urban or Rural Residence	<p>Q. HH6: Location</p> <p>1 = Capital city 2 = Aimag centre 3 = Soum centre 4 = Countryside</p> <p>Codes: <i>Urban</i> = Capital city or Aimag centre <i>Rural</i> = Soum centre or Countryside</p>
Level of Mother Engagement	Same as Father Engagement
Level of Engagement from Other Adults in Household Aged 15+	Same as Father Engagement
Number of Adults Aged 18 and Over in Household	<p>Calculated based on the number of household members aged 18 years and older.</p> <p>Q. HL6: Record [age] in completed years:</p>
Number of Children Aged 0-4 in Household	<p>Calculated based on the number of household members aged 0-4 years.</p> <p>Q. HL6: Record [age] in completed years:</p>
Early Childhood Development Score	<p>Calculated based on the number of positive responses to the following questions regarding child development (0-11):</p> <p>Q. EC7N: Can (child's name) identify colours? Q. EC7M: Can (child's name) recognize simple shapes such as triangles, rectangles and circles? Q. EC8: Can (child's name) identify or name at least ten letters of the alphabet? Q. EC9: Can (child's name) read at least four simple words? Q. EC9A: Can (child's name) count? Q. EC10: Does (child's name) know the name and recognize the symbol of all numbers from 1 to 10? Q. EC13: Does (child's name) follow simple directions on how to do something correctly? Q. EC14: When given something to do, is (child's name) able to do it independently? Q. EC15: Does (child's name) get along well with other children? Q. EC16: Does (child's name) kick, bite, or hit other children or adults? Q. EC17: Does (child's name) get distracted easily?</p> <p>1 = Yes 2 = No 8 = DK</p>
Number of Children's Books in Household	<p>Q. EC1: How many children's books or picture books do you have for (child's name)?</p> <p>Number of children's books: __ None = 00 Ten or more books = 10</p>

References

1. National Statistics Office of Mongolia, UNICEF. Mongolia “Child and Development Survey 2000”: National Report. 2001.
2. National Statistics Office of Mongolia, UNICEF. Mongolia “Child and Development 2005” Survey (MICS-3): Final Report. 2007; Available from:
http://www.childinfo.org/files/MICS3_Mongolia_FinalReport_2005_Eng.pdf
3. National Statistics Office of Mongolia, UNICEF. Mongolia “Child Development 2010” Survey (MICS-4): Final Report. 2013.
4. National Statistics Office of Mongolia, UNICEF. Mongolia - Social Indicator Sample Survey 2013: Final Report. 2015.

Appendix D

Ethics Approval



QUEEN'S UNIVERSITY HEALTH SCIENCES & AFFILIATED TEACHING HOSPITALS RESEARCH ETHICS BOARD (HSREB)

HSREB Initial Ethics Clearance

September 13, 2018

Dr. Davison
Department of Public Health Sciences
Queen's University

ROMEO/TRAQ #: 6024437

Department Code: EPID-632-18

Study Title: "Exploring Fathers' Changing Familial Roles and the Effects on Child Illness in Mongolia"

Co-Investigator: Ms. Lesley Anne Pablo

Review Type: Delegated

Date Ethics Clearance Issued: September 13, 2018

Ethics Clearance Expiry Date: September 13, 2019

Dear Dr. Davison

The Queen's University Health Sciences & Affiliated Teaching Hospitals Research Ethics Board (HSREB) has reviewed the application and granted ethics clearance for the documents listed below. Ethics clearance is granted until the expiration date noted above.

- Study Design: Thesis Proposal 2018JUL31

Documents Acknowledged:

- CORE Ethics Certificate L. Pablo 2017DEC28

Amendments: No deviations from, or changes to the protocol should be initiated without prior written clearance of an appropriate amendment from the HSREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involve(s) only administrative or logistical aspects of the trial.

Renewals: Prior to the expiration of your ethics clearance you will be reminded to submit your renewal report through ROMEO. Any lapses in ethical clearance will be documented on the renewal form.

Completion/Termination: The HSREB must be notified of the completion or termination of this study through the completion of a renewal report in ROMEO.

Reporting of Serious Adverse Events: Any unexpected serious adverse event occurring locally must be reported within 2 working days or earlier if required by the study sponsor. All other serious adverse events must be reported within 15 days after study team members have become aware of the information.

Reporting of Complaints: Any complaints made by participants or persons acting on behalf of participants must be reported to the Research Ethics Board within 7 days of study team members becoming aware of the complaint.