Essays on Disability and Wellbeing in Uganda

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This Thesis is dedicated to my late father, Alhaji Mohammed Abubakar who passed away on the 29th of June, 2003. If you were here with us today, you would have been so proud to see what your only daughter has grown to become.

Abstract

This thesis introduces three independent but related empirical studies on disability and wellbeing in Uganda. The first essay evaluates the short-term health and economic impacts of providing orthotic equipment to adults with lower limb disability using unique data collected during an orthotic equipment intervention between 2012 and 2013. The study adopts a before-after estimation strategy to examine changes to: (i) functional mobility and (ii) labour market outcomes, including the type of employment and monthly earnings. One year after the intervention, the effects are noticeably gendered; men exhibit an improvement in their level of functional mobility, while women face little change or a reduction in their mobility levels. In terms of labour market outcomes, for men, the intervention leads to an increase in monthly earnings, which is partly due to a switch from self- to wage employment. Earnings increase for women, although the overall effect is much smaller. Taking into account the intensity of equipment use, the Wald estimates reveal larger marginal effects on both mobility and earnings.

The second essay tracks the outcomes of a medical intervention which provided lower limb orthosis to adults with disabilities between 2012 and 2018. Six years after the intervention, over one-third of the recipients were still using their orthotic devices. However, using a discrete-time hazard model, the analysis examines the speed at which the orthotic devices failed and evaluates how personal characteristics and clinical factors acted as potential risk markers of early equipment failure. The study finds that the peak time of failure lay between the fourth- and fifth-year post-fitting, with the probability of orthosis failure being significantly lower for women, the elderly and most importantly, those who had access to follow up care compared to their respective counterparts. The study also analysed the implications of orthotics failure on life satisfaction, health-related quality of life and disability severity, which are designed to measure subjective wellbeing. Notably, the results indicate that access to follow up care improves functional efficiency, while failure of the orthosis consistently acts as a negative correlate of wellbeing.

The final essay provides some useful insights into the disability-wellbeing nexus using cross-sectional data from the Uganda Functional Difficulties Survey 2017. It adopts a multilevel modelling approach to evaluate the determinants of subjective wellbeing on a sample of disabled and non-disabled adults in Uganda. Particularly, the study analysed the relationship between wellbeing and (i) having a disability (ii) socio-psychological markers, including levels of discrimination, access to Information & Communication Technologies (ICT) as proxied by mobile phone use, and personal safety and (iii) the role of intrahousehold arrangements in disabled and non-disabled households. Although the observed effects do not occur universally, the analysis identifies the presence of disability and levels of discrimination as negative correlates of wellbeing, while feelings of personal safety, and access to ICT are positively linked to wellbeing. We also find that education and household wealth have positive interactive effects on the disability-wellbeing nexus, while ICT use may positively buffer the discrimination-wellbeing relationship. Lastly, the analysis finds that the type of household and a person's relationship to the head of the household partly explain distributional differences in personal wellbeing.

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Thesis Introduction

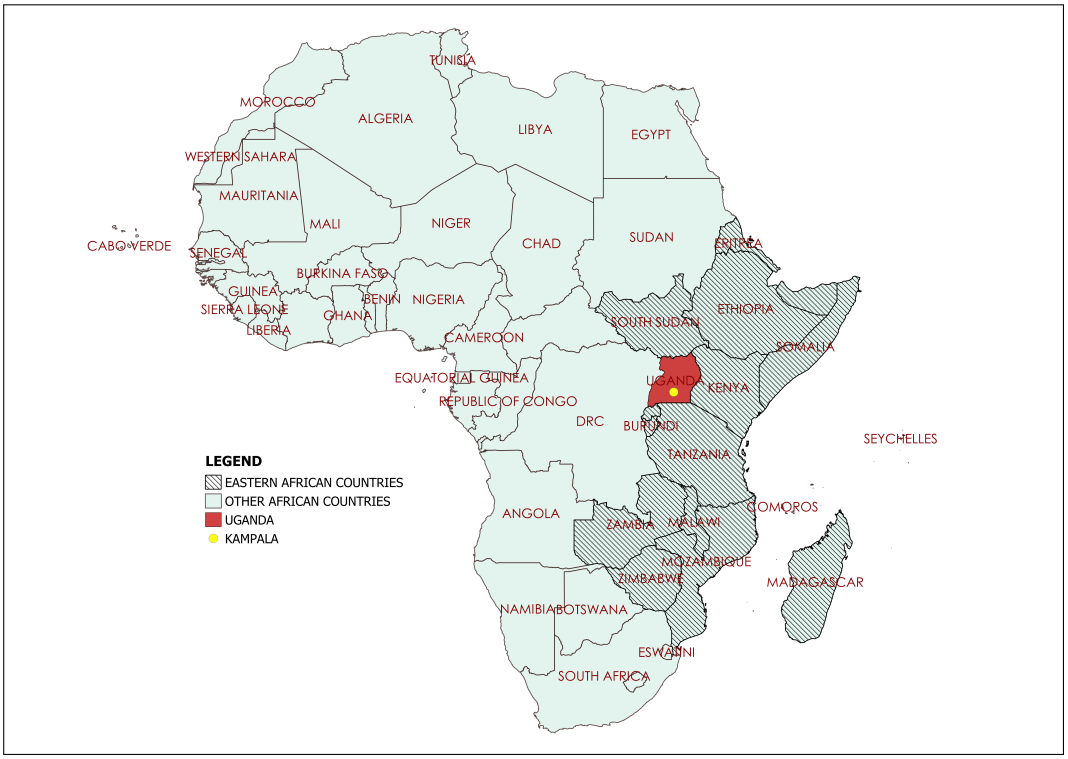
Data and empirical research on people with disabilities have been limited even though they are the largest minority group globally. The 'World Report on Disability' estimates that around 15% of the world's population have a disability and low-income countries harbour the largest share (80%). Disability prevalence is increasing due to population ageing and the increasing number of people with chronic health conditions (WHO & World Bank, 2011). Disability is a cluster of disadvantages and is understood as the interaction between long-term impairment, activity limitations and participation restrictions. It is an intersection between a person's body and its contextual environment. Hence, people with disabilities are not vulnerable, it is the environment they live in that makes them vulnerable (Al Ju'beh, 2017).

While only a small body of empirical evidence on people with disabilities exists in developing countries, what is available shows that people with disabilities experience inter alia, relatively lower levels of education and employment, higher poverty rates and worse living conditions (Fafchamps & Kebede, 2012; Mitra et al., 2013; Banks et al., 2021b). Hence, the broad theme of the post-2015 agenda for sustainable development is the pledge to "leave no one behind" with at least seven of these goals having targets with a disability component.

Although studies on people with disabilities are relatively scarce in sub-Saharan Africa, Uganda is an interesting case study to analyse considering the prevalence of diseases that cause disability, for instance polio, the series of violent conflicts and the six-year protracted civil war that left many people

disabled. Uganda is a landlocked country that is geographically located in the eastern part of sub-Saharan Africa (Figure 1). As of 2018, the country's population was over 41 million, with a GNI per capita under $800 (Atlas), and a relatively low and declining level of health expenditure as a share of GDP – 12% in 2007 compared to 6.5% in 2018 (World Bank, 2021a). Despite its poverty reduction rates, Uganda remains among the poorest countries in the world having a third of its citizens living below the international extreme poverty line of $1.90 a day (2011 prices), while the share of people at risk of falling back into poverty has increased (World Bank, 2016).

Figure 1: Map of Africa Showing the Geographical Location of Uganda



Note: Map created using QGIS

According to the Uganda Bureau of Statistics (2016), the prevalence of disability remains high at 14% of the population and is more common amongst women compared to men (15% vs. 10%). A study by Wandera et al. (2014) explored the prevalence and correlates of disability and identified a third of the older population in Uganda as disabled. Disability was associated with

the presence of self-reported morbidities, ageing, rural residency, dependence on remittances, as well as living alone, divorce, separation or widowhood (Wandera et al., 2014). Like many other developing countries, disability prevalence rates are rising in Uganda, due to the increasing burden of communicable and non-communicable diseases in the country; this is projected to increase substantially across all age groups by 2050 (Kett & Kidd, 2020). These predictions have implications for future policies and strategies that Uganda must put in place to understand and address the challenges and barriers that people with disabilities face.

Since 1995, Uganda has enacted several disability-friendly laws and policies supporting disability interventions. The Constitution of Uganda 1995 prohibits discrimination of any form and prescribes affirmative action in favour of marginalised groups on the basis of gender, age, or disability. This aligns with the stride towards the elimination of all forms of discrimination and violence against marginalized groups as enshrined in SDG16. In 2008, the country ratified the United Nations Convention on the Rights of Persons with Disabilities (CRPD) which emphasizes the importance of mainstreaming disability issues as an integral part of inclusive and sustainable development strategies. Despite this, people with disabilities continue to face barriers to participation as equal members of the society and experiences of human rights violations persist amidst underdeveloped social protection systems.

People with disabilities and their households face extra costs of living with a disability. A situational analysis of people with disabilities in Uganda by the Ministry of Gender, Labour and Social Development (MGLSD) shows that alongside lower living standards and functional limitations that incur productivity losses, households with disabled members spend 39% more on household expenses (including direct costs of healthcare, childcare, education and transport) than households without a disabled member (MGLSD, 2020). Moreover, a significant burden of caring for people with disabilities, in most cases, by other household members, means that they lose out on time and

earning a full income.

As regards healthcare in Uganda, Basaza (2020) cautioned that access to healthcare remains a challenge as only 1% of the Ugandan population is covered by health insurance. Women are treated as second class citizens and men are often reluctant to pay for treatment for women who are sick (Craze, 2012). Studies have shown that in many developing settings, health insurance arrangements often do not cover assistive devices or disability-related care, so people with disabilities and their families may still face challenges with associated healthcare spending and affordable access to specialist services (Palmer, 2014; Banks et al., 2019; Soltani et al., 2019; Banks et al., 2021a). Additionally, public healthcare services are expected to be free, but in many cases health workers extort money from patients in need of services and often times, facilities do not have essential drugs (Kavuma, 2009). People with disabilities and their families also experience unfair treatment such as neglect, verbal or sexual abuse while trying to access healthcare in Uganda (Mulumba et al., 2014). This is in addition to the stigma associated with disability that may lead households to hide mentally disabled members. Hence, the disadvantages of living with a disability, along with loss of economic opportunities due to stigma, discrimination, stress and social isolation, mean that people with disabilities and their families are increasingly being left behind (MGLSD, 2020).

Relatedly, the 'World Happiness Report' shows a steep increase in regional subjective wellbeing inequalities across sub-Saharan Africa (Helliwell et al., 2019). Between 2016 and 2018, Uganda ranked 136th out of 156 countries, making it one of the least happy countries across the globe and has seen a decline in wellbeing over the past decade (Helliwell et al., 2019).

This thesis introduces three independent but related studies on disability and wellbeing in the context of Uganda. It aims to contribute to the empirical research on a myriad of indicators including functional independence, labour market participation, social outcomes and the subjective wellbeing of people

with disabilities.

To the best of our knowledge, there has been no evidence to show whether, and to what extent, the provision of appropriate medical treatment would improve the life circumstances and overall level of wellbeing of people with disabilities in Uganda. This thesis fills this gap in the literature. The first and second essays exploit a unique longitudinal dataset collected during a medical intervention in Uganda which gifted orthotic devices to adults with lower limb physical disabilities. The first empirical essay (Chapter 1) evaluates the short-term health and economic impacts of the orthotic equipment intervention. With specific emphasis on differences in outcomes by gender and using a before-after estimation strategy, the analysis examines changes to functional mobility and labour market outcomes, including the type of employment and monthly earnings between 2012 and 2013. Chapter 2 extends the analysis in the first chapter to assess the long-term effects of the medical intervention between 2012 and 2018. The novelty of this research is that many studies in the disability literature have touched on prosthetics outcomes, but only a handful of studies have analysed orthotics outcomes and followed up on subjects over a long period of time. To the best of our knowledge, there is no existing empirical evidence on the determinants and implications of orthosis failure on the lives of people with disabilities. A discrete time hazard model is applied to evaluate the speed at which the provided equipment failed over time and the relationship between orthosis failure and its determinants. The study also investigates the effect of orthotics failure on life satisfaction, health-related quality of life and disability severity, which are designed to measure subjective wellbeing.

The third chapter of the thesis provides a unique complement to the first two chapters. Using cross-sectional data from the 2017 Uganda Functional Difficulties Survey and a multilevel modelling approach to account for non-independence of observations, Chapter 3 analyzes the determinants of subjective wellbeing over a large sample of disabled and non-disabled adults

and their family members. The first part of the analysis proposes that health and social-psychological markers are vital to understanding people's wellbeing. In the second part of the analysis, the intrahousehold distribution of subjective wellbeing is studied on the basis of testing the implications of communitarian versus cooperative bargaining theories of the family on wellbeing. A person's relationship to the household head is used as a proxy for intrahousehold bargaining power and included as an additional factor influencing the level of personal wellbeing in disabled and non-disabled households. Most studies exploring this relationship only consider two adults within the household, a few adults or only stratify the sample across household income status. By considering all adults within the household, this study adds new knowledge by proposing that wellbeing disparities within the family as it relates to cultural norms or the intrahousehold distribution of power can differ between disabled and non-disabled households.

The thesis is structured as follows. Chapter 1 evaluates the short term effects of a medical intervention by examining changes to functional and labour market outcomes across a sample of 150 respondents with disabilities. Chapter 2 explores the determinants of orthotic equipment failure and the implications it may have on subjective wellbeing among a sample of 591 adults with lower limb disabilities. Chapter 3 assesses a myriad of subjective wellbeing determinants over a unique sample of 13,544 Ugandan adults and their family members. Finally, a concluding section of the thesis summarizes key findings and provides disability-sensitive policy recommendations for Uganda and other developing countries in sub-Saharan Africa.

Chapter 1

The Gendered Effects of an Orthotic Equipment Intervention[1]

1.1 Introduction

To date, there has been very limited research on people with disabilities, who are often seen as a neglected part of society and forgotten in development agendas (Mitra, 2018). Using data from an orthotic intervention, we investigate the impact of providing medical equipment on the health and economic status of adults with physical disabilities. Specifically, a team led by Dr Owens provided orthotic equipment (such as callipers, crutches and shoe raises) to adults with a lower limb disability, living in Kampala, Uganda, and using responses to detailed surveys and medical assessments, this chapter measures levels and changes in mobility, employment and earnings.

This question is examined in the context of the introduction of the Sustainable Development Goals, which has put disability at the forefront of the 2030 development agenda (United Nations, 2018b). The slogan "no one to be left behind" signals a sea change in development policy that introduces the possibility of improving life outcomes for people living with disabilities. The numbers affected by disability are not negligible. The 'World Report

[1] A shorter version of this chapter has been published (Abubakar et al., 2021). Although there are no substantive differences between this chapter and the published version, this chapter includes a paragraph on the study's theoretical motivation in section 1.2 while in section 1.3, details on the variables and equipment provided during the intervention was presented. Additionally, a brief discussion of gender-disaggregated characteristics before and after the intervention, as well as estimates from the sensitivity analysis is respectively included in sections 1.4 and 1.5.

on Disability' estimates that approximately one billion (15%) of the global population suffer from a disability (WHO & World Bank, 2011), of whom 200 million (20%) experience difficulties in functioning. Of these, as many as 20 million people continue to live with the consequences of polio. According to Groce et al. (2014), vaccination campaigns only reached developing countries in late 1988, meaning millions disabled by polio are still children and young adults.

Approximately 10% of the world's population with disability live in Africa (Disabled World, 2018). Although the incidence of disability varies across the African continent, countries with a legacy of weak healthcare and conflict have a greater proportion of their populations living with disabilities. Many go untreated. Uganda stands out in this respect; the Uganda Bureau of Statistics (2016) reports that one in seven of the population is disabled (disproportionately higher among women), of whom 36% suffer from a walking disability, with polio and road traffic accidents being the leading causes. Facilities to treat are scarce with the majority of care being provided by either the National Referral Hospital in Kampala (at a cost) or scattered NGOs who have limited funding (May-Teerink, 1999). There is scant evidence documenting the life circumstances of this group of society, nor has there been any interventions to show whether, and to what extent, the provision of appropriate medical treatment would improve their condition and overall level of wellbeing. Focusing on just one aspect of disability, namely a lower limb physical disability, we address this gap in the literature.

In the analysis that follows, our approach is two-fold. First, we examine whether and the extent to which the orthotic intervention leads to any changes in mobility levels measured by objective medical tests administered by a team of doctors from the United Kingdom. Second, we investigate whether the intervention leads to an improvement in labour market outcomes, including the type of employment and monthly earnings, measured using a detailed socio-economic survey conducted by trained Ugandan enumerators overseen

by United Kingdom based economists.

The chapter is organized as follows. Section 1.2 describes the background and existing literature. Section 1.3 outlines the intervention design including the sampling approach and implementation of the intervention. Section 1.4 presents the data and descriptive statistics. Section 1.5 outlines the empirical specification and results, while in Section 1.6 we conclude.

1.2 Background

To date, studies on people with disabilities have focused on providing information on their status at a point in time and space, typically using cross-sectional household surveys. Studies have shown that living with disability undermines economic and social wellbeing. People with disabilities face higher costs of healthcare, are more likely to be poor on multiple indicators of deprivation and are more likely to be socially and politically marginalised (Groce et al., 2011; Mitra et al., 2013; Sightsavers, 2016; Mitra, 2018; United Nations, 2018b). They are also likely to have lower levels of subjective wellbeing which is exacerbated by their lower material wealth (Fafchamps & Kebede, 2012; Barazzetta et al., 2019). School-age children with disabilities are less likely to be enrolled in school (Filmer, 2008; Mizunoya et al., 2018); adults with disabilities have restricted access to employment and income-earning opportunities (Yeo & Moore, 2003); and households with members with disability are likely to be poorer than households without (Harriss-White (1996); Masset & White (2004); specific to Uganda see Hoogeveen (2005); United Nations (2018b)).

In addition, poverty and marginalization are compounded when gender and disability intersect, leading to double discrimination. While women and those with disabilities already experience grossly unfair levels of discrimination, a report by the World Health Organization finds that women with disabilities are less likely to be able to access healthcare, education and employment than men or non-disabled women (WHO, 2015). It argues that the provision of

assistive devices can neutralise the stigmatization effects of having a disability and allow this vulnerable group to actively participate in society.

It is also the case that people with disabilities face exclusion from existing poverty alleviation programmes. Evidence from the Swedish Development Agency suggests that staff have limited understanding and knowledge on how to include the interests of people with disabilities in aid projects and dialogue, which often results in people with disabilities not being considered a high priority in poverty reduction strategies (Ribohn, 2013). The World Bank (2007) reports that between 2002 and 2006 only 4% of all Bank projects, representing 5% of lending volume, had an integrated disability component. Kett et al. (2009) note that in Nigeria, policymakers and the public at large view disability issues in terms of charity and welfare, which mitigates against the social inclusion of people with disabilities within policy agendas. If this is the case, then people with disabilities are unable to benefit from poverty interventions and are more likely to remain in a vicious cycle of poverty. Parents with disabilities can lead to an inter-generational transmission of poverty. Anecdotal evidence from Africa suggests that in most cases, prolonged poverty and disability are closely related (Lwanga-Ntale & McClean, 2004). This is a concern when we consider the numbers affected.

As mentioned, figures for Uganda show that 14.3% of the population report having a disability, of which over one-third experience difficulties in physical functioning (Uganda Bureau of Statistics, 2016). A review of the database of the largest disability charity in Uganda, the Uganda National Action on Physical Disability (UNAPD), show that over 70% of its members report a lower limb disability impairing their ability to stand or walk which could be treated with prosthetic and orthotic (P&O) equipment. Assistive technology interventions are often simple to implement, facilitate functioning and allow individuals greater integration in society. In developed countries, this is a specialty with an established record. In developing countries, however, this receives little public health input and is often neglected by medical authorities

and donors. There are few P&O facilities in developing countries; production and quality of equipment are often poor; and many national governments do not see such services as a priority which has led to a lack of strategic policies (WHO, 1999).

Although the Ugandan government is among the world leaders in terms of political empowerment of people with disabilities (Yeo & Moore, 2003; Owens & Torrance, 2016), there are few government programmes for the disabled (May-Teerink, 1999). Uganda has a long history of the uneven provision of P&O services; in 2013, there were only five public clinics, with most support provided by NGOs that have lacked necessary funding, thus limiting their coverage.

Improving access to appropriate treatment for people with disabilities is a key challenge in many developing countries. In Uganda, while there is an assessment of needs (Altman, 1998) and a description of the population (Lwanga-Ntale & McClean, 2004), there is no study which provides specific evidence on the impact an assistive treatment would have on the lives of people with disabilities. The existing evidence on the impact of orthotic equipment is primarily limited to developed countries, is often fragmented, uses cross-sectional data, and rarely makes use of robust statistical techniques. The limited evidence that does exist suggests that providing orthotic equipment improves quality of life (Moraros & Hodge, 1993; Walter et al., 2004; Mauro et al., 2015). Similarly, there are very few studies which examine the effects of interventions and labour market outcomes. Systematic reviews by Tripney et al. (2015) and subsequently Sightsavers (2016) on the effects of interventions on the labour market outcomes of adults with disabilities, including those with mobility, hearing, mental and visual impairments in low- and middle-income countries (LMICs), found only 13 studies to include in their reviews. These studies find that low labour force participation comes predominately from negative attitudes and stigmatisation. There is an overarching stereotype that sees people with disabilities as not suitable for participating in the

labour market and any positive effects of labour market interventions are often negated by social attitudes and perceptions.

Addressing these notable gaps raised in the literature, we look in detail at the effect the provision of orthotic equipment has on functional mobility and labour market outcomes for people with lower limb disabilities in Kampala, Uganda. Our theoretical motivation is based on the seminal work of Becker (1964) who asserts that health, like education, can be considered a form of human capital. Building on this, Grossman (1972) argues that although individuals inherit a stock of health, which subsequently depreciates with age, they have the capacity to invest in health inputs, thereby increasing their health stock.[2] It follows from this that although changes to health stock or the level of disability can influence productivity or wages directly, these changes may also affect the ability to work. Improvements in health stock may, for example, make it easier for someone to engage in wage activities, increasing labour supply (Strauss & Thomas, 1998; Thirumurthy et al., 2008). Additionally, functional independence may also reduce the risk of discrimination people with disabilities face from employers, which may in turn increase their employability and/or wages (Jones, 2008; Rohwerder, 2018).

We acknowledge at the outset that while there is an accepted negative association between economic wellbeing and disability status, it is also the case that a poorer economic situation may also influence the level of disability by impacting on possible treatments over time. To limit this concern in our analysis, we follow the path of individual participants by considering the initial level and cause of disability to compare changes in functional mobility before and after the intervention.

[2]The health production function describes how health inputs interact to produce a level of health, and how health status changes if the health inputs used and their combinations change.

1.3 Data and Intervention

The project was initiated and led by Dr Owens (the team hereafter) in the spring of 2011 with the aim of taking unwanted and used orthotic equipment from the United Kingdom (UK) to treat people with a lower-limb disability in Uganda. The orthotic equipment, defined as externally applied mechanical devices that complement or support weakened or abnormal joints and limbs, included callipers, ankle and foot orthosis, crutches and orthotic shoes (ISO, 2020). These equipment were collected from hospitals and orthotic manufacturers in the UK before being shipped to Uganda.

The intervention took place at the Mulago National Referral Hospital, Kampala, the largest hospital in Uganda, and ran for 10 working days in both June 2012 and 2013. Directed by British orthotists, a broad selection criterion was adopted. Regardless of background, all adults aged between 15 and 65 with any type of lower limb disability were eligible for inclusion in the study. Given a focus of the study was on the economic impact of treating people with disabilities, the team included only those of working age. Potential candidates for inclusion in the intervention were decided in collaboration with a health economist from the University of Makerere and the two main disability charities in Uganda, UNAPD and the National Union of Disabled Persons in Uganda (NUDPU).

To begin, the team used a snowball sampling strategy to draw up a list of names of potential participants from the charity registers, health clinics and hospitals based in Kampala. The sample was not restricted to Kampala, however, due to the orthotists requiring specialised machinery to alter the equipment, which was only available at Mulago Hospital, the resulting sample was urban. The team randomly invited individuals for inclusion in the orthotics intervention prior to their arrival to ensure they had patients to treat.[3] On day two of the project, a radio call was made by the local Disability

[3]We cannot verify how many of those invited had up to date contact details and received the invitation. Of those invited 31% attended.

Radio Channel inviting participants. That, and subsequent word of mouth led to a daily stream of potential participants residing in Kampala and surrounding areas. All participants who arrived were assessed at triage by the medics and included in the study only if they fitted the selection criteria of being between 15 and 65 and having a lower limb disability.

In June 2012, the UK-based intervention team, with the help of local Ugandan staff, treated and surveyed the sample participants. In June 2013, the team returned. All participants were invited to have their equipment reassessed and re-adjusted where necessary, and re-surveyed.

The initial sample in June 2012 comprised of 228 adults with a lower-limb disability who were treated. In November 2012 and April 2013, the team carried out a short telephone survey to maintain contact with the sample and reduce attrition. Nevertheless, there was an attrition rate of 34%, which was largely due to a transport strike that occurred in Kampala during the follow-up visit.[4] This represents a source of potential selection bias. Indeed, one may speculate that the most disabled participants were more dependent on public transportation and thus disproportionately missed the follow-up visits. However, a balance test on the 2012 data between those who did and did not attend the follow-up shows that no significant differences exist between the baseline characteristics of the two groups (see Table A1 in the Appendix). In other words, the attrition appears to be random. Even though the final sample was somewhat reduced, it nevertheless still comprises of 150 participants for which we have baseline and follow-up information.

In terms of the equipment used, each participant received a combination of the following six types of orthoses:

i. Knee-Ankle-Foot Orthosis (KAFO): This is a long-leg orthosis that spans from the knee to the ankle of the participant to stabilise the joints and

[4]Mbale taxi drivers strike over fees by Vision Reporter (17th June 2013): Click here to access the report [Retrieved 26th Jun. 2018]. We repeatedly phoned those who missed their appointments. The overriding message was they would have attended if they could have got transport.

assist the leg muscles.

ii. Ankle-Foot Orthosis (AFO): This controls the position and motion of the ankle, compensates weakness, or corrects deformities such as foot drop.

iii. Knee-Ankle Brace: This extends above and below the knee joint to support and align the knee.

iv. Crutch and Leg Stick: This aids mobility by transferring the body weight from the legs to the upper body.

v. Shoe Raise: This is a footwear that raises the foot of the wearer and compensates for leg length discrepancy.

vi. Other Equipment: This includes miscellaneous items such as shoes, insoles, wrist splints, and heel caps.

In total, 269 pieces of equipment were given to participants as part of the intervention. This is greater than the sample size since participants often needed more than one piece of equipment (receiving two on average). We find no significant gender differences in terms of the type of equipment received (Table 1.1 on the following page).

In this study, our main results refer to the treatment as the full medical care offered to the participants. The estimated effects presented should be interpreted, therefore, as the overall effect of the intervention package, rather than the effect of a specific type of treatment. The goal of each treatment is to improve the mobility levels of each individual participant and it is the individual that we compare before and after treatment. However, as part of the sensitivity analysis that follows, we examine whether certain types of orthotic interventions are more valuable than others.

1.3.1 Variables

During the intervention, a team of enumerators administered a detailed questionnaire designed to collect information on each participant's

Table 1.1: Items Allocated

	(1) Whole Sample mean/n	(2) Men mean/n	(3) Women mean/n	(4) t-test (2)/(3) p-value
Knee-Ankle-Foot Orthosis (=1)	0.22	0.21	0.23	0.716
Knee-Ankle-Foot Orthosis (#)	(33)	(18)	(15)	
Ankle-Foot Orthosis (=1)	0.23	0.21	0.25	0.559
Ankle-Foot Orthosis (#)	(34)	(18)	(16)	
Knee-Ankle Brace (=1)	0.19	0.21	0.16	0.413
Knee-Ankle Brace (#)	(28)	(18)	(10)	
Crutches (=1)	0.44	0.45	0.42	0.702
Crutches (#)	(66)	(39)	(27)	
Shoe Raise (=1)	0.27	0.26	0.28	0.730
Shoe Raise (#)	(40)	(22)	(18)	
Other Orthotic Equipment (=1)	0.45	0.42	0.5	0.325
Other Orthotic Equipment (#)	(68)	(36)	(32)	
Observations	150	86	64	
Items allocated	269	151	118	

Note: The table shows the share and number (#) of participants receiving a type of equipment. It should be noted that the total number of items is greater than the sample size because some participants were allocated with more than one piece of equipment. Number of observations are reported in parentheses.

demographic and socio-economic characteristics including details of their labour market characteristics.[5] The medics collected a detailed medical history of each participant, which included questions relating to the nature of their impairment, the age of onset, current orthotic treatment, the frequency of falls, and the level of pain at rest and during activity. In addition, at both the baseline and during follow-up, the medics carried out the following two well established and easy to implement locomotive tests designed to assess functional mobility, the 10-metre walk test and the timed up and go (TUG) test. In what follows, we use the outcome of these two tests to assess the objective health effects of the intervention.

The *10-metre walk test* assesses gait speed in metres per second (m/s) and measures the time it takes a person to walk at a normal pace over a

[5]The individual-level survey was piloted in Kampala a week prior to the intervention when enumerators and their supervisors attended a training workshop.

short distance without assistance. To allow for acceleration and deceleration, the total distance walked is ten metres, although only walking speed for the intermediate six metres is measured (Wolf et al., 1999). Gait speed is important for community mobility, for example, crossing a street before the traffic light changes. Normal gait speed varies by age and gender but on average, a healthy male in his 40s can walk 1.46m/s and a healthy female 1.39m/s (Bohannon, 1997).

The *TUG test* measures, in seconds, the time it takes an individual to stand up from a chair, walk three metres, turn, walk back to the chair, and sit down (Podsiadlo & Richardson, 1991). No physical assistance is allowed, except for the use of a mobility aid such as a crutch. This test is a standard and reliable measure of functional performance that captures transfers, gait and turning movements. The test results are easy to interpret, with a slower time indicating a poorer functional performance and an increased risk of falls. In the analysis that follows, the TUG test is analysed both as a continuous and as a categorical variable to indicate normal versus below normal mobility levels. Scores of around 10 seconds or less indicate normal mobility. Although reported cut-off times vary from 10 to 13.5 seconds in the literature (Lusardi et al., 2017) depending on the study and sample participants, a recommended, practical cut-off, within the specialty, suggests that a TUG score of less than 12 seconds indicates normal versus below normal performance (Bischoff et al., 2003).

1.4 Summary Statistics

We start our preliminary analysis by presenting an overview of the baseline characteristics of the sample, disaggregated by gender. Table 1.2 reports mean responses and the respective standard deviations, and p-values to test the equality of the means between men and women.

The sample is 43% female, has a mean age of 41 years and just under 9 years of education (equivalent to a lower secondary education), 43% are

married, while nearly two-thirds are the household head living in a household with, on average, four other members, one of which is a child under the age of 15.

The vast majority of respondents (75%) are in some form of employment. Those in employment, work on average 52 hours per week (median 50 hours), with 63% of those in employment working more than a typical 40 hour working week. Of those employed, over three-quarters are self-employed living off profits and the rest in wage employment earning a salary. Compared to the general population, employment among the sample is casual and low skilled. The small number of men in wage employment work as storekeepers, office attendants or iron benders,[6] and women as secretaries, cleaners or waitresses. Self-employed men are typically laundrymen, gadget-menders or cobblers, while females are often street vendors, tailors or hairdressers. If we consider employment in the Kampala area for people without disabilities with a similar level of education, we find our sample fares worse in terms of job market opportunities. An average Ugandan with a similar level of education living in the same area would be engaged in low-skilled jobs such as transport workers, domestic helpers, agricultural, shop and market salespersons, with these generally considered to be more stable forms of employment (Uganda National Panel Survey, 2012; Uganda Bureau of Statistics, 2013).

Median earnings are also low, averaging around 100,000 UGX per month (mean earnings are 300,000 UGX), which equates to approximately US$40 per month. This is half the median earnings of the general population which according to the Uganda National Panel Survey (2012), were 209,000 UGX (with mean earnings of 320,000 UGX). The 26% of the sample that are in wage employment earn significantly more than those in self-employment. This holds for men and women. Comparing men and women across employment type, although numbers are small, and not statistically significant, women in

[6]Iron bending involves bending reinforcement bars to required angles in civil and construction engineering; usually performed on a construction site. Manual bar bending involves strenuous upper body physical activity.

Table 1.2: Demographic and Socio-economic Characteristics

Variables	(1) Whole Sample mean/sd	(2) Men mean/sd	(3) Women mean/sd	(4) t-test (2)/(3) p-value
Demographic Characteristics:				
Age (years)	40.56	42.09	38.5	0.088
	(12.78)	(13.43)	(11.62)	
Schooling (years)	8.89	8.94	8.83	0.871
	(3.81)	(3.65)	(4.03)	
Marital Status:				
Single (=1)	0.21	0.16	0.28	0.081
	(0.41)	(0.37)	(0.45)	
Married (=1)	0.43	0.57	0.25	0.000
	(0.50)	(0.50)	(0.44)	
Divorced (=1)	0.15	0.09	0.22	0.031
	(0.35)	(0.29)	(0.42)	
Widowed (=1)	0.13	0.07	0.2	0.015
	(0.33)	(0.26)	(0.41)	
Cohabiting (=1)	0.08	0.1	0.05	0.200
	(0.27)	(0.31)	(0.21)	
Household Characteristics:				
Lives alone (=1)	0.09	0.13	0.03	0.038
	(0.28)	(0.34)	(0.18)	
Household head (=1)	0.65	0.71	0.56	0.064
	(0.48)	(0.46)	(0.50)	
Household size	4.85	4.85	4.84	0.989
	(2.28)	(2.34)	(2.21)	
At least one dependent child (=1)	0.53	0.57	0.48	0.303
	(0.50)	(0.50)	(0.50)	
No. of dependent children	1.33	1.56	1.03	0.043
	(1.58)	(1.72)	(1.33)	
No. of other adults in household in employment	0.85	0.72	1.02	0.110
	(1.12)	(0.93)	(1.32)	
Labour Market Outcomes:				
Employed (=1)	0.75	0.8	0.67	0.070
	(0.44)	(0.40)	(0.47)	
Hours worked (per week)	51.71	49.07	55.95	0.104
	(21.79)	(20.62)	(23.16)	
Worked more than 40 hours per week (=1)	0.63	0.59	0.7	0.273
	(0.48)	(0.49)	(0.46)	
Monthly median earnings (in 000s of UGX)	100	150	100	0.501
	(841)	(1037)	(340)	
Wage employment:				
Wage employment (=1)	0.26	0.23	0.3	0.412
	(0.44)	(0.43)	(0.46)	
Monthly median wages (in 000s of UGX)	211	199	300	0.198
	(335)	(298)	(384)	
Self-employment:				
Self-employment (=1)	0.76	0.78	0.72	0.462
	(0.43)	(0.42)	(0.45)	
Monthly median profits (in 000s of UGX)	60	80	40	0.013
	(810)	(1018)	(190)	
Observations	150	86	64	

Note: UGX= Ugandan Shillings. Earnings are in 2011 prices. Monthly median earnings = median wages + median profits from self-employment. Pearson's chi-squared test is used to test the null hypothesis that median values differ between the two groups. Monthly earnings and profits from self-employment are conditional on employment in paid and self-employment, respectively. The proportion in wage and self-employment adds up to more than one because some participants had both a wage and self-employed job. Standard deviations are reported in parentheses.

wage employment earn more than men, and in self-employment less. These results are driven by the types of jobs. The few women in wage employment are engaged in relatively skilled jobs compared to their male counterparts.

Although few significant differences exist between men and women in terms of their baseline employment and schooling characteristics, there are differences in marital status and household characteristics. Here, we find that 57% of men are married compared to only 25% of women, while women are also less likely to have children. In a developing country setting where children are often viewed as an insurance mechanism to protect livelihoods in times of crisis and old age, this adds to the vulnerability these women face. This might reflect the fact that women are still seen as the primary caregivers within a household, and as such, are responsible for many labour-intensive tasks that those with a disability may find difficult to complete, making them less likely to marry and have children. The share of divorcees and widows is also higher among women. Such marital shocks often make women more vulnerable to economic hardships and social stigma (Djuikom & van de Walle, 2018). Although the majority of women are not married, only 3% live alone compared to 13% of men.

To place this description of our dataset in context, in Table A2 in the Appendix, we compare the baseline characteristics of our sample with the Uganda National Panel Survey (2012), a nationally representative sample of households in Uganda. As expected, we find our sample was significantly less educated and more likely to be self-employed than the Uganda National Panel Survey sample.

Finally, we present the past medical history of the sample, disaggregated by gender (Table 1.3). The main source of disability for the sample is polio (62%), with other sources including road traffic accidents (11%) and cerebral diseases (9%). Other conditions (15%) such as osteoarthritis, birth defects and osteomyelitis are also reported, although none individually constitute more than 4% of the total dataset. The majority of those with polio became disabled

during childhood (around 4 years of age), while for the other groups, the onset of disability was much later (around 25 years).

Table 1.3: Medical History

Variables	(1) Whole Sample mean/sd	(2) Men mean/sd	(3) Women mean/sd	(4) t-test (2)/(3) p-value
Polio (=1)	0.62	0.6	0.64	0.656
	(0.49)	(0.49)	(0.48)	
Road traffic accident (=1)	0.11	0.16	0.05	0.027
	(0.32)	(0.37)	(0.21)	
Bone related (=1)	0.03	0.02	0.03	0.766
	(0.16)	(0.15)	(0.18)	
Cerebral (e.g. stroke) (=1)	0.09	0.09	0.08	0.75
	(0.28)	(0.29)	(0.27)	
Other conditions (e.g. hip infection) (=1)	0.15	0.12	0.2	0.146
	(0.36)	(0.32)	(0.41)	
Age at onset of disability (years) - Polio	3.78	3.15	4.59	0.151
	(4.76)	(2.20)	(6.70)	
Age at onset of disability (years) - Non-polio	24.67	25.22	23.86	0.782
	(17.44)	(15.99)	(19.71)	
Health at baseline:				
10-metre walk test (m/s)	0.58	0.61	0.55	0.07
	(0.21)	(0.20)	(0.23)	
TUG test (seconds)	13.89	12.73	15.31	0.147
	(10.49)	(5.50)	(14.40)	
Mobility: Normal (=1 if TUG<=12)	0.57	0.55	0.6	0.539
	(0.50)	(0.50)	(0.49)	
Fear of falling (=1)	0.69	0.71	0.67	0.626
	(0.46)	(0.46)	(0.47)	
No. of falls in the past month	1.74	1.88	1.55	0.568
	(3.51)	(3.70)	(3.26)	
Had at least one fall in the past month (=1)	0.35	0.36	0.33	0.683
	(0.48)	(0.48)	(0.47)	
Pain (=1)	0.7	0.65	0.77	0.132
	(0.46)	(0.48)	(0.43)	
Pain at rest (0-10)	1.54	1.48	1.61	0.75
	(2.44)	(2.38)	(2.54)	
Pain during activity (0-10)	4.23	3.8	4.8	0.072
	(3.25)	(3.38)	(3.01)	
Seen a doctor/nurse in the last year (=1)	0.48	0.41	0.57	0.064
	(0.50)	(0.49)	(0.50)	
Current equipment: KAFO/calliper (=1)	0.18	0.21	0.14	0.282
	(0.39)	(0.41)	(0.35)	
Current equipment: Crutches (=1)	0.26	0.27	0.25	0.811
	(0.44)	(0.45)	(0.44)	
Current equipment: Stick/pole (=1)	0.21	0.26	0.14	0.086
	(0.41)	(0.44)	(0.35)	
Current equipment: Other (e.g. shoes) (=1)	0.03	0.01	0.05	0.187
	(0.16)	(0.11)	(0.21)	
Current equipment: None (=1)	0.33	0.26	0.42	0.032
	(0.47)	(0.44)	(0.50)	
Observations	150	86	64	150

Note: TUG=Timed Up and Go. For the 10-metre walk and TUG tests, the summary statistics are based on the sample of 145 and 141 individuals who were able to perform the respective tests in 2012. Standard deviations are reported in parentheses.

In terms of the 10-metre walk test, the average gait speed is 0.58m/s, which

is very slow when compared to a healthy adult whose gait speed averages 1.43m/s (Bohannon, 1997). Similarly, they take just under 14 seconds to complete the TUG test, and as such, 43% of the sample are classified as having extremely poor mobility levels. In addition, nearly two-thirds of the sample report a fear of falling, 35% report at least one fall in the past month (with an average of two falls in the past month). Around two-thirds also report pain, especially while moving. Despite this, visits to see a doctor or nurse are rare, only 48% report that they have seen a health professional in the past year.

By gender, we find that there is almost an even occurrence of polio, bone related and cerebral conditions. However, men are more likely to have been involved in a road accident and women are marginally more likely to report a variety of other conditions. In terms of mobility, there is a significant difference in the 10-metre walk test between men and women (walking speed for women is only 0.55m/s compared to 0.66m/s for males); they also perform the TUG test in a slower time than men (although this difference is only significant at the 15% level). Women also experience more pain than men and are more likely to have visited a medical practitioner in the previous year.

In terms of mobility aids, only a small proportion of the sample uses any form of orthotic equipment (for example, KAFOs or callipers) with the majority relying on rudimentary aids (for example, poles/sticks or wooden crutches). A significant proportion, especially women, had no equipment, highlighting the need for interventions of this kind.

A similar table on key characteristics before and after treatment is reported for the sample, disaggregated by gender (see Table A3 in the Appendix). We find that the share of men whose functional mobility is reported as normal in 2013 increased by 15 percentage points from 2012, while women experienced no significant change. Although more women were initially in the normal category range in 2012 in terms of TUG, by 2013 this had reversed. An increase in the fear of falls and degree of pain was more prominent among women than men which could partly work against functional mobility and active participation

in society.[7] For other outcome variables, namely, employment characteristics, at the mean, we find little change.

These descriptive statistics not only paint a picture of a sample with extreme mobility problems, but they also highlight significant variations in mobility levels between participants. Many of those who had been disabled for longer (often due to polio) had developed their own style of moving: from walking with a simple wooden pole, curling their damaged leg around the pole; to those struggling with heavy wooden crutches; to crawling. For many, years of using poorly fitted, heavy equipment, or having no equipment at all, has led to additional medical complaints, including, for example, curvature of the spine, due to the way they had adapted their gait to account for their disability. With this in mind, we now turn to examine the effect the medical intervention has had on two key outcomes: functional mobility and participation in the labour market.

1.5 Empirical Strategy

Given the nature of the intervention, and the relatively short interval between treatment and follow-up, in the analysis that follows, we estimate the effects of the intervention by means of a before-after estimator, which consists of a comparison in outcomes between baseline and follow-up scores. The key idea of this estimator, therefore, is to use pre-intervention data of treated patients as a counterfactual outcome for what would have happened in the absence of the intervention. Formally, let us consider a regression model with a fixed effect error structure as follows:

$$\begin{aligned} Y_{it} = \alpha + \beta_0 T_{it} + \beta_1 (T_{it} * female_{it}) + \beta_2 (T_{it} * polio_{it}) \\ + \beta_3 (T_{it} * female_{it} * polio_{it}) + f_i + v_{it} \end{aligned} \tag{1.1}$$

[7] For instance, during data collection, one of the female participants complained that during raining season, she rarely goes to work due to a fear of falls. This highlights the need to build in follow-up care during medical intervention planning and implementation.

where Y_{it} is the outcome of interest for individual i at time t ($t = 0, 1$). T_{it} is an indicator variable that takes the value 0 at baseline (i.e. at $t = 0$) and 1 after the intervention has taken place (i.e. at $t = 1$). Further $female_{it}$ is a dummy variable that takes the value 1 if the respondent is female (and is 0 otherwise) and $polio_{it}$ is a dummy variable that takes 1 if the respondent has polio (and is 0 otherwise). The coefficients then measure the effect the intervention has on different sub-groups. Finally, f_i is an unobservable individual-specific time-invariant effect that does not vary over time, while υ_{it} is an independent and identically distributed error term.

The before-after estimator suffers from two potential drawbacks, referred to in the literature as 'history' and 'maturation' (Cook et al., 2002). The former suggests that events other than the intervention may have occurred during the period of interest, which might then contribute to the differences in outcomes between baseline and follow-up. Although macroeconomic events might have non-ignorable effects on labour market outcomes, we argue that the time period that elapsed is unlikely to have been long enough to see significant changes in the economy, and the period 2012 to 2013 was one of macroeconomic stability. Furthermore, figures from the International Labour Organization (ILOSTAT database) suggest that the labour force participation rate was virtually constant at a rounded 70% in both years.

The second potential drawback, maturation, refers to the concern that the differences we observe may be the result of ageing rather than the intervention itself, although since the follow-up is only one year later, this is unlikely to be the case. Despite this, if anything, ageing and maturation should have a negative effect on our outcome measures and hence, the coefficients we present in this study should, at the very least, be a lower bound of the true causal effect of the intervention. In consultation with the medics at the design of the project, the decision was made to identify a disability that would be comparable across individuals and over time. Given the length of time participants had been disabled, it is unlikely that their impairment would have worsened during the

intervening year. Since the follow-up was only one year later, we argue that any difference in outcomes we observe is due to the intervention, rather than any other factor.

1.5.1 Results

Table 1.4 reports the before-after estimates of the effect the intervention has on our measures of functional mobility. In Panel A, we examine how the effects of the intervention varies by gender, while Panel B estimates the full model as outlined in equation (1.1). Columns 1 and 2 of each panel examine changes in gait speed and the TUG score, respectively, while in column 3, we look at changes in mobility status (1 if normal mobility, 0 otherwise).

Table 1.4: Impacts on Health Outcomes - Before-After Estimates

	(1) 10-metre walk	(2) TUG	(3) Mobility: Normal
Panel A:			
Treatment	0.000	-1.290**	0.173***
	(0.024)	(0.583)	(0.061)
Treatment*Female	-0.075**	3.549***	-0.260***
	(0.032)	(1.134)	(0.080)
Panel B:			
Treatment	0.082*	-3.286***	0.367***
	(0.042)	(0.965)	(0.101)
Treatment*Female	-0.167***	4.877***	-0.567***
	(0.055)	(1.594)	(0.136)
Treatment*Polio	-0.133***	3.326***	-0.322**
	(0.049)	(1.172)	(0.124)
Treatment*Female*Polio	0.149**	-2.306	0.496***
	(0.066)	(2.183)	(0.165)
Observations	138	133	133

Note: Results are for the sample of participants with valid health measures in both waves. Similar results hold when we use the same sample for all columns. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Overall, noticeable differences exist between men and women in terms of the effect the intervention has on mobility levels. Panel A, column 1 shows that for men, the intervention has little effect on gait speed, measured by the 10-metre walk test, however, column 2 shows that they performed the TUG

test 1.3 seconds faster than in the previous year, which leads to an increase in the proportion of men whose mobility levels are now 'normal' (column 3). In contrast, for women, regardless of the measure used, the intervention has a negative effect on mobility levels; it reduces gait speed by 0.08 m/s, increases the time taken to complete the TUG test by 2.3 seconds, leading to a decrease in the number of women with normal mobility levels.

Investigating these effects further, we examine how the intervention varies by both gender and disability in Panel B. Now the results show that for men, the main beneficiaries of the intervention are those without polio. For this group, the intervention increases gait speed by 0.08 m/s, reduces the time taken to complete the TUG test by 3.3 seconds and has a positive effect on mobility levels. In comparison, for those with polio, although the intervention improves gait speed, it has little effect on their TUG score, while a much smaller proportion experience an improvement in their overall level of mobility. Similar differences hold for women, although now what we are observing is a larger deterioration in health outcomes for those with polio than without.

These findings may reflect differences in the ease with which participants were able to adapt to their new equipment, suggesting a need for follow-up physiotherapy care in future interventions of this kind. The extent of this need was not foreseen by the medics during the design of the intervention (nor would it have been possible to provide follow-up care given the budget). Indeed, for some, the equipment may have required significant physical adaptation to use effectively, making muscle strength important. If this is the case, then the greater upper body strength of men may have made it easier for them to adapt to their new equipment, while the lack of follow-up care may have meant that the women were unable to overcome years of weak power to adapt effectively. In addition, those who had been disabled for longer, usually due to polio, had often developed their own particular gait, making adjustment to the new equipment more difficult, at least initially.

Further support for this can be found in Table A4 in the Appendix where

we document changes in mobility disaggregated by the five main equipment changes. For men with polio, we find that although those who were fitted with complex orthosis for the first time experience a deterioration in mobility, TUG levels have improved for those who received rudimentary aids for the first time or had their existing complex orthosis readjusted or replaced. In other words, although the speed of adjustment to complex devices may be slow, it appears that those with polio will eventually adapt to wearing their new equipment. For men without polio, adjustment is much easier. Here, the beneficial effects are greatest for those who were fitted with complex orthosis for the first time and those who had their existing devices readjusted or replaced. For women, regardless of the nature of their disability, it is those who receive complex orthosis for the first time that experience an improvement in mobility, as reflected in their TUG score.

Next, we present the before-after estimates of the impact the intervention had on labour market outcomes (Table 1.5). In column 1, we examine changes in employment status (1 if employed, 0 otherwise) for the whole sample. In columns 2 to 5, we explore changes in labour market outcomes for those who were employed in both waves, including changes to real earnings (column 2), wage or self-employment status (columns 3 and 4, respectively) and jobs (column 5). The results suggest that although the intervention has no significant effect on the level of employment, column 2 shows that for those already in employment, it has a positive effect on earnings.[8]

[8]In the Appendix, Table A5 reports estimates of logged earnings which mimics these findings. Additionally, Figure A1 depicts a graphical representation of monthly earnings distributions for men and women, before and after the intervention. The changes in the distribution for male participants shows that more men moved to higher levels of earnings after the intervention with a slight expansion upwards and rightwards. Hence, after the intervention, the distribution for men is less skewed and more peaked indicating a significant improvement in earnings. A similar pattern is observed for women, but earnings have increased to a lesser extent than for men. Accordingly, it is the case that high earning females remained where they were, while for those at the bottom of the distribution, although some see an improvement, a handful see a slight decrease.

Table 1.5: Impacts on Labour Market Outcomes - Before-After Estimates

	(1) Employment	(2) Monthly earnings (in 000s)	(3) Wage employment	(4) Self-employment	(5) Job change
Treatment	-0.035	1.359**	0.103*	-0.086	0.121***
	(0.051)	(0.574)	(0.059)	(0.062)	(0.043)
Treatment*Female	0.066	-1.170*	-0.155**	0.189**	0.008
	(0.071)	(0.632)	(0.069)	(0.079)	(0.069)
Observations	150	97	97	97	97

Note: Results in columns 2 to 5 are for the sample of participants who were employed in both waves. In this specification, we do not include a dummy for whether the participant had polio because it was not statistically significant. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

For men, this arises because the intervention leads to a switch in employment from self- to wage employment, while a significant proportion also change job (but not sector of employment). Indeed, further analysis shows that it is those men who enter wage employment (from self-) that experience the biggest increase in earnings, followed by those who switched to a new wage-employed job.[9] As before, the results for women are more muted; monthly earnings increase although the overall effect is smaller than for men (column 2). Although it appears that the intervention leads to a switch from wage to self-employment, further investigation revealed that only four women influence this outcome, two of which now have a job in both sectors.

It should, however, be noted that a preference for self-employment among women was strong in both waves. In 2012, around 92% of females reported that they would like their own business, compared to 69% of men, while in 2013, reported figures were 83% versus 77%, respectively. As already mentioned, since women are still the primary caregivers within a household, they are often time poor. Self-employment therefore offers them a higher degree of flexibility, providing them with an opportunity to strike a balance between labour market and household tasks. Moreover, since those in self-employment usually work from home,[10] it saves them from the difficulties associated with travelling to work, and offers other benefits that wage employment may not be able to provide, for instance, the flexibility to take time off when ill. As found in the

[9] These results are not reported here but are available upon request.

[10] Over half of women reported that they resided where their business was located, while the remaining half had on average a five-minute walk to work.

literature, gendered motivations for self-employment differ considerably, while men are likely driven by higher potential returns, women often want flexibility aimed at a better work-life balance (Simoes et al., 2016).

Again, we find evidence that some of the differences in labour market outcomes that we observe can be explained by the changes in equipment that occurred because of the intervention. In line with our previous findings, Table A6 in the Appendix provides tentative evidence that it is those men who had their existing devices readjusted or replaced that see the biggest increase in earnings. In contrast, for women, it is those who switched to having rudimentary aids for the first time or had their pre-existing devices replaced that see the largest rise in earnings.

1.5.2 Sensitivity Analysis

A limitation of our approach is that it assumes that all participants make full use of the equipment provided to them. As already mentioned, since the team was unable to provide regular check-ups to adjust and maintain the equipment, issues with fitting are likely to have occurred. As part of the follow-up interviews, participants were asked to document the extent to which this was the case, including any problems that they faced (reported in Table A7 in the Appendix). Reassuringly, usage was high; 57% of participants used their equipment every day, with just over two-thirds using the equipment at least once a week. The most frequent reason for not using the equipment was that it had broken (35%), although other reasons included poor fitting (18%), sores or pain due to the equipment (18%), lost or stolen equipment (8%), or that usual activities took longer with the equipment (6%). Although few significant differences exist between men and women in terms of reasons for not using the equipment, a notable exception was that 35% of women reported that their orthosis was poorly fitted, compared to only 4% of men, once again highlighting the need for follow-up care, especially among female respondents.

To illustrate further, Table 1.6 shows the evolution of two participants

(#177 and #77) during the intervention. It shows that participant #177 used the equipment a few times per month, while #77 was unable to use the equipment because it had broken. Before being treated, participant #177 performed the TUG and 10-metres walk tests in over 21 seconds and 0.5m/s, respectively and reported monthly earnings of 70,000 UGX while in self-employment.

Table 1.6: Evolution of Two Participants

Respondent ID	Outcomes	2012	2013	Change
#177	Used equipment		**Yes**	
	TUG (s)	21	8	↓ of 13
	10-metres walk (m/s)	0.5	0.8	↑ of 0.3
	Earnings (in 000s of UGX)	70	350	↑ of 280
#77	Used equipment		**No**	
	TUG (s)	9	9	↔ of 0
	10-metres walk (m/s)	0.6	0.7	↑ of 0.1
	Earnings (in 000s of UGX)	40	40	↔ of 0

One year after the intervention, having used the equipment more often, this individual showed important improvements in the outcomes of interest; specifically, performing the TUG and 10-metres walk tests much faster, in only 8 seconds and 0.8m/s respectively, while monthly earnings increased to 350,000 UGX. On the other hand, although participant #77 performed the initial TUG and 10-metre walk tests in a much quicker time of 9 seconds and 0.6m/s respectively, one year later, and not having used the equipment, this individual's key outcome remained virtually unchanged.

This illustration is insightful and shows that the extent to which participants used their equipment needs to be accounted for in the analysis. Given that some individuals did not or could not comply with using the equipment, what we have estimated in the previous sub-section, in the language of the treatment effects literature, is an intention to treat (ITT) effect rather than the average treatment effect on the treated (ATT).

In the spirit of Bloom (1984), to account for this potential issue and estimate the effect of the intervention on those who used the equipment (ATT),

we use the Wald estimator. To do this, we define a dummy indicator D_i that takes a value of one for participants who used the equipment at least once a week; then, the average treatment effect on the treated, denoted α_{ATT}, can be estimated using the Wald estimator as follows:

$$\alpha_{ATT} = \frac{E(Y_{i,t+1} - Y_{i,t})}{\Pr(D_i = 1)} \tag{1.2}$$

As equation (1.2) shows, the main idea behind the Wald estimator is to rescale the intervention effects estimated above (the ITTs) by the fraction of participants who used the equipment on a regular basis (the ATTs). Therefore, Table 1.7 reports that overall, 68% of participants used their equipment at least once a week, and intensity of use was similar for both men and women.

Table 1.7: Equipment Usage

	(1) Whole Sample	(2) Men	(3) Women
$Pr(D_i = 1)$	0.680***	0.686***	0.672***
	(0.038)	(0.050)	(0.059)
Observations	150	86	64

Note: The table shows the proportion of treated participants who used the equipment provided during the intervention at least once a week. Robust standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

The Wald estimates for the health and labour market outcomes are presented in Tables 1.8 and 1.9, respectively. Both sets of results reinforce our previous findings. They show that the estimated coefficients are larger in magnitude once we account for the frequency with which the equipment was used. Table 1.8 indicates that those without polio record an improvement of 0.12m/s and 5 seconds in the 10-metre walk and TUG tests, respectively. In contrast, for women, especially those without polio, the magnitude of the detrimental effects is now much smaller. This implies that for those that adapted well to their new equipment, consistent use of the orthosis essentially pays off.

Additionally, labour market outcomes in Table 1.9 show that for men,

monthly earnings increase by 2,074 UGX when we rescale the intervention effects by the intensity of use. We observe a 16% increase in the likelihood of male participants switching to wage-paid jobs, while 18% are also more likely to change jobs following the intervention. Similarly, women benefit from the intervention in terms of the effect it has on their earnings, increasing them by 1,037 UGX.

Finally, we acknowledge there may be bias in who showed up for treatment. We found that those in wage employment were more likely to show up in the second week, no doubt having to rearrange work commitments. Analysis done by week of treatment does not alter the findings. What we find is the intervention worked best for those who had previously not received treatment. We argue that given we are considering a participant before and after treatment the concern of endogeneity is less of an issue than if we were looking across participants.

Table 1.8: Impacts on Health Outcomes – Wald Estimates

	(1) 10-metre walk	(2) TUG	(3) Mobility: Normal
Panel A:			
Treatment	0.001	-1.861**	0.250***
	(0.034)	(0.850)	(0.092)
Treatment* Female	-0.075**	3.543***	-0.259***
	(0.031)	(1.126)	(0.082)
Panel B:			
Treatment	0.118*	-4.694***	0.524***
	(0.062)	(1.496)	(0.156)
Treatment*Female	-0.165***	4.642***	-0.540***
	(0.056)	(1.659)	(0.151)
Treatment*Polio	-0.132***	3.274**	-0.316**
	(0.050)	(1.263)	(0.138)
Treatment*Female*Polio	0.147**	-1.97	0.458**
	(0.067)	(2.221)	(0.183)
Observations	138	133	133

Note: Results are for the sample of participants with valid health measures in both waves. Similar results hold when we use the same sample for all columns. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.9: Impacts on Labour Market Outcomes – Wald Estimates

	(1) Employment	(2) Monthly earnings (in 000s)	(3) Wage employment	(4) Self-employment	(5) Job change
Treatment	-0.051	2.074**	0.158*	-0.132	0.184***
	(0.075)	(0.889)	(0.090)	(0.094)	(0.066)
Treatment*Female	0.065	-1.087*	-0.148**	0.184**	0.015
	(0.071)	(0.639)	(0.068)	(0.077)	(0.071)
Observations	150	97	97	97	97

Note: Results in columns 2 to 5 are for the sample of participants who were employed in both waves. In this specification, we do not include a dummy for whether the participant had polio because it was not statistically significant. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

1.6 Discussion and Conclusion

This chapter uses data from a unique medical intervention to evaluate the health and economic implications of providing orthotic devices to adults with lower limb disabilities in Uganda, a developing country where the prevalence of disability is high.

For a sample drawn from Kampala and surrounding areas, the results provide evidence of improved functional mobility following the intervention, although the beneficial effects are noticeably stronger for men than women. One year after treatment, men exhibit an improvement in their level of mobility, while women face little change or in some cases, a reduction in their functional performance.

Investigating these effects further, we find that the intervention works better for some groups. For men, it is those without polio that see the biggest improvement in their mobility levels, particularly those who received orthosis for the first time or who had their existing orthotic equipment adjusted or replaced, compared to those who arrived using very rudimentary equipment. In contrast, the beneficial effects are much weaker for those with polio, who had typically been disabled since childhood. For women, regardless of the length of the disability, it is those who received orthotic equipment for the first time that experience an improvement in mobility.

In the absence of empirical literature on the effects of orthotic interventions and gender differences, we draw from studies on prosthetics. The gender

difference we find in health outcomes resonates with this literature: women are more likely to experience pain (Gallagher et al., 2001; Wen et al., 2018), they experience more difficulty in fitting of equipment (Singh et al., 2008), and more difficulty in strenuous physical activities (Hirsh et al., 2010; da Silva et al., 2011; Wen et al., 2018).

With respect to labour market outcomes, the intervention leads to an increase in monthly earnings. For men, this arises, at least in part, due to a transition from self- to wage employment, although a significant proportion also change job (but not sector of employment). For women, the results are less pronounced. Monthly earnings increase although the overall effect is much smaller than for men, perhaps reflecting their poorer outcomes in terms of mobility, but also the additional barriers to accessing appropriate employment they are still likely to face.

Altogether, this study shows that even with a small urban sample, our empirical findings provide compelling evidence that this type of medical intervention can have positive effects on the life outcomes of adults with lower limb disabilities. These results echo previous studies in the literature reporting the connection between health and labour market outcomes (Grossman, 1972; Strauss & Thomas, 1998; Thirumurthy et al., 2008; Mitra, 2018) and should encourage further research in this area, including interventions in rural areas.

Despite this, we show that even within this specific category of people with disabilities, namely, those with lower limb disabilities, women benefited less from the intervention than men. The women in the sample faced difficulties because of both their disability and their gender; similar to men with disabilities, they have limited socio-economic opportunities, yet they are also less likely to be married and have fewer children and therefore have less of a support network. Perhaps any positive effects of the intervention have been negated by social attitudes and perceptions, a finding of Tripney et al. (2015), which may have been more pertinent to women than men.

One particular finding relevant for future interventions concerns the speed

with which participants adapted to using the equipment. Women were more likely to experience higher levels of pain than men and were more likely to complain of poor fitting. It follows from this that more targeted help in adapting to equipment through physiotherapy, especially for women, is clearly required to ensure that they benefit from interventions of this type. We also find that women would be more likely to benefit from disability- and family-friendly employment opportunities in order to bridge both gender and disability related inequalities. Currently they rely on self-employment to bridge this gap with its lower earning potential. Changes to wage employment conditions that mimic the flexibility of self-employment would be beneficial for women with disabilities.

Overall, the policy implication of our findings is that timely health interventions can have an impact on mobility and employment opportunities. Those with a recent onset of disability fared better in terms of both mobility and labour market outcomes, suggesting that more prompt interventions can have a significant impact. The more immediate the intervention, the less likely people adapt to their disability, and the less likely there is an accumulation in disadvantages, whether that be adapting their gait or being out of the labour market for an extended period (or having never entered the market).

Appendix A

Additional Tables and Figures for Chapter 1

Table A1: Baseline Characteristics - Attrited versus Non-Attrited

Variables	(1) Attrited mean/sd	(2) Non-Attrited mean/sd	(3) t-test (1)/(2) p-value
Demographic Characteristics:			
Female (=1)	0.42	0.43	0.959
	(0.50)	(0.50)	
Age	39.24	40.56	0.483
	(13.75)	(12.78)	
Schooling (years)	8.95	8.89	0.933
	(4.34)	(3.81)	
Single (=1)	0.29	0.21	0.190
	(0.46)	(0.41)	
Married (=1)	0.47	0.43	0.558
	(0.50)	(0.50)	
Divorced (=1)	0.13	0.15	0.700
	(0.34)	(0.35)	
Widowed (=1)	0.06	0.13	0.110
	(0.25)	(0.33)	
Cohabiting (=1)	0.04	0.08	0.185
	(0.19)	(0.27)	
Household Characteristics:			
Lives alone (=1)	0.06	0.09	0.534
	(0.25)	(0.28)	
Household head (=1)	0.59	0.65	0.406
	(0.50)	(0.48)	
Household size	5.24	4.85	0.225
	(2.36)	(2.28)	
No. of dependent children	1.21	1.33	0.546
	(1.48)	(1.58)	
At least one dependent child (=1)	0.53	0.53	0.913
	(0.50)	(0.50)	
No. of other adults in the household in employment	0.96	0.85	0.533
	(1.41)	(1.12)	
Medical History:			
Polio (=1)	0.68	0.62	0.372
	(0.47)	(0.49)	

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Table A1 – continued from previous page

Variables	(1) Attrited mean/sd	(2) Non-Attrited mean/sd	t-test (1)/(2) p-value
Age at onset of disability (years) - Polio	4.94	3.78	0.387
	(8.80)	(4.76)	
Age at onset of disability (years) - Non-polio	21.2	24.67	0.399
	(16.56)	(17.44)	
10-metres walk (m/s)	0.58	0.58	0.922
	(0.22)	(0.21)	
TUG test (seconds)	13.61	13.89	0.832
	(8.14)	(10.49)	
Mobility: Normal (=1 if TUG<=12s)	0.59	0.57	0.813
	(0.50)	(0.50)	
Fear of falling (=1)	0.71	0.69	0.855
	(0.46)	(0.46)	
No. of falls in the past month	1.74	1.74	0.997
	(3.69)	(3.51)	
Had at least one fall in the past month (=1)	0.33	0.35	0.841
	(0.47)	(0.48)	
Pain (=1)	0.69	0.7	0.905
	(0.46)	(0.46)	
Pain at rest (0-10)	1.55	1.54	0.964
	(2.54)	(2.44)	
Pain during activity (0-10)	4.24	4.23	0.981
	(3.04)	(3.25)	
Seen doctor/nurse in the last year (=1)	0.45	0.48	0.731
	(0.50)	(0.50)	
Items allocated:			
Knee-Ankle-Foot Orthosis (=1)	0.17	0.22	0.343
	[13]	[33]	
Ankle-Foot Orthosis (=1)	0.31	0.23	0.184
	[24]	[34]	
Knee-Ankle Brace (=1)	0.21	0.19	0.739
	[16]	[28]	
Crutches (=1)	0.41	0.44	0.669
	[32]	[66]	
Shoe Raise (=1)	0.27	0.27	0.967
	[21]	[40]	
Other Equipment (=1)	0.4	0.45	0.421
	[31]	[68]	
Labour Market Outcomes:			
Employed (=1)	0.68	0.75	0.296
	(0.47)	(0.44)	
Hours worked (per week)	49.47	51.71	0.553
	(22.96)	(21.79)	
Worked more than 40 hours per week (=1)	0.6	0.63	0.713
	(0.49)	(0.48)	
Monthly median earnings (in 000s of UGX)	150	100	0.334
	(630.43)	(840.85)	
Wage employment:			
Wage-employment (=1)	0.28	0.26	0.749
	(0.45)	(0.44)	
Monthly median wages (in 000s of UGX)	220	211	0.750
	(259.48)	(334.81)	
Self-employment:			

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Table A1 – continued from previous page

Variables	(1) Attrited mean/sd	(2) Non-Attrited mean/sd	t-test (1)/(2) p-value
Self-employment (=1)	0.72	0.76	0.575
	(0.45)	(0.43)	
Monthly median profits (in 000s of UGX)	50	60	0.655
	(638.77)	(810.22)	
Observations	78	150	

Note: TUG=Timed Up and Go; UGX= Ugandan Shillings. Statistics for earnings and employment type are for the sample of employed workers only. The proportion in wage and self-employment adds up to more than one because some participants had both a wage and self-employed job. Pearson's chi-squared test is used to test the null hypothesis that median values differ between the two groups. Monthly median earnings = median wages + median profits from self-employment. Standard deviation is in parenthesis. Number of items allocated is in square brackets.

Figure A1: Kernel Density Functions of Real Earnings (log) - Before and After



Note: The displayed graph is for the sample of employed participants in both waves

Table A2: Summary Statistics - UDS versus UNPS

Variables	(1) UDS mean/sd	(2) UNPS mean/sd	(3) t-test (1)/(2) p-value
Demographic Characteristics:			
Female (=1)	0.43	0.52	0.049
	(0.50)	(0.50)	
Age (years)	40.56	29.83	0.000
	(12.78)	(13.55)	
Schooling (years)	8.89	10.45	0.001
	(3.81)	(5.17)	
Single (=1)	0.21	0.49	0.000
	(0.41)	(0.50)	
Married (=1)	0.43	0.4	0.464
	(0.50)	(0.49)	
Divorced (=1)	0.15	0.06	0.000
	(0.35)	(0.24)	
Widowed (=1)	0.13	0.04	0.000
	(0.33)	(0.19)	
Household Characteristics:			
Lives alone (=1)	0.09	0.02	0.000
	(0.28)	(0.14)	
Household head (=1)	0.65	0.3	0.000
	(0.48)	(0.46)	
Household size	4.85	6.57	0.000
	(2.28)	(3.70)	
At least one dependent child (=1)	0.53	0.66	0.004
	(0.50)	(0.48)	
No. of dependent children	1.33	1.78	0.005
	(1.58)	(1.79)	
No. of other adults in household in employment	0.85	2.55	0.000
	(1.12)	(1.85)	
Labour Market Outcomes:			
Employed (=1)	0.75	0.52	0.000
	(0.44)	(0.50)	
Hours worked (per week)	51.71	43.74	0.007
	(21.79)	(28.37)	
Worked more than 40 hours per week (=1)	0.63	0.58	0.325
	(0.48)	(0.49)	
Monthly median earnings (in 000s of UGX)	100	209	0.005
	(841)	(437)	
Wage employment:			
Wage employment (=1)	0.26	0.56	0.000
	(0.44)	(0.50)	
Monthly median wages (in 000s of UGX)	211	209	0.733
	(335)	(436)	
Self-employment:			
Self-employment (=1)	0.76	0.52	0.000
	(0.43)	(0.50)	
Monthly median profits (in 000s of UGX)	60	200	0.008
	(810)	(358)	
Observations	150	691	

Table A3: Key Summary Statistics Before and After - Disaggregated by Gender

	(1)	(2)	(3)	(4)	(5)	(6)
	Men			Women		
Variables	2012 mean/sd	2013 mean/sd	t-test (1)/(2) p-value	2012 mean/sd	2013 mean/sd	t-test (4)/(5) p-value
Health Outcomes:						
10-metre walk test (m/s)	1.86	1.88	0.878	2.43	2.64	0.527
TUG test (seconds)	12.73	11.85	0.309	15.31	15.96	0.787
Mobility: Normal (=1 if TUG<=12)	0.55	0.70	0.061	0.6	0.53	0.391
Pain at rest (0-10)	1.48	3.5	0.000	1.61	3.58	0.001
Pain during activity (0-10)	3.8	5.61	0.001	4.8	5.63	0.155
Fear of falling (=1)	0.71	0.72	0.867	0.67	0.92	0.000
No. of falls in the past month	1.88	1.2	0.131	1.55	1.52	0.956
Labour Market Outcomes:						
Employed (=1)	0.8	0.77	0.580	0.67	0.7	0.706
Wage-employed (=1)	0.23	0.33	0.193	0.3	0.27	0.715
Self-employed (=1)	0.78	0.71	0.349	0.72	0.8	0.390
Hours worked (per week)	49.07	47.11	0.646	55.95	46.22	0.067
Worked more than 40 hours per week (=1)	0.59	0.56	0.695	0.70	0.58	0.247
Monthly mean earnings (in 000s of UGX)	351.75	370.06	0.900	216.4	244.99	0.688
Observations	86	86	172	64	64	128

Note: The table reports key indicators before and after the intervention. It should be noted that the number of observations is slightly lower for the 10-metre walk (138 observations); TUG and Mobility: Normal (133 observations). Similar summary statistics hold if the sample is restricted to the smaller sample. Earnings are in 2011 prices. Monthly earnings and profits from self-employment are conditional on employment in paid and self-employment, respectively.

Table A4: Changes in Mobility - Disaggregated by Equipment

	(1)	(2)	(3)	(4)	(5)
	None to basic	None to complex	Basic to basic	Basic to complex	Complex to complex
	mean	mean	mean	mean	mean
Men:					
10-metre walk					
Polio	-0.06	-0.04	-0.07	-0.06	-0.03
Non-polio	-0.15	0.12	0.17	0.09	0.08
TUG					
Polio	-0.98	0.14	1.21	0.90	-1.31
Non-polio	2.21	-3.74	-3.91	-4.50	-3.63
Mobility: Normal					
Polio	0.20	-0.13	0.09	0.00	0.08
Non-polio	0.00	0.67	0.38	0.33	0.67
Women:					
10-metre walk					
Polio	0.00	-0.08	-0.02	-0.09	-0.10
Non-polio	-0.07	-0.06	-0.17	-0.01	-0.20
TUG					
Polio	1.51	-0.04	0.64	2.47	7.81
Non-polio	1.75	6.56	1.05	-2.76	5.40
Mobility: Normal					
Polio	0.14	-0.10	0.00	-0.10	0.00
Non-polio	-0.20	0.00	-0.20	-0.20	-1.00
Observations	22	25	29	38	25

Note: Basic= rudimentary aids such as crutches, shoe raises and other basic aids; Complex= actual orthoses such as knee-ankle-foot orthoses, ankle-foot orthoses and knee-ankle braces.

Table A5: Before-After Estimates – Change in Earnings

	Monthly ln(earnings)
Treatment	2.385***
	(0.038)
Treatment*Female	-0.086*
	(0.046)
Observations	97

Table A6: Changes in Labour Market Outcomes - Disaggregated by Equipment

	(1) None to basic mean	(2) None to complex mean	(3) Basic to basic mean	(4) Basic to complex mean	(5) Complex to complex mean
Men:					
Employment	0.00	0.00	0.10	-0.08	-0.17
Monthly earnings (in 000s)	0.03	-0.28	0.90	2.36	2.90
Wage employment	0.22	0.13	0.33	0.00	-0.18
Self-employment	-0.22	-0.13	-0.33	0.00	0.27
Job change	0.22	0.13	0.00	0.13	0.18
Women:				0.13	
Employment	0.08	-0.07	-0.11	0.11	0.11
Monthly earnings (in 000s)	1.06	0.08	0.62	-0.65	0.54
Wage employment	-0.17	-0.11	0.00	0.00	0.00
Self-employment	0.50	0.11	0.00	0.00	0.00
Job change	0.00	0.22	0.17	0.18	0.00
Observations	22	27	30	44	27

Table A7: Intensity of Equipment Usage

	(1) Whole Sample mean	(2) Men mean	(3) Women mean	(4) t-test (2)/(3) p-value
Intensity of use:				
Every day (=1)	0.57	0.58	0.56	0.801
	(85)	(49)	(36)	
A few times per week (=1)	0.09	0.10	0.09	0.976
	(14)	(8)	(6)	
Once per week (=1)	0.02	0.02	0.02	0.728
	(3)	(2)	(1)	
A few times per month (=1)	0.09	0.07	0.11	0.423
	(13)	(6)	(7)	
A few times since June (=1)	0.20	0.20	0.19	0.823
	(29)	(17)	(12)	
Never (=1)	0.03	0.02	0.03	0.784
	(4)	(2)	(2)	
Why equipment not used daily:				
Pain (=1)	0.18	0.19	0.17	0.872
	(9)	(5)	(4)	
Poor fitting (=1)	0.18	0.04	0.35	0.005
	(9)	(1)	(8)	
Broken (=1)	0.35	0.46	0.22	0.076
	(17)	(12)	(5)	
No longer have the equipment (=1)	0.08	0.12	0.04	0.369
	(4)	(3)	(1)	
Used for certain activities (=1)	0.08	0.08	0.09	0.901
	(4)	(2)	(2)	
Tiring (=1)	0.06	0.04	0.09	0.490
	(3)	(1)	(2)	
Health improved (=1)	0.06	0.08	0.04	0.635
	(3)	(2)	(1)	
Observations	148	84	64	

Note: The table presents mean responses on how often participants use their orthotic equipment and why some participants do not use it daily. Number of responses are in parentheses. Two participants did not answer the question on intensity of use.

Chapter 2

The Long Term Effects of a Medical Intervention: Determinants and Implications of Orthotic Equipment Failure

2.1 Introduction

The pioneering "World Report on Disability" estimates that approximately one billion (15%) of the global population suffer from a disability, of whom 200 million experience difficulties in functioning (WHO & World Bank, 2011). The report also estimates that 80% of this vulnerable group reside in low-income countries (LICs hereafter) with numbers expected to rise in the coming years due to ageing populations and the global increase in chronic health conditions. Yet, national data assessing the needs and unmet needs of rehabilitation services (including mobility devices) have been found to be inadequate in developing countries (WHO, 2011). The most recent data for LICs estimates that 30 million people with disabilities require assistive devices, with only 5-15% having their needs met (WHO, 2018).

For those whose needs have been met, there is scant evidence on the success of rehabilitative interventions. While evidence surrounding prosthetic interventions in developed countries are well documented, there is limited empirical evidence on orthotics and prosthetics (O&P) outcomes in developing countries. In particular, there is a lack of substantive evidence able to

inform intervention decisions regarding what works best and for whom and the potential factors that may influence the sustainability of orthoses in the long-term. This paper intends to fill this gap. We conduct a six-year orthosis survival analysis among 591 Ugandan adults with lower limb disabilities. The paper's broad objective is to examine and identify the potential factors influencing the success and failure of an intervention that provided orthotic equipment to adults with disabilities.

In previous research, we examined the immediate, short-term effects of the intervention among a sample of 150 respondents (see Chapter 1).[1] Our findings provided evidence of improved functional mobility following the intervention, although the beneficial effects were noticeably stronger for men than women. Twelve months after treatment, men exhibited an improvement in their level of mobility, while women faced little change or in some cases a reduction in their functional performance. Likewise, we found that those with polio fared less well with their devices compared to those with non-polio-related disabilities. We suspect that this had to do with the differences in the speed at which the participants adapted to the use of their orthotic devices.

One area of concern in the limited literature on outcomes is how patients receiving O&P equipment fare over time. Despite the need for and importance of assistive devices and recent progress in service provision, the average equipment failure rate in the past three decades has hovered around 30% (Scherer, 2014). Not using an assistive device implies that the number of functionally dependent people with disabilities will continue to increase. Hence, the Uganda Disability Project instigated follow up surveys to gather data on intensity of use, and possible reasons for failing to use the equipment,

[1]Note that Chapter 1 explored a two-period balanced panel of those who attended the baseline and follow-up intervention waves in June 2012 and June 2013, respectively. However, the current chapter now includes all respondents who were ever treated by the UK-based intervention team in June 2012, irrespective of whether they attended or did not attend the June 2013 intervention wave (n=228); it also includes an additional sample of 179 individuals who were treated for the first time by the UK-based team in June 2013; and finally, it incorporates a sample of 184 individuals who were treated by a team of local orthotists in 2012, which brings the total sample of those treated during the Uganda Disability Project up to 591 individuals.

namely, pain, discomfort, poor fitting, breakage and general wear and tear. In resurveying participants in November 2012, April 2013, June 2013, June 2016 and June 2018, the project followed a trajectory of those who continued to use the devices and the reasons why others abandoned them. In doing so, this chapter addresses a growing concern in the intervention literature, namely, that most trials or clinical studies have relatively short follow-up periods, with, in many cases, the event of interest not occurring before the end of the study for many subjects (Davies et al., 2013). There is growing recognition that after an intervention, it is imperative to track subjects over a longer period to support, sustain and improve adaptation to the intervention which may considerably improve longer-term outcomes. By studying long term outcomes, we can identify mechanisms that link use with sustainability and highlight specific risk factors leading to failures in implementation.

The determinants of the long-term outcome of a medical intervention can be multifaceted, including: patient-specific factors such as age, gender and subjective wellbeing; clinical factors such as the type and length of the diagnosis i.e., whether the disability is acquired (traumatic) or congenital; the type of treatment that has been prescribed or administered; and whether the patient was able to access follow up care in the interim. It is also the case that differences in skills and expertise of healthcare (orthopaedic) personnel in administering an intervention can partly influence outcomes (Guldemond et al., 2005; Sexton et al., 2012; WHO, 2013b). In high-income countries, the notion that more highly trained professionals will provide better quality services seems well accepted (Forghany et al., 2018). Forghany et al. (2018) argued that compromises might have to be made in LICs depending on the balance between the clinical need and the resources available. Moreover, the skill-mix between foreign versus local orthotists in fitting foreign-made orthoses can differ. Knowing whether this holds for our sample is crucial in informing decisions regarding the implementation and effectiveness of a medical intervention while ensuring scalability and sustainability through

fostering community engagement and more local service delivery.

Our approach to the analysis is twofold. First, we examine the determinants of both the use of the equipment and the subsequent speed at which the orthotic equipment failed. Second, we analyse the implications of equipment failure on subjective wellbeing. Six years after the intervention, the analysis finds that 37% of respondents were still using their orthotic equipment and it takes an average participant 4.8 years of orthotic equipment usage. Findings indicate that women, the elderly and those who have had access to follow-up care have a lower likelihood of early device failure compared to their respective counterparts. We also find fitting by foreign or local orthotists did not impact on outcomes which is reassuring in terms of scalability. With respect to wellbeing, the analysis reveals that access to follow up care reduces disability severity, while failure of the orthosis induces a reduction in life satisfaction, health-related quality of life, and functional efficiency (or an increase in disability severity).

The chapter is organized as follows. Section 2.2 describes the background and existing literature. The conceptual framework guiding the analysis is explained in Section 2.3. Section 2.4 gives a brief overview of the intervention and data collection protocols. In Sections 2.5 and 2.6, we outline the methodological specifications and descriptive analysis, respectively. A discussion of our main findings and robustness checks is presented in Section 2.7, while in Section 2.8, we conclude.

2.2 Literature Review

2.2.1 Determinants and Impacts of Rehabilitative Care

To date, studies on healthcare utilization among people with disabilities have mostly focussed on the determinants of health seeking behaviour or the utilization of physical rehabilitation services (Elrod & DeJong, 2008; Moscoso-Porras & Alvarado, 2018). For those who have received rehabilitative

care, this literature review explores the determinants of continued use of care as it relates to orthotics and prosthetics (O&P), and its ramifications on health and wellbeing outcomes.

Inadequate local staff capacity has been identified as one of the barriers to providing O&P services in developing countries. In their qualitative study of the experiences of O&P services in Sierra Leone from local staff's perspective, Magnusson & Ahlström (2012) found that local staff felt a sense of inability to deliver high-quality O&P services and therefore assistance from stakeholders was considered necessary, alongside training more O&P staff to ensure quality healthcare service delivery. Although it is presumed that service quality is dependent on the effect of practitioner education and training, evidence to establish whether levels of training and education in O&P services have an effect on service quality or on the health outcomes of those using the service is non-existent (Forghany et al., 2018). Therefore, it is unclear whether tailoring pre-service education towards the required standards of service provision can have any precise effect on the quality of service delivery.

Learning to live with a lower limb disability and to use assistive devices in daily life activities demands good physical, as well as cognitive capacities (Spruit-van Eijk et al., 2012; Lee & Costello, 2018). Factors including age, gender, education, cultural beliefs and more subjective traits such as satisfaction with the assistive device and motivation are found to be equally important (Geertzen, 2008; Hussain, 2011). Moreover, lack of transport and the inability of persons with disabilities living in rural areas to afford transportation and pay for services affects access to rehabilitative care (Van Rooy et al., 2012).

While there is little evidence surrounding orthotics, data relating to prosthetics by Nunes et al. (2014) found that being female, less educated and having long-term illnesses are risk indicators associated with difficulty in adaptation to the prosthesis and the use of rehabilitative care among 149 patients in Brazil. Hence, these adults may need a considerable time to adapt

to the use of their assistive devices, in which many of them only are fairly successful. Moreover, Nair et al. (2008) used retrospective data on 173 English adults with disabilities over 10 years and found that being young as well as having traumatic-related causes of disability were significant factors linked to experiences of prosthetic episodes (failure). Therefore, to better understand and accommodate adults with disability who may need long-term follow up care to adapt to their assistive devices, there is the need to further explore the determinants of orthotics failure especially in the context of developing countries.

Assistive devices unsuited for the topographical and cultural (social and attitudinal) contexts of LICs are strongly linked to poor patient outcomes including dissatisfaction and limited participation in meaningful activities (Mulholland et al., 1998; Matsen, 1999; Van Brakel et al., 2010). Mulholland et al. (1998) used an exploratory case study approach to assess the functional needs of ten women with lower limb disabilities in Gujarat, India. The results indicated that environmental barriers were commonly encountered as the terrain was diverse and sometimes unpredictable. The authors concluded that it is imperative to explore mobility alternatives that will ensure an individual's full participation in life activities. Similarly, Van Brakel et al. (2010) found that Vietnamese amputees living in wet terrains were less likely to use their prosthesis frequently than those living in other environments. Therefore, the environment should be considered in choosing the type of prosthesis, type of foot and in the training provided to users.

In exploring how personal and environmental factors influence the activity and participation of lower-limb prosthetic users in LICs, Kam et al. (2015) qualitatively stressed the importance of follow-up care, outdoor environment, user comfort, aesthetics and durability in the provision of prosthetics in promoting activity and participation.[2] Through additional research, a deeper

[2]Activity and participation include but are not limited to functionality, interpersonal interactions, communication, learning, mobility and self-care (WHO, 2013a).

understanding of the contextual factors associated with a patient's involvement in meaningful activities post-rehabilitation can be investigated.

There is also a literature that links personality types with medical outcomes (Michal et al., 2011; Friedman et al., 2013; Nolan et al., 2019). Depending on the type of healthcare sought by individuals, openness to experience, conscientiousness, agreeableness, and neuroticism are associated with long-term healthcare use in the US (Friedman et al., 2013), while in Ireland only openness to experience was found as significantly linked with preventative healthcare use (Nolan et al., 2019). Moreover, Khosravinasr (2017) found that only agreeable and extroverted personalities were significant predictors of assistive technology usage among respondents with disabilities in the US. With respect to wellbeing, evidence from Korea suggests that people high in extraversion, openness to experience and agreeableness experience higher levels of life satisfaction (HAN, 2020); while in Nigeria, people who are less neurotic and highly conscientious, extroverted or agreeable are more likely to be satisfied with life (Abdullahi et al., 2020). This foreshadows the presence of significant variations in the effects of personality types on outcomes across cultures and contexts (Vittersø, 2001; Geertzen, 2008; Abdullahi et al., 2020).

The use of O&Ps is found to be highly beneficial on the functional outcomes of adults with lower limb disabilities in developing countries (Magnusson & Ahlström (2017) in Sierra Leone and Malawi, Arifin et al. (2017) in Malaysia, Järnhammer et al. (2018) in Nepal, and Abubakar et al. (2021) in Uganda); while a handful of studies have analogously underscored the positive effects of O&Ps on the quality of life of adults with physical disabilities (Gailey et al., 2010; Sexton et al., 2012; Davie-Smith et al., 2017; Magnusson et al., 2019; Shankar et al., 2020). Yet, none of these studies assess sustainability and long-term functional use post-treatment, which is essential in sustaining the overall quality of life of these individuals.

For example, a cross-sectional study by Gailey et al. (2010) compared

prosthetic device use on the functional outcomes of two combat-related groups: 178 veterans from the Vietnam war with over 38 years of experience with prosthetics use and 172 servicemembers from the Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) conflicts who were fairly new (average of 3 years) to prosthetics. Although the OIF/OEF group were still adjusting to their limb loss and were early in the rehabilitation process, they had higher quality of life and better functional abilities than their veteran counterparts because the former had more advanced prosthesis and had higher rates of prostheses prescriptions than the latter during the first year post-limb loss. In addition, the authors found that the average prostheses replacement times were longer for the veterans (60% replaced every 3–5 years) than the OIF/OEF group (92% replaced within 2 years). This could be driven by the differences in prosthetics use between the two groups and the fact that the veterans were significantly older, had more age-related health issues and had poorer functional abilities than their OIF/OEF counterparts. The authors emphasized the importance of appropriate assistive devices to ensure better functional outcomes and higher quality of life of this group.

Contrary to Gailey's findings, Shankar et al. (2020) studied the effects of prosthetic rehabilitation on quality of life among lower limb amputees in India and found that time since amputation positively affected quality of life. They also found that those who already had prostheses were marginally more likely to have higher quality of life than new amputees without prostheses. Similarly, a systematic study by Davie-Smith et al. (2017) concluded that being able to walk with a prosthesis is crucial to improving quality of life, however, factors such as being male, ageing, time since amputation, level of social support and the presence of comorbidities adversely affected quality of life. Hence, to better understand and improve the wellbeing of this vulnerable group, there is a need for more prospective longitudinal studies with standardised outcome measures which can examine possible changes in quality of life over time. Another study by Magnusson et al. (2019) used cross-sectional data to

compare the quality of life of 155 O&P users with disability and 122 individuals without disability. They found that despite rehabilitation services, people with physical disability experienced lower quality of life especially those with irregular or no income, those living in urban slums, and those that have no formal education. The authors suggested that these individuals need to be prioritized in health, rehabilitation, and development programmes to further improve their wellbeing.

2.2.2 Rehabilitative Care in Uganda

Uganda's population is over 41 million, with a GNI per capita of US$1,370 and a relatively low level of health expenditure (7.2% as a proportion of GDP).[3] The Uganda Bureau of Statistics (2016) noted that although significant improvements in life expectancy and infant mortality rates have been recorded recently, the prevalence of disability remains high (1 in every 7 persons – approximately 36% of these have a walking disability) with gender disparities revealing that disability prevalence is higher among women (15%) compared to men (10%). These individuals are vulnerable by virtue of their impairment, they face challenges ranging from a lack of access to appropriate equipment and associated support services, to social isolation and negative societal attitudes (Owens & Torrance, 2016; Kenney et al., 2019).

Uganda has 72 districts with only 19 O&P service centres dispersed across the country, hence the country's current O&P service appears to be struggling; it is significantly under-resourced in terms of facilities, supply chains as well as coordinating efforts to facilitate prescriptions and repairs (Sexton et al., 2012). Moreover, specialised components and materials are imported, often at a high cost (Sexton et al., 2012). Despite this, orthopaedic technologists in Uganda are an extremely capable and multi-skilled group and there is genuine enthusiasm to see services improve (Kenney et al., 2019). Moreover, Sexton et al. (2012) acknowledged that the International Society for Prosthetics and

[3] 2016 statistics retrieved from https://www.who.int/countries/uga/en/. Retrieved 4th Jul. 2021.

Orthotics (ISPO) has been successful in training personnel to improve O&P services for persons with physical disabilities in Uganda.

O&Ps budgets are often inadequate and reliance on donations is common (Sexton et al., 2012; Kenney et al., 2019). Costs vary with the type of disability. Lower limb assistive devices may cost up to US$400 (Kenney et al., 2019), which is significantly more than the average monthly Ugandan household income of US$133.[4] A descriptive cross-sectional study conducted among a sample of 318 people with physical disabilities in Kawempe division of Kampala reported that only 26% of participants utilized rehabilitation services (Zziwa et al., 2019). Notable factors associated with service utilization included age, socioeconomic status, level of education and awareness of the participants about these services. In a region with poor transport infrastructure like Acholi in Northern Uganda, the average distance from a patient's home to a referral hospital is 91 kilometres with less than 1% of patients being formally referred to rehabilitation services (Okello et al., 2019). Consequently, this highlights the need to address the constraints to sustainable rehabilitative care access and use in Uganda.

2.2.3 Orthotics and Prosthetics Survival Analysis[5]

To the best of our knowledge, only a handful of researchers have explored the determinants of O&P outcomes in developing countries. What papers are available have tended to focus on prosthetics and have used linear regression-based approaches. Jensen et al. (2004) conducted a study on 320 patients who were fitted with Jaipur-technology prostheses in Uganda, Honduras and India. Of the total sample, the authors followed up on 172

[4]Equivalent to 500,000 UGX (Uganda Bureau of Statistics, 2017).

[5]Survival analysis has had a long-standing in many areas such as Economics, Engineering and Biomedicine. This type of approach is appealing due to its simplicity, nonparametric nature, and clear robustness in the presence of censoring. In the area of labour economics, for instance, employment or even firm durations are treated as survival times and analysed accordingly (Heckman & Singer, 1986; Kiefer, 1988; Lancaster, 1990; Holmes et al., 2010; Bridges et al., 2018; Milner et al., 2018). Similarly, in the field of education, survival analysis has been used to examine when students with disabilities graduated high school and how graduation patterns differed for students based on selected demographic and educational factors (Schifter, 2016).

patients after a median of 35 (11-81) months. They recorded a cumulative failure rate of 71% over the study period; 1 in 4 patients needed a new component or part within the first 36 months post-fitting. The prostheses had failed after a median of 22 (2-47) months which was due to a high incidence of poor fitting. Being young, longer hours of daily use, barefoot walking, and higher user intensity significantly influenced the incidence of prosthetics failure. Also, the authors mentioned that despite high prosthesis satisfaction and compliance rates, it did not live up to the benchmark standard of prosthetic service provision due to discomfort and walking distances less than 1 kilometre. In the hot and humid climate of Uganda, the authors added that over half of subjects had dismissed the use of a soft liner, which aggravated pain, discomfort and partly worked against survival rates.

In Sierra Leone and Malawi, Magnusson & Ahlström (2017) used linear regression analyses on a cross-sectional sample of 222 participants. They found that within 22 months post-rehabilitation, 86% of assistive devices were in use but over half of these needed repair. Hence, access to repairs and follow-up services were the most important aspects of assistive service provision to participants in the study contexts. Also, the majority of participants had experienced high levels of pain alongside difficulty walking on uneven surfaces and on stairs; therefore improvements to adaptable, low-cost technology in LICs need to be made.

Recent research in developed countries have used long term follow up and survivorship analyses to investigate lower limb prosthesis failure, time to revision (i.e., prosthesis removal or replacements), as well as other treatment relapses. A majority of these studies focus specifically on total knee or hip replacements and amputations as it relates to prostheses (Rand et al., 2003; Bordini et al., 2007; Ritter, 2009; Julin et al., 2010; Culliford et al., 2013; Kamrad et al., 2015; Bayliss et al., 2017).[6] For example, a study in the US

[6]Usually, participants' time to prostheses failure or revision are treated like survival times and analysed accordingly.

found that prosthetic survivorship was 78% at twenty years post-surgery with women, the elderly and those with inflammatory arthritis being more likely to have higher prosthetics survival rates (Rand et al., 2003).[7] Consequently, developing targeted models of care and innovations could optimise functional outcomes as well as facilitate the allocation of healthcare resources more efficiently.

Despite the consideration of context-specific requirements and the use of local resources, the provision of appropriate assistive services in LICs is still limited and fraught with challenges. With prosthetics, the literature shows that these are significant problems needing attention. Our previous findings with orthotics also reached the same conclusion. The use of O&Ps in developing countries is not well documented in the literature. Existing evidence is usually descriptive, cross-sectional, short-term, and the sample size is usually small. Moreover, participants included in these studies mostly acquired their disabilities through trauma, with people having congenital-related disabilities seldomly analysed. To the best of our knowledge, we have not found any empirical evidence that investigates the survival of lower limb orthoses in a developing context; even in developed countries, the majority of evidence that exists focuses on prosthetics. Addressing this notable gap in the literature, this study aims to assess the potential determinants of orthotic equipment use and its implications on wellbeing using a unique sample of 591 adults with lower limb disabilities in Uganda.

To implement this, we use a discrete time hazard model to describe the process that leads to failure.[8] We explore this by linking equipment use and

[7] An earlier study found that prosthesis survival rate was 67% at 10 years among a sample of 82 patients in the US (Malawer & Chou, 1995). Given the sample size, the authors could not detect age, diagnosis and gender as distinguishing factors affecting survival rates but devices fitted in the proximal part of the tibia had lower likelihood of survival. A more recent paper quantified the use of prosthetics among 201 individuals with lower limb amputation in Australia between 4 to 12-months post-discharge (Roffman et al., 2014). The risk factors for non-use had nothing to do with personal characteristics, instead, amputation above the transtibial level and the use of basic mobility aids such as crutches were the most common determinants of early prosthetics non-use.

[8] This approach permits obtaining an unbiased estimate of the conditional probability of failure (the failure probability profile) in a particular year, conditional on the participant not

its failure to gender, age, marital status, the type and length of impairment, the type of equipment received and a proxy capturing access to follow up care. More importantly, we test whether scalability and sustainability holds by comparing orthotic equipment failure between treatment given by the foreign versus local team of orthotists. Furthermore, an extended analysis investigates the potential determinants of subjective wellbeing as measured by life satisfaction, health-related quality of life and the severity of disability. Ultimately, O&P maintenance programmes are expensive (Narang & Jape, 1982; Hoaglund et al., 1983); hence, it is imperative to monitor O&P outcomes through recurring analysis to inform effective, efficient and sustainable policy decisions. We turn now to presenting a framework for modelling orthotic device outcomes.

2.3 Conceptual Framework

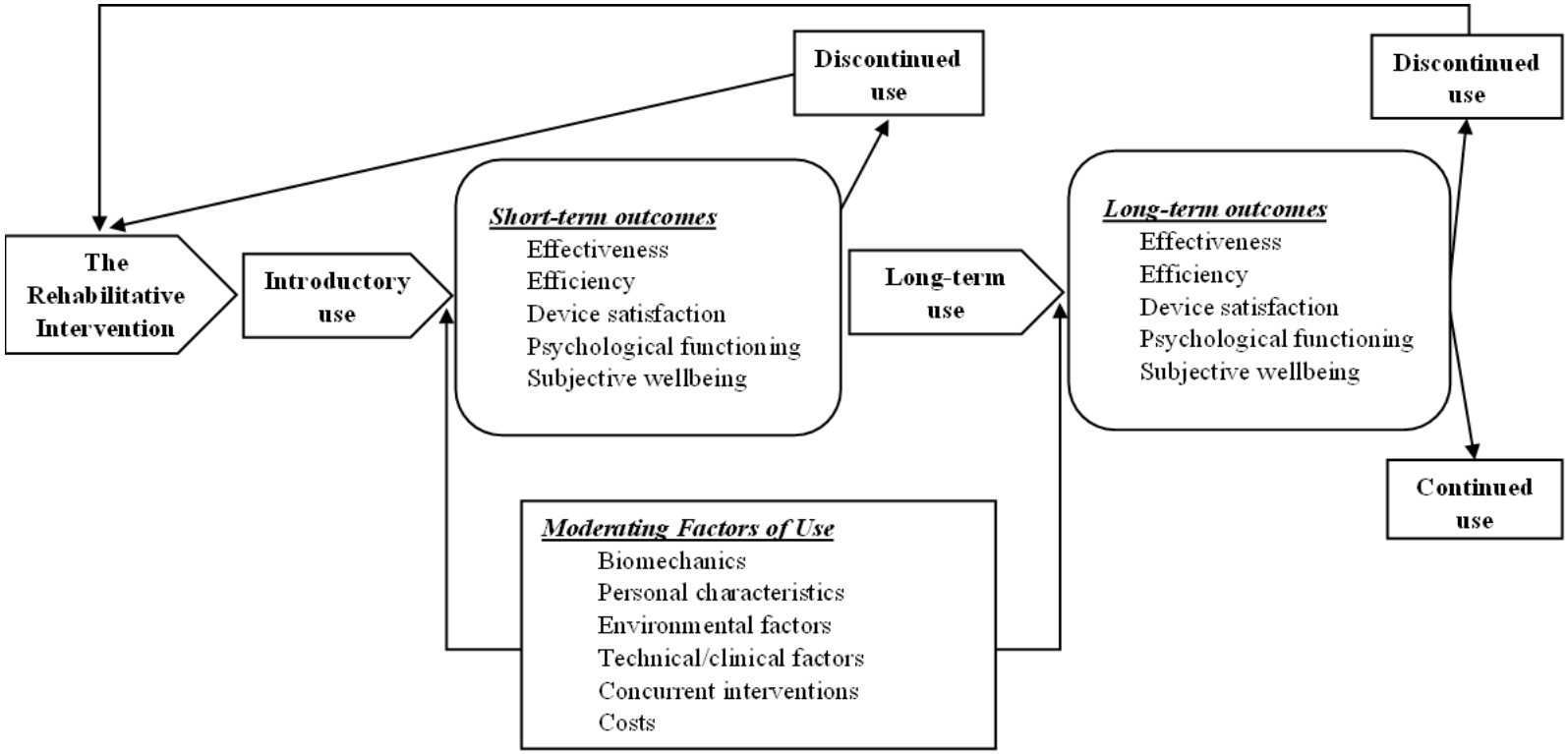
An important framework for the conceptual modelling of Assistive Technology Device (ATD) outcomes was proposed by Fuhrer et al. (2003), which has the potential to facilitate the development of device-specific causal models and contribute to developing ATD outcomes research agenda, for example, researching the manner and duration of device usage.

Adapting Fuhrer's framework to orthosis, Figure 2.1 illustrates a starting point when an individual receives a rehabilitative intervention (i.e., fitted with an orthosis). There is an introductory phase such that the patient begins to familiarize themselves with using the equipment. This leads to a range of short-term outcomes, for example, effects on functional mobility, adaptability, or subjective wellbeing which occur as an interaction between introductory use and an array of moderating co-factors such as biomechanics (body functions and structure), personal factors (e.g., age, gender), environmental (e.g., terrain, activities and participation, stereotypes, stigma or embarrassment),

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having failed or been censored from the dataset previously, while accounting for unobserved heterogeneity.

Figure 2.1: The Conceptual Modelling of ATD Outcomes.



Source: Adapted and modified from Fuhrer et al. (2003).

technical/clinical factors (e.g., diagnosis, access to follow up care, presence of comorbidities), concurrent interventions (e.g., alternatives to current devices or assistance from others), and cost implications. This interaction eventually leads to either discontinued use or long-term use such that the long-term outcomes and the interactions of usage with various moderating factors mimic those of the short-term phase.

Subsequently, Lenker & Paquet (2004) proposed a user-focussed approach that predicts device usage as a function of the perceived relative advantages of the device. The authors proposed that the primary outcome could be device usage (e.g., duration of use) while secondary outcomes resulting from ATD use are impacts on usability (e.g., reasons for non-use) and quality of life (e.g., life satisfaction, health-related quality of life, and severity of disability).

Hence the predictive model begins with a person's opportunity to use an ATD, such that a person perceives a prior relative benefit (or drawback) of the ATD in terms of impacts on secondary outcomes (Appendix Figure B1). The perceived relative advantage, as it bears on the completion of meaningful tasks, creates an intention to use the device, which is in turn, moderated by an array of contextual factors. The resultant ATD use or non-use engender impacts on secondary outcomes. The perceived advantages of ATD use are then evaluated against the perceived benefits of alternative options, which in turn, yields a perception of relative advantage, expressed in terms of impacts on secondary outcomes; this influences future ATD use intentions. Hence the use of assistive devices is a decision process recurring over time and is influenced by the utility of concurrent interventions. Lenker & Paquet (2004) suggest that further validation of this framework will require studies in which sample characteristics and treatment are clearly described, so that their influence as outcome modifiers can be interpreted within the context of the model.

As a schema commonly found in the health science literature, the conceptual framework for evaluating assistive device outcomes can be understood as resulting from the interaction of the characteristics of the device,

its users and their environment. The next section describes the Uganda Disability Project and data used for the analysis.

2.4 Data and Intervention

In June 2012, a team led by Dr Owens embarked on a unique orthotic equipment intervention in Kampala, Uganda.[9] Between 2012 and 2013, the Uganda Disability Project fitted orthotic devices to approximately 591 adults with lower limb disabilities, administered a detailed socio-economic questionnaire and health assessment before and after the intervention; followed up with telephone interviews at four-month intervals between 2012 and 2013; and then in 2016 and 2018. Thus, the intervention team has created a detailed panel dataset from which they tracked the success of the intervention over time.[10] As previously mentioned, participants were seen either once or twice during the intervention, of which 69% (n=407) were treated by the UK-based intervention team while the remaining 184 participants were treated by the local Ugandan team of orthotists.

In terms of items allocated during the intervention, Table B1 in the Appendix shows that the types of orthoses received by the participants were knee–ankle–foot orthosis (KAFO; 18%), ankle–foot orthosis (AFO; 15%), knee-ankle brace: (12%), crutches (20%), and other orthoses such as shoes, insoles and shoe raises, splints, corsets, heel and kneecaps (34%). In what follows, we classify the first three types of assistive devices as complex orthoses while crutches and other equipment are classified as basic.

To conduct orthotics survival analysis and assess the determinants of subjective wellbeing, we exploit three aspects of data collected during the Uganda Disability Project.[11] *Firstly*, respondents were asked when last they

[9] Orthotic equipment are externally applied body-powered devices that support or complement weakened or abnormal joints or limbs, such as callipers, ankle and foot orthoses, crutches and orthotic shoes (ISO, 2020).

[10] See Appendix Figure B2 which illustrates the evolution of data collection.

[11] Table B2 in the Appendix provides an overview of the main variables used in the analysis. In addition, we also included categorical variables for being educated at least to primary level and being employed as subjective wellbeing determinants.

used their orthosis if not currently using it.[12] Thus, the outcome, time to event (in years) is measured as time between orthotic-fitting and the time a participant's orthotic device failed (defined as non-use). It is a time-varying dichotomous variable coded 1 in the year that a participant's orthosis failed and 0 otherwise i.e., a value of 0 until a failure is experienced, when the value becomes 1 and the participant exits the intervention (n=186; 31%). Participants who exited the dataset (censored) for reasons other than failure, have a value of 0 throughout. A participant is censored if their event time is unknown because (i) they have not (yet) experienced the event during the study period (n=112; 19%) or (ii) they have been lost to follow up possibly due to change of contact or death (n=6; 1%), or because they were not contacted during the 2018 follow up survey (n=287; 49%).[13]

Note that because failure refers to the year a respondent stopped using the equipment (not the survey year), when the conversion into a person-period format occurs, it uses the spell and censoring information from a person-level dataset to distinguish those with known event times from censored individuals, and those who were lost to follow up from those who never failed.[14] To illustrate further, Table B3 shows the conversion of data from a person-level to a person-period format using four respondents. The first two respondents (#8 and #9) have known event times (because they used their orthosis until the fourth and fifth year, respectively). The third respondent (#62) was lost to follow up during the second year, while #63 never failed during the six-wave study period. A difference exists between participants #62 and #63 because

[12]For simplicity and recall bias concerns linked to memory failure, we found it more realistic to ask respondents about the precise year (round figure) which they experienced the outcome of interest. We checked for recall bias among a sub-sample of 120 respondents between 2016 and 2018 and found that 95 (79%) accurately recalled their year of failure – time is measured in discrete intervals. In the robustness checks, we test how sensitive our estimates are to recall bias.

[13]Given the budget, it was not possible to survey all the respondents in 2018. Of those who were not contacted in 2018, 56% were treated by the local orthotists. The intent was to follow up on these respondents in March 2020 but this was disrupted by the COVID-19 pandemic.

[14]This episode-splitting routine is a strength and key feature that makes the process that leads to failure partly duration dependent.

#62 left the dataset (censored) by the second year and would then be dropped from those at risk of failure as from the third year onward, while #63 remained part of those at risk until the end of the study period when they became censored.

The *second* aspect of the data that we utilize involves the identification of potential risk markers of orthotic device failure. We use (i) demographic features including gender, age and marital status; (ii) clinical factors such as diagnosis, the complexity of the orthosis, whether a participant was seen twice during the intervention (i.e., in 2012 and 2013) and whether a participant was recruited and treated by the local team of orthotists; and (iii) The Big 5 personality traits which elucidates that an individual's personality consists of five components that portray ways of thinking, feeling and behaving. These traits include openness, conscientiousness, extraversion, agreeableness and neuroticism.[15]

To assess the potential determinants of subjective wellbeing, the *third* aspect of the data that we exploit are three Patient-Reported Outcome Measures (PROMs), namely: life satisfaction, the SF-8 and WHODAS 2.0 which are designed to assess subjective wellbeing. The variable, life satisfaction, asks respondents how satisfied they are with life on a scale of 1-7 with a higher value indicating more life satisfaction.

The generic SF-8 assesses Health-Related Quality of Life (HRQL) with values ranging between 0 and 100 where higher scores indicate better health.[16] Scores above (below) 50 are considered above (below) the average in the general U.S. population (Ware et al., 2001).[17] Although the SF-8 can be further broken down into three additional groups of measures,[18] we use the overall summary

[15]See Appendix Table B4 for the respective definitions and the list of questions measuring these traits.

[16]See Appendix Table B5 for the list of SF-8 questions measuring the HRQL.

[17]The SF-8 has been validated in developing countries and Uganda specifically. See Roberts et al. (2008) for details.

[18]First, it can be summarized into two summary scores, physical (PCS) and mental component summary scores (MCS). Second, it can be specified by eight single-item scales of general health, physical functioning, role limitations due to physical health problems, bodily pain, vitality, social functioning, mental health, and role limitations due to emotional

score and test the reliability of this score in the following analysis.[19] *Alpha*, expressed as a number between 0 and 1 was developed by Lee Cronbach in 1951 to assess how well a construct or instrument measures what it should (reliability). In other words, it is a measure of how closely the Likert items that make up a composite score are correlated. If the items are all perfectly correlated, then alpha will be one (its maximum possible value). If the items are all independent, then alpha will be zero, in which case, a composite score created from the items would be unreliable. Acceptable Cronbach's alpha cut offs vary in the literature, a range between 0.65 and 0.9 is considered good and thought to show high reliability of the construct (Tavakol & Dennick, 2011). The SF-8 score displays good internal consistency with a Cronbach's alpha of 0.86 implying that it is a good measure of health-related quality of life for our sample.

The 12-item version of WHODAS 2.0 (World Health Organization's Disability Assessment Schedule) is used to track changes in the severity of disability over time. It produces specific scores for six different functioning domains: cognition, mobility, self-care, getting along, life activities (household and work/school) and participation.[20] The World Health Organization's simple scoring method gives a score ranging from 12 to 60, where higher scores indicate higher disability or loss of function (Ustun et al., 2010). In the following analysis, we use the overall WHODAS score which displays internal consistency with a Cronbach's alpha of 0.84 indicating that the construct is a good measure of disability severity (or functional efficiency) for our sample.

In what follows, we evaluate the long-term effects of the orthotic equipment

problems. Third, the subscales, "physical role limitations" and "physical functioning" can be used to estimate overall physical health while "emotional role limitations" and "mental health" are used to estimate overall mental health.

[19]The Stata command 'alpha' generates a composite (simple mean) score from the eight Likert questions and computes a reliability coefficient known as Cronbach's alpha. An alternative approach could have been the use of principal component or factor analysis to create a score. We chose to implement a simple arithmetic averaging of the Likert items and then used the alpha coefficient to assess internal consistency as commonly implemented in quality of life and wellbeing studies (Lins & Carvalho, 2016).

[20]See Appendix Table B6 for the set of questions included in the WHODAS 2.0 12-item version.

intervention by analysing the potential determinants of orthotic device failure and further explore the effects of device failure on subjective wellbeing using the six waves of data collection rounds: June 2012, November 2012, April 2013, June 2013, June 2016 and June 2018.

2.5 Methodology

Firstly, we are interested in assessing the speed at which orthosis failure occurs over time, hence we adopt the most common approach, survival or duration analysis, which is designed to analyse transitions from a given state to another. Formally, let T denote a discrete random variable measuring the duration of a certain spell and t the actual realised duration, having a cumulative distribution function of $F(t)$ and a probability density function of $f(t)$.[21] The survivor function is written as:

$$S(t) = Pr[T > t] = 1 - F(t) \tag{2.1}$$

while the sample counterpart of equation 2.1 is expressed as:

$$\widehat{S(t)} = \prod_{t|t<T} \left(1 - \frac{d_t}{n_t}\right) \tag{2.2}$$

where $\widehat{S(t)}$ is the Kaplan-Meier estimate of the survivor function which represents the proportion of individuals who are still using their orthotic devices at each time interval; d_t represents the number of persons recorded to have made a transition from orthosis use to non-use at time t while n_t is the number of participants whose orthotic devices are still in use at time t.

We then define the discrete-time hazard function $h(t)$ in equation 2.3, which is the conditional probability of orthosis failure in the time interval $[t, t+1)$, given that the event has not occurred at any time prior to t.

$$h(t) = Pr(t < T < t + 1|T > t) \tag{2.3}$$

[21] $F(t) = Pr[T < t]$ measures the probability that person i will experience the event of interest before time t while $f(t) = S(t_{t-1})\left(1 - \frac{d_t}{n_t}\right)$ measures the probability that person i will experience the target event in time t.

To estimate the probability of orthotic equipment failure, we only consider a single spell transition from orthosis use to non-use.[22] Not only are we interested in estimating the hazard function capturing orthotic equipment failure per se, but particularly in its determinants. We examine the risk factors of orthosis failure and the extent to which these factors affect the hazard. To implement this, we use a discrete-time duration model by reorganizing the dataset into a person-period format as opposed to the current person-level format (Jenkins, 1995; Singer & Willett, 2003). This approach uses an episode-splitting routine which splits the spells of each person into years such that we observe person i's spell from year $t = 1$ to the end of the T^{th} year at which point person i's spell is either complete (if their orthosis failed) or right censored (Jenkins, 2005).

Although the hazard function in equation 2.3 above indicates the population hazard in time t, it does not specify the functional form of that dependence. Additionally, Lancaster (1990) suggests that not accounting for unobserved heterogeneity induces an under-estimate of the extent to which the hazard rate increases with duration (or an over-estimate of the decline), and decreases the magnitude of the effects of covariates on the hazard rate.[23] Hence, we fit a logistic hazard frailty model where the log odds of the hazard takes the following form:[24]

$$\frac{h(t, X_i|u_i)}{1 - h(t, X_i|u_i)} = \left[\frac{h_0(t)}{(1 - h_0(t)}\right] \exp(\beta X_{it} + u_i) \tag{2.4}$$

which formally leads to a hazard model with a residual components structure that expresses the log odds of the probability of failure as a linear function of

[22] Here we are making the assumption that the event occurs only once during the entire spell duration, i.e., participants do not revert to using their gifted devices after orthosis failure has been recorded. While this may be a strong simplification, it is a necessary compromise we have to make in this study.

[23] Put differently, the presence of unobserved person-specific risk factors that are time-invariant leads to frailty in the hazard. If frailty is incorrectly ignored, high risk individuals are likely to experience the event leaving low risk respondents in the dataset, for example, thereby creating a selection effect.

[24] In doing so, we use a logit hazard function that is completely general with time. This flexible specification lets the "data speak for themselves" by placing no constraints on the shape of the logit hazard function (Singer & Willett, 2003).

the baseline hazard and a vector of determinants:

$$Y_{it} = \alpha(t) + \beta X_{it} + u_i + \varepsilon_{it} \tag{2.5}$$

where $Y_{it} \equiv logit[h(t, X_i|u_i)]$ is a sequential binary indicator which initially takes the value of 0, and subsequently 1 if orthosis failure occurs for person i during time interval t. The term $\alpha(t)$ characterizes the baseline hazard function which captures the pattern of duration dependence that is common to all individuals. The term β is a vector of parameters capturing the extent to which the change in the logit hazard function corresponds to unit changes in the associated X determinants.[25] The term u_i captures unobserved heterogeneity (or frailty) between individuals due to time-invariant omitted variables while ε_{it} is a logistic distributed error term with a mean of zero and finite variance, independently of u_i.

Secondly, we used the unbalanced raw panel data to assess the effect of orthosis failure on subjective wellbeing using the following specification:

$$Y_{it} = \alpha + \gamma failure_i + \beta X_{it} + \delta W_t + u_i + \varepsilon_{it} \tag{2.6}$$

where Y_{it} represents the respective subjective wellbeing measures outlined in section 2.4 and γ our main parameter of interest, captures the extent to which the wellbeing of an individual is affected by $failure$ of the orthosis.[26] As before, the term X is a person-specific vector of covariates, and β is the associated vector of parameters to be estimated, while δ represents a vector of parameters for the associated vector of W_t wave dummies. The error terms u_i and ε_{it} are the between and within estimators which both

[25] Although we also include time dummies, other covariates used in the hazard estimations are longitudinally invariant. Time-invariant covariates provide information on the change in the relative risk of experiencing the event for an individual possessing the characteristic measured by the covariate. Given that the hazard rate is measured in discrete-time, we make a conceptual assumption that the hazard function depends on only baseline characteristics, including age, to keep the effects on the hazard rate constant.

[26] Because failure of the orthosis is based on retrospective information and not directly from the panel data, it was more realistic to consider it as a fixed dummy across all waves for those whose devices had failed. However, employment status and age are considered as time varying in this specification.

capture unobserved heterogeneity, respectively. Here we used a random-effects specification because a comparison between the fixed and random-effects linear regression leads to a rejection of the model with fixed-effects. This is discussed further in the results section.

2.6 Descriptive Analysis

In this section, we present a descriptive analysis using baseline summary statistics and provide a narrative of the evolution of key outcomes over time. To identify differences between sub-groups, we report mean values for continuous variables and proportions for categorical variables in the first 3 columns of the summary tables. In the final column, we show p-values from t-tests comparing the respective sub-groups. Table 2.1 reports the baseline characteristics of respondents, disaggregated by gender. The participants are 43% female, with a mean age of 42 years and an average of 9 years of schooling (which equates to a lower secondary qualification). Just over half of the sample are married and 73% are the household head, with an average of five members, and having one dependent child within the household.

In terms of clinical indicators, the most common cause of disability was of congenital origin (e.g., polio or clubfoot; 62%) while others had traumatic or acquired causes (e.g., road traffic accidents, stroke, conflict-related, etc.). Around 46% received complex orthoses as a therapeutic intervention. During the intervention, 32% were seen twice within a twelve-month interval while a similar proportion was treated by the local team of orthotists. In terms of subjective wellbeing, it shows that although average life satisfaction was around 4 out of 7, the health-related quality of life index is above the average US population (64 vs. 50 out of 100 points). The average index for disability severity stood at 25 out of 60 points. In terms of economic activities, participants were predominantly (self-) employed (68%), reporting median monthly earnings of 150,000 UGX (equivalent to $40).

In column 4, notable gender disparities exist between the two groups.

Table 2.1: Baseline Summary Statistics

Variables	(1) Whole Sample mean/sd	(2) Men mean/sd	(3) Women mean/sd	(4) t-test (2)/(3) p-value
Demographic Characteristics:				
Age (years)	41.72	42.36	40.87	0.217
	[14.53]	[13.68]	[15.55]	
Schooling (years)	8.94	9.23	8.55	0.065
	[4.21]	[4.02]	[4.43]	
Household Characteristics:				
Married (=1)	0.55	0.68	0.37	0.000
	[0.50]	[0.47]	[0.48]	
Household head (=1)	0.73	0.87	0.56	0.000
	[0.50]	[0.34]	[0.50]	
Household size	4.91	5.04	4.73	0.169
	[2.65]	[2.80]	[2.42]	
No. of dependent children	1.21	1.46	0.88	0.000
	[1.63]	[1.86]	[1.20]	
Clinical Factors:				
Congenital (=1)	0.62	0.59	0.66	0.158
	[0.49]	[0.49]	[0.48]	
Complex orthosis (=1)	0.46	0.43	0.49	0.186
	[0.50]	[0.50]	[0.50]	
Treated twice (=1)	0.32	0.33	0.30	0.464
	[0.47]	[0.47]	[0.46]	
Local staff (=1)	0.31	0.29	0.33	0.315
	[0.46]	[0.46]	[0.47]	
Subjective Wellbeing:				
Life satisfaction (1-7)	3.55	3.53	3.59	0.705
	[1.91]	[1.91]	[1.91]	
HRQL	63.86	64.81	62.6	0.139
	[15.60]	[15.99]	[15.03]	
Severity of disability	25.00	24.72	25.37	0.394
	[7.97]	[7.98]	[7.97]	
Labour Market Outcomes:				
Employed (=1)	0.68	0.74	0.61	0.001
	[0.47]	[0.44]	[0.49]	
Self-employment (=1)	0.67	0.68	0.65	0.645
	[0.47]	[0.47]	[0.48]	
Wage employment (=1)	0.34	0.34	0.35	0.734
	[0.48]	[0.47]	[0.48]	
Monthly median earnings (in 000s of UGX)	150	200	102	0.016
	[623.16]	[760.27]	[258.75]	
Observations	591	336	255	

Note: HRQL=Health-related quality of life. UGX= Ugandan Shillings. Statistics for earnings and employment type are for the sample of employed workers only. The proportion in wage and self-employment adds up to more than one because some participants had both a wage and self-employed job. Pearson's chi-squared test is used to test the null hypothesis that median values differ between the two groups. Monthly median earnings = median wages + median profits from self-employment. Standard deviation is in parenthesis.

Men are likely to be more educated, be married and have children compared to women. Moreover, more years of schooling appears to be correlated with higher employment rates and earnings for men relative to women.

These differences further imbed the socio-economic inequalities that women in developing countries face.

We split the sample between participants recruited and treated by the UK team versus those treated by the local team of orthotists.[27] Analysis shows that the foreign staff sample is significantly different from the local staff sample in virtually all aspects of the baseline characteristics. Therefore, in the sensitivity analysis, we address this potential selection issue by assessing the robustness of our findings to the exclusion of the local sample from the analysis.

Next, Table 2.2 analyzes the evolution of key outcomes over time, disaggregated by gender. Overall, it shows that although usage declined with the increase in orthosis failure rates over time, usage intensity was consistently high. Six years after the intervention, 37% of the sample were still using their equipment. Although people lose their jobs over time, which also reflects in decreasing monthly earnings, this job loss is more pronounced in wage-paid jobs as opposed to self-employment. Over time, women still harbour the largest share in self-employment and earn less than men which is consistent with our findings in the first chapter which explored the short-term effects of the intervention on functional independence and labour market outcomes.

The statistics for life satisfaction aligns with the notion of adaptation which states that although life satisfaction is sensitive to tragic events, with time, people adjust to the new normal. We find that this is exactly the case for the female sample where their average levels of satisfaction in 2012 and 2013 are identical (3.52). Barazzetta et al. (2019) tracked changes and compared differences in the life satisfaction of these individuals during the first twelve months after the intervention (2012 to 2013) and found that subjective wellbeing had returned to pre-baseline levels after the intervention. Tracking these respondents for a longer period beyond twelve months, we find that average life satisfaction initially declined further in 2016 but increased to 4.11 in 2018, beyond its baseline average of 3.56. A similar trend is observed for

[27] Details can be found in Table B7 of the Appendix.

Table 2.2: Evolution of Key Outcomes Overtime

Variables	(1) Jun.12 mean	(2) Nov.12 mean	(3) Apr.13 mean	(4) Jun.13 mean	(5) Jun.16 mean	(6) Jun.18 mean
Panel A – Whole Sample:						
Using (=1)	n/a	0.97	0.91	0.86	0.62	0.37
Every day (=1)	n/a	0.81	0.86	0.76	0.97	0.94
Employed (=1)	0.69	0.64	0.66	0.73	0.45	0.59
Self-employment (=1)	0.66	0.62	0.71	0.76	0.79	0.81
Wage employment (=1)	0.35	0.38	0.29	0.28	0.21	0.19
Monthly earnings	312.73	236.96	214.48	414.63	158.53	n/a
Life satisfaction (1-7)	3.56	3.87	3.84	3.48	3.03	4.11
HRQL	64.19	68.9	68.6	62.3	63.13	65.26
Severity of disability	25.13	n/a	n/a	23.98	n/a	29.48
Observations	499	359	333	365	128	282
Panel B – Men:						
Using (=1)	n/a	0.96	0.93	0.87	0.57	0.37
Every day (=1)	n/a	0.85	0.86	0.75	0.94	0.97
Employed (=1)	0.74***	0.66	0.68	0.76	0.44	0.61
Self-employment (=1)	0.67	0.59	0.72	0.75	0.79	0.75**
Wage employment (=1)	0.35	0.41	0.28	0.28	0.21	0.25**
Monthly earnings	380.35**	273.02	236.07	537.39	191.97*	n/a
Life satisfaction (1-7)	3.59	3.8	3.81	3.46	3.04	4.12
HRQL	65.21	68.96	69.59	63.09	63.82	65.34
Severity of disability	24.97	n/a	n/a	23.84	n/a	28.63
Observations	280	206	191	213	75	164
Panel C – Women:						
Using (=1)	n/a	0.97	0.88	0.85	0.68	0.37
Every day (=1)	n/a	0.77	0.86	0.79	1.00	0.90
Employed (=1)	0.62***	0.62	0.64	0.69	0.47	0.56
Self-employment (=1)	0.66	0.66	0.69	0.78	0.80	0.91**
Wage employment (=1)	0.35	0.35	0.31	0.27	0.20	0.09**
Monthly earnings	207.59**	184.43*	183.24	222.08	114.40*	n/a
Life satisfaction (1-7)	3.52	3.96	3.89	3.52	3.02	4.1
HRQL	62.88	68.82	67.27	61.22	62.16	65.15
Severity of disability	25.34	n/a	n/a	24.17	n/a	30.68
Observations	219	153	142	152	53	118

Note: Mean/proportions are reported. Data on usage and intensity of use are missing for the first wave because participants were surveyed prior to fitting. Information on monthly earnings was not collected in the 6th wave. Data on severe disability were collected for the 1st, 4th, and 6th waves only. *** p<0.01, ** p<0.05, * p<0.1 indicate sample t-tests of significance between the two groups.

health-related quality of life. We find a reduction in the average disability severity score between 2012 and 2013 due to the intervention, as expected, this increased in 2018 as people revert to being more functionally dependent without the use of orthosis. Hence, we suggest that failure of the orthosis could negatively affect the general wellbeing of these individuals.

Furthermore, Appendix Tables B8 and B9 respectively explore the evolution of key outcomes over time by stratifying the sample based on the type of orthoses and age grouping. In Table B8, we find little differences between those who received a basic aid versus those fitted with complex orthoses. It appears that users of basic functional aids do much better in subjective wellbeing in the early years, however, those with more complex orthosis switch to having higher subjective wellbeing in later years. This may imply that it took complex orthosis users more time to become accustomed to their devices compared to users of basic aids, hence a reflection in their subsequent levels of wellbeing.

The stratification by younger versus older respondents in Table B9 shows that older adults (aged over 55) are more likely to be using their equipment over time. It is also possible that younger adults (aged 55 or less) experience orthosis failure because they are more likely to be engaged in wage-paid economic activities. With self-employment, respondents can work at their own pace unlike wage-paid jobs which require working under pressure, hence the heightened activity levels for the younger. Considering the levels of physical activity among youngsters, this could serve as a potential warning trigger for early orthotic equipment failure.

Finally, in Table 2.3, we report reasons for orthosis failure, disaggregated by gender.[28] Column 1 shows that of those who stopped using their devices, the leading cause of failure is broken equipment (83%), 11% was due to pain or poor fit, and other reasons were due to theft, misplacement, the device being too hot or tiring, do not like them or only needed for certain activities (6%). As part of the follow up survey, we asked respondents with broken equipment whether they made efforts in fixing the device. Nearly half of these respondents said they could not afford a repair, 24% stated that their equipment had already been repaired several times to no avail, while another

[28] As previously mentioned, of those with follow up information (n=298), about 62.4% (n=186) experienced orthosis failure, while the remaining participants were still using their devices at the end of the study period.

28% admitted that they did not know how or who could fix it. This highlights the importance of ensuring that appropriate awareness and support structures, affordable maintenance programs and strong social protection systems are in place to support these individuals.

Table 2.3: Reasons for Orthotics Failure

Variables	(1) Whole Sample %	(2) Men %	(3) Women %	(4) t-test (2)/(3) p-value
Panel A - Reasons for non-use:				
Pain or poor fit (=1)	0.11 [20]	0.11 [12]	0.11 [8]	0.849
Broken (=1)	0.83 [151]	0.83 [87]	0.84 [64]	0.810
Other reasons (e.g. theft =1)	0.06 [10]	0.06 [6]	0.05 [4]	0.896
Panel B - Maintenance efforts made due to breakage:				
Too expensive (=1)	0.48 [68]	0.42 [33]	0.55 [35]	0.126
Repaired several times (=1)	0.24 [35]	0.28 [22]	0.20 [13]	0.301
Unaware of how/who could fix it (=1)	0.28 [40]	0.30 [24]	0.25 [16]	0.480

Note: Number of observations are reported in squared brackets. Five respondents did not report reasons for non-use. Eight respondents whose equipment broke did not respond to the question on maintenance efforts.

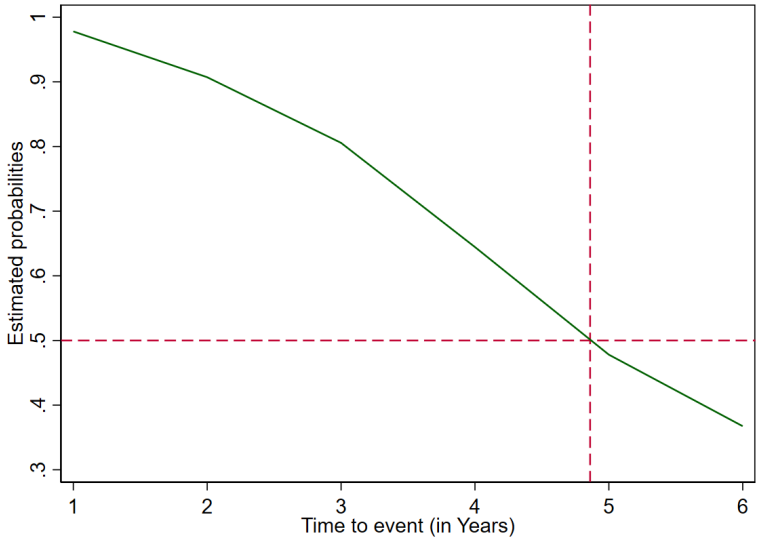
In what follows, we use Kaplan-Meier survival curves to investigate the rates of survival of the orthoses and compare differences between subgroups.

2.6.1 The Kaplan-Meier Survivor Function

Using equation 2.2 from section 2.5, we estimate orthosis survival probabilities with the aid of Kaplan-Meier survivor curves. Graphical evidence for the whole sample shows that survival probabilities declined over time with a median survival time of 4.8 years post-fitting (Figure 2.2). By default, the depicted survivor curve also implies that the hazard of orthotics failure increases monotonically over time. Because our metric for time is discretized at the year level, it implies that an average respondent exits (fails) between four and

five years of using the equipment. Furthermore, the curve shows that orthotic devices have a 37% chance of survival beyond six years.[29] Hence, in comparison to the findings of Jensen et al. (2004) which showed a median survival time of 22 months, our results for orthosis stood at 58 months.

Figure 2.2: Kaplan-Meier Survival Curve



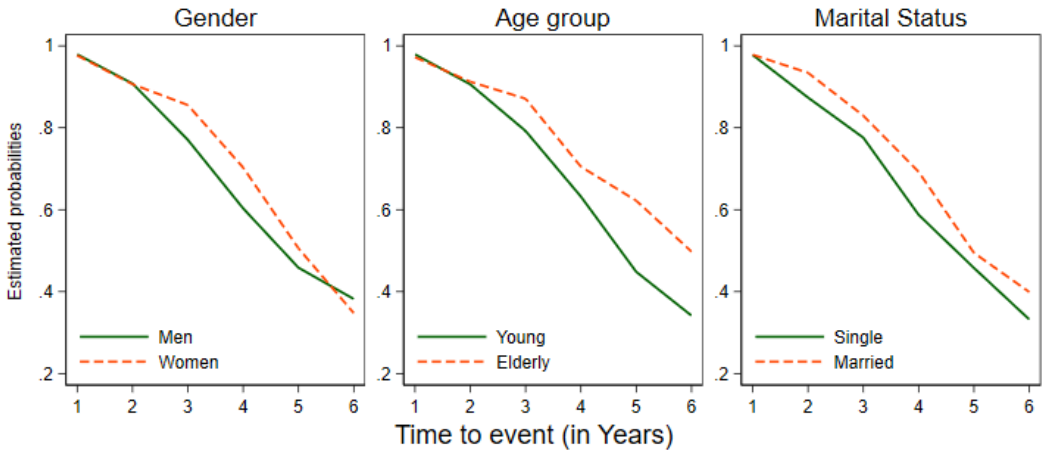
Note: The farther an individual is from the origin, the more likely they are to keep using their equipment compared to an individual nearer to the origin.

Figure 2.3 illustrates survival probabilities, disaggregated by a set of personal characteristics, namely, gender, age and marital status. The estimated survival functions for men versus women displayed on the left panel shows that in the early years post-fitting, the risk of hazard is the same for men and women. However, time begins to affect the narrative as male respondents begin to experience lower chances of survival compared to women up to the 6^{th} period when they re-converge. It follows from this that men are at higher risk of orthosis failure than women which might arise due to differences in biomechanics and activity levels between the two groups. It could also be the case that women were more resilient due to perceived relative benefits of the orthosis, with a higher sense of device ownership than men in terms of looking

[29]Note that it is pure coincidence that the estimate of a 37% probability of equipment surviving beyond six years is similar to the percentage of the sample still using the equipment at the six-year survey end point.

after their devices. In the previous chapter, we explained that although usage was high for both groups, women benefited less from the intervention compared to men which may be due to adaptation issues. However, the current finding implies that struggling with adaptation has no effect on subsequent failure.[30]

Figure 2.3: Kaplan-Meier Survival Curves - Personal Factors



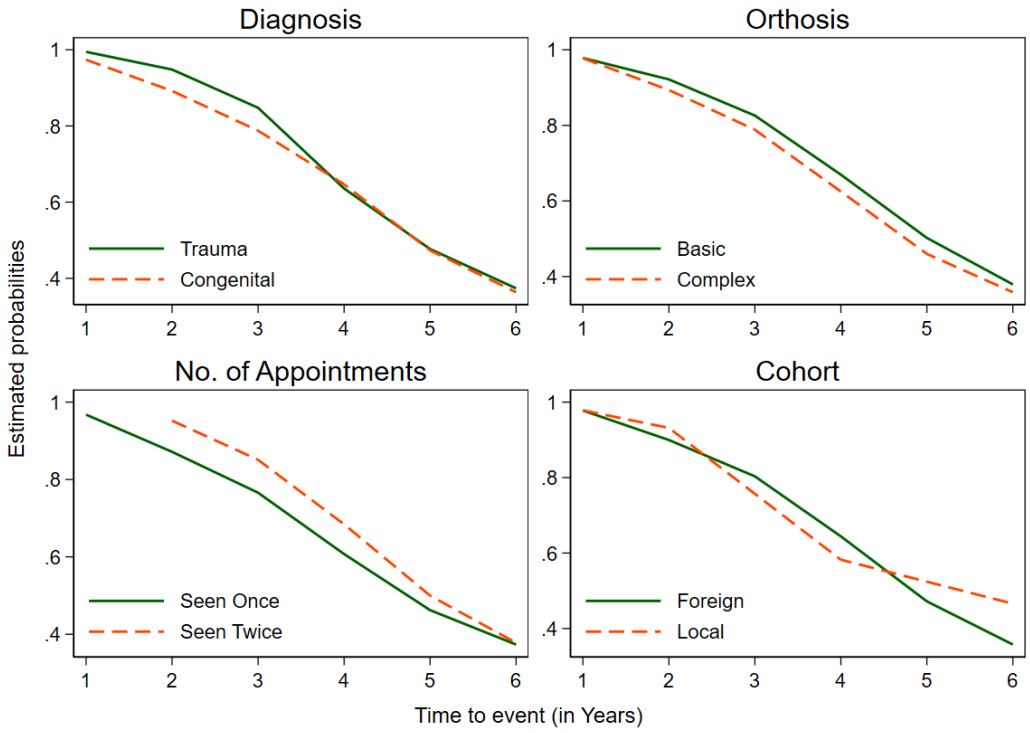
In the middle panel of Figure 2.3, the orthoses of respondents aged 55 or below are less likely to survive than those aged over 55. This reinforces our preliminary findings regarding differences in activity levels between the two groups which might lead to early device failure.[31] On the right panel, the difference in survival rates between married and singles over time appears stark. It shows that married participants have higher survival probabilities than their single peers which is potentially due to the availability of informal social or spousal support. This could also mean that unmarried respondents are potentially more actively involved in the society compared to their married peers which may partly work against orthosis survival.

[30] One may also be inclined to argue that men received orthoses that were more likely to fail or received complex orthoses requiring professional repairs or parts replaced more frequently. However, the type of intervention received did not differ by gender except for the case where women were less likely to receive crutches which is classified as a basic aid (see Table B1). Hence in the case that complex orthosis were more likely to fail, both men and women randomly received complex orthosis.

[31] We also compared the survival probabilities of those in wage employment versus self-employment by age group and gender and find no distinctive pattern. Hence these activity levels may not be entirely linked to work-related engagements. These results are omitted from the chapter but available upon request.

Similarly, in Figure 2.4, we compare survival probabilities, disaggregated by clinical factors such as diagnosis, the type of orthosis, number of appointments and treatment cohort. At the top left panel of the graph, the difference in survivor functions between those with congenital and traumatic diseases is less pronounced especially in later periods. Likewise at the top right panel, although the gap is small, those with complex orthoses are less likely to survive. This should be expected because as the orthoses wear out, someone using a KAFO or a knee-ankle brace, for example, would require mechanical components to be replaced more often compared to someone having orthotic shoes or splints.

Figure 2.4: Kaplan-Meier Survival Curves - Clinical Factors



In terms of the number of appointments as displayed at the bottom left of Figure 2.4, it shows that those seen twice during the 2012-2013 intervention waves have a higher survivor function compared to those treated once. This finding highlights the importance of follow up care. It shows that participants should have their equipment reviewed at least annually to ensure that the

effects of such therapeutic interventions are sustained and to ensure continued activity and participation of these individuals in society. In terms of whether a respondent was treated by a local or foreign orthotist during the intervention, the bottom right panel shows no distinctive pattern between the two survivor functions.

Altogether, our preliminary findings show that being male, young, married, using complex orthosis and having no access to follow up care are noticeable factors associated with lower survival rates of the orthoses. The following section adopts an econometric approach to test for statistical significance of these variables.

2.7 Results and Discussion

2.7.1 The Risk Factors of Orthotic Equipment Failure

To investigate these effects further, a discrete-time logit hazard model is used to analyse time to orthotic equipment failure. In this analysis, the time variable is the time (in years) spent using the orthotic device before it failed due to reasons outlined in section 2.6. As mentioned, we use a hazard frailty model because we are interested in assessing variables that are time invariant and to account for unobserved heterogeneity. The maximum likelihood estimates from equation 2.5 are given in Table 2.4. In column 1, we report estimates (odds ratios) for the effects of personal and clinical factors on orthotic equipment failure while column 2 extends the regression to control for the Big 5 personality traits.

The effects of personal and clinical factors hold consistently across the two columns. In column 1, all else equal, we reject the null hypothesis that personal factors do not affect orthosis failure. With the exception of access to follow up care as measured by the variable "treated twice", estimates for other clinical proxies considered are unrelated to orthosis failure. The results in column 2 also suggest that personality traits are unrelated to failure of the orthosis. Below the results table, the likelihood ratio tests rejects the null hypothesis

Table 2.4: Hazard Estimates of Orthosis Failure

	(1) Orthosis failure	(2) Orthosis failure
Personal Factors:		
Female (=1)	-1.425**	-1.272**
	(0.655)	(0.565)
Married (=1)	-1.577**	-1.356**
	(0.699)	(0.591)
Age (years)	0.355**	0.321**
	(0.159)	(0.134)
Age squared	-0.004**	-0.004**
	(0.002)	(0.002)
Clinical Factors:		
Congenital (=1)	0.154	0.100
	(0.634)	(0.542)
Complex orthosis (=1)	0.641	0.494
	(0.645)	(0.544)
Treated twice (=1)	-1.249*	-1.109*
	(0.682)	(0.602)
Local staff (=1)	-1.383	-1.507
	(1.114)	(0.983)
The Big Five:		
Openness		0.073
		(0.076)
Conscientiousness		-0.018
		(0.090)
Extraversion		-0.05
		(0.071)
Agreeableness		0.002
		(0.096)
Neuroticism		0.123
		(0.092)
Time dummies	✓	✓
Obs.	1582	1569
LR test of rho=0: chibar2(01)	4.92**	3.33**

Note: Both columns account for duration dependence. The further reduced sample in column 2 is due to 13 missing values for the Big Five personality traits. Results are consistent when the regressions for personal and clinical factors are run separately.Robust standard errors are reported in parenthesis *** p<0.01, ** p<0.05, * p<0.1.

that unobserved heterogeneity is zero in both columns. This suggests that the current model which accounts for unobserved heterogeneity is robust and consistent as opposed to a pooled model which assumes homogeneity across individuals over time. For brevity, we use the margins command in Stata to

obtain the estimated marginal effects in column 1 and interpret the results therein.[32]

Consistent with our preliminary findings, Table 2.5 shows that the fitted baseline hazard probabilities for the entire sample increases monotonically over time. In the first year, the fitted hazard probability is just 0.3 percentage points, by the end of the third year, it had increased to 17%, and by the sixth year, hazard probability was about 67%. The effects of personal risk factors suggests that all else being equal, the conditional probability of orthosis failure is 7.5 percentage points lower for women compared to men. Similarly, partnered participants have a lower likelihood of experiencing orthosis failure as opposed to their unpartnered counterparts (8.3%).[33]

The effects of age and age squared reinforce our preliminary findings. It shows that the relationship between age and orthotics failure is concave (n-shaped) implying that as participants grow older, the conditional hazard probability of failure is lessoned. We find little evidence on the effects of clinical proxies i.e., having a disability caused by congenital illnesses, using complex orthosis, and being treated by a local orthotist. Of importance, the estimated coefficient for being treated twice reveals that the conditional hazard probability is 6.6 percentage points less for participants who received follow up care during the intervention as opposed to those who did not. The local staff variable indicates that the intervention is scalable as no significant differences between the local and foreign orthotists in terms of the treatment given.

Since the empirical literature on orthotics is rare, we mainly compare our

[32] Larsen et al. (2000) argued that interpreting parameters in the presence of frailty is not always straightforward. Hence for ease of interpretation, we use marginal effects as opposed to odds ratios. Longhi & Nandi (2015) suggest that marginal effects are computed by additionally setting the unobserved heterogeneity at its average value for all observations.

[33] Considering that women are less likely to be married, and the fact that both female and married respondents experience longer survival, we further explored a specification that includes an interaction term for gender and marital status, finding non-significant interactive effects. Similarly, to identify additional coefficients that may differ between men and women, we analysed the hazard estimates separately for both groups and found none of the risk factors to be statistically significant, which may be due to the considerably smaller sample sizes associated with the sample splits. These results are omitted from the chapter but available upon request.

Table 2.5: Hazard Estimates - Average Marginal Effects, Delta-Method

	dy/dx	Std.Err.	z	P>z
Period:				
2	0.003	0.002	1.45	0.147
3	0.022	0.012	1.87	0.062
4	0.168	0.052	3.22	0.001
5	0.484	0.069	6.97	0.000
6	0.669	0.067	10.02	0.000
Personal:				
Female (=1)	-0.075	0.032	-2.32	0.020
Married (=1)	-0.083	0.033	-2.50	0.012
Age (years)	0.019	0.007	2.61	0.009
Age squared	0.000	0.000	-3.15	0.002
Clinical:				
Congenital (=1)	0.008	0.033	0.24	0.807
Complex orthosis (=1)	0.034	0.033	1.02	0.307
Treated twice (=1)	-0.066	0.033	-2.00	0.045
Local staff (=1)	-0.073	0.058	-1.24	0.214

Note: The predicted hazard probabilities for Table 2.4 (column 1) are reported.

findings with studies on prosthetics. Our findings resonate with Rand et al. (2003) on the effects of age and gender on equipment failure. Although our study finds no evidence for diagnosis and the type of equipment received, Rand et al. (2003) found that younger patients and men had lower prosthetics survival rates than their respective counterparts. Similar to Jensen et al. (2004), we suspect that the intensity of equipment use may have worked against the equipment's survival. Moreover, considering the hot and humid climate in Uganda, some participants in our sample removed the soft liner as they left the hospital during the intervention, which might have aggravated pain and poor fit, hence partly working against the equipment's survival. In terms of personality traits, existing evidence suggests effects on healthcare utilization (Friedman et al., 2013; Khosravinasr, 2017; Nolan et al., 2019), however, we find no empirical effects of these traits in our sample (column 2).

To summarize, the results related to the determinants of orthotic device failure indicate that significant risk markers include person-specific factors such as age, gender and marital status, much less for personality traits and clinical

factors, with the exception of a proxy measuring access to follow up care. Our findings reveal that developing targeted models of care and innovations could optimise functional outcomes in future interventions of this kind. The next section explores the effect of orthosis failure on subjective wellbeing.

2.7.2 Linking Orthotic Equipment Failure and Wellbeing

Based on equation 2.6, Table 2.6 reports the effects of orthosis failure on subjective wellbeing. The linear estimates for life satisfaction, health-related quality of life and severity of disability are respectively reported in columns 1, 2 and 3. We find that overall, the effect of being female on subjective wellbeing is quite weak as only the estimates in column 2, show that women have less health-related quality of life than men. The lack of sufficient gender evidence that we observe may indicate that people with disabilities have very similar subjective feelings regardless of gender. Also, the coefficients for age and age squared in column 2 hint that the effect of age on wellbeing is non-quadratic implying that health-related quality of life is likely to decline as adults grow older.

In line with the literature, being formally educated and employed both play significant roles in subjective wellbeing. This reflects the knowledge and skills that formal education offers, enabling people to improve their lives, their health, and their civic and political participation, as well as making them to be more likely to earn a living to meet their needs (Krauss, 2012). Furthermore, the results on congenital causes of disability reiterate the notion of the readjustments of subjective wellbeing to lifetime events over time. Evidence for this in the literature is mixed. While the conclusions reached by Shankar et al. (2020) in India matches our estimates showing that those with long-term disabilities have higher quality of life, this contrasts with the finding of Gailey et al. (2010) in Vietnam.

Our previous findings in Chapter 1 showed that because people with disabilities since childhood had become accustomed (habituated) to their own

Table 2.6: Determinants of Subjective Wellbeing

	(1) Life Satisfaction	(2) HRQL	(3) Severe Disability
Female (=1)	0.078	-2.022**	0.515
	(0.102)	(0.978)	(0.650)
Married (=1)	-0.075	-0.44	-0.307
	(0.104)	(0.969)	(0.648)
Age (years)	-0.03	-0.469**	0.038
	(0.021)	(0.203)	(0.131)
Age squared	0.000*	0.003	0.000
	(0.000)	(0.002)	(0.001)
Educated (=1)	0.173*	1.970**	0.128
	(0.100)	(0.861)	(0.619)
Employed (=1)	0.367***	6.372***	-3.641***
	(0.098)	(0.821)	(0.699)
Congenital (=1)	0.144	3.771***	-1.425**
	(0.099)	(0.910)	(0.671)
Treated twice (=1)	-0.11	1.098	-1.545**
	(0.097)	(0.903)	(0.645)
Failed (=1)	-0.247**	-3.379***	2.360***
	(0.097)	(0.888)	(0.640)
Openness	0.024	-0.03	0.029
	(0.016)	(0.126)	(0.091)
Conscientiousness	0.025*	0.455***	0.001
	(0.014)	(0.120)	(0.096)
Extraversion	0.006	0.081	0.025
	(0.014)	(0.113)	(0.084)
Agreeableness	-0.044***	-0.092	-0.12
	(0.015)	(0.141)	(0.096)
Neuroticism	-0.026	-0.326**	0.091
	(0.016)	(0.147)	(0.093)
_cons	3.874***	68.619***	26.495***
	(0.576)	(5.553)	(3.363)
Wave dummies	✓	✓	✓
Obs.	1667	1603	915
Breusch-Pagan LM	26.99***	62.07***	0.00
Hausman	6.97	5.16	90.52***

Note: Results are for the sample of those who responded to the subjective wellbeing measures during the survey. Data on severity of disability was only collected for the 1st, 4th, and 6th waves, respectively. Only employment status and age have longitudinal variations. Robust standard errors are reported in parenthesis *** p<0.01, ** p<0.05, * p<0.1.

style of gait, they struggled with their new equipment which worked against their functional mobility, at least initially. An interesting finding from this current analysis demonstrates that because people with long term (congenital)

disabilities have adapted to their impairment, they experience higher levels of health-related quality of life and functional independence than people who acquired their disability later in life (columns 2 and 3).

The results on being treated twice used as a proxy for access to follow up care is positively correlated with normal function (column 3) but we find no effects on life satisfaction or HRQL. Compelling evidence in Table 2.6 reveals that our key variable of interest, failure of the orthosis is a significantly negative determinant of wellbeing. Failure of the orthosis induces a reduction in life satisfaction and HRQL by 0.247 and 3.38 units, respectively, and increases disability severity by 2.36 units. This resonates with Shankar et al. (2020) who finds that those who had a prosthetic devices had higher quality of life as opposed to those who had not.

Since these wellbeing measures are subjective, we also account for potential endogeneity by controlling for the Big 5 personality traits in the subjective wellbeing regressions. The estimates of personality traits show some evidence that being conscientious is a positive determinant of life satisfaction and HRQL. Also, agreeable individuals tend to reach a compromise at the expense of their own life satisfaction, while having an emotionally unstable personality (neuroticism) is adversely associated with HRQL. This is in line with the literature (Azizan & Mahmud, 2018; Pontarollo et al., 2020).

At the bottom of Table 2.6, the Breusch-Pagan Lagrangian Multiplier test for random effects in columns 1 and 2 rejects the hypothesis that unobserved heterogeneity is zero while the Hausman test also confirms that the results of the random effects estimator is consistent and preferred as opposed to the fixed effects estimator. However, this is not the case in column 3 which may be due to the fact that only three waves of data on disability severity was available, hence these estimates should be interpreted with caution.

Taken together, we find that in line with common perceptions, being educated, employed, and conscientious are positive correlates of wellbeing while being female, ageing, and having agreeable and neurotic personalities

are identified as negatively linked to wellbeing. People who had acquired a disability since childhood are more likely to experience higher levels of wellbeing compared to those with a sudden onset of disability caused by trauma. More importantly, our results show that across the respective wellbeing measures, orthotic equipment failure induces a reduction in life satisfaction, quality of life and functional efficiency; while access to follow up care works best in promoting functional efficiency. The analysis therefore concludes that having timely access to rehabilitative care is likely to induce an improvement in the general wellbeing of people with physical disabilities. Therefore, interventions that ensure orthotics survival and promote the physical, physiological and psychological wellbeing of people with disabilities could improve their overall quality of life.

2.7.3 Robustness

We subject our analysis to two robustness checks. First, this study relies on recall information which is a strength that enabled us to analyse the data using a hazard modelling approach to address the research questions. We assessed recall accuracy by comparing responses from a sample of 120 participants who were asked in 2016, about when they had last used their orthosis and then resurveyed approximately 2 years later (2018). About 79% of these individuals accurately recalled the last time they had used their equipment. This indicates that a significant fraction of participants' responses are reliable. Notwithstanding, we excluded those with inconsistent recall information regarding the year of last use from the sensitivity analysis.

A second potential issue is sample selection and missing data from the sample treated by the local orthotists, especially in light of the fact that this subsample was significantly different from the main sample in terms of their baseline characteristics. While our main estimates in Section 2.7.1 controlled for being treated by a local orthotist and was found to be insignificant, implying that sample selection is not an issue, we test how sensitive our findings are to

the exclusion of this sub-sample.

Reassuringly, the results from the sensitivity analyses in Tables 2.7 and 2.8 respectively demonstrate that our earlier estimates are consistent and robust to the exclusion of these individuals. This confirms our main findings which identified users at risk of early orthotic equipment failure and highlights the need to guide rehabilitation services towards tailoring innovative approaches that are inclusive of the needs of these individuals. Ultimately, findings from this analysis further underscore the need for sustainable access to rehabilitative care and follow up on the use of orthotics over time.

Table 2.7: Hazard Estimates of Orthosis Failure – Recall Bias and Sample Selection

	(1) Recall bias	(2) Sample selection
Female (=1)	-1.548**	-1.366**
	-0.709	-0.66
Married (=1)	-1.303*	-1.554**
	(0.728)	(0.695)
Age (years)	0.300*	0.322*
	(0.156)	(0.165)
Age squared	-0.004*	-0.004*
	(0.002)	(0.002)
Congenital (=1)	0.260	0.236
	(0.671)	(0.637)
Complex orthosis (=1)	0.833	0.533
	(0.682)	(0.642)
Treated twice (=1)	-1.210*	-1.227*
	(0.710)	(0.685)
Local staff (=1)	-2.096	
	(1.344)	
Time dummies	✓	✓
The Big Five	X	X
Obs.	1505	1400

Note: Both columns account for duration dependence. Column 2 reports estimates for only the sample of respondents treated by the UK team. For brevity, we exclude the column which controls for personality traits given that these variables do not significantly change the results. Robust standard errors are reported in parenthesis *** p<0.01, ** p<0.05, * p<0.1.

Table 2.8: Determinants of Subjective Wellbeing – Sample Selection

	(1) Life Satisfaction	(2) HRQL	(3) Severe Disability
Female (=1)	0.069	-2.305**	0.476
	(0.112)	(1.078)	(0.707)
Married (=1)	0.044	-0.428	-0.52
	(0.112)	(1.048)	(0.698)
Age (years)	-0.017	-0.299	0.111
	(0.026)	(0.219)	(0.157)
Age squared	0.000	0.002	-0.001
	(0.000)	(0.002)	(0.002)
Educated (=1)	0.172	1.591*	0.465
	(0.108)	(0.936)	(0.677)
Employed (=1)	0.442***	6.478***	-3.164***
	(0.105)	(0.876)	(0.752)
Congenital (=1)	0.173	4.236***	-1.825**
	(0.111)	(1.044)	(0.757)
Treated twice (=1)	-0.038	1.293	-1.757**
	(0.105)	(0.969)	(0.690)
Failed (=1)	-0.223**	-3.520***	2.634***
	(0.104)	(0.947)	(0.691)
The Big Five	✓	✓	✓
Wave dummies	✓	✓	✓
Obs.	1484	1428	816

Note: Results are for the sample of those who responded to the subjective wellbeing measures during the survey. Data on severity of disability was only collected for the 1st, 4th, and 6th waves, respectively. Only employment status and age have longitudinal variations. We also run similar regressions excluding the sample of those with recall bias and find that our estimates are unaltered. These estimates are omitted but available upon request. Robust standard errors are reported in parenthesis *** p<0.01, ** p<0.05, * p<0.1.

2.8 Concluding Remarks

To the best of our knowledge, this is the first study to assess the long-term effects of an orthotic equipment intervention using a unique sample of adults with lower limb disabilities in a developing country context, namely, Uganda. Using a discrete-time hazard regression model, the analysis evaluated the speed at which the gifted orthoses failed over time and the variables correlated with that failure. We extended the analysis to investigate the effect of orthotic equipment failure on patient-reported outcome measures including life satisfaction, health-related quality of life and severity of disability, which

are designed to measure subjective wellbeing.

Six years after the intervention, 37% of respondents were still using their equipment and median survival time was 4.8 years post-fitting, with the majority of devices needing repair or replacement. Most of those with failed devices mentioned that they have no access to affordable orthotics repair services, hence foreshadowing the additional costs of living with a disability. The analysis suggests that potential risk markers of orthosis failure include gender, age, marital status, and access to follow up care; much less for other clinically-related factors and personality traits. In terms of the determinants wellbeing, our findings show that orthotic device failure is negatively correlated with wellbeing while access to follow up care improves normal function. The effects of other covariates generally reflect those found in the literature. This study underscores the importance of the long-term usefulness of orthotic equipment among adults with lower limb disabilities, both in terms of the need to ensure continued access to rehabilitative care to sustain functional independence, as well as enrich wellbeing and promote inclusivity in society.

We acknowledge some important limitations. The determinants of orthosis failure that we have empirically considered are limited and time-invariant. To better understand and accommodate disabled adults with long term rehabilitative care needs as it relates to orthoses, future research could assess additional factors including, for example, intrahousehold arrangements, environmental factors, and existing institutional support structures that may vary over time. Future analysis could fit discrete-choice competing risk models on the reasons for non-use, with the possibility of individuals having multiple episodes of orthosis failure and how this relates to their wellbeing. Lastly, we have only analysed the contemporaneous relationship between orthosis failure and wellbeing. With data and a larger sample, future research could for example, explore changes in wellbeing before and after failure of the orthosis using lags and leads and test for habituation i.e., whether the wellbeing effects of failure depend on the duration of the failure.

Despite these shortcomings, this paper adds to the very scarce empirical evidence on orthotics in developing countries. The analysis has shown that in line with the conventional view on prosthetics, the orthosis for men, younger adults and those who had no follow-up care were more likely to fail than their respective counterparts. To encourage and sustain activity and participation of people with disabilities, this study underscores the need to strengthen social protection systems that ensure access to affordable rehabilitative care. Ultimately, innovative public-private (hybrid) collaborations would ensure that sustainable support structures are in place to address the long-term disability needs of people with disabilities in developing countries.

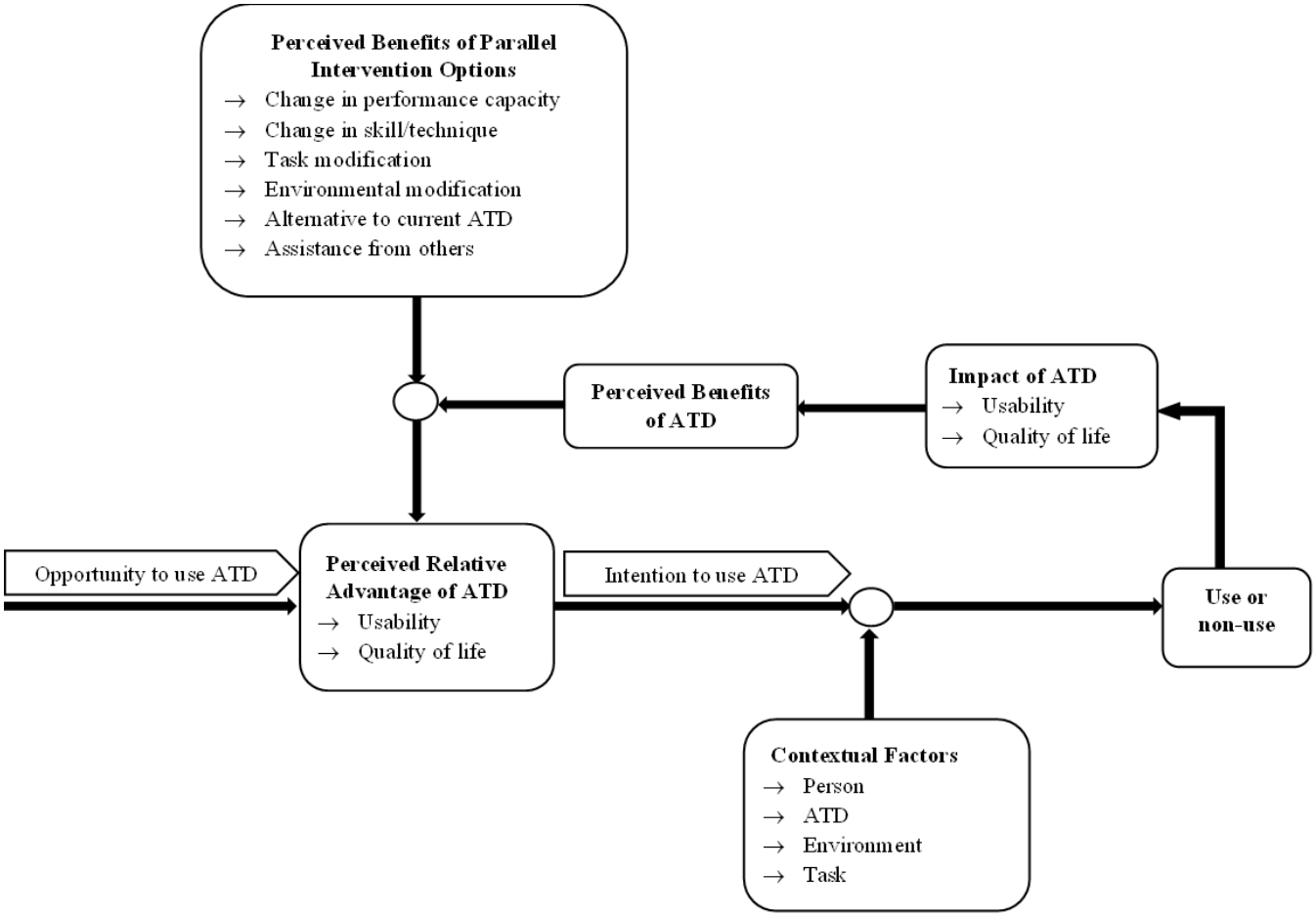
Developing targeted models of care and innovations could optimise functional outcomes in future interventions of this kind. In addition to self-help groups, community-based rehabilitation (CBR) centres could work with people with disabilities and their families to determine their assistive device needs, facilitate access to affordable devices and ensure timely maintenance, repairs and replacements when necessary. Given the potentials these services have in improving activity and participation for persons with lower limb impairments, problems with fitting, follow-up care and repairs need to be addressed if ever scaling up needs to be considered. Any alterations required in fabrication and fitting, and even in current practices necessitates the presence of indigenous assistive technologists with adequate training and education in biomechanics, materials engineering and fitting of appropriate assistive technologies. This paper serves as a steppingstone and therefore underscores the need to prioritise participatory research in LICs to improve development practices that ensure interventions are relevant, appropriate and inclusive.

Appendix B

Additional Tables and Figures for Chapter 2

See Figure B1 on the next page.

Figure B1: A User-Centred Predictive Model of ATD Usage



Source: Adapted and modified from Lenker & Paquet (2004).

Figure B2: Data Collection Timeline

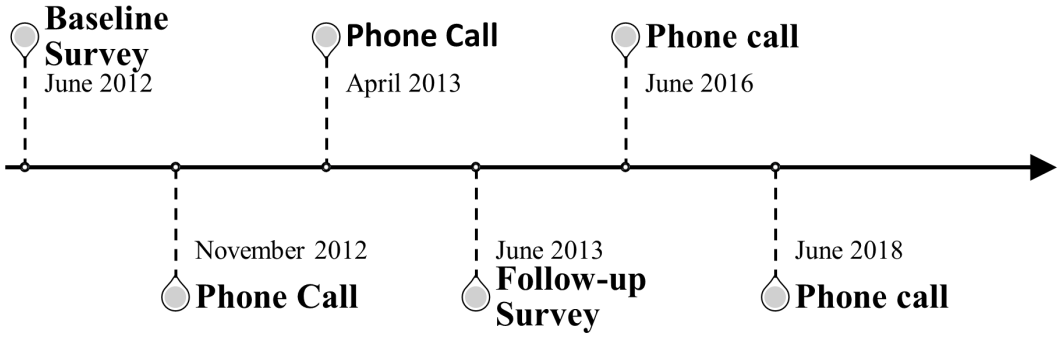


Table B1: Items Allocated

	(1) Whole Sample %	(2) Men %	(3) Women %	(4) t-test (2)/(3) p-value
Knee-Ankle-Foot Orthosis (=1)	0.18 [109]	0.18 [60]	0.19 [49]	0.674
Ankle-Foot Orthosis (=1)	0.15 [87]	0.14 [46]	0.16 [41]	0.418
Knee-Ankle Brace (=1)	0.12 [73]	0.12 [39]	0.13 [34]	0.528
Crutches (=1)	0.21 [122]	0.24 [80]	0.16 [42]	0.029
Other Equipment (=1)	0.34 [200]	0.33 [111]	0.35 [89]	0.636
Observations	591	336	255	

Note: Number of observations are reported in squared brackets.

Table B2: Variables Description

	Definition	Variable	Role
First	Orthotic equipment Failure	Failure (=1)	Outcome & predictor
Second	**Personal Factors:**		
	Gender	Female (=1)	Predictor
	Age	Age (in years)	✓
	Marital status	Married (=1)	✓
	Clinical Factors:		
	Diagnosis	Congenital (=1)	Predictor
	The type of equipment	Complex (=1)	✓
	Treated twice	Treated twice (=1)	✓
	Local staff	Local staff (=1)	✓
	The Big Five Personality Traits:		
	Openness	Trait 1 (1-21)	Predictor
	Conscientiousness	Trait 2 (1-21)	✓
	Extraversion	Trait 3 (1-21)	✓
	Agreeableness	Trait 4 (1-21)	✓
	Neuroticism	Trait 5 (1-21)	✓
Third	**Subjective Wellbeing:**		Outcome
	Life satisfaction	Life satisfaction (1-7)	✓
	HRQL	SF-8 (0 -100)	✓
	Severity of disability	WHODAS (12-60)	✓

Table B3: Person-Level to Person-Period Data Conversion for Four Respondents

Person-level data			Person-period data		
id	spell	censor	id	period	event
8	4	0	8	1	0
9	5	0	8	2	0
62	2	1	8	3	0
63	6	1	8	4	1
			9	1	0
			9	2	0
			9	3	0
			9	4	0
			9	5	1
			62	1	0
			62	2	0
			63	1	0
			63	2	0
			63	3	0
			63	4	0
			63	5	0
			63	6	0

Table B4: The Big 5 Personality Traits

I see myself as someone who ...: 1=Does not apply;7=Applies very well
Openness: *values artistic/aesthetic experiences, imaginative and open to new ideas.* -Is original, comes up with new ideas -Values artistic, aesthetic experiences -Has an active imagination
Conscientiousness: *self-disciplined, strong-willed, and purposeful.* -Does a thorough job -Tends to be lazy (recoded) -Does things effectively and efficiently
Extraversion: *sociable, active, dominating and talkative. In contrast, an introvert is less assertive and anti-social.* -Is communicative, talkative -Is outgoing, sociable -Is reserved (recoded)
Agreeableness: *prefers to compromise, is tolerant and altruistic in nature. The reverse phrasing is antagonism.* -Is sometimes somewhat rude to others (recoded) -Has a forgiving nature -Is considerate and kind to others
Neuroticism: *vulnerable to stress, anxiety, and insecurity. Low neuroticism scores indicate emotional stability.* -Worries a lot -Gets nervous easily -Is relaxed, handles stress very well (recoded)

Table B5: Health-Related Quality of Life (SF8)

1	Overall, how would you rate your health during the past 4 weeks?
2	During the past 4 weeks, how much did physical health problems limit your usual physical activities (such as walking or climbing stairs)?
3	During the past 4 weeks, how much difficulty did you have doing your daily work, both at home and away from home, because of your physical health?
4	How much bodily pain have you had during the past 4 weeks?
5	During the past 4 weeks, how much energy did you have?
6	During the past 4 weeks, how much did your physical health or emotional problems limit your usual social activities with family or friends?
7	During the past 4 weeks, how much have you bothered by emotional problems (such as feeling anxious, depressed, or irritable)?
8	During the past 4 weeks, how much did personal or emotional problems keep you from doing your usual work, school or other daily activities?

Table B6: Severity of Disability (WHODAS 2.0)

	In the last 30 days, how much difficulty did you have in:
1	Standing for long periods such as 30 minutes?
2	Taking care of your household responsibilities?
3	Learning a new task, for example, learning how to get to a new place?
4	How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?
5	How much have you been emotionally affected by your health problems?
6	Concentrating on doing something for ten minutes?
7	Walking a long distance such as a kilometre (or equivalent)?
8	Washing your whole body?
9	Getting dressed?
10	Dealing with people you do not know?
11	Maintaining a friendship?
12	Your day-to-day work/school?

Table B7: Baseline Summary Statistics – Foreign versus Local Sample

Variables	(1) Foreign mean/sd	(2) Local mean/sd	(3) t-test (2)/(3) p-value
Demographic Characteristics:			
Female (=1)	0.42	0.46	0.315
	[0.49]	[0.50]	
Age (years)	41.08	43.15	0.109
	[13.10]	[17.28]	
Schooling (years)	8.99	8.79	0.623
	[3.96]	[4.82]	
Household Characteristics:			
Married (=1)	0.51	0.64	0.003
	[0.50]	[0.48]	
Household head (=1)	0.73	n/a	
	[0.44]		
Household size	5.16	4.35	0.001
	[2.67]	[2.51]	
No. of dependent children	1.47	0.63	0.000
	[1.73]	[1.22]	
Clinical Factors:			
Congenital (=1)	0.67	0.43	0.000
	[0.47]	[0.50]	
Complex orthosis (=1)	0.57	0.19	0.000
	[0.49]	[0.39]	
Treated twice (=1)	0.39	0.15	0.000
	[0.49]	[0.36]	
Subjective Wellbeing:			
Life satisfaction (1-7)	3.37	4.1	0.000
	[1.93]	[1.76]	
HRQL	65.65	55.91	0.000
	[15.75]	[12.14]	
Severity of disability	23.97	29.57	0.000
	[7.70]	[7.57]	
Labour Market Outcomes:			
Employed (=1)	0.74	0.55	0.000
	[0.44]	[0.50]	
Self-employment (=1)	0.75	0.41	0.000
	[0.43]	[0.49]	
Wage employment (=1)	0.26	0.6	0.000
	[0.44]	[0.49]	
Monthly median earnings (in 000s of UGX)	150	300	0.001
	[620.19]	[631.57]	
Observations	407	184	

Note: Data on household headship status is missing from the local sample. See additional notes in Table 2.1

Table B8: Evolution of Key Outcomes Overtime, Disaggregated By Equipment Type

Variables	(1) Jun.12 mean	(2) Nov.12 mean	(3) Apr.13 mean	(4) Jun.13 mean	(5) Jun.16 mean	(6) Jun.18 mean
Panel A – Basic equipment:						
Using (=1)	n/a	0.97	0.9	0.84	0.62	0.38
Every day (=1)	n/a	0.82	0.82	0.75	1.00	0.93
Employed (=1)	0.65	0.60	0.62	0.72	0.4	0.58
Self-employment (=1)	0.63	0.61	0.66	0.78	0.81	0.82
Wage employment (=1)	0.38	0.39	0.35*	0.28	0.19	0.18
Monthly earnings	321.4	254.39	251.5	248.39	188.33	n/a
Life satisfaction (1-7)	3.72*	3.87	3.86	3.47	3.08	4.03
HRQL	61.97**	69.95	70.46**	61.84	63.62	63.84
Severity of disability	25.81	n/a	n/a	24.05	n/a	29.39
Observations	269	182	159	169	52	112
Panel B – Complex equipment:						
Using (=1)	n/a	0.96	0.92	0.87	0.62	0.37
Every day (=1)	n/a	0.81	0.9	0.78	0.95	0.95
Employed (=1)	0.72	0.68	0.7	0.74	0.49	0.59
Self-employment (=1)	0.7	0.63	0.75	0.75	0.78	0.81
Wage employment (=1)	0.31	0.38	0.25*	0.27	0.22	0.19
Monthly earnings	304.5	221.01	186.24	546.72	141.62	n/a
Life satisfaction (1-7)	3.40*	3.86	3.83	3.49	3	4.16
HRQL	66.11**	67.82	66.91**	62.67	62.8	66.2
Severity of disability	24.53	n/a	n/a	23.92	n/a	29.55
Observations	230	177	174	196	76	170

Note: See notes in Table 2.2

Table B9: Evolution of Key Outcomes Overtime, Disaggregated by Age Group

Variables	(1) Jun.12 mean	(2) Nov.12 mean	(3) Apr.13 mean	(4) Jun.13 mean	(5) Jun.16 mean	(6) Jun.18 mean
Panel A – Young (<=55):						
Using (=1)	n/a	0.97	0.89**	0.86	0.59	0.34**
Every day (=1)	n/a	0.82	0.88*	0.79	0.98	0.92
Employed (=1)	0.7	0.65	0.67	0.74	0.44	0.6
Self-employment (=1)	0.66	0.63	0.71	0.77	0.74*	0.79
Wage employment (=1)	0.35	0.38	0.3	0.27	0.26*	0.21
Monthly earnings	289.01	239.52	214.08	440.75	152.23	n/a
Life satisfaction (1-7)	3.52	3.85	3.85	3.43	2.97	4.12
HRQL	64.73	69.24	68.81	63.15**	63.39	65.91**
Severity of disability	24.74*	n/a	n/a	23.77	n/a	29.66
Observations	405	295	272	310	106	233
Panel B – Elderly (>55):						
Using (=1)	n/a	0.94	0.98**	0.88	0.73	0.51**
Every day (=1)	n/a	0.80	0.78*	0.63	0.94	1.00
Employed (=1)	0.62	0.59	0.62	0.69	0.5	0.53
Self-employment (=1)	0.69	0.58	0.71	0.74	1.00*	0.92
Wage employment (=1)	0.33	0.42	0.29	0.34	0.00*	0.08
Monthly earnings	433.2	224.29	216.39	250.66	185.45	n/a
Life satisfaction (1-7)	3.73	3.94	3.82	3.77	3.32	4.06
HRQL	61.36	67.34	67.7	57.40**	61.93	62.24**
Severity of disability	27.02*	n/a	n/a	25.18	n/a	28.65
Observations	94	64	61	55	22	49

Note: See notes in Table 2.2

Chapter 3

Linking Adult Wellbeing to Disability, Social Inclusion and Intrahousehold Arrangements

3.1 Introduction

In recent times, there has been a growing attention to subjective wellbeing (SWB) studies due to its potential in informing policy decisions and social initiatives that could promote social inclusion and improve quality of life. However, Clark et al. (2005) have argued that there is no reason to assume that the determinants of wellbeing are homogeneous across people. This is especially so among marginalised groups. People with disabilities are considered to be the largest minority group globally. Around 15% of the world's population have a disability and low-income countries harbour the largest share (80%). Disability prevalence is increasing due to population ageing and the increasing number of people with chronic health conditions (WHO & World Bank, 2011).

To address issues of disability and wellbeing in the context of Uganda, this study utilizes a unique dataset, collected as part of the 2017 Uganda Functional Difficulties Survey (UFDS) with the aim of monitoring and planning future disability interventions in Uganda. Considering that having some functional difficulty was used to select households for the UFDS, this chapter adopts the most widely used definition of disability which is based on having a lot of

difficulty or cannot do at all in any domain of functioning.[1] By quantifying the effects of disability on wellbeing, and also comparing wellbeing between disabled and non-disabled adults over a large sample of 13,544 respondents in 7,123 households, we evaluate the determinants of subjective wellbeing, assess the pathways through which the relationship between perceived discrimination and wellbeing is explained by various forms of discrimination and examine the role of Information and Communication Technologies (ICT), as proxied by mobile phone use, in the relationship between discrimination and wellbeing. Finally, we attempt to unpack the role of intrahousehold arrangements in shaping personal wellbeing among disabled and non-disabled households.

This chapter contributes to three strands of the literature. The *first* strand of the literature explores the link between disability and subjective wellbeing. Fafchamps & Kebede (2012) underscored disability as an important welfare concern in developing economies, yet empirical studies analysing the disability-wellbeing nexus in sub-Saharan Africa are rather scant. Limited evidence among older adults with HIV/AIDs in Uganda and South Africa suggests that marked socio-demographic disparities influence the extent to which wellbeing is affected and that the African continent should not be considered as a homogeneous entity (Nyirenda et al., 2013). In the first chapter, we found that a medical intervention which gifted orthoses to people with disabilities in Uganda improved their wellbeing (Abubakar et al., 2021). However, having an unsupportive and non-inclusive social climate can be a barrier to making use of healthcare services because stigmatized individuals tend to avoid negative experiences and therefore may not be motivated to seek rehabilitative care that could empower them, especially those with physical and communication disabilities (Moscoso-Porras & Alvarado, 2018). Hence, victimization, stigma and discrimination can significantly magnify the difficulties faced by people with disabilities (Rohwerder, 2018) and this

[1] This definition of disability and the alternative distinctions for identifying people with disabilities is explained in more detail in Sections 3.3 and 3.7, respectively.

has been found to be negatively correlated with wellbeing (Paradies et al., 2015; Williams et al., 2019; Hackett et al., 2020), especially among the poor (Fuller-Rowell et al., 2012). Similarly, Syropoulos (2020) contends that although personal safety is a prerequisite for leading a happy life, this is understudied. To the best of our knowledge, no quantitative studies directly exploring the effects of discrimination and personal safety on the wellbeing of people with disabilities have been documented in Uganda.

Cultivation theory postulates that media messaging systems play a role in shaping attitudes, preferences, and perceptions. Hence, the *second* aspect of the literature that we explore is media psychology. Studies have shown that ICT builds social capital, encourages social integration and participation, improves a sense of belonging and boosts subjective wellbeing (Greyling, 2018; Pontarollo et al., 2020). Specific to people with disabilities, Izzo (2012) found that digital technologies enhance the learning outcomes of American students with disabilities, while Hasan et al. (2017) found that due to ICT, Bengalis with disabilities have access to jobs, are more independent and contribute to household income.

Social psychology has linked media exposure to perceptions of discrimination, and at least two distinct views exist: one that proposes that greater exposure to negative media portrayals leads minority or disadvantaged groups to a heightened perception of discrimination (Gandy & Matabane, 1989; Browne Graves, 1999; Benbow, 2007; Entman & Rojecki, 2010); and another that contends that the use of ICT creates a sense of belonging, encourages social integration, and enhances minority groups' sense of personal control over social situations (Damásio et al., 2012; Wei & Gao, 2017; Chib & Shi, 2018; Miller et al., 2020). In this chapter, we examine the link between ICT use, through mobile phones, and discrimination and wellbeing.

The *third* strand of the literature covers intrahousehold arrangements. Most wellbeing studies rely on the assumption that each individual is independent. In reality, a person's wellbeing can be influenced by close

contacts, and spillovers can occur from within shared contexts. The household is considered as a black box which may entail communitarianism, altruism, cooperation, bargaining and/or conflict (Hart, 1992; Bergstrom, 1997; Vogel et al., 2003). However, most studies typically examine two household members at a time (e.g., husband-wife, boy-girl, or parent-child), ignoring the role of other respondent types in shaping personal wellbeing. Drawing from Rojas (2011), the nature of intrahousehold arrangements can be applied to the study of people's subjective wellbeing and whether family members benefit equally from their household's resources. While studies have mostly focused on gender, little is known about intrahousehold arrangements in disabled households. We are particularly interested in examining the effects of a person's role in the family, measured by their relationship to the head of the household, on their personal wellbeing and how this differs between disabled and non-disabled households in the context of low-, middle- and high-income households.

The wellbeing determinants of people with disabilities, who already are disadvantaged by virtue of their impairment, alongside other forms of inequalities they face, may differ from those of able-bodied individuals. This chapter aims to add new knowledge in better understanding people's wellbeing and therefore inform appropriate policy decisions based on people's preferences, experiences and social welfare in a given group, time and context. By exploring people's wellbeing and those of their household members, particularly those with disabilities, interventions that account for the nature of intrahousehold arrangements can be incorporated into the design of targeted programs.

Using a multilevel modelling approach which considers the nested nature of respondents within households, estimates from the baseline analysis identify the presence of disability, the number of morbidities and discrimination as negative determinants of wellbeing; while mobile phone use, personal safety, education and household wealth are positively associated with wellbeing. However, these effects vary depending on the type of respondent. We find that

women with disabilities report lower levels of wellbeing. The positive wellbeing effects of education, marriage and personal safety are more pronounced among people with disabilities compared to their non-disabled peers. Alongside the non-disabled group, the use of mobile phones works best for men and young people with disabilities. The analysis also reveals that the use of mobile phones can positively moderate the relationship between discrimination and wellbeing. In terms of intrahousehold arrangements, we first utilized standard inequality decomposition techniques to assess whether the type of household within which a person resides may partly explain distributional differences in wellbeing. The analysis suggests that at least 43% of total inequality in disabled households can be attributed to inequalities occurring inside the household, while in non-disabled households, the relative share of intrahousehold inequality is 35%. For a given level of household income and disability status, our analysis also suggests that wellbeing is not always evenly distributed within the household due to a person's relationship to the head of the household.

The remainder of the chapter is structured as follows. The next section provides an overview of the literature on subjective wellbeing as it relates to our questions of interest. Section 3.3 describes the data used in the analysis, including summary statistics, while Section 3.4 presents the empirical strategy. In Section 3.5, the findings from the baseline estimates are reported, while the results from the analysis of intrahousehold arrangements are presented in Section 3.6. Section 3.7 discusses the sensitivity analysis and Section 3.8 concludes the chapter.

3.2 Related Literature

Subjective wellbeing is often used by economists and psychologists to refer to the evaluation of one's own life as a whole and is typically measured through individual wellbeing, happiness or satisfaction with life (Van Praag et al., 2003). From an economist's viewpoint, subjective wellbeing is considered as a reflection of utility (Frey & Stutzer, 2002; Diener, 2006). Clark & Oswald

(2002), Clark et al. (2008) and Van Praag & Baarsma (2005) document findings from the analysis of objective data, arguing that the determinants of subjective wellbeing strongly mimic the base arguments of a utility function which implies that happiness or life satisfaction scores provide information about a person's utility.

A myriad of factors including age, gender, ethnicity, marital status, household structure, income, health and personality traits have been analysed as subjective wellbeing determinants (Clark & Oswald, 2002; Van Praag et al., 2003; Blanchflower & Oswald, 2004; Clark et al., 2008; Boarini et al., 2012; Fafchamps & Kebede, 2012; Deeming, 2013; Sarracino, 2013; Sutin et al., 2015; Daley et al., 2018; Pontarollo et al., 2020; Rishworth et al., 2020). Clark & Oswald (2002) compared the relative importance of income with life events such as illness, marriage, and unemployment on people's happiness. They found that physical health is one of the strongest events explaining wellbeing, while the effects of bereavement and losing a job outweigh a drop in income.

Studies have found that leisure (Van Praag et al., 2003), social capital and relational goods (Sarracino, 2013) have positive impacts on human wellbeing, while being disadvantaged such as the elderly (Rishworth et al., 2020), women and ethnic minorities (Blanchflower & Oswald, 2004) and people with disabilities (Fafchamps & Kebede, 2012) have been found to lower wellbeing. What is more, some studies have underscored the importance of a person's environment as conducive for wellbeing (Brereton et al., 2008; Graham & Pozuelo, 2017), for example, living in places with strong social safety nets, supportive government and strong healthcare systems favour a person's wellbeing.

3.2.1 Disability, Health and Wellbeing

Most disability and subjective wellbeing studies focus on developed countries where a growing body of evidence shows that people with disabilities should not be presented as a homogeneous group. Not all people with disabilities

should be perceived as suffering or as victims (Headey & Wearing, 1992; Cummins et al., 1997; McGillivray et al., 2009; Aujla & Needham-Beck, 2020). For example, McGillivray et al. (2009) found that people with intellectual (or cognitive) disabilities in Australia have levels of subjective wellbeing that are within a comparable range with the general population. Aujla & Needham-Beck (2020) also reached similar conclusions among youth with intellectual disabilities in the UK.

There is a significant evidence gap on the disability-wellbeing research in the context of sub-Saharan Africa (Fafchamps & Kebede, 2012). Using cross-sectional data for Ethiopia, Fafchamps & Kebede (2012) found that the detrimental effect of functional limitations on subjective wellbeing disappears in the presence of material welfare. The authors also found that households with at least one disabled person have lower subjective wellbeing compared to those without disabled members. Using the same sample from the Uganda Disability Project analysed in Chapter 1, Barazzetta et al. (2019) tracked simultaneous changes in the physical health and subjective wellbeing of treated adults with lower limb disabilities over a period of twelve months. Despite significant improvements in objective outcomes, they found that positive health changes only led to short-lived increases in subjective wellbeing after which these individuals returned to their baseline pre-treatment wellbeing levels.

Additional studies in Uganda have focussed on the wellbeing of the elderly. Motivated by population ageing and declining rates of wellbeing in sub-Saharan Africa, Rishworth et al. (2020) explored the different conditions that shape subjective wellbeing opportunities among older men and women in Uganda. Results showed a significant adverse effect of ageing on wellbeing through indirect pathways including support structure, education, work status and asset levels. Another study by Nyirenda et al. (2013) compared the wellbeing of older people with HIV/AIDS in Uganda and South Africa and concluded that sub-Saharan Africa as a region should not be treated as a homogeneous entity. While older people's health challenges were similar in both countries, marked

socio-demographic disparities such as being young, married, uneducated, unemployed and rural residency influenced the extent to which their health was affected. Compared to Ugandans, South Africans were more likely to be disabled, but did better in terms of subjective wellbeing. Hence, designing policies to improve the welfare of the Ugandan population requires not only investments in health care services, but also improvements in social services.

3.2.2 Disability, Social Inclusion and Wellbeing

Unfavourable social environments dissuade social inclusivity. For example, Friedman (2020) found that people with disabilities are less likely to be employed despite the ability to and interest in work because employment disparities are intertwined with disability prejudice. Moreover, when social situations become extremely unpleasant, a person starts to avoid them, significantly impairing their quality of life (Juretić & Živčić Bećirević, 2013). These experiences vary with disability forms. For instance, having a concealable form of disability implies that a person is able to hide their impairment to avoid stigmatization. Conversely, people with visible disabilities can be more prone to societal stereotyping, hence increasing the risk of discrimination and social avoidance. These social outcomes impair wellbeing.

Even though integration across health and social systems is imperative for wellbeing, Holt-Lunstad et al. (2017) argued that government agencies and other key health stakeholders including public and private care funders and providers have not been particularly proactive in recognizing human social relationships as either a health determinant or a health risk marker in a manner that is analogous to other public health priorities. This is because the pace of initiating effective social relationship interventions is noticeably slow and stakeholders are not entirely sure how to act. Holt-Lunstad et al. (2017) underscored the importance of empirical research that considers the processes by which social relationships influence physical health as well as channels through which appropriate interventions may be applied to reduce

risk and improve public health.

A review by George (2010) also suggests that although many factors contribute to evaluations of wellbeing, social integration is critical to maintaining life satisfaction. In the context of Albania, an empirical study by Litchfield et al. (2012) revealed that average life satisfaction was found to be higher among individuals with better social networks including the number of friends and having active community organizations, while the cost of having an additional child within the household induce a reduction in average wellbeing. Among people with disabilities, Hsieh & Waite (2019) analysed a cross-sectional sample of older adults in China and found that disability predicts lower levels of subjective wellbeing which is partly linked to spending more time alone and lower social interaction with others.

People have a strong need to belong, and often feel distressed when they do not have desired social relationships (Hawkley & Cacioppo, 2010; Chou et al., 2014; Kuwert et al., 2014). Discrimination may elicit feelings of being excluded, while chronic loneliness increases the risk of unhealthy behaviours (Hawkley & Cacioppo, 2010). Discrimination serves as a barrier to social inclusion because it affects people's opportunities, their wellbeing and their sense of agency (United Nations, 2018a). Rohwerder (2018) cautioned that there is a significant evidence gap on discriminatory experiences among the disabled population in low-income countries. Moreover, studies that analyse discrimination as a social marker of subjective wellbeing are mostly specific to developed countries (Kim, 2015; Dammeyer & Chapman, 2018; Hackett et al., 2020). Other studies have only focused on people with mental illnesses (Krajewski et al., 2013; Sibitz et al., 2013; Perese, 2016; Finzen, 2017) or specific age groups (Sutin et al., 2015; Daley et al., 2018).

Linking disability discrimination and wellbeing, a recent study by Hackett et al. (2020) found that perceived discrimination is associated with poorer wellbeing among British people with disabilities. Another study by Sutin et al. (2015) used a two-period (2006 and 2010) longitudinal dataset and found

that discrimination was specifically associated with loneliness and lower life satisfaction and that discrimination had more pervasive effects on loneliness among older American adults. The authors also found that the effects of discrimination were mainly driven by attributes that change over time including age, weight, disability and appearance, rather than more stable attributes such as race or gender.

Another study by Dammeyer & Chapman (2018) analysed the effects of gender and the type and degree of disability on the likelihood of experiencing discrimination among Danish people with disabilities. Women with disabilities were more likely to report humiliation and discrimination than their male peers. Although Dammeyer & Chapman (2018) indicated that neither severity nor visibility of disability were significant risk factors of discrimination, people with mental disabilities were more prone to reporting all types of discrimination than those with physical disabilities.

Some studies have also identified different moderators of discrimination on wellbeing. A paper by Kim (2015) found that disability acceptance positively mediated the effects of discrimination on life satisfaction among Korean women with severe disabilities. Daley et al. (2018) also assessed the social complexities of disability on life satisfaction and showed that in the face of discrimination, young Canadians with a higher sense of belonging in the community reported higher life satisfaction.

With respect to personal safety, there is evidence that both men and women with disabilities are more likely to experience some form of crime victimization than people without disabilities, with women particularly vulnerable to sexual violence while men are more characterised as victims of physical abuse (Hughes et al., 2012; Dammeyer & Chapman, 2018; Kett & Kidd, 2020). Litchfield et al. (2012) found a negative relationship between criminal activities within the community and life satisfaction in Albania while cross-national evidence from the World Value Survey across 59 countries including Africa, showed positive associations between feelings of personal safety and subjective wellbeing

(Syropoulos, 2020).

3.2.3 Disability, ICT and Wellbeing

The use of Information and Communication Technologies (ICT) is viewed as a fast-growing channel for conveying information about health, transport, education, employment opportunities and many government services which are important markers that constitute an inclusive society. In low-income contexts, mobile phones have been viewed as the mainstream avenue for strengthening gender equality and women's bargaining power (Zheng & Lu, 2021). This could have comparable effects on other "left-behind" groups.

Research by Hewitt (2018) found that mobile money platforms have been used by people with disabilities in Uganda to overcome barriers to microfinance access. Ali et al. (2020) also demonstrated that ICT can have positive effects on people with disabilities as it complements traditional forms of healthcare. However, technological and economic constraints such as assistive technology and digital skills are limiting factors for adoption. A WHO & World Bank (2011) report on disability underscores the importance of ICT accessibility in narrowing the digital divide and ensuring the full integration of people with disabilities into society. Marginalised groups are the least likely to gain access to ICT, but when they do, it can make a difference to their lives. There is, however, limited research on mobile phone usage in addressing the needs of people with disabilities in low-income countries (Barlott et al., 2016; Thompson, 2018; Ali et al., 2020).

Information exclusion not only impacts people with disabilities, but also their family members. Many family members become isolated because they must remain at home to take care of a disabled member. Barlott et al. (2016) qualitatively analysed a community-based research project in Bogota, Colombia, where caregivers of people with disabilities were provided with mobile phones to access information about rehabilitation services and community events. The project found that as important as these events

were to participants, they were initially unaware of these possibilities. Having increased exposure to information, participants expressed a desire for raising awareness on disability issues in their community. The intervention focused on the caregivers of people with disabilities, hence Barlott et al. (2016) recommended that future studies on the effects of ICT should focus on people with disabilities themselves.

A qualitative review by Thompson (2018) identified the major barriers to inclusion and how mobile-enabled services can help to reduce inequality for people with disabilities. Thompson (2018) argued that the use of technology to empower people with disabilities is not a new concept especially because assistive technologies have been used to promote independence and participation for some time. With new mobile technology functionalities emerging to facilitate communication and access to information, the author found that mobile devices can promote the social integration of people with disabilities across six themes including societal acceptance, having relationships, being involved in activities, living arrangements, employment, and support systems. Hence ICT has the potential to help people with disabilities overcome barriers to communication, social interaction and access to information.

The empirical literature has also shown the beneficial effects of ICT on people's quality of life. Proponents of ICT for Development (ICT4D) have argued that exposure to digital technologies reduces loneliness, boosts social capital, promotes a sense of belonging and inclusion and improves subjective wellbeing (Damásio et al., 2012; Greyling, 2018; Pontarollo et al., 2020). Smith & Phillips (2006) proposed that media works to develop forms of communal relationships among socially diverse individuals within modern societies.

Two strands of the literature exploring the link between discrimination and ICT have also emerged. Opponents in the media psychology literature contend that media stimulates prejudice; perpetuates discrimination, stereotypes, myth, social distance; and negative self-imagery (Gandy & Matabane, 1989;

Browne Graves, 1999; Benbow, 2007; Entman & Rojecki, 2010). The Investor Alliance for Human Rights (nd) argued that ICT can exacerbate inequality and discrimination, inciting violence against marginalised groups. However, Sizemore & Milner (2004) in their empirical investigations among Hispanics found that personal, social and ethnic identities, explain discrimination perceptions more than ICT. An early study among Hispanics by Subervi-Velez (1979) found that this could also depend on the type of media: after controlling for background factors, exposure to television had a negative correlation with perceived discrimination while other media types including radio, did not explain discrimination perceptions.

However, proponents contend that a potential channel through which individuals can cope with discrimination is through ICT. A recent study among Asians and Asian-Americans in the United States by Yang et al. (2020) found that social media messaging, posting and commenting, was associated with perceived social support and reduced discrimination concerns on subjective wellbeing during the COVID-19 lockdown. Therefore, ICT uptake can serve as a form of problem-focused coping with potential face-to-face discrimination, enhance minority groups' social identity and increase social participation (Damásio et al., 2012; Wei & Gao, 2017; Chib & Shi, 2018; Miller et al., 2020). This in turn, can influence wellbeing.

3.2.4 Intrahousehold Dynamics and Wellbeing

Empirical studies on the determinants of subjective wellbeing have, until now, analysed individuals with the assumption that family members act homogeneously to maximize a single utility function (a unitary model). While most of these studies are aware of this shortcoming, recent developments on the availability of family data have allowed studies to model households as composed of heterogeneous individuals (a non-unitary model).

The family is viewed as a black box, where the distributive pattern of household resources, whether economic or non-economic (e.g., income,

wellbeing, emotional support, division of household tasks, etc.) could entail communitarianism, altruism, cooperation, bargaining, or conflict (Hart, 1992; Bergstrom, 1997; Vogel et al., 2003). Communitarianism implies that household resources are pooled into a common pot where everyone benefits equally. In altruistic households, some members make sacrifices for the benefit of others. Under a cooperative equilibrium, self-motivated adults remain in the group as long as they attain benefits from household resources, while in cooperative bargaining, benefits are shared on the basis of a bargaining process. Individualism entails that members act as partners drawing from separate pots of resources within the household.

At least one-third of total inequality is due to disparities occurring inside a household rather than between households (Haddad & Kanbur, 1990), hence a realistic analysis of inequalities needs to account for intrahousehold disparities (De Vreyer & Lambert, 2021; Klasen & Lahoti, 2021). While studies on intrahousehold dynamics are vast (including exploration of income and consumption disparities (De Vreyer & Lambert, 2021), power dynamics (Haddad et al., 1997), time use (Pitt & Rosenzweig, 1990) and labour supply (Bridges et al., 2018)), few papers have touched on intrahousehold subjective wellbeing inequalities. The evidence that exists has mostly focused on disparities in boys and girls (Dercon & Singh, 2013) or couples (Radchenko, 2016; Bárcena-Martín et al., 2020; Kollamparambil, 2021), much less on people with disabilities and their family members (Carew et al., 2019). Bolt & Bird (2003) also cautioned that little attention has been given to other dimensions in the study of intrahousehold dynamics such as age, birth order, illness, disability, or wives' status and that of her children.

Different empirical approaches have been applied to evaluating intrahousehold inequalities in the distribution of subjective wellbeing. Given the limited research on intrahousehold disability dynamics, we mainly draw from the existing literature on couples. Kalugina et al. (2009) proposed that subjective data can be used to purposefully test some of the assumptions

made in non-unitary models of the household and find that responses to life satisfaction by different members of the household elicit pertinent information on income sharing and utility in the household. Using probit-based models, Kalugina et al. (2009) found a significant positive effect of the female-male wage ratio on income perception and satisfaction between household members. Similar conclusions were reached by Radchenko (2016) who used a collective model of labour supply and life satisfaction to analyse Russian spouses. Radchenko found evidence that intrahousehold inequalities in satisfaction were associated with disparities in the consumption of market goods, leisure and optimism. The higher the wife-to-husband wage ratio, the more likely that the wife's share of the total utility was higher.

Using self-reported health as a measure of wellbeing, Bárcena-Martín et al. (2020) analysed the importance of intrahousehold arrangements among couples residing in 24 European countries. They found that higher levels of wellbeing were linked with controlling or sharing financial decisions but this also depended on income pooling status i.e., whether or not all incomes are treated as common resources within the household. Men's wellbeing was positively linked to women making domestic decisions, and negatively if they were financial decisions, while women's wellbeing was positively linked with taking domestic decisions only in households where incomes were not fully pooled into a common pot.

A recent study by Kollamparambil (2021) used a range of approaches to measuring intrahousehold disparities in life satisfaction among South African couples between 2012 and 2016. The author first evaluated overall inequality using Theil's L and decomposed the measure into within- and between-household components. Secondly, she used a regression-based approach to investigate the correlates of intrahousehold inequality and finally applied the Oaxaca-Blinder decomposition to identify the sources of increased intra-household inequality between the two study periods. Overall, Kollamparambil found a reduction in wellbeing inequality between the two

periods, however, between-household inequalities reduced at the expense of greater inequalities within households. The author found that reliance on household level outcomes like income and access to public amenities were not a sufficient condition to reduce intrahousehold inequalities but that power dynamics, through education-based positive assortative mating, were found to reduce inequality.

Despite being the world's largest minority group (Swartz et al., 2018), and the most marginalised and vulnerable group within any population (Groce & Trani, 2009), the existing literature on intrahousehold subjective wellbeing inequalities among people with disabilities is rare. Carew et al. (2019) is the only paper to our knowledge. Across five communities in Liberia, they sampled 485 and 538 households with and without a disabled person, respectively. Among a total of 2,020 respondents and using a multidimensional wellbeing framework, Carew et al. (2019) found that people with disabilities were equal to their non-disabled peers in terms of economic hardship, however, disabled individuals were more disadvantaged in terms of life satisfaction, transport access, political participation and social inclusion. People with disabilities who are not household heads were at greater risk of relative inequality in healthcare access, transport and political participation, which could partly be associated with relative power dynamics within the household. Moreover, the authors found that disability can lead to household level inequality in terms of trust held in neighbours which is potentially linked to unfavourable social environments (such as discrimination).[2]

An important study by Rojas (2011) proposed that the role of a person within the household is relevant for the study of subjective wellbeing. The author assessed the relationship between adult health satisfaction and family status (or structure) among Mexican households. The paper found that women are not as well-off as men depending on the household's socio-economic status.

[2]A limitation of this study's approach is that they do not explore the extent to which inequalities are explained by between and within household disparities and used only gender, age, education and household wealth quintile as covariates.

In low income households, sons and mothers have very similar wellbeing levels as fathers but daughters have a higher probability of experiencing poorer health satisfaction than other family members. In high-income families, mothers experience considerably lower health satisfaction than fathers but sons and daughters tend to experience very similar wellbeing levels as fathers. The author stressed that intrahousehold wellbeing disparities can be explained by cultural patterns that discriminate against women and by cooperative bargaining elements present in household arrangements.

Altogether, the empirical literature documenting the determinants of subjective wellbeing in the presence of disability is understudied and mostly centred on developed countries. Due to differences in cultural norms and income levels, the nature of family arrangements and other wellbeing determinants are likely to vary across and within contexts. Despite the significance of health and social markers on wellbeing, only a handful of studies exist in the context of sub-Saharan Africa with evidence for Uganda mostly non-existent. Moreover, only a few quantitative studies have attempted to untangle the dynamics of households having a disabled member. Recognising these gaps in the empirical literature, this chapter adds new knowledge in the context of Uganda using unique cross-sectional data from the 2017 Uganda Functional Difficulties Survey, which we describe in the next section.

3.3 Data and Summary Statistics

The 2017 Uganda Functional Difficulties Survey (2017 UFDS) is a novel dataset on people with functional difficulties aimed at monitoring and planning future disability interventions in Uganda. The sample was drawn from the 2016 Uganda Demographic and Health Survey (2016 UDHS) comprising of eligible households i.e., having at least one member with 'some' functional difficulty. Only households that consented to being revisited were included, and the survey had a 99% response rate. The data provides an in-depth insight into the social complexities affecting varied groups of people with functional difficulties

across Uganda, covering 15 sub-regions. Hence, it provides a representative picture of people with disabilities in Uganda.

Since only the subjective wellbeing of adults is measured in the UFDS, we only consider the adult sample and take advantage of two unique features of the data. First, the household schedule collects detailed information on household composition, while the adult questionnaire (18+) collects data on subjective wellbeing, discrimination perceptions, safety, and access to and use of mass media. It also contains information on self-reported morbidities as outlined in the Uganda Persons with Disability Act (UPWA 2006) and a detailed adult functioning module which aligns with the Washington Group measures of disability. We describe the set of variables used for the analysis in more detail below:

Subjective Wellbeing. In the literature, subjective wellbeing is typically proxied by either life satisfaction or happiness. The survey asked respondents to rate their overall level of happiness as very happy, somewhat happy, neither happy nor unhappy, somewhat unhappy or very unhappy. Data collection using visual aids tend to demonstrate greater reliability and accuracy of information. Hence, respondents were shown smiley cards to explain what each level of happiness represents, which were recorded on a 5-point scale with higher values indicating better wellbeing. See Figure C1 for a distributive picture of happiness responses in the Appendix.

Disability and Health. We adopt the most widely used disability measure constructed by the Washington Group on Disability Statistics (WG). The WG was set up in 2001 as a United Nations Statistical Commission City Group, comprising of a given set of questions that are often used in censuses and surveys to provide internationally comparable population-based measures of disability. The disability measure is intended for the adult population and designed to identify the majority of people who are at greater risk of social participation restrictions based on six functioning domains including walking and climbing steps (mobility), vision, hearing, cognition (remembering

and concentrating), communication and self-care. People with disabilities are identified as having a lot of difficulty/cannot do in any given domain (Disability=1 if having a lot of difficulty/cannot do in at least one domain, and a value of 0 otherwise).

In line with the existing literature (Wandera et al., 2014; Daley et al., 2018), we also control for morbidity count which is the number of self-reported mental (i.e., hydrocephalus, autism, and Down's syndrome) and physical (i.e., spina bifida, rheumatism, spinal cord injury, epilepsy and leprosy) impairments.[3] While these health conditions do not directly imply disablement, they can be significantly detrimental to wellbeing and can further compromise the life quality of an individual.

Personal Safety. Two questions were asked on personal safety. (i) How safe do you feel when you are at home alone after dark, and (ii) how safe do you feel walking alone in your neighbourhood after dark. On a 4-point scale, respondents can rate their feelings of safety in both situations as either very unsafe, unsafe, safe, or very safe. Individuals who responded to "never alone after dark" were coded as missing/not applicable. For the analysis, we create a simple score of personal safety from the two questions which indicates good internal consistency (Cronbach's alpha= 0.75).[4]

Discrimination. Participants attributed their experiences of discrimination on the basis of ethnicity, gender, sexual orientation, age, religion, disability and other grounds.[5] Respondents reported binary responses (yes/no) to the

[3]The 2017 UFDS only captured health conditions that were visible by the enumerators.

[4]The Stata command 'alpha' generates a composite mean score from the two personal safety questions and computes a reliability coefficient known as Cronbach's alpha. Alpha, expressed as a number between 0 and 1 was developed by Lee Cronbach in 1951 to assess how well a construct or instrument measures what it should (reliability). The higher the alpha coefficient, the more the items have shared covariance and likely measure the same underlying concept. In other words, it is a measure of how closely the Likert items that make up a composite score are correlated. If the items are all perfectly correlated, then alpha will be one (its maximum possible value). If the items are all independent, then alpha will be zero, in which case, a composite score created from the items would be unreliable. Acceptable Cronbach's alpha cut offs vary in the literature, a range between 0.65 and 0.9 is considered good and thought to show high reliability of the construct (Tavakol & Dennick, 2011).

[5]This question is in line with the SDG16 on peace, justice and strong institutions under indicator 16.b.1 and follows the recommended illustrative list of grounds prohibited by the

respective forms of discrimination that apply and in what follows, we include sexual orientation in the 'other' category since this was fairly uncommon (3%). The discrimination count variable represents the number of types of discrimination a respondent experienced, while for the pathway analysis, Disc=1 if answered 'yes' to any form of discrimination, or a value of 0 otherwise.

Information and Communication Technologies (ICT). As a proxy for ICT, respondents were asked whether they have used a mobile phone almost every day, at least once a week, less than once a week or not at all in the past three months.[6] For the pathway analysis, Phone=1 if used mobile phone at least once per week, and 0 otherwise.

Additional Controls. Socio-demographic variables include gender (female=1, and 0 otherwise), age in years, categorical dummies for educational attainment (no education, primary, secondary, higher), living as a couple (married/cohabiting=1, and 0 otherwise), and household level characteristics including household size, dependency ratio,[7] household wealth score and dichotomous variables for household wealth status (low, middle, and high). Note that data on respondents' level of education and household wealth was extracted from 2016 UDHS and merged with the 2017 UFDS.

The second feature of the data that we exploit is that all adults in each household were surveyed which implies that some respondents share a common household. This not only permits the identification of different respondent types but also permits the analysis of the relationship between intrahousehold arrangements and wellbeing among disabled and non-disabled households. The final data consists of 13,544 adults (level 1) in 7,123 households (level 2). The flow chart diagram in Appendix Figure C2 provides further detail on

international human rights law, as described by the Office of the United Nations High Commissioner for Human Rights (OHCHR) in this document [Last updated 3rd Dec. 2018; Retrieved 14th Oct. 2021].

[6]The use of mobile phone as an ICT is common to most developing countries in sub-Saharan Africa compared to other alternatives (e.g., computer and internet). As expected, the use of alternative ICTs was considerably unpopular in this sample (usage at least once/week was 3% and 5% for computers and internet, respectively).

[7]Dependency ratio=(members<18y + members>=65y)/household size.

the hierarchical structure of the sample and demonstrates that 9,965 persons are nested in 5,051 non-disabled households while 4,179 persons are nested in 2,072 disabled households. Note that the comparison of households with and without disabled members is based on whether an adult has a lot of difficulty or cannot do in any functional domain (people with disabilities). Considering we do not have access to data on children, if all adults in a household have no functional difficulties, we can infer that there are likely children with some difficulties and/or children with disabilities.

3.3.1 Descriptive Analysis

The starting point of the preliminary analysis illustrates the background profile of respondents in Table 3.1, disaggregated by disability status. Additional sample splits by gender and disability status are reported in Table C1 in the Appendix.

Around 18% of respondents are classified as having a disability and just over half of respondents are women (55%). On average, respondents are aged 40 (ranging from 18 to 97). Over two-thirds are married, with nearly one-fifth either divorced, separated or widowed. Average schooling is 5.3 years, with more than three-quarters having either no formal education or educated to primary level. This is similar to the national average of 5.8 years in 2017 (World Bank, 2021b).

Respondents with disabilities differ from their non-disabled peers in numerous ways (columns 2 to 4). More non-disabled adults live as a couple compared to their disabled peers (65% vs. 55%). Although marriage provides social support and resource pooling opportunities that can influence wellbeing, female respondents with disabilities are the least likely to marry. People with disabilities, especially women, are less likely to be educated (28% vs. 18%). In terms of household characteristics, disabled respondents are more likely to live in smaller and poorer households than their non-disabled peers (6 vs. 7 members, 50% vs. 47% in low wealth households).

Table 3.1: Background Profile

	(1) Whole Sample mean	(2) PwDs mean	(3) ND (All) mean	(4) t-test (2)/(3) p-value
Disability (=1)	0.18			
Female (=1)	0.55	0.58	0.54	0.0***
Age (in years)	40.11	46.13	39.08	0.0***
Age 50+ (=1)	0.27	0.41	0.25	0.0***
Married/cohabiting (=1)	0.65	0.59	0.66	0.0***
Education:				
Schooling (in years)	5.28	4.34	5.45	0.0***
No education/preschool (=1)	0.19	0.28	0.18	0.0***
Primary (=1)	0.58	0.55	0.59	0.0***
Secondary (=1)	0.17	0.13	0.18	0.0***
Higher education (=1)	0.05	0.03	0.05	0.0***
HH characteristics:				
Household size (#)	7.17	6.45	7.29	0.0***
Dependency ratio	0.59	0.62	0.58	0.0***
Household wealth score	-0.17	-0.25	-0.16	0.0***
Wealth status:				
Low (=1)	0.48	0.50	0.47	0.0***
Middle (=1)	0.22	0.23	0.21	0.1*
High (=1)	0.31	0.28	0.31	0.0***
Subjective wellbeing:				
Happiness (1-5)	3.37	2.92	3.44	0.0***
Levels of SWB:				
Very unhappy	0.07	0.17	0.05	0.0***
Somewhat unhappy	0.13	0.19	0.12	0.0***
Neither happy nor unhappy	0.26	0.27	0.26	0.0**
Somewhat happy	0.44	0.29	0.47	0.0***
Very happy	0.10	0.08	0.10	0.0***
Socio-psychological markers:				
Perceived discrimination (=1)	0.17	0.31	0.15	0.0***
Discrimination count [1-6]	1.65	1.79	1.60	0.0***
Personal safety score	0.03	-0.21	0.07	0.0***
Mobile phone use:				
Not at all	0.29	0.39	0.27	0.0***
Less than once/week	0.16	0.15	0.16	0.4
At least once/week	0.15	0.14	0.15	0.2
Almost every day	0.40	0.31	0.41	0.0***
Health:				
Morbidity (=1)	0.13	0.30	0.10	0.0***
Morbidity count [1-8]	1.19	1.28	1.15	0.0***
Observations	13478	2388	11084	

Note: PwDs=people with disabilities. ND=all non-disabled irrespective of household type. The recommended WG-SS measure of disability (Disability3) = a lot/cannot do in any domain is used to identify PwDs. Proportions and means are respectively reported for categorical and continuous variables. Column 4 reports p-values from t-tests of differences in means between the two groups with significance * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Sampling weights have been applied.

Concerning the subjective wellbeing of respondents, Table 3.1 shows that just over half of respondents (54%) feel "somewhat happy" or "very happy", with non-disabled individuals reporting higher levels of happiness than people with disabilities (57% vs. 37%). Appendix Table C1 shows that at the lowest level of wellbeing (very unhappy), women fare worse irrespective of their disability status. Within the disabled sample, women with disabilities are more likely to report being very unhappy compared to their male peers (18% vs 15%).

Around 17% report having felt discriminated against, especially on the basis of ethnicity, gender, and disability, albeit other forms of discrimination were also disclosed by around a half of respondents.[8] People with disabilities were more likely to report discriminatory experiences than their non-disabled peers with a 1% level of statistical significance.[9] With respect to personal safety and security, people with disabilities are less likely to feel safe alone after dark either at home or while walking in the community.

In recent times, ICT coverage has expanded rapidly across sub-Saharan Africa. Yet, some variations exist in the intensity of mobile phone usage; around one in three of respondents do not have access to mobile phones while nearly two-thirds of respondents use mobile phones at least once per week.[10] Disabled adults are significantly less exposed to mobile phones daily compared to their non-disabled peers (31% vs. 41%) albeit more non-disabled men are likely to use phones than non-disabled women (Table C1). This demonstrates a clear gender and disability digital divide among respondents, working against the ICT for Development (ICT4D) agenda.[11]

[8]The respondents were not asked to specify these other forms. We suggest that alongside reasons based on sexual preferences, some other forms may include social/income class, level of education, personal appearance etc., as commonly mentioned in the literature on discrimination. See Kilpatrick & Taylor (2018) for example.

[9]Figure C3 in the Appendix shows a tree diagram of fifteen possible combinations of double discrimination.

[10]We do not have information to distinguish between smartphones and basic mobile phones.

[11]ICT4D entails the use of digital solutions to accelerate socio-economic development and bridge inequalities. Appendix Table C2 further disaggregates key characteristics by perceived discrimination and mobile phone usage and interestingly, the results from this disaggregation reflect as mirror images.

The health profile of the sample shows that 13% self-report the presence of multiple morbidities ranging between 1 to 8 chronic illnesses such as spina bifida, rheumatism, autism and Down's syndrome.[12] Alongside their functional limitations, more adults with disabilities are prone to having comorbidities compared to their non-disabled peers. Non-disabled women are noticeably more prone to having morbidities than their male peers (Table C1).

Table 3.2 focuses on people with disabilities. Nearly one-third report having multiple disabilities.[13] The most common form of functional constraint being walking and climbing steps (mobility), reported by 46% of respondents. Difficulty with seeing is the next most common disability (40%), with 33% reporting disabilities associated with cognition. In addition to reported morbidities, 66% report having a physical impairment, and 11% a mental impairment, while 23% are classified as having both physical and mental impairments in tandem.[14] Table 3.2 also confirms that women experience greater health challenges than men. They are more likely to have multiple disabilities than men (33% vs 24%), and more likely to experience difficulty with mobility and cognition.[15]

Finally, we regroup individuals based on having or not having a disabled member as part of their households. Figure 3.1 shows that having a disability

[12]Table C3 in the Appendix shows the proportion of respondents reporting each type of illness or medical condition. Of those with health conditions, 94% have physical illnesses while only a small fraction (3%) report having either a mental-related morbidity or both physical and mental morbidities. This classification of morbidities is subsequently used to describe people with different forms of impairments.

[13]Figure C4 in the Appendix illustrates the distribution of the respective levels of functional difficulties experienced across the six domains of functioning. Under the Washington Group's definition of disability, any individual reporting 'a lot of difficulty' or 'cannot do at all' in any domain is classified as disabled, hence, not all households have a disabled adult member, especially because some individuals only report 'some difficulty'.

[14]Note that difficulties in seeing, hearing, mobility, selfcare and communication can be classified as 'physical' difficulties while cognition can be classified as a 'mental' functional difficulty. Therefore, impairment is defined as having a type of functional difficulty that is physical or mental and/or having a type of physical or mental morbidity as previously described in Table C3.

[15]A similar table describing the health profile of the non-disabled sample is reported in Appendix Table C4. The table confirms that including people with 'some' difficulties in the identification of people with disabilities may potentially overstate the prevalence of disability. Of those reporting 'some' difficulties (38%), many have difficulties with seeing (62%), mobility (35%) and cognition (25%), particularly women. Just under 60% of the non-disabled sample report having no functional difficulty or medical condition.

Table 3.2: Disability Profile of PwDs

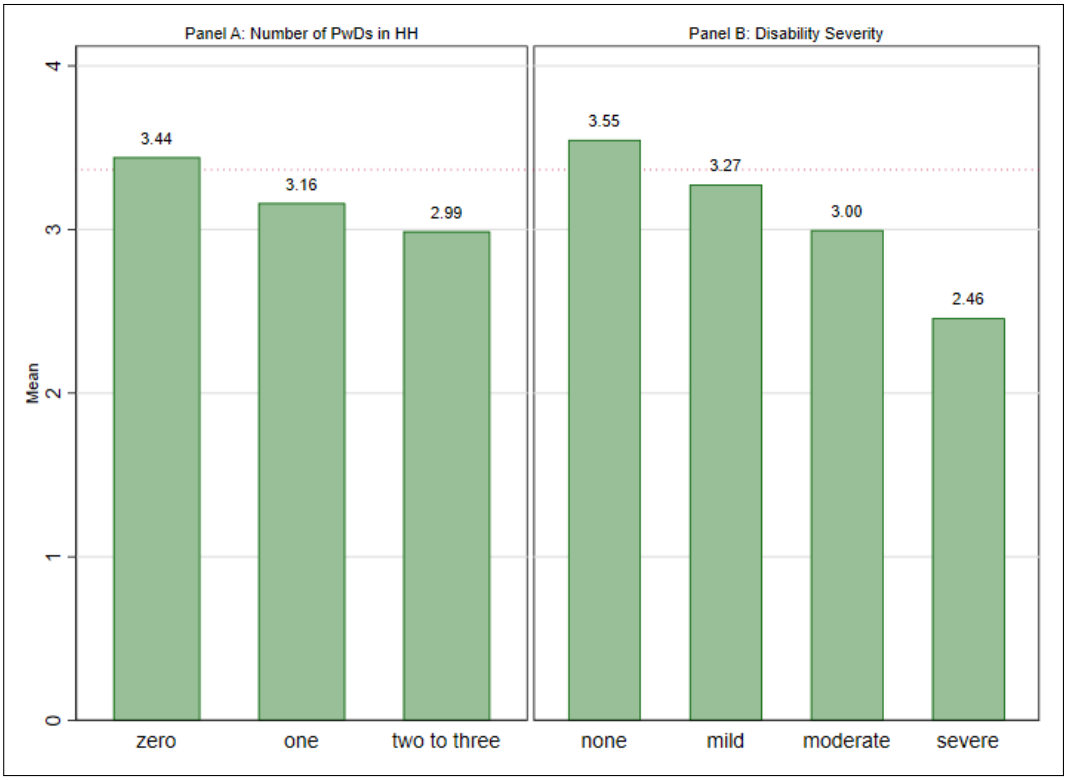
	(1) All PwDs %	(2) Men %	(3) Women %	(4) t-test (2)/(3) p-value
Multiple disabilities (=1)	0.29	0.24	0.33	0.0***
Domain-specific prevalence:				
Seeing	0.40	0.39	0.40	0.1
Hearing	0.14	0.13	0.14	0.5
Mobility	0.46	0.44	0.47	0.0**
Cognition	0.33	0.3	0.35	0.0***
Selfcare	0.08	0.07	0.10	0.3
Communication	0.04	0.04	0.04	0.3
Type of impairment:				
Physical impairment	0.66	0.69	0.64	0.0***
Mental impairment	0.11	0.11	0.11	0.6
Both physical and mental	0.23	0.2	0.25	0.0***
Observations	2388	952	1436	

Note: Estimates of domain-specific prevalence adds up to more than one because some respondents report multiple difficulties across the six domains of functioning. Physical impairment= Physical morbidities + difficulties in seeing, hearing, mobility, selfcare, & communication. Mental impairment= Mental morbidities + cognitive difficulties. See additional notes in Table 3.1

can have trickle down outcomes on other family members, especially when a household contains more than one person with a disability (panel A) or when the degree of disability is severe (panel B). This provides preliminary evidence on the variations associated with welfare sharing within households in the presence or absence of a disability.

Taken together, the summary statistics show that a pattern of inequality is beginning to emerge among different groups of respondents and across a range of indicators. We show that disability in itself is an identifying form of disadvantage and constitutes multiple disadvantages, with women being especially left behind. Belonging to a disabled household can potentially have spill over effects on the wellbeing of others in the household. We explore this in more detail in the subsequent sections.

Figure 3.1: Wellbeing by Household's Disability Status and Disability Severity



Note: The dotted reference line is the average level of happiness for the entire sample.

3.4 Empirical Strategy

Considering that most respondents in the data share a common household, a standard regression model violates the assumption that the observations are independent. To address this concern we use a multilevel mixed-effects model, a flexible analytic approach that recognizes this data structure by partitioning the residual components at the individual and household level. In this case, the equation to be estimated is written as:

$$Y_{ij} = \alpha + \beta X_{ij} + \gamma Z_j + \varepsilon_{ij} + u_j, \text{with } i = 1, ..., N_j; j = 1, ..., J. \tag{3.1}$$

$$\varepsilon_{ij} \sim N(0, \sigma_\varepsilon^2)$$
$$u_j \sim N(0, \sigma_u^2)$$

where Y_{ij} measures the subjective wellbeing of person i in household j while α is the intercept. The term X_{ij} is a vector of individual characteristics,

and β is the associated vector of parameters to be estimated; Z_j is a vector of household characteristics, and γ is the associated vector of parameters. Here, ε_{ij} and u_j are the respective residuals estimated at the individual and household level, each assumed to be normally distributed.[16] This strategy allows the residuals to vary randomly across households by decomposing their variances into two components: the intrahousehold component (σ_ε^2 i.e., variance of the individual-level residuals) and the interhousehold component (σ_u^2 i.e., variance of the household-level residuals). From this, the intraclass correlation coefficient (ICC), $\rho = \sigma_u^2/(\sigma_u^2+\sigma_\varepsilon^2)$ measures the extent to which the unexplained variation in Y_i can be accounted for by the respondent's household. In other words, ICC measures the extent to which unobserved factors within each household are shared by respondents.

In specifying a linear regression, we are making the assumption that subjective wellbeing is a cardinal rather than an ordinal construct such that the difference between values of (say) 1 and 2 is the same as the difference between values of 4 and 5. The advantage of this approach is that the linear results are easier to interpret, while producing similar empirical results to ordinal measures of wellbeing (Ferrer-i-Carbonell & Frijters, 2004). Clark et al. (2008) adopt a similar estimation strategy when looking at the determinants of life satisfaction. As part of the robustness analyses, we examine whether an ordinal analysis of wellbeing produces similar results.

Finally, studies have compared multilevel models with ordinary (monolevel) linear regression models that use cluster-adjusted standard errors, finding multilevel modelling to be superior (Cheah, 2009; Yanai, 2016; Garson, 2019). However, multilevel modelling does not deal with model misspecification or heteroscedasticity which may exist beyond the clustering effect of households, especially in cases where the number of clusters (i.e., households) are large (Garson, 2019). To address this issue, we use household cluster-adjusted

[16] The coefficients and residual components are estimated using maximum likelihood methods and can be executed using the 'mixed' command in Stata.

standard errors and also include district dummies to account for unobserved district level heterogeneity.

3.5 Baseline Estimates

We start by analysing the determinants of wellbeing as part of the baseline estimates and then explore potential channels between disability and wellbeing. To identify pathways through which discrimination relates to wellbeing, we also explore which types of discrimination influence wellbeing and then assess whether the use of a mobile phone affects the relationship between discrimination and wellbeing.

3.5.1 Basic Results

Table 3.3 (column 1) reports estimates from the multilevel mixed effects regressions for the entire sample. In panel A, estimates are reported separately for people with disabilities (column 2), for the non-disabled living in disabled households (ND1) in column 3 while those of non-disabled respondents living in non-disabled households (ND2) are reported in column 4. Panel B (columns 5 to 8) also reports estimates for the respective gender and age subgroups of people with disabilities.[17] We find comparable results across different groups albeit the effect size, sign and statistical significance of some regressors vary.

In line with the summary statistics outlined in the previous section, a person's health strongly defines their level of wellbeing. Overall, the presence of disability and morbidity count exhibit significant negative influences on wellbeing (column 1).[18] Note in column 2 which refers to only the disabled, the effect of morbidity count is no longer significant because disability in itself, is a powerful predictor of wellbeing among people with disabilities.

[17] An alternative approach to analysing effects across different groups would have been to interact the key variables of interest with the dummies for the respective groups. We choose not to adopt this approach due to the large number of interaction terms this would generate. All our findings are, however, robust to employing this method.

[18] Replacing the disability variable with having single or multiple disabilities show similar effects on wellbeing. The results are not shown but available upon request.

Table 3.3: Determinants of Wellbeing – Baseline Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Panel A: Respondent Types			Panel B: Subgroups of PwDs			
	Whole Sample	PwDs	ND1	ND2	Men	Women	Young	Elderly
Disability (=1)	-.293***							
	(0.03)							
Morbidity count (#)	-.126***	-0.064	-.17***	-.126***	-0.083	-0.045	-0.091	-0.07
	(0.023)	(0.041)	(0.063)	(0.029)	(0.066)	(0.050)	(0.063)	(0.056)
Discrimination count (#)	-.15***	-.148***	-.193***	-.151***	-.162***	-.157***	-.133***	-.163***
	(0.014)	(0.027)	(0.041)	(0.017)	(0.044)	(0.033)	(0.039)	(0.039)
Personal safety score	.048***	.099***	0.048	0.021	0.057	.138***	.082**	.108***
	(0.012)	(0.024)	(0.034)	(0.014)	(0.040)	(0.031)	(0.035)	(0.035)
Mobile phone use: Ref=Not at all								
Less than once/week	0.04	0.02	-0.047	0.037	.224**	-.176*	0.153	-0.097
	(0.029)	(0.073)	(0.087)	(0.034)	(0.108)	(0.102)	(0.107)	(0.103)
At least once/week	.098***	.168**	0.04	.09***	.262*	0.081	.262**	0.037
	(0.029)	(0.079)	(0.080)	(0.033)	(0.133)	(0.103)	(0.118)	(0.106)
Almost every day	.124***	.208***	0.05	.117***	.318***	0.11	.261***	0.144
	(0.025)	(0.067)	(0.071)	(0.028)	(0.107)	(0.087)	(0.094)	(0.105)
Female (=1)	-0.021	-.104**	0.024	-0.013			-.141**	-.153*
	(0.016)	(0.051)	(0.050)	(0.018)			(0.068)	(0.082)
Age (in years)	-.006**	0.007	-.014**	-0.005	0.011	0.005	0.03	0.0002
	(0.002)	(0.007)	(0.006)	(0.003)	(0.011)	(0.009)	(0.029)	(0.036)
Age-squared/100	.006**	-0.004	.014**	0.004	-0.01	-0.002	-0.036	0.0001
	(0.003)	(0.006)	(0.006)	(0.004)	(0.011)	(0.009)	(0.043)	(0.025)
Education: Ref=No education/preschool								
Primary (=1)	.043*	.154**	-0.019	0.028	.203*	.137*	.362***	0.013
	(0.025)	(0.060)	(0.067)	(0.030)	(0.108)	(0.076)	(0.097)	(0.079)
Secondary (=1)	.06*	.197**	(0.09)	0.058	.299**	0.162	.348***	0.059
	(0.032)	(0.091)	(0.090)	(0.038)	(0.135)	(0.140)	(0.129)	(0.155)
Higher education (=1)	.095**	0.19	0.11	.088*	0.234	0.216	.409**	-0.002
	(0.046)	(0.143)	(0.152)	(0.051)	(0.213)	(0.185)	(0.201)	(0.192)

Continued on next page

Table 3.3 – continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Panel A: Respondent Types			Panel B: Subgroups of PwDs			
	Whole Sample	PwDs	ND1	ND2	Men	Women	Young	Elderly
Married/cohabiting (=1)	0.03	.102*	0.02	0.02	0.138	0.067	.148*	-0.041
	(0.020)	(0.055)	(0.053)	(0.023)	(0.090)	(0.070)	(0.076)	(0.081)
Household size (log)	.066***	0.01	0.10	.077***	0.001	0.002	0.104	-0.03
	(0.022)	(0.047)	(0.066)	(0.026)	(0.075)	(0.060)	(0.089)	(0.059)
Dependency ratio	-.148***	0.08	-0.156	-.223***	0.196	-0.008	-0.095	0.015
	(0.052)	(0.107)	(0.141)	(0.063)	(0.172)	(0.135)	(0.211)	(0.139)
Household wealth status: Ref=Low								
Middle (=1)	.101***	.146**	-0.003	.094***	0.061	.175*	0.115	.188*
	(0.030)	(0.071)	(0.076)	(0.036)	(0.108)	(0.090)	(0.099)	(0.099)
High (=1)	.173***	0.108	0.099	.168***	0.038	0.136	-0.013	.279**
	(0.031)	(0.076)	(0.079)	(0.036)	(0.115)	(0.099)	(0.101)	(0.114)
_cons	3.319***	2.581***	3.825***	3.322***	2.332***	2.68***	1.982***	3.175**
	(0.086)	(0.268)	(0.230)	(0.099)	(0.415)	(0.348)	(0.521)	(1.258)
lns1_1_1:_cons	-.519***	-.429***	-.806***	-.525***	-.553*	-.375**	-.731**	-.302**
	(0.023)	(0.089)	(0.136)	(0.026)	(0.296)	(0.147)	(0.319)	(0.121)
lnsig_e:_cons	-.244***	-.171***	-.152***	-.309***	-0.171	-.23**	-0.079	-.33***
	(0.012)	(0.053)	(0.039)	(0.015)	(0.137)	(0.110)	(0.088)	(0.126)
Observations	12521	2069	1633	8819	842	1227	1060	1009
Households	6802	1825	1134	4862	812	1193	985	937
ICC	0.366	0.374	0.213	0.394	0.318	0.428	0.214	0.514
LR test (Chi-2)	879.06***	34.81***	22.15***	682.49***	3.70**	9.85***	3.62**	18.87***

Note: The estimates in columns 3 and 4 are respectively reported for the sample of non-disabled individuals living with PwDs (ND1) and those who do not have PwDs as part of their households (ND2). The young and the elderly are classified as <50 years and 50+ years, respectively. District dummies are included in all regressions. lns1_1_1:_cons and lnsig_e:_cons respectively represent the estimated parameters for the between and within household random effect variance components. The sample is somewhat reduced because the question on personal safety was not applicable to 775 respondents while 65 respondents did not respond to the question on discrimination. Household clustered standard errors are reported in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Favourable social environments are crucial for wellbeing. Overall, discrimination count is associated with lower levels of wellbeing (column 1) while personal safety positively correlates with wellbeing, especially for women with disabilities (column 6). Uganda, like many other developing countries in sub-Saharan Africa where victimization is a major public health and human rights concern (Swedo et al., 2019), this underscores the importance of ensuring a peaceful and inclusive society for all.

The media literature finds that ICT uptake enhances quality of life (Lee et al., 2008; Wei & Gao, 2017). We find that the intensity of mobile phone use either once per week or almost every day directly correlates with wellbeing, compared to not using at all (column 1). However, these effects are more distinct for people without disabilities (column 4) and young men with disabilities (column 5 and 7). A potential explanation is that the elderly may be conservative and less adventurous in using modern technologies, whilst women and the elderly may also value more face-to-face interactions and networking with close contacts than engaging in virtual platforms. Evidence suggests that women derive more satisfaction with interactions and support from closest connections than men (Oksuzyan et al., 2009), while the elderly also tend to value proximate familial and intergenerational relationships (Neves et al., 2013). Hence a one-size-fits-all model for media technologies may not be entirely appropriate.

Turning to socio-demographic markers, we find that the effects appear to be in line with the summary statistics. Column 2 shows that it is women with disabilities, irrespective of age, that are less likely to be happy. Uganda, like many patriarchal societies across sub-Saharan Africa, are deeply-rooted with gender norms regarding the roles and responsibilities that influence access to and control over resources. Women are mainly responsible for caregiving and other domestic chores and these challenges are further magnified for women with disabilities who have to independently manage the tasks that they have to complete (Beleza, 2003), hence impacting negatively on their wellbeing.

The estimates for age and age-squared in column 1 provides a convex non-linear indication that the highest levels of wellbeing are achieved during youth and old age (Rishworth et al., 2020), although this appears more visible

in column 3 among family members of people with disabilities. Compared to having no formal education, being educated has positive effects on wellbeing for the disabled, leaving out only the elderly which will be because education was less common when they were young. Given that people with disabilities are less likely to be married/cohabiting, those that do find a partner report slightly higher levels of wellbeing (column 2 and 7).

Regarding household level characteristics, we find that having a larger family size with a smaller dependency ratio enriches the wellbeing of the non-disabled group in column 4 but not for other respondent types. On the basis of the results for the entire sample, it is clear that wellbeing is positively associated with household wealth. People with disabilities (the elderly and women) and non-disabled respondents in column 4 report higher wellbeing if they belong to wealthier households. For the elderly with disabilities, there are several other potential challenges with ageing, including loss of social status, reduced income, loneliness and the death of loved ones that may partly work against their wellbeing.

To assess the extent to which a person's household is important in explaining their personal wellbeing, the residual intraclass correlation coefficients (ICCs) estimated from the variance components across all columns indicate that conditional on the regressors, roughly between 21.3% to 51.4% of the unexplained variance in wellbeing can be accounted for by the household a person belongs to. Put differently, individuals living in the same households, are not substantially similar in terms of their wellbeing levels. This will be further explored in Section 3.6.

In addition, we estimate a likelihood ratio (LR) test to compare our current multilevel model to one which assumes a constant household level variance as in a standard OLS specification. Here we reject the null hypothesis across all columns that the household level variance is zero, hence our current model offers a significantly better fit to the data than a standard OLS. This underscores the relevance of a multilevel modelling approach, both in terms of reinforcing the role of individual and household level characteristics as they relate to wellbeing, and in terms of recognizing that individuals do not act

independently of their households.[19]

Finally, Table 3.4 takes a closer look at the mechanisms through which disability may influence wellbeing. We first consider the entire sample in column 1 and then split the sample across gender and age subgroups in columns 2 to 5. Controlling for other determinants, the panels show the interactions of having a disability with (A) living in a nonpoor household, (B) being educated at least to primary level and (C) living in an urban household. Overall, we find that having a disability and living in wealthier households is positively correlated with wellbeing. This resonates with the findings of Fafchamps & Kebede (2012), who showed that the presence of material welfare neutralises the effects of disability on wellbeing among Ethiopian households. Additionally, panel B reinforces our findings from the baseline estimates that the interaction of disability and education is positively associated with wellbeing, particularly for men and youth with disabilities (column 2 and 5). Lastly, panel C suggests that living in an urbanized environment as opposed to a rural one does not moderate the effects of disability on wellbeing.

To summarize, our baseline estimates suggest that the determinants of wellbeing vary across different groups of respondents but overall, we show that disability, the number of health conditions, discrimination count, and dependency ratio are negative correlates of wellbeing; age displays a u-shaped effect on wellbeing; while feeling safe, ICT as proxied by mobile phone use, education, household size and household wealth are positively associated with wellbeing. In addition, being educated and belonging to wealthier households can serves as a positive buffer on the inverse disability-wellbeing relationship.

[19] As part of the robustness analyses, we first compute the random effect residuals and then use quantile-quantile plots to check whether the predicted household effects are normally distributed. This is executed using the 'predict' and 'qnorm' commands in Stata, respectively. Figure C5 in the Appendix confirms that most households lie fairly close to or along the 45 degree line suggesting that the predicted effects are approximately normally distributed. We find that only 717 households differ significantly from the average household, with 267 and 450 households respectively scoring lower and higher than the average household. An additional robustness check re-estimates the baseline regressions using a mixed effects ordered probit model and we find that the results qualitatively mimic those of the linear mixed effects regressions (see Table C5 in the Appendix).

Table 3.4: Pathways between Disability and Wellbeing

	(1)	(2)	(3)	(4)	(5)
		Whole Sample Subgroups			
	Whole Sample	Men	Women	Young	Elderly
Panel A – Poverty: *Ref= Disabled=1#Nonpoor=0*					
Disabled=0#Nonpoor=0	.336***	.289***	.413***	.367***	.308***
	(0.039)	(0.060)	(0.050)	(0.055)	(0.057)
Disabled=0#Nonpoor=1	.458***	.368***	.526***	.466***	.45***
	(0.043)	(0.062)	(0.054)	(0.057)	(0.064)
Disabled=1#Nonpoor=1	.206***	.161**	.252***	.172**	.254***
	(0.052)	(0.079)	(0.067)	(0.071)	(0.076)
_cons	3.023***	3.06***	2.975***	2.881***	2.321***
	(0.090)	(0.127)	(0.117)	(0.170)	(0.625)
Panel B – Education: *Ref= Disabled=1#Educated=0*					
Disabled=0#Educated=0	.358***	.346***	.35***	.542***	.262***
	(0.050)	(0.108)	(0.057)	(0.089)	(0.062)
Disabled=0#Educated=1	.384***	.403***	.385***	.574***	.282***
	(0.048)	(0.099)	(0.057)	(0.085)	(0.063)
Disabled=1#Educated=1	.117**	.175*	0.049	.286***	0.035
	(0.052)	(0.104)	(0.066)	(0.090)	(0.069)
_cons	3***	2.994***	3.05***	2.713***	2.342***
	(0.092)	(0.143)	(0.114)	(0.179)	(0.623)
Panel C – Residence: *Ref= Disabled=1#Urban=0*					
Disabled=0#Urban=0	.287***	.257***	.326***	.313***	.259***
	(0.030)	(0.046)	(0.039)	(0.040)	(0.045)
Disabled=0#Urban=1	.256***	.21***	.315***	.288***	.228***
	(0.045)	(0.064)	(0.056)	(0.055)	(0.074)
Disabled=1#Urban=1	-0.076	0.043	-0.127	-0.127	0.012
	(0.075)	(0.118)	(0.093)	(0.094)	(0.118)
_cons	3.057***	3.088***	3.038***	2.914***	2.349***
	(0.093)	(0.130)	(0.119)	(0.170)	(0.625)
Observations	12521	5524	6997	8695	3826
Households	6802	4611	5863	5229	3046

Note: Panels A, B and C are three separate regressions and the number of observations are the same across all the panels. Poor=1 if household wealth status= low, 0 otherwise. Educated=1 if primary education or higher, 0 otherwise. For brevity, explanatory variables have been controlled for but not reported in the Table. See additional notes in Table 3.3

3.5.2 Pathways between Discrimination and Wellbeing

Our baseline estimates showed that the relationship between discrimination and wellbeing is negative and consistent across groups. To assess the pathways through which discrimination relates to wellbeing, we first alter the discrimination count variable with categorical forms of discrimination and intersectional discrimination. Then we interact discrimination (Disc=1, 0 otherwise) and mobile phone use (Phone=1, 0, otherwise) to explore the role of mobile phones in moderating the relationship between discrimination and wellbeing.

Here we are interested in investigating which types of discrimination best explain the wellbeing of respondents. Table 3.5 (Panel A) reports the estimates from this exercise, disaggregated across respondent types as before. For the whole sample, column 1 shows that all the types of discrimination are significant with the exception of gender-based discrimination. Across respondent types however, columns 2 to 8 indicate that certain types of discrimination best explain the discrimination-wellbeing nexus more than others. Among non-disabled adults with a disabled family member, column 3 shows that conditional on experiencing only one count of discrimination, ethnic- and disability-based discrimination are significant while for the non-disabled group (column 4), ethnic-, gender- and age-based discrimination best explain their wellbeing. Among men and women with disabilities, columns 5 and 6 respectively show that only the effects of disability- and religious-based discrimination are noticeable but at a 10% level of significance. Note that most discrimination types are not associated with the wellbeing of the elderly with disabilities unless it is ethnic-based (column 8).

Moreover, if a person experiences 'other' or multiple forms of discrimination, the estimates are noticeably consistent across groups.[20] This finding generally resonates with the literature that certain forms of discrimination could be more or less prominent on wellbeing across varied groups in society (Pascoe & Smart Richman, 2009; Sutin et al., 2015). Although in general, people could internalise negative attitudes towards varied forms of discrimination, family members of people with disabilities perceive some form of disability-based discrimination which tolls on their wellbeing. Qualitative studies in the context of Uganda have documented disconcerting experiences of people with disabilities and their families as targets of prejudice and discrimination (Mulumba et al., 2014; Donelly, 2020). As a consequence, an empirical study in the context of Australia found that people who experience

[20]We also altered the double discrimination dummy with a vector of fifteen possible combinations of double discrimination. Although the cell sizes are now quite small due to the large number of interaction terms, the significance of the interaction terms for the 'main' versus 'other' forms is common. We find that it is ethnic-gender, gender-age, and religious-disability combinations that best explain the relationship between double discrimination and wellbeing. These results are omitted from the chapter but available upon request.

Table 3.5: Pathways between Discrimination and Wellbeing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Panel A: Respondent Types			Panel B: Subgroups of PwDs			
	Whole Sample	PwDs	ND1	ND2	Men	Women	Young	Elderly
Panel A – Discrimination forms: *Ref=No discrimination*								
Ethnic (=1)	-.243***	-0.217	-.472***	-.231***	-0.179	-0.297	-0.069	-.635**
	(0.063)	(0.161)	(0.158)	(0.076)	(0.263)	(0.193)	(0.176)	(0.298)
Gender (=1)	-0.13	0.037	-0.085	-.207*	0.213	0.099	0.042	0.111
	(0.103)	(0.254)	(0.289)	(0.112)	(0.319)	(0.303)	(0.355)	(0.373)
Age (=1)	-.334***	-0.255	-0.479	-.309**	-0.23	-0.323	-0.27	-0.278
	(0.108)	(0.196)	(0.394)	(0.130)	(0.327)	(0.262)	(0.488)	(0.207)
Religious (=1)	-.172*	-.485*	-0.159	-0.082	0.033	-.692*	-0.512	-0.212
	(0.094)	(0.279)	(0.265)	(0.102)	(0.471)	(0.354)	(0.323)	(0.427)
Disability (=1)	-.139*	-0.143	-.374*	-0.118	-.288*	-0.088	-0.031	-0.248
	(0.076)	(0.124)	(0.215)	(0.107)	(0.173)	(0.185)	(0.154)	(0.228)
Other forms (=1)	-.328***	-.334***	-.414***	-.344***	-0.137	-.593***	-.559***	-0.009
	(0.047)	(0.128)	(0.131)	(0.055)	(0.216)	(0.147)	(0.169)	(0.201)
Double discrimination (=1)	-.346***	-.28***	-.284**	-.433***	-.531***	-0.17	-.328**	-0.188
	(0.050)	(0.098)	(0.136)	(0.064)	(0.157)	(0.129)	(0.130)	(0.162)
Triple+ discrimination (=1)	-.439***	-.554***	-.587***	-.347***	-.479**	-.611***	-.449***	-.669***
	(0.059)	(0.112)	(0.176)	(0.071)	(0.187)	(0.132)	(0.158)	(0.160)
_cons	3.324***	2.586***	3.836***	3.328***	2.427***	2.627***	1.999***	3.177**
	(0.086)	(0.271)	(0.231)	(0.099)	(0.443)	(0.349)	(0.526)	(1.252)
Panel B – Discrimination and ICT: *Ref= Disc=1#Phone=0*								
Disc=0#Phone=0	.344***	.413***	.417***	.32***	.521***	.355***	.458***	.35***
	(0.039)	(0.079)	(0.118)	(0.047)	(0.138)	(0.104)	(0.117)	(0.115)
Disc=0#Phone=1	.427***	.522***	.47***	.411***	.614***	.496***	.549***	.446***
	(0.039)	(0.084)	(0.115)	(0.047)	(0.149)	(0.109)	(0.120)	(0.126)
Disc=1#Phone=1	.16***	.362***	0.094	.112**	.484***	0.198	.41***	.255*

Continued on next page

Table 3.5 – continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Panel A: Respondent Types			Panel B: Subgroups of PwDs			
	Whole Sample	PwDs	ND1	ND2	Men	Women	Young	Elderly
	(0.045)	(0.093)	(0.130)	(0.055)	(0.160)	(0.123)	(0.128)	(0.154)
_cons	3.015***	2.223***	3.404***	3.033***	2.049***	2.301***	1.818***	2.777**
	(0.091)	(0.272)	(0.248)	(0.107)	(0.440)	(0.351)	(0.520)	(1.281)
Observations	12521	2069	1633	8819	842	1227	1060	1009
Households	6802	1825	1134	4862	812	1193	985	937

Note: Panels A and B are two separate regressions and the number of observations are the same across both panels. In Panel A, the estimates for the main types of discrimination (i.e., ethnic, gender, age, religious, disability and other forms) are conditional on reporting one count of discrimination while double and triple+ classifications are for those reporting two and three or more counts, respectively. In Panel B, Disc=1 if experienced any form of discrimination, 0 otherwise. Phone=1 if used a mobile phone at least once/week, 0 otherwise. Explanatory variables have been included in all regressions but not reported in the Table. See additional notes in Table 3.3

disability-based discrimination such as insults, harassment or humiliating jokes have considerably poorer health and wellbeing (Krnjacki et al., 2018).

Next, panel B analyzes the indirect link between discrimination and ICT on wellbeing. In other words, conditional on a person's level of mobile phone usage at least once per week, of interest is the extent to which discrimination would relate to influence wellbeing. To implement this, we replace discrimination counts and mobile phone use intensity with four categories of interaction terms. Controlling for other determinants of wellbeing, the coefficient of Disc=1#Phone=1 is statistically different from zero implying that mobile technology positively moderates the relationship between discrimination and wellbeing by 16% (column 1), but this does not occur universally.[21] Instead, the interactive effect between discrimination and ICT on wellbeing is only significant among the non-disabled group and men with disabilities in columns 4 and 5. At least for certain groups of individuals more than others, the promotion of social interaction through ICT could improve a sense of belonging, reduce loneliness and potentially neutralize the effects of discrimination on wellbeing. Our findings coincide with the literature which suggests that ICT can serve as a coping mechanism against potential face-to-face discrimination, enhance minority groups' social identity and increase social participation (Sizemore & Milner, 2004; Damásio et al., 2012; Wei & Gao, 2017; Chib & Shi, 2018; Miller et al., 2020).[22]

Combined, the analysis of the pathways between discrimination and wellbeing suggests that while perceived discrimination as an acute stressor can broadly impact wellbeing, certain forms of discrimination occur more subtly or chronically across varied groups in society. Our results also suggest that ICT may buffer the discrimination-wellbeing relationship, but this does not occur universally. People who internalise negative attitudes towards a particular characteristic that they identify with, such as being affiliated with a disability, whether or not they are themselves disabled, can potentially be at risk of

[21] Clearly, usage at least once a week or more is required for significant effects to be observed. When we expand the cell size to include those who use ICT less than once per week, we find no direct or indirect effects on wellbeing. These results are not shown but available upon request.

[22] We also interact disability with mobile phone use and find that wellbeing is higher for mobile phone users with disabilities compared to non-users with disabilities.

having additional physical and mental health challenges that may impair their wellbeing. We discuss this further in the next sub-section.

3.5.3 Health Challenges and Wellbeing in Disabled Households

This section briefly considers the type of health challenges people with and without disabilities experience and how this relates to wellbeing. The effects of health challenges on wellbeing may depend on whether a person has an impairment (defined as having a health condition or functional difficulty) that is classed as physical, mental or both.[23] Given that having an impairment does not necessarily imply having activity limitations (i.e., being disabled), people with disabilities can be compared with their non-disabled peers in terms of physical and mental forms of impairments.[24]

In comparing the average wellbeing of disabled individuals and their family members, we find that those with disabilities having mental impairments are happier on average than their non-disabled peers. Figure C6 in the Appendix indicates that of those with mental health conditions, the non-disabled living with disabled members experience slightly lower wellbeing outcomes than their disabled family members (Panel A) and this is consistent irrespective of gender (Panel B).[25] This echoes our proposition that the negative effect of disability is shared by other family members, whether or not they are themselves disabled. Our findings resonate with Chang et al. (2010), who found that informal caregivers of disabled or chronically ill family members at home are potentially at risk of caregiver burden and declining physical and psychological health. Hence it is therefore not always the case that people with disabilities are worse off than other household members.

[23] As previously mentioned, impairment among people with disabilities implies having a lot of difficulty or cannot do at all in any physical or mental type of functional difficulty and/or morbidity (Table 3.2). While for the non-disabled, impairment is defined as having 'some' physical or mental type of functional difficulty and/or a morbidity (Table C4).

[24] Initially, we compared the average levels of wellbeing disaggregated by the respective forms of impairment for the entire sample and find that overall, those with physical impairments are more likely to be happier than those with mental impairments. However, people having both mental and physical impairments in tandem are worse off than those with one type of impairment or no impairment at all. These differences are also consistent when we replace the disability variable with impairment types in the multilevel regressions. These results are omitted from the chapter but available from the author upon request.

[25] Similar findings hold when we consider only those with a physical impairment.

3.6 Intrahousehold Arrangements and Wellbeing

Our previous analysis has focused on average differences across respondent types. We show that disability inequality in wellbeing exists and women with disabilities are more at a disadvantage. We also demonstrated that living with a disabled member can impair a non-disabled person's wellbeing. However, a limitation of our previous analysis is that it does not provide an overall picture of wellbeing inequality in terms of the type of household a person belongs to, and we have not demonstrated the extent to which inequality in wellbeing can be explained by differences within households.

This section takes a closer look into intrahousehold arrangements and takes a twofold approach to the analysis. We first estimate overall wellbeing inequality using Theil's L and decompose this measure into within and between household components. Then we analyse the relationship between family status and wellbeing by regrouping individuals according to their household type (i.e., disabled or non-disabled), and stratifying these households across income groups (i.e., low, middle and high).

As part of the analysis on intrahousehold wellbeing inequalities, we utilize the Theil's L index, a simple normative indicator of inequality which measures the extent to which the distribution of wellbeing between groups (e.g., households) differs from the distribution of the population (entire sample). Theil's L or mean logarithmic deviation (MLD) is a generalized entropy class measure of inequality, GE(0), which places greater weight to differences at the lower end of the distribution, giving relevance to those who are more disadvantaged.[26] Hence the distribution is understood as equal (i.e., MLD = 0) for groups whose share of wellbeing equals the population share. The advantage of using Theil's L is that it is easily decomposable by population groups because it aggregates subgroup inequalities using subgroup population

[26]Other inequality measures within the generalised entropy class are GE(1) and GE(2), where the former is similarly sensitive to gaps at the bottom end of the distribution while the latter is sensitive to gaps at the top end. Using these alternative measures does not alter our conclusions. Several papers in the distributive analysis literature have also shown that these measures lead to closely similar conclusions as with the GE(0). See for example Krstić et al. (2007), Sahn & Younger (2009) and Kollamparambil (2021).

shares.

Drawing on Sahn & Younger (2009), Rodriguez (2016) and Kollamparambil (2021), we let the entire sample consist of N individuals, $i = 1$ to N, distributed across J households, $j = 1$ to J, with a total inequality, $I(total)$ written as:

$$I(total) = \frac{1}{N} \sum_{i=1}^{N} ln \left(\frac{\mu}{y_i} \right) \tag{3.2}$$

so that inequality in the sample of N individuals from equation 3.2 can be perfectly decomposed into 'within' and 'between' household components:

$$I(total) = \sum_{j=1}^{J} \frac{N_j}{N} \cdot I_j + \sum_{j=1}^{J} \frac{N_j}{N} \cdot ln \left(\frac{\mu}{\mu_j} \right) \tag{3.3}$$

where y_i is the subjective wellbeing of person i in household j and I_j is the inequality for each household. The terms μ and μ_j respectively represent the average wellbeing of the entire sample and household j while the associated sample sizes for the entire sample and for household j is respectively denoted by N and N_j. In equation 3.3, the within group inequality (the first term) sums up the inequality for each household, weighted by its population share while the between group inequality (the second term) is obtained by subtracting the within group inequality from the overall inequality.[27] Because the Theil's L index of inequality is unbounded and depends on the unit of measurement, its estimated value is difficult to interpret in absolute terms. Instead, we use the Gini index to interpret total inequality which ranges between zero and one, with higher values indicating more inequality. Unlike the Theil's L however, the Gini index is not perfectly decomposable (Cowell, 1995), impeding on our interest of estimating the relative share of intrahousehold inequality.[28] For this reason, we rely on the Theil's L index in our interpretations of the within- and between-household inequality decompositions.

[27] In the decomposition of $I(total)$, the intrahousehold component indicates how much of the total inequality can be attributed to inequalities inside the household. Hence the relative share of intrahousehold inequality is derived by dividing the estimated intrahousehold inequality by the overall inequality. In cases where the intrahousehold component for a household is zero because there is no inequality within that household, this household can still contribute to the between-group component if its average wellbeing differs from that of the entire sample.

[28] The Theil's L and Gini index were estimated using Jenkins' 'ineqdeco' command in Stata. Alternatively, these measures can be computed using the 'Distributive Analysis Stata Package' by Araar & Duclos (2007).

Finally, to investigate the effects of family structure on a person's wellbeing, we reanalyse equation 3.1 as before, but this time, incorporate a vector of family status dummies as covariates of interest.

3.6.1 Inequality Decomposition

The first column of Table 3.6 documents the respective wellbeing inequality indices for the entire sample.[29] As previously mentioned, the overall inequality estimated using Theil's L does not allow for meaningful interpretation in absolute terms, hence the Gini coefficient indicates the presence of an unequal wellbeing distribution. The Gini index shows that the degree of inequality in the distribution of wellbeing is 16%. Treating each household as a group, the decomposition of total inequality into within and between household components using the Theil's L index reveals some interesting facts. Overall, we find that the extent to which within-household inequality contributes to total inequality is 38% while the remaining portion is attributable to the between-household inequality component. There is therefore a potential role of the type of household within which a person resides in terms of explaining distributional differences in wellbeing. This analysis provides evidence in response to the question posed by Haddad & Kanbur (1990) regarding the importance of accounting for intrahousehold inequality in the analysis of distributional differences, without which wellbeing disparities would be underestimated by just over one-third. Therefore, potentially impactful actions aimed at improving wellbeing and reducing inequalities should consider intrahousehold dynamics.

Next, columns 2 and 3 independently consider each household type as a group i.e., disaggregating by disabled and non-disabled households, respectively. The Gini coefficient shows that total inequality is 5.4% larger in disabled households compared to households without disabilities. In line with this, we find that the extent to which intrahousehold inequality contributes to total inequality is higher in disabled households compared to non-disabled

[29] To estimate inequality and its subgroup components, we exclude one-adult households because the within-group contribution of these households to overall inequality would be nil which weighs down the relative share of intrahousehold inequality. This brings the sample to 10,988 individuals nested within 4,567 households and having a range of two to twelve adults per household.

Table 3.6: Wellbeing Inequality Decomposition

	(1) Whole Sample	(2) PwD HHs	(3) ND HHs
Gini coefficient	0.165 (0.002)	0.201 (0.003)	0.147 (0.002)
Theil's L: GE(0)	0.067 (0.001)	0.090 (0.002)	0.055 (0.001)
Theil's L decomposition:			
Within households	0.025 (0.001)	0.039 (0.002)	0.019 (0.001)
Between households	0.043 (0.001)	0.051 (0.002)	0.037 (0.001)
Relative share of within (%)	0.38	0.43	0.35
Relative share of between (%)	0.62	0.57	0.65

Note: Standard errors are reported in parenthesis.

households. As measured by the Theil's L index, the relative share of within household inequality indicates that about 43% of total inequality in the distribution of wellbeing in disabled households, is attributed to within household disparities while in non-disabled households, the contribution of intrahousehold disparities to total inequality is 35%. Tautologically, not accounting for the within-household component of total inequality would have underestimated the overall inequality by nearly half in disabled households and as much as over one-thirds in non-disabled households.[30]

Taken together, our findings provide some indication that having a disabled member as part of the household potentially magnifies inequalities inside the household. While it is well established in the literature that people with disabilities have poorer physical and mental health, Ward-Griffin & McKeever (2000) stated that caregivers often neglect their own health and hide information about their own health problems. This may exacerbate the prevalence of wellbeing disparities inside these households. Although the decomposition estimates are suggestive, they show that when total wellbeing inequality is divided into within-household and between-household components, the relative contribution of within-household inequality is eight (8) percentage points higher in disabled households compared to non-disabled

[30]By excluding PwDs from the inequality estimates, further analysis explored the extent to which the greater inequality in PwD households simply reflects the lower satisfaction of PwDs, *ceteris paribus*. We still find that total inequality is higher in PwD households although the relative share of intrahousehold inequality is now 24% in PwD households which is lower than the estimated relative share of 35% in ND households. Additional decompositions by other subgroups such as gender, age, education, etc., is beyond the scope of this paper. However, further analysis had explored the potential drivers of these inequalities and our findings corroborate those of the baseline results.

households. Hence the assumption that family members could benefit equally from household-level interventions that improve wellbeing needs to be re-evaluated. The next section unpacks the possibility that family structure may also contribute to the understanding of disparities occurring inside these households.

3.6.2 Family Structure and Wellbeing

Taking a subjective wellbeing approach, Rojas (2011) contends that substantial wellbeing inequalities within the household can be a reflection of the fact that some household members are being marginalised from access to household resources and this marginalization can have negative effects on a person's wellbeing, especially in low-income settings. These inequalities may be a reflection of differences in the relative bargaining power of individuals within their households.

The strength of a person's bargaining power within the household is often proxied by their relationship with the household head. Customs and traditions tend to establish a hierarchy within which the household head and their spouse are expected to have more decision-making power within the household. However, this may differ by some cultural setting. Rojas (2011) suggests that in some settings, the elders are highly respected and have strong bargaining power, while in others, adult children have stronger bargaining power. Many African families rely on elders for advice and sometimes, wives could for example, report their husbands to family elders regarding the refusal of husbands to pay for children's medical treatment when they have the money to do so, which is sometimes successful (Tolhurst et al., 2008). Drawing from Jensen (2004) who analysed the extent to which adult children continued to provide transfers to their parents once the parents received state support in South Africa, Doss (2013) in her interpretation, suggested that intergenerational support from adult children to parents influences their relative bargaining power and that adult children and their parents may have different preferences when they live together.

In the current study, seven categories of family status are defined: head and then in relation to the household head, spouse, son, daughter, grandchild,

elder (i.e., parent, uncle or aunt) and other relative (including in-law, sibling, nephew or niece). Note that because only individuals aged 18 years or over were asked about their wellbeing, we do account for household size and number of dependents to capture children in the sample. Table 3.7 (Panel A) shows the distribution of individuals according to their status in the household, disaggregated by disability status. We find that more household heads are significantly prone to having a disability compared to being a spouse, a son or other relative. Anecdotally, we know that disabled individuals can often be excluded from their birth households and therefore have to set up their own homes.[31] With the data, we cannot test this.

Table 3.7: Key Summary Statistics - Family Structure and Disability

	(1) Whole Sample mean	(2) PwDs mean	(3) ND mean	(4) t-test (2)/(3) p-value
Panel A: Sample Distribution				
Head	0.51	0.58	0.49	0.000
Spouse	0.27	0.21	0.28	0.000
Son	0.08	0.07	0.09	0.013
Daughter	0.07	0.07	0.07	0.950
Grandchild	0.02	0.02	0.01	0.102
Elder	0.01	0.02	0.01	0.128
Other	0.05	0.04	0.05	0.007
Panel B: Average Wellbeing				
Head	3.31	2.97	3.39	0.000
Spouse	3.39	2.91	3.47	0.000
Son	3.42	3.07	3.48	0.000
Daughter	3.34	2.83	3.44	0.000
Grandchild	3.41	2.87	3.56	0.000
Elder	3.47	3.20	3.54	0.047
Other	3.36	2.89	3.43	0.000
Observations	13536	2387	11149	

Column 1 (Panel B) shows that for the whole sample, wellbeing is slightly greater for elders and sons, however, this also depends on whether a person is disabled. Among people with disabilities (column 2), wellbeing is greater for elders, sons and heads while among people without disabilities, wellbeing is slightly higher for grandchildren, elders and sons. Intuitively,

[31] Often times, stigma is fuelled by beliefs that people with disabilities are cursed and should be secluded or expelled from their community, hence many disabled people in Uganda continue to live on the abyss against their family's wish (Donelly, 2020).

we observe that disabled individuals, irrespective of their family status have noticeably lower wellbeing compared to their non-disabled peers (column 4). However, these wellbeing disparities could be a reflection of differences in other socio-demographic, economic and social experiences that may be connected to a person's role in the family.

Table 3.8 investigates the role of family status in explaining a person's wellbeing,[32] while controlling for wellbeing determinants as implemented in our baseline regressions. In this exercise, we run separate regressions for disabled and non-disabled households. The first estimation (M1), controls for only basic socio-demographic variables and morbidity count while M2 builds the regression further by adding a set of social-psychological controls as described in section 3.3.

Table 3.8: Family Structure and Wellbeing

	(1)	(2)	(3)	(4)
	Disabled households		Non-disabled households	
	M1	M2	M1	M2
Family structure: Ref=Head				
Spouse	-0.033	-0.004	0.013	0.009
	(0.040)	(0.041)	(0.021)	(0.021)
Son	0.007	-0.001	-.123***	-.104**
	(0.075)	(0.079)	(0.044)	(0.044)
Daughter	-0.075	-0.079	-.13***	-.122**
	(0.074)	(0.077)	(0.047)	(0.048)
Grandchild	0.004	-0.013	-0.06	-0.04
	(0.127)	(0.137)	(0.092)	(0.096)
Elder	0.163	0.12	0.016	0.014
	(0.104)	(0.121)	(0.086)	(0.093)
Other	0.004	0.011	-.16***	-.14***
	(0.085)	(0.091)	(0.051)	(0.052)
Age (in years)	-0.006	-0.006	-.012***	-.011***
	(0.005)	(0.006)	(0.004)	(0.004)
Age-squared/100	0.007	0.007	.01***	.01**
	(0.005)	(0.005)	(0.004)	(0.004)
Education: Ref=No education				
primary	.074*	.097**	0.034	0.028
	(0.043)	(0.044)	(0.030)	(0.030)
secondary	0.058	0.095	0.057	0.055
	(0.059)	(0.062)	(0.038)	(0.038)
higher	0.081	0.085	0.042	0.045
	(0.101)	(0.107)	(0.051)	(0.052)

Continued on next page

[32]Using household heads as the reference group, we first looked at the simple relationship between family status and wellbeing (without controls). We find that in disabled households, the coefficient for sons and elders is positive and significant while in non-disabled households, only the coefficient for spouse is positive and significant. The results are omitted from the chapter but are available upon request.

Table 3.8 – continued from previous page

	(1)	(2)	(3)	(4)
	Disabled households		Non-disabled households	
	M1	M2	M1	M2
Married/cohabiting (=1)	0.04	0.019	0.011	0.004
	(0.038)	(0.039)	(0.024)	(0.024)
Morbidity count (#)	-.185***	-.149***	-.149***	-.121***
	(0.035)	(0.037)	(0.029)	(0.029)
Household size (log)	.128***	.12***	.095***	.085***
	(0.037)	(0.038)	(0.027)	(0.027)
Dependency ratio	-.158*	-0.116	-.226***	-.217***
	(0.086)	(0.090)	(0.063)	(0.064)
Household wealth score	.137***	.101***	.172***	.145***
	(0.034)	(0.037)	(0.019)	(0.019)
Discrimination count (#)		-.165***		-.15***
		(0.023)		(0.017)
Personal safety score		.098***		0.022
		(0.021)		(0.014)
Mobile phone: Ref=Not at all				
Less than once a week		0.027		0.034
		(0.055)		(0.034)
At least once a week		.135**		.084**
		(0.056)		(0.033)
Almost every day		.143***		.101***
		(0.050)		(0.028)
_cons	3.153***	3.145***	3.454***	3.416***
	(0.195)	(0.209)	(0.106)	(0.109)
Observations	4113	3701	9219	8818
Households	2051	1940	5011	4862

Note: District dummies are included in all regressions. Household clustered standard errors are reported in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Columns 1 and 2 respectively report the estimates from M1 and M2 for disabled households. We find no significant effects of family status on wellbeing although the effects of other determinants are consistent with those obtained from the baseline estimates. For non-disabled households, columns 3 and 4 indicate that there are important differences in the relationship between family status and wellbeing; sons, daughters and other relatives experience significantly lower wellbeing than household heads. We also find that age is quadratic in non-disabled households, with the nadir (lowest point) of happiness at 58 years. However, the turning point is likely to differ across family status. A closer look at non-disabled households shows that the effects for sons and daughters is partly age-driven.[33]

Unpacking these effects further, we estimated marginal effects by fixing

[33]Among the regressors, it is the exclusion of age that renders the effects of family status irrelevant.

age at representative values from 18 through 98 in increments of 4 years.[34] Figure 3.2 plots this relationship for heads, sons and daughters in non-disabled households. The largest divergence in turning points are between sons and heads (20 vs. 70 years).[35] Moreover, the age-wellbeing curves for sons and heads go in significantly opposite directions compared to daughters. Therefore, wellbeing disparity between heads and sons progressively widens as both groups get older.

Figure 3.2: Wellbeing U Curves for Heads and Adult Children in Non-disabled Households

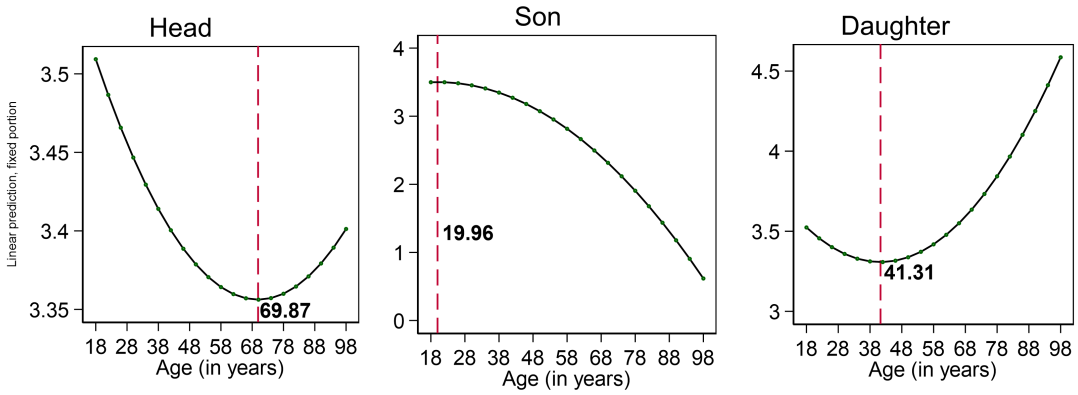


Figure 3.2 also confirms that younger sons, especially those in their early twenties, are better off than much older sons. This finding provides some indication that positive attitudes towards sons, due to son preference, puts them at a greater advantage than young daughters in early life.[36] However, expectations of intergenerational support in adult-child and ageing-parent relationship foreshadows some of the observed nuances in wellbeing. Being the next potential breadwinner after heads, expectations from older sons become amplified later in life. Like many households in Asia, families in sub-Saharan

[34]We use Stata's 'margins' post-estimation command, which estimates the wellbeing slope with respect to age while producing standard errors and confidence intervals based on the delta-method. For most of the age groups and family status combinations, we obtained quadratic functions at a 1% level of significance. However, we concentrate on sons and daughters since these were both significant categories in the regressions.

[35]Using Stata's 'testnl' command, a test of the null hypothesis that the two turning points are equal is rejected (3.75, p= 0.053). We find no statistical differences in turning points for spouses (48), elders (38) and grandchildren (17) in relation to the head. For other relatives, the turning point was unrealistically 304 years, making it a non-comparable category to analyse further.

[36]The idea that having a son prevents difficulties in old age is a typical driving force behind son preference and discrimination against girls and women. Moreover, Uganda's underdeveloped social welfare system for the elderly, can also contribute to son preference.

Africa are traditionally patriarchal, patrilineal and patrilocal, such that adult sons are more likely to cohabit with their parents. Hands-on care of aged parents is naturally provided by sons and their wives (daughters in law), while daughters typically marry out and become part of a different household. Zeng et al. (2016) however, argues that older parents benefit more from daughters' emotional care in old age. Not only old-aged parents, altruistic sons are likely to also care for the wellbeing of others (including their own children, younger siblings and in-laws), which may partly work against their adulthood wellbeing, especially if the support provided is a financial one (Morelli et al., 2015; Thomas et al., 2017). Moreover, cohabiting with old-aged parents, elders and older siblings creates a sense of lack of control or freedom over an adult son's personal affairs, lowering his intrahousehold bargaining/decision-making power. It could also be that older sons that were successful left the household, leaving the less successful ones behind.

As previously mentioned, intrahousehold disparities may have more prominence in low-income families compared to their economically advantaged counterparts. We explore this possibility in Appendix Table C6 by running regressions for each income group subsample. Among disabled households, significant disparities between spouses and heads appear more visible only in nonpoor households (Panel A, columns 3 and 5) albeit this is only significant at the 10% level. However, the observed effects for spouses become muted with the inclusion of social-psychological variables in columns 4 and 6, respectively. In non-disabled households (Panel B), it seems that daughters of low-income households are less happy than heads. Hence, daughters face a double disadvantage due to living in a poor household as well as their status in the family. It is possible that daughters in these contexts are socialized into having lower expectations for themselves due to institutions and norms surrounding gender roles, marriage and inheritance which could potentially impede their intrahousehold bargaining power in the face of acute deprivations. Contrary to the findings for disabled households, spouses of middle-income non-disabled households are happier than heads (column 4). Moreover, it is sons of high-income non-disabled households that experience significantly less wellbeing than heads (column 5). Lastly, disparities against other relatives

tend to be more pervasive at both sides of the extremes (i.e., low- and high-income settings).

Finally, we would expect a disabled person to have less intrahousehold bargaining power compared to their non-disabled peers.[37] Our next approach takes a closer look within disabled households and we find one more twist to the story. Using non-disabled heads as the base group, Table 3.9 analyzes the role of disability as it relates to family status in explaining personal wellbeing. Interestingly, column 1 indicates that all household members without a disability and elders with a disability experience similar wellbeing levels as non-disabled heads. Irrespective of their family status, virtually all other disabled members, including a disabled head, experience significantly lower wellbeing levels than a non-disabled head.

A few noticeable differences emerge in Table 3.9 across income groups (columns 2 to 4). For disabled spouses, effects are consistent irrespective of income status, while for disabled heads and disabled sons or daughters, effects are more pronounced in low- and high-income households (columns 2 and 4). Among other relatives with a disability, the negative relationship is only visible in low-income settings (column 2) while for a grandchild with a disability, the effect appears more prominent in high-income settings (column 4).[38]

Altogether, our approach suggests distinctive effects of family status on wellbeing which are potentially explained not just based on a household's socio-economic status or cultural norms regarding the role of women versus men, but this also depends on whether a household has a disabled adult member or otherwise. Our findings in this section are threefold. Firstly, disabled households (particularly low-income ones) appear to share their deprivations and bargaining power equally, while among the non-disabled group of households, high-income family sons, low-income family daughters and other relatives have significantly lower wellbeing than heads. Secondly, in nonpoor families, spouses in disabled households have a negative coefficient

[37]We find that additionally controlling for disability does not alter the results in disabled households and disability effects remain consistent as in the baseline estimates. The results are not shown but available upon request.

[38]To explore the robustness of these estimates, we alter the reference category for the interaction terms and conclusions reached are invariant to this particular exercise.

Table 3.9: Family Structure and Disability Interactions by Wealth Status

	(1) All	(2) Low	(3) Middle	(4) High
Disability & Family structure: Ref=Head=1#Disabled=0				
Spouse=1#Disabled=0	0.06	0.029	0.023	0.101
	(0.060)	(0.098)	(0.111)	(0.104)
Son=1#Disabled=0	0.015	0.022	0.093	-0.046
	(0.097)	(0.155)	(0.173)	(0.171)
Daughter=1#Disabled=0	0.009	0.062	-0.066	-0.005
	(0.098)	(0.165)	(0.181)	(0.170)
Grandchild=1#Disabled=0	0.115	0.065	-0.174	0.23
	(0.161)	(0.245)	(0.331)	(0.256)
Elder=1#Disabled=0	0.027	0.128	0.333	-0.316
	(0.131)	(0.240)	(0.218)	(0.234)
Other=1#Disabled=0	0.05	0.106	0.068	-0.071
	(0.101)	(0.158)	(0.267)	(0.161)
Head=1#Disabled=1	-.181***	-.221***	-0.124	-.176*
	(0.054)	(0.080)	(0.114)	(0.097)
Spouse=1#Disabled=1	-.279***	-.163*	-.34***	-.439***
	(0.063)	(0.094)	(0.121)	(0.115)
Son=1#Disabled=1	-.225**	-.316*	0.091	-.426**
	(0.109)	(0.165)	(0.208)	(0.198)
Daughter=1#Disabled=1	-.391***	-.444***	-0.228	-.488***
	(0.106)	(0.161)	(0.216)	(0.172)
Grandchild=1#Disabled=1	-.555***	-0.552	-0.178	-.886**
	(0.202)	(0.350)	(0.358)	(0.383)
Elder=1#Disabled=1	0.078	-0.018	0.452	-0.076
	(0.200)	(0.270)	(0.432)	(0.505)
Other=1#Disabled=1	-.304*	-.582**	0.53	-0.259
	(0.159)	(0.230)	(0.377)	(0.245)
_cons	3.285***	3.085***	3.797***	2.914***
	(0.216)	(0.976)	(0.349)	(0.372)
Observations	3701	1773	858	1070
Households	1940	992	426	522

Note: Estimates are restricted to only disabled households. Other explanatory variables have been controlled for but omitted from the Table. Household clustered standard errors are reported in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

on wellbeing but this effect is positive among non-disabled households. At least for disabled households, our results are in line with Rojas (2011) who finds that although the personal wellbeing of sons and daughters does not substantially differ from those of fathers in low-income Mexican families, high-income family mothers have significantly lower wellbeing than fathers. In non-disabled households, our estimates resonate with Rojas (2011) who finds that overall, daughters have a greater probability than other family members

of having poorer wellbeing. Thirdly, wellbeing disparities in disabled homes become more apparent when we account for a person's disability. Alongside other non-disabled members, disabled elders share very similar wellbeing levels as their non-disabled head, while other household members with disabilities have significantly lower wellbeing levels. With the exception of elders with a disability, our findings generally echo those of Carew et al. (2019) who show that people with disabilities in Liberia who are not heads have lower wellbeing outcomes.

3.7 Robustness

We subject the empirical analysis to a number of robustness checks. We check the reliability of wellbeing responses and examine whether our findings are sensitive to changes in the disability definition of the sample.

3.7.1 Reliability of Wellbeing Responses

People's subjective wellbeing does not change significantly over the course of their lives but the notion of subjective wellbeing can be sensitive to tragic events (Oswald & Powdthavee, 2008). Hence controlling for wellbeing change from the past year can adjust for unobserved effects of events that happened in the pre-interview period which could potentially have an influence on a person's current level of wellbeing.

To check the reliability of wellbeing responses, we use a wellbeing change variable which is based on the question: "compared to this time last year, would you say that your life has improved, stayed more or less the same or worsened, overall" (improved=1, 0 otherwise). Those who reported an improvement were significantly more likely to report higher levels of wellbeing and this is consistent across samples. Overall, we find that our estimates are unaltered. These results are omitted from the chapter but available upon request.

3.7.2 Disability Definition

The United Nations WG questions are rated on an ascending scale of difficulty: no difficulty, some difficulty, a lot of difficulty, and cannot do at all. One key

factor used to determine the proportion of people with disabilities is the cut-off point, and different countries use different thresholds for political, social and economic reasons (Palmer & Harley, 2012). The current analysis identifies disabled and non-disabled adults based on the sample of those who report that they experience a lot of difficulty/cannot do in any of the functional domains (Disability3). However, disability is complex and there is no holistic measure that perfectly reflects disability prevalence in a given context (Loeb et al., 2008; Palmer & Harley, 2012; Putz & Glickman, 2019). Alongside Disability3, the WG measure defines Disability1, Disability2 and Disability4 as alternative thresholds for measuring disability prevalence. In Vietnam, Mont (2007) finds that disability prevalence was 32% if a cut-off of some difficulty was used (Disability1), 10% for a lot of difficulty (Disability3) and 2.6% for cannot do at all (Disability4). In Zambia, however, Loeb et al. (2008) found that, the resultant national prevalence rate was 13.4% if some difficulty was experienced in at least two domains (Disability2) which increased to 17.8% if the Disability1 threshold was used.[39]

Whilst the WG measure has been acknowledged as best reflecting the current paradigm of disability, certain sub-populations may be over- or underrepresented. For example, we may expect that some adults will more likely report some difficulties in walking or seeing due to ageing but still have some degree of functional independence.[40] Hence, changes to the definition of disability in relation to how people perceive their degree of difficulty may mean that our results are sensitive to a smaller or larger subset of the disabled population. We address these potential selection issues in Tables 3.10, 3.11 and 3.12, where we test how sensitive our estimates are to altering the identification of people with disabilities.

[39]In line with this discussion, Figure C7 in the Appendix shows that 53% of adults in Uganda are disabled because they report at least some difficulty in any domain (Disability1). A more conservative measure, Disability2, shows that 31% have at least some difficulty in any two domains, have a lot of difficulty or cannot do at all. Disability4, the most restrictive measure, classifies only 1.2% of adults as disabled. Disability4 is often considered as closest to the previously used binary (yes/no) measure which identifies only people with severe disabilities. We could not use this measure in the robustness test since only a small fraction of adults meet this criteria (n=164). However, we would expect that the estimates from other measures could serve as a lower bound on the effects of disability on wellbeing.

[40]As described in our main results, we found no significant effects of age among people with disabilities.

Table 3.10 reports the sensitivity analysis for the baseline estimates. By and large, the results are unchanged when we respectively use Disability1 and Disability2 in panels A and B, albeit the significance of one or two regressors vary. Analogously, the presence of disability is correspondingly associated with lower levels of wellbeing by 24% and 29.2% in columns 1 and 5. However, columns 2 and 6 indicate that because functional limitations are quite subdued, morbidity count is now significant, while gender is no longer significant for this subset of people with disabilities.

Furthermore, the effects of family structure on wellbeing may vary with the definition of disability. Table 3.11 reports the analysis from this exercise and as before, we show estimates based on Disability1 and Disability2 in panels A and B, disaggregated by the corresponding subsets of disabled and non-disabled households. Panel A shows that daughters of disabled families in columns 1 and 2 experience lower wellbeing than heads, while in non-disabled households (columns 3 and 4) everyone enjoys similar levels of wellbeing as heads with the exception of other relatives in column 3 which is weakly significant. This implies that using Disability1 may further introduce heterogeneity in the identification of people with disabilities because it incorporates people with some degree of functional abilities. In panel B, the estimates using Disability2 strongly echo those of the widely used measure. Sons, daughters and other relatives of non-disabled households experience significantly lower wellbeing than household heads.

Finally, Table 3.12 reports estimates for the interaction effects of disability and family structure. We find that irrespective of the definition used across both columns, the results are strongly analogous to our previous findings.

A general conclusion from this sensitivity analysis is that Disability2 and Disability3 generate nearly identical results in terms of identifying people with disabilities and evaluating wellbeing. However, we find that the wellbeing estimates of family structure among 'disabled' households using a less restrictive measure of disability that incorporates those with relatively mild forms of limitations (Disability1), are closely comparable to those we found for 'non-disabled' households using the widely used measure. Compared to more profound measures that identify people with disabilities, our findings may reflect some degree of similarity in terms of ableism or functional independence between the disabled in Disability1 and the non-disabled in Disability3.

Table 3.10: Determinants of Wellbeing – Baseline Estimates Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Disability1 Definition				Panel B: Disability2 Definition			
	Whole Sample	PwDs	ND1	ND2	Whole Sample	PwDs	ND1	ND2
Disability (=1)	-.24***				-.292***			
	(0.018)				(0.022)			
Morbidity count (#)	-.119***	-.109***	-.102*	-0.04	-.101***	-.073**	-.195**	-.055*
	(0.023)	(0.026)	(0.060)	(0.078)	(0.023)	(0.030)	(0.076)	(0.034)
Discrimination count (#)	-.146***	-.151***	-.155***	-.149***	-.143***	-.153***	-.172***	-.135***
	(0.014)	(0.016)	(0.037)	(0.039)	(0.014)	(0.020)	(0.033)	(0.022)
Personal safety score	.046***	.064***	-0.016	.043*	.045***	.068***	0.01	.034**
	(0.012)	(0.016)	(0.025)	(0.023)	(0.012)	(0.020)	(0.027)	(0.016)
Mobile phone use: Ref=Not at all								
Less than once/week	.054*	0.065	0.022	0.024	0.042	0.046	0.01	0.02
	(0.029)	(0.041)	(0.058)	(0.058)	(0.029)	(0.055)	(0.068)	(0.039)
At least once/week	.103***	.168***	0.026	-0.019	.089***	.11*	0.004	.083**
	(0.029)	(0.042)	(0.056)	(0.055)	(0.029)	(0.060)	(0.065)	(0.037)
Almost every day	.13***	.183***	.079*	0.049	.118***	.191***	0.08	.089***
	(0.025)	(0.036)	(0.047)	(0.047)	(0.025)	(0.050)	(0.057)	(0.031)
Female (=1)	-0.014	-0.032	0.024	-0.012	-0.015	-0.045	0.012	-0.006
	(0.016)	(0.026)	(0.033)	(0.029)	(0.016)	(0.037)	(0.039)	(0.020)
Age (in years)	-.005*	-0.001	-.009*	-0.008	-.005**	0.003	-.01*	-.01**
	(0.002)	(0.004)	(0.005)	(0.006)	(0.002)	(0.005)	(0.005)	(0.004)
Age-squared/100	.005*	0.001	.01*	0.007	.006**	-0.002	.011*	.01**
	(0.003)	(0.004)	(0.006)	(0.007)	(0.003)	(0.005)	(0.006)	(0.005)
Education: Ref=No education/preschool								
Primary (=1)	.049*	.103***	-0.038	-0.021	.047*	.132***	-0.026	-0.001
	(0.025)	(0.034)	(0.052)	(0.054)	(0.025)	(0.044)	(0.055)	(0.036)
Secondary (=1)	.065**	.112**	-0.023	0.005	.062*	.111*	0.012	0.032
	(0.032)	(0.047)	(0.065)	(0.065)	(0.032)	(0.066)	(0.070)	(0.045)

Continued on next page

Table 3.10 – continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Disability1 Definition				Panel B: Disability2 Definition			
	Whole Sample	PwDs	ND1	ND2	Whole Sample	PwDs	ND1	ND2
Higher education (=1)	.093**	.163**	-0.01	0.058	.091**	0.081	0.121	0.068
	(0.046)	(0.070)	(0.091)	(0.084)	(0.045)	(0.103)	(0.109)	(0.058)
Married/cohabiting (=1)	.053***	.139***	-0.043	0.061	.038*	.144***	-0.01	0.013
	(0.020)	(0.030)	(0.037)	(0.041)	(0.020)	(0.041)	(0.042)	(0.027)
Household size (log)	.052**	0.005	0.066	0.051	.052**	-0.019	0.061	.083***
	(0.022)	(0.028)	(0.052)	(0.048)	(0.022)	(0.036)	(0.057)	(0.031)
Dependency ratio	-.145***	-0.055	-.233**	-0.135	-.133***	-0.01	-0.084	-.215***
	(0.052)	(0.064)	(0.119)	(0.117)	(0.052)	(0.080)	(0.124)	(0.076)
Household wealth status: Ref=Low								
Middle (=1)	.102***	.118***	0.03	0.081	.1***	.14***	0.001	.094**
	(0.030)	(0.039)	(0.057)	(0.058)	(0.030)	(0.052)	(0.063)	(0.041)
High (=1)	.171***	.15***	.116**	.194***	.17***	.171***	.108*	.159***
	(0.031)	(0.041)	(0.056)	(0.057)	(0.031)	(0.055)	(0.065)	(0.041)
_cons	3.353***	2.971***	3.559***	3.593***	3.337***	2.815***	3.514***	3.484***
	(0.085)	(0.131)	(0.165)	(0.167)	(0.086)	(0.189)	(0.193)	(0.115)
lns1_1_1:_cons	-.519***	-.525***	-.601***	-.571***	-.52***	-.503***	-.768***	-.527***
	(0.023)	(0.041)	(0.063)	(0.048)	(0.023)	(0.063)	(0.102)	(0.030)
lnsig_e:_cons	-.246***	-.184***	-.28***	-.38***	-.247***	-.15***	-.181***	-.352***
	(0.012)	(0.021)	(0.032)	(0.027)	(0.012)	(0.032)	(0.033)	(0.018)
Observations	12521	6512	2989	3020	12521	3708	2394	6419
Households	6802	4927	2239	1757	6802	3122	1720	3549
ICC	0.367	0.336	0.345	0.406	0.366	0.33	0.236	0.413

Note: See notes in Table 3.3

Table 3.11: Family Structure and Wellbeing - Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Disability1 Definition				Panel B: Disability2 Definition			
	Disabled households		Non-disabled households		Disabled households		Non-disabled households	
	M1	M2	M1	M2	M1	M2	M1	M2
Family structure: Ref=Head								
Spouse	0.007	0.016	-0.006	-0.016	0.00004	0.018	0.004	-0.001
	(0.022)	(0.023)	(0.033)	(0.034)	(0.030)	(0.031)	(0.023)	(0.023)
Son	-0.051	-0.044	-0.11	-0.095	0.021	0.02	-.142***	-.123**
	(0.044)	(0.045)	(0.081)	(0.082)	(0.057)	(0.059)	(0.053)	(0.053)
Daughter	-.107**	-.111**	-0.04	-0.005	-0.052	-0.057	-.122**	-.109*
	(0.045)	(0.046)	(0.088)	(0.089)	(0.057)	(0.059)	(0.057)	(0.057)
Grandchild	-0.062	-0.078	0.172	0.237	0.028	-0.007	-0.029	0.026
	(0.084)	(0.090)	(0.186)	(0.186)	(0.097)	(0.105)	(0.125)	(0.123)
Elder	0.094	0.058	0.042	0.064	0.124	0.089	-0.016	-0.016
	(0.073)	(0.081)	(0.190)	(0.182)	(0.086)	(0.100)	(0.102)	(0.101)
Other	-0.082	-0.072	-.15*	-0.128	-0.054	-0.06	-.134**	-.108*
	(0.052)	(0.055)	(0.081)	(0.082)	(0.068)	(0.074)	(0.056)	(0.056)
_cons	3.192***	3.141***	3.535***	3.563***	3.019***	2.992***	3.604***	3.574***
	(0.115)	(0.121)	(0.186)	(0.191)	(0.150)	(0.159)	(0.125)	(0.127)
Observations	10195	9500	3137	3019	6664	6101	6668	6418
Households	5258	5045	1804	1757	3412	3253	3650	3549

Note: Estimates in panels A and B are respectively based on the Disability1 and Disability2 measures. Other explanatory variables have been controlled for but omitted from the table. Household clustered standard errors are reported in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.12: Family Structure and Disability Interactions - Robustness

	(1) Disability1	(2) Disability2
Disability & Family structure: Ref=Head=1#Disabled=0		
Spouse=1#Disabled=0	0.037	0.028
	(0.039)	(0.048)
Son=1#Disabled=0	-0.005	0.024
	(0.061)	(0.074)
Daughter=1#Disabled=0	-0.06	0.002
	(0.064)	(0.077)
Grandchild=1#Disabled=0	-0.02	0.066
	(0.109)	(0.120)
Elder=1#Disabled=0	0.043	0.004
	(0.111)	(0.118)
Other=1#Disabled=0	0.025	0.021
	(0.072)	(0.091)
Head=1#Disabled=1	-.19***	-.221***
	(0.033)	(0.042)
Spouse=1#Disabled=1	-.192***	-.229***
	(0.035)	(0.046)
Son=1#Disabled=1	-.258***	-.222***
	(0.058)	(0.079)
Daughter=1#Disabled=1	-.326***	-.353***
	(0.058)	(0.076)
Grandchild=1#Disabled=1	-.37***	-.439***
	(0.124)	(0.151)
Elder=1#Disabled=1	-0.107	-0.046
	(0.109)	(0.155)
Other=1#Disabled=1	-.329***	-.397***
	(0.074)	(0.108)
_cons	3.279***	3.159***
	(0.123)	(0.164)
Observations	9500	6101
Households	5045	3253

Note: Estimates are restricted to only disabled households. Other explanatory variables have been controlled for but omitted from the Table. Household clustered standard errors are reported in parenthesis * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.8 Summary and Conclusion

Using data from the 2017 Uganda Functional Difficulties Survey, this paper explores the determinants of subjective wellbeing, with specific emphasis on people with disabilities. A multilevel mixed effects modelling approach is used to account for non-independence of observations. The baseline

analysis identifies the presence of disability, the number of health conditions, discrimination count, and dependency ratio as negative correlates of wellbeing. Age exhibits a u-shaped relationship with wellbeing while feelings of personal safety, ICT as proxied by mobile phone use, education, household size and household wealth are positively associated with wellbeing. An extended analysis finds that being educated and belonging to wealthier households serves as a positive buffer to the inverse disability-wellbeing nexus. With respect to the pathways between discrimination and wellbeing, the analysis for the entire sample suggests that the different types of discrimination are quite pervasive with the exception of discrimination experienced on the basis of gender. Although our estimates are not causal, they suggest that even for adults with a relatively basic level of education, ICT may positively buffer the discrimination-wellbeing relationship.

However, these effects depend on the type of respondent. We find that women with disabilities experience lower levels of wellbeing than their male peers. The positive wellbeing effects of personal safety and education are more pronounced among people with disabilities compared to their non-disabled peers, but we also find that the positive interactive effect of education and disability is more noticeable among men and youth with disabilities. We also find that the effects of certain types of discrimination occur more subtly or chronically across groups. The negative wellbeing effects of ethnic-based discrimination was more visible among the non-disabled and the elderly with disabilities, while disability-based discrimination had more prominence among men with disabilities and non-disabled family members of people with disabilities. With the exception of multiple discrimination, the significance of gender-, age and religious-based discrimination on wellbeing was somewhat uncommon across samples. Additionally, ICT works best for the non-disabled, men and young people with disabilities. Here our findings generally show that women and the elderly with disabilities are especially at a disadvantage in terms of the positive wellbeing effects of ICT and education but this group exhibit more prominently, positive evaluations of wellbeing if they belong to wealthier households compared to other types of respondents.

The distribution of wellbeing within the household is crucial to the

understanding of personal wellbeing and for the design of policies. Our findings from wellbeing inequality decompositions provide some indication that having a disabled member within the family magnifies inequalities inside the household. The intrahousehold distribution of subjective wellbeing is also studied on the basis of testing the implications of communitarian versus cooperative bargaining theories of the family on wellbeing. Drawing from Rojas (2011), family status (being a head, spouse, son, daughter, elder or other) is used as a proxy for a person's relative intrahousehold bargaining power. Some evidence of communitarianism was found in poor disabled households; however, family status is noted to make a difference in wellbeing among higher income groups with spouses in nonpoor 'disabled' households experiencing lower wellbeing than heads but experiencing higher wellbeing in middle-income 'non-disabled' households. In non-disabled households, daughters of poor families and sons of nonpoor families experience lower wellbeing relative to heads. Wellbeing disparities between disabled and non-disabled family members could be explained by cultural patterns in the intrahousehold distribution of roles, or aspects such as lack of assistive devices or inability to enter the labour market – topics which have been covered in the first two chapters. When disability and family status intersect, we find that alongside other non-disabled members, disabled elders share very similar wellbeing levels with a non-disabled head while other disabled types, including a disabled head, experience significantly lower wellbeing. An important conclusion from this investigation is that generally, most of the drivers of wellbeing inequality in disabled households are disability-based whether or not they are low- or high-income households.

We find, however, that it is not always the case that people with disabilities are worse-off than their non-disabled members. Often times, family members of disabled people experience unfair treatment, which takes a toll on their personal wellbeing. Having a disabled member in the household implies taking time off to look after them, loosing time on leisure and earnings. In the absence of a well-developed social welfare system for people with disabilities in Uganda, our findings underscore the need to design interventions that ease the disproportionate burden of care to improve the overall wellbeing of adult

family members of people with disabilities.

Our analytical approach and sensitivity analysis confirm the reliability of our findings, however, there are important limitations to this study. The conclusions of this paper are based on the analysis of cross-sectional data, hence we could not establish causality or derive conclusions on inter-temporal effects of life events on happiness. With longitudinal data, future research could for example, explore how transitions in family structure influence personal wellbeing. Our analysis is based on self-reported data which may be susceptible to some response errors. However, self-reported data is widely used in epidemiological and wellbeing research because it provides useful information from a respondent's perspective and estimates are fairly similar to those of objective data. Another limitation is that our analysis focuses on adult family members. The data collected information on all household members, including children but only the wellbeing of adult members was measured. While this is a caveat, many papers on intrahousehold outcomes focus on the adult population and often times, not all adult members in the household are analysed (Rojas, 2011; Carew et al., 2019). Moreover, measuring children's subjective wellbeing through their own evaluations of life is sometimes complicated (Lee & Yoo, 2015). Hence, future research could incorporate children's wellbeing in the analysis. Finally, the composition of the sample may undermine the generalizability of our finding to other populations in Uganda. Although the data provides a representative picture of people with disabilities because the sample was drawn from the 2016 Uganda Demographic and Health Survey, the selection criteria was households having at least one person (including children) with some difficulty which is therefore not representative of all households in Uganda. In line with this selection criteria and considering that in this chapter, the non-disabled group of households have been defined as having no adult with a disability, these households may contain children with disabilities. We had no access to the children's data to check this.

Despite these limitations, this study is useful in informing policy decisions that could level the playing field for people with disabilities and their family members, improve wellbeing and reduce social inequalities. Formal

support systems are well established in developed countries to help provide professional care for people with disabilities, however, this is persistently deficient in developing countries. A potential way forward is to strengthen social protection systems that prioritise the needs of disadvantaged groups. Social health insurance provisions that are disability-care friendly, including assistive devices, should be encouraged, especially for women with disabilities.

The effects of household wealth provide some indication that there is some pooling of resources within Ugandan households with respect to allocating household resources for wellbeing. In communitarian households, designing policies that increase the welfare of all household members is warranted. However, for a given level of household wealth status, our findings show that there are important intrahousehold wellbeing disparities. The assumption that resource allocation is efficient leads to mistargeting of interventions that improve the wellbeing of some family members at the disadvantage of others within the household. This implies that interventions such as cash transfers at the household level may not have the desired effect. Targeting more disadvantaged groups within a given household, interventions could look deeper into social and psychological, rather than material aspects of wellbeing. This paper, therefore, suggests that intrahousehold arrangements need to be considered in the design of interventions aimed at addressing social problems that improve people's wellbeing.

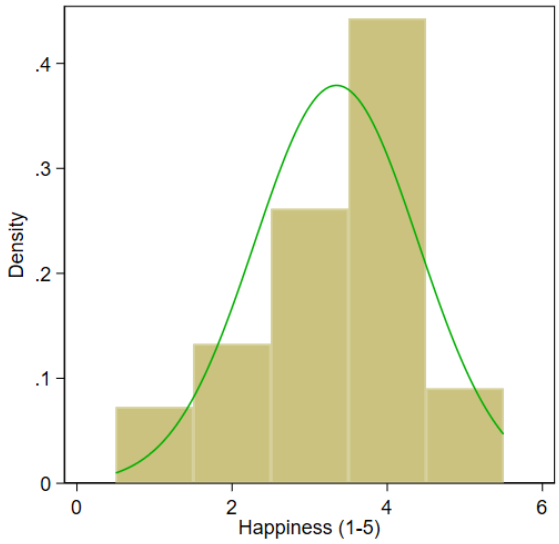
To improve the quality of life of people with disabilities, not only should we care about economic or assistive technology interventions but also consider the social and psychological implications of stigma and discrimination. Although we find that discrimination and use of ICT have positive interactive effects on wellbeing, a one-size-fits-all model for media technologies may not be entirely appropriate because effects do not occur universally. Providing an enabling environment through support structures such as self-help groups and community-based centres could assist stigmatised identities in having a greater sense of belonging and provide opportunities to engage with ideas about rights, empowerment and greater equality. For example, mimicking England's 'Time to Change' (TTC) anti-stigma campaign program launched in 2009 worked in reducing stigma and discrimination among people with mental health problems

(Henderson et al., 2012). Such interventions could encourage people with disabilities to engage actively in society (e.g., apply for jobs, attend schooling) and lead happy lives.

Appendix C

Additional Tables and Figures for Chapter 3

Figure C1: Wellbeing Distribution



Note: In the sample, 7.3% were very unhappy, about 13.3% were somewhat unhappy, while 26.2% responded as neither happy nor unhappy. The largest fraction of respondents were somewhat happy (nearly half) and the remaining 9% reported being very happy.

Table C1: Background Profile by Gender and Disability Status

	(1)	(2)	(3)	(4)	(5)	(6)
	People with Disabilities			Non-Disabled (All)		
	Men mean	Women mean	t-test (1)/(2) p-value	Men mean	Women mean	t-test (4)/(5) p-value
Age (in years)	44.42	47.35	0.0***	39.43	38.78	0.7
Married/cohabiting (=1)	0.69	0.51	0.0***	0.69	0.64	0.0***
Education:						
Schooling (in years)	5.54	3.48	0.0***	6.49	4.58	0.0***
No education/preschool (=1)	0.15	0.38	0.0***	0.09	0.25	0.0***
Primary (=1)	0.61	0.50	0.0***	0.60	0.58	0.0***
Secondary (=1)	0.20	0.09	0.0***	0.23	0.14	0.0***
Higher education (=1)	0.04	0.03	0.0**	0.07	0.04	0.0***
HH characteristics:						
Household size (#)	6.53	6.40	0.0***	7.49	7.13	0.0***
Dependency ratio	0.59	0.64	0.0***	0.57	0.60	0.0***
Household wealth score	-0.25	-0.25	0.5	-0.15	-0.17	0.4
Wealth status:						
Low (=1)	0.49	0.50	0.8	0.47	0.48	0.2
Middle (=1)	0.24	0.22	0.7	0.22	0.21	0.4
High (=1)	0.28	0.28	0.9	0.31	0.31	0.4
Subjective wellbeing:						
Happiness (1-5)	3.05	2.83	0.0***	3.47	3.42	0.0**
Levels of SWB:						
Very unhappy	0.15	0.18	0.0**	0.05	0.06	0.0**
Somewhat unhappy	0.16	0.22	0.0**	0.12	0.13	0.2
Neither happy nor unhappy	0.29	0.26	0.6	0.26	0.26	0.4
Somewhat happy	0.31	0.27	0.0**	0.47	0.46	0.6
Very happy	0.10	0.07	0.1*	0.10	0.10	0.3
Socio-psychological markers:						
Perceived discrimination (=1)	0.30	0.32	1.0	0.15	0.15	0.3
Discrimination count [1-6]	1.82	1.77	0.8	1.53	1.65	0.2
Personal safety score	-0.20	-0.21	0.1	0.10	0.04	0.0***
Mobile phone use:						
Not at all	0.38	0.41	0.3	0.27	0.27	0.3
Less than once/week	0.16	0.15	0.5	0.16	0.17	0.2
At least once/week	0.14	0.15	0.6	0.16	0.15	0.1
Almost every day	0.33	0.29	0.3	0.41	0.41	0.4
Health:						
Morbidity (=1)	0.28	0.31	0.2	0.09	0.11	0.0***
Morbidity count [1-8]	1.31	1.27	0.6	1.12	1.17	0.1
Observations	952	1436		4968	6116	

Figure C2: Sample Size Flow Chart

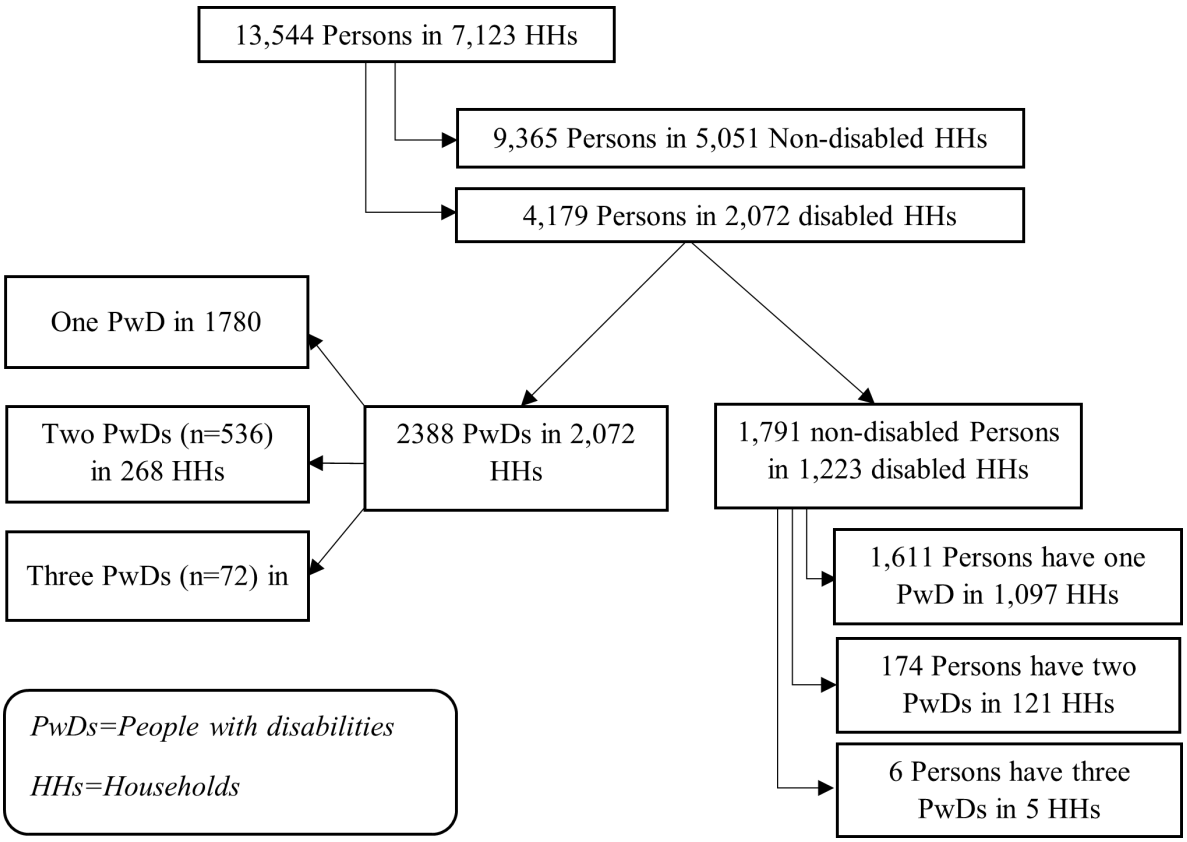
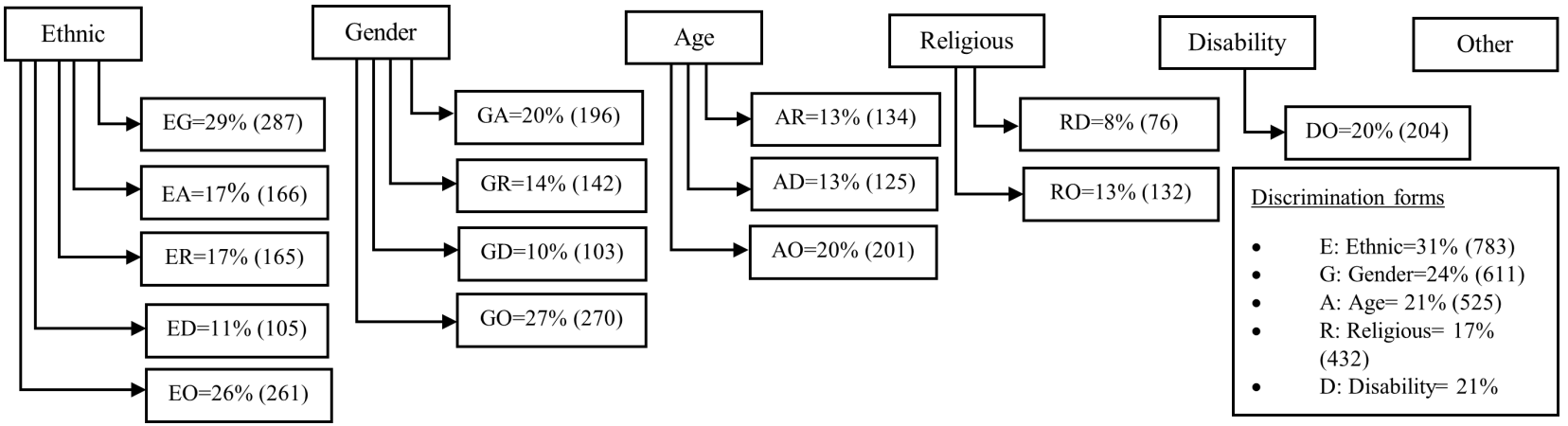


Figure C3: Discrimination Forms and Intersectional Discrimination



Note: Of those reporting discrimination, two in five (1000) individuals report multiple discrimination. Of those who report multiple discrimination, two-thirds report double discrimination, 25% on three grounds, 11% on four, 4% on five and 1% on six grounds. Sample size in parenthesis.

The tree diagram illustrates discrimination forms and fifteen possible combinations of double discrimination. Here we find that of those experiencing discrimination in multiple forms (39%), ethnic-gender combinations were the most commonly reported (29%), followed by gender-age (20%). Hence disability, alongside other social identities as ethnicity, gender and age can potentially explain a mix of discriminatory experiences. Also, the intersections between the main and 'other' forms of discrimination is fairly common, however, future data could elicit specific information on what respondents imply in the "other" category.

It should however be noted that variations across forms of discrimination show that more of the non-disabled experience ethnic-related discrimination (33% versus 26%) while less report age- or disability-related discrimination than the disabled. Moreover, more women without disabilities significantly report discrimination on the basis of gender or age than their male peers and we find no differences in discrimination between men and women with disabilities. The response to disability discrimination among non-disabled respondents may show that what counts as disability is perceived by individuals differently. It also means that disability is not always clearly visible. Therefore, restricting the definition of disability to the WG criteria masks additional nuances and should only serve as a lower bound.

Table C2: Key Characteristics by Discrimination and ICT status

	(1)	(2)	(3)	(4)	(5)	(6)
	Discrimination			Mobile Phone Use		
	Disc. mean	No Disc. mean	t-test (1)/(2) p-value	Phone mean	No Phone mean	t-test (4)/(5) p-value
Female (=1)	0.56	0.55	0.1	0.54	0.56	0.0**
Age (in years)	40.82	39.97	0.0***	39.18	41.24	0.0***
Married/cohabiting (=1)	0.65	0.65	0.400	0.69	0.60	0.0***
Household headship (=1)	0.49	0.42	0.0***	0.44	0.43	0.4
Schooling (in years)	5.12	5.32	0.0***	6.13	4.25	0.0***
Household size (#)	6.53	7.31	0.0***	7.22	7.12	0.0**
Dependency ratio	0.59	0.59	0.1	0.58	0.61	0.0***
Wealth status:						
Low (=1)	0.54	0.46	0.0***	0.35	0.64	0.0***
Middle (=1)	0.19	0.22	0.0***	0.23	0.20	0.0***
High (=1)	0.27	0.31	0.0***	0.43	0.16	0.0***
Happiness (1-5)	3.02	3.44	0.0***	3.45	3.26	0.0***
Personal safety score	-0.24	0.09	0.0***	0.07	-0.02	0.0***
Phone (=1)	0.55	0.55	0.50			
Observations	2534	10879		7582	5882	

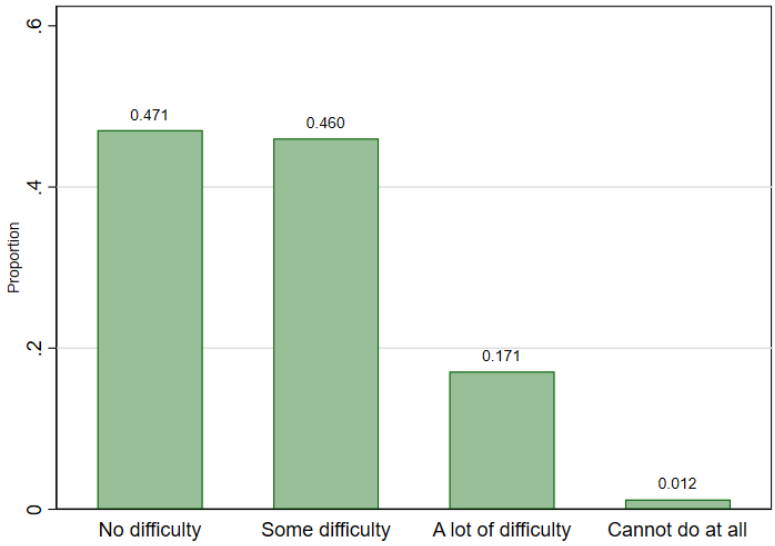
Note: Disc. (=1) if perceived discrimination (=1). Phone (=1) if mobile phone>=once/week (=1). See additional notes in Table 3.1

Table C3: Reported Morbidities

	(1)	(2)	(3)	(4)
	Whole Sample %	PwDs %	ND (All) %	t-test (2)/(3) p-value
Comorbidities (=1)	0.17	0.26	0.13	0.0***
Morbidities:				
Spina bifida	0.04	0.03	0.04	0.0**
Hydrocephalus	0.02	0.01	0.02	0.1*
Rheumatism	0.62	0.63	0.61	0.9
Epilepsy	0.07	0.07	0.08	0.7
Autism	0.02	0.04	0.01	0.0***
Spinal cord injury	0.38	0.46	0.35	0.0***
Leprosy	0.02	0.03	0.01	0.0***
Down's syndrome	0.02	0.03	0.02	0.0**
Types of morbidities:				
Physical morbidities	0.94	0.93	0.95	0.0***
Mental morbidities	0.03	0.02	0.03	0.6
Both physical and mental	0.03	0.05	0.02	0.0***
Observations	1995	717	1278	

Note: Results shown are for those who suffer from any type of morbidity. We find no significant differences in reported morbidities by gender irrespective of disability status. Physical morbidities= spina bifida, rheumatism, epilepsy, spinal cord injury and leprosy. Mental morbidities= hydrocephalus, Down's syndrome and autism. See additional notes in Table 3.1

Figure C4: Functional Status



Note: Figure C4 illustrates the respective levels of functional difficulties experienced across the six domains of functioning and some respondents report difficulties across more than one domain. Around 47% of respondents reported that they had no functional difficulty in any domain and a similar proportion reported some difficulty in at least one domain. Additionally, 17% and 1.2% respectively report a lot of difficulty or could not do at all and this group of respondents constitute people with disabilities. The respective levels of functioning are not mutually exclusive, except for those reporting 'no difficulty' across the six domains of functioning.

Table C4: Health Profile of the Non-disabled

	(1) All ND %	(2) Men %	(3) Women %	(4) t-test (2)/(3) p-value
Some difficulties (=1)	0.38	0.35	0.4	0.0***
Domain-specific prevalence:				
Seeing	0.62	0.62	0.62	0.1
Hearing	0.21	0.20	0.22	0.1
Mobility	0.35	0.33	0.37	0.0**
Cognition	0.25	0.24	0.25	0.0**
Selfcare	0.03	0.03	0.03	0.7
Communication	0.02	0.02	0.02	0.1*
Type of impairment:				
Physical impairment	0.31	0.29	0.32	0.0***
Mental impairment	0.03	0.03	0.03	0.7
Both physical and mental	0.07	0.06	0.08	0.0***
None	0.59	0.62	0.57	0.0***
Observations	11084	4968	6116	

Note: Estimates of domain-specific prevalence adds up to more than 100 because some respondents report multiple difficulties across the six domains of functioning. Statistics for domain-specific prevalence is for the sample of those reporting some difficulties. Physical impairment= Physical morbidities + some difficulties in seeing, hearing, mobility, selfcare, & communication. Mental impairment= Mental morbidities + some cognitive difficulties. See additional notes in Table 3.1.

Figure C5: Household Effects Quantile-Quantile Plot

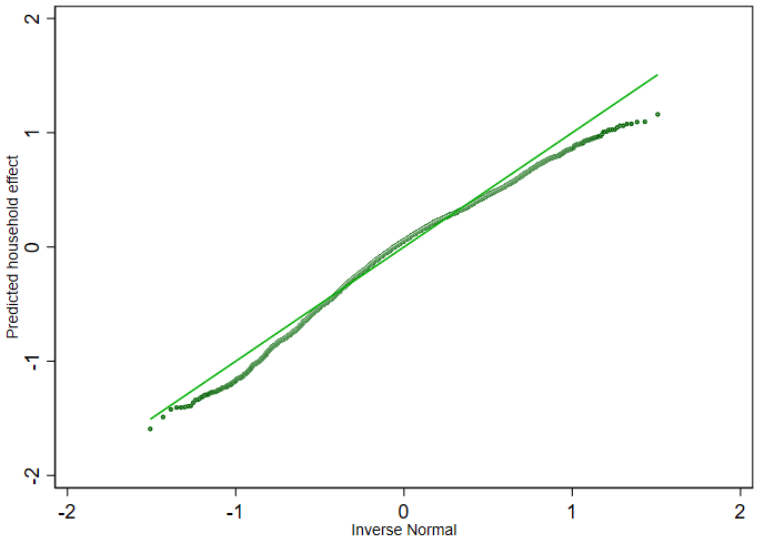


Table C5: Determinants of Wellbeing - Baseline Ordered Probit Estimates

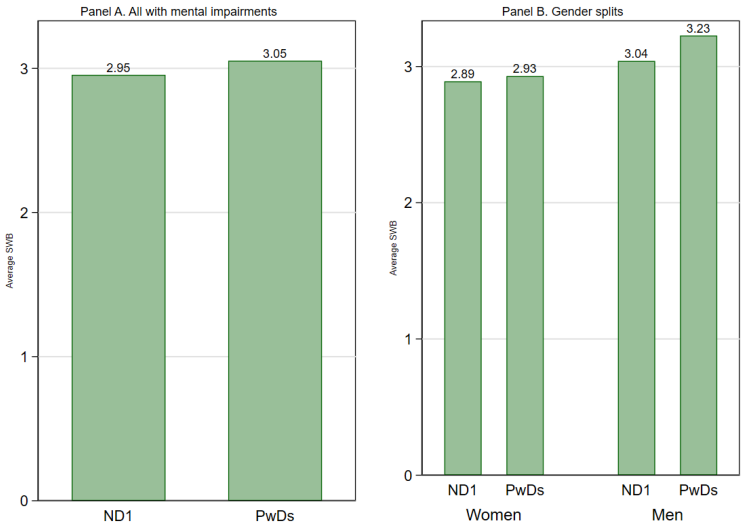
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Panel A: Respondent Types			Panel B: Subgroups of PwDs			
	Whole Sample	PwDs	ND1	ND2	Men	Women	Young	Elderly
Disability (=1)	-.384***							
	(0.038)							
Morbidity count (#)	-.163***	-0.065	-.192**	-.188***	-0.083	-0.043	-0.103	-0.084
	(0.031)	(0.054)	(0.076)	(0.041)	(0.086)	(0.071)	(0.075)	(0.092)
Discrimination count (#)	-.195***	-.184***	-.234***	-.214***	-.19***	-.209***	-.146***	-.249***
	(0.019)	(0.037)	(0.050)	(0.025)	(0.063)	(0.055)	(0.047)	(0.073)
Personal safety score	.066***	.13***	0.068	0.033	0.076	.189***	.095**	.177***
	(0.016)	(0.033)	(0.043)	(0.021)	(0.054)	(0.048)	(0.042)	(0.062)
Mobile phone use: Ref=Not at all								
Less than once/week	0.052	0.006	-0.065	0.055	.253*	-.237*	0.168	-0.165
	(0.039)	(0.094)	(0.107)	(0.049)	(0.139)	(0.143)	(0.127)	(0.162)
At least once/week	.123***	.218**	0.051	.119**	.316*	0.113	.296**	0.05
	(0.040)	(0.104)	(0.101)	(0.049)	(0.173)	(0.140)	(0.143)	(0.173)
Almost every day	.17***	.263***	0.052	.178***	.389***	0.155	.298***	0.213
	(0.034)	(0.087)	(0.090)	(0.042)	(0.137)	(0.119)	(0.113)	(0.173)
Female (=1)	-0.028	-.127*	0.02	-0.016			-.162**	-.228*
	(0.023)	(0.068)	(0.063)	(0.027)			(0.081)	(0.134)
Age (in years)	-.008**	0.008	-.017**	-.008*	0.012	0.006	0.036	-0.003
	(0.003)	(0.009)	(0.008)	(0.005)	(0.014)	(0.013)	(0.034)	(0.058)
Age-squared/100	.009**	-0.006	.017**	0.008	-0.011	-0.003	-0.043	0.002
	(0.004)	(0.009)	(0.008)	(0.005)	(0.014)	(0.012)	(0.050)	(0.042)
Education: Ref=No education/preschool								
Primary (=1)	0.057	.197**	-0.015	0.043	.254*	.197*	.399***	0.033
	(0.035)	(0.079)	(0.083)	(0.045)	(0.143)	(0.106)	(0.120)	(0.127)
Secondary (=1)	.076*	.247**	-0.128	0.087	.359**	0.234	.389**	0.044
	(0.046)	(0.118)	(0.111)	(0.058)	(0.179)	(0.193)	(0.153)	(0.245)

Continued on next page

Table C5 – continued from previous page

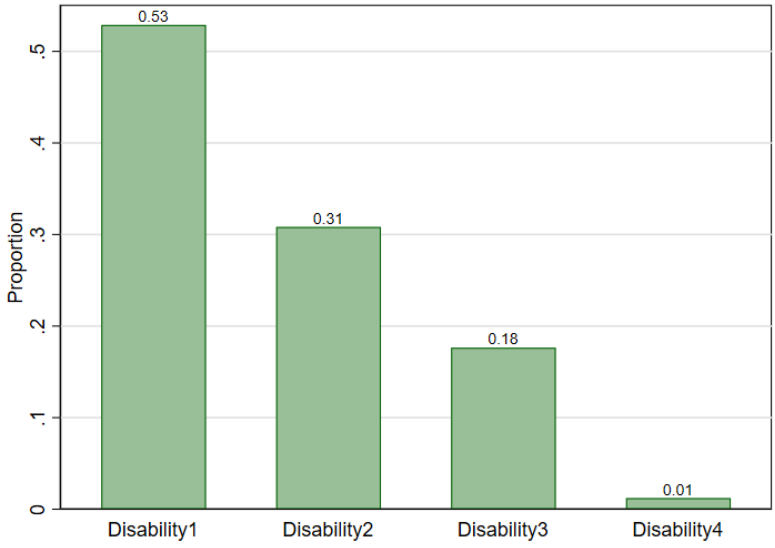
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Panel A: Respondent Types			Panel B: Subgroups of PwDs			
	Whole Sample	PwDs	ND1	ND2	Men	Women	Young	Elderly
Higher education (=1)	.128**	0.244	0.157	.131*	0.342	0.254	.453*	-0.013
	(0.065)	(0.185)	(0.198)	(0.078)	(0.281)	(0.250)	(0.237)	(0.306)
Married/cohabiting (=1)	0.03	.13*	0.011	0.024	0.164	0.095	.171*	-0.083
	(0.028)	(0.073)	(0.066)	(0.035)	(0.118)	(0.098)	(0.091)	(0.127)
Household size (log)	.084***	0.010	0.108	.105***	0.014	0.002	0.116	-0.043
	(0.030)	(0.062)	(0.084)	(0.040)	(0.097)	(0.084)	(0.106)	(0.096)
Dependency ratio	-.198***	0.114	-0.176	-.322***	0.229	0.004	-0.091	0.014
	(0.071)	(0.140)	(0.175)	(0.095)	(0.228)	(0.185)	(0.247)	(0.221)
Household wealth status: Ref=Low								
Middle (=1)	.121***	.193**	-0.02	.116**	0.08	.234*	0.152	.296*
	(0.043)	(0.093)	(0.095)	(0.054)	(0.139)	(0.124)	(0.117)	(0.166)
High (=1)	.236***	0.15	0.13	.242***	0.06	0.18	-0.009	.475**
	(0.044)	(0.100)	(0.098)	(0.055)	(0.149)	(0.137)	(0.118)	(0.202)
/cut1	-1.979***	-.971***	-2.435***	-2.085***	-0.65	-1.189**	-0.205	-2.208
	(0.125)	(0.344)	(0.313)	(0.157)	(0.519)	(0.492)	(0.601)	(2.048)
/cut2	-1.097***	-0.05	-1.516***	-1.186***	0.20	-0.19	0.663	-1.134
	(0.123)	(0.341)	(0.300)	(0.153)	(0.518)	(0.471)	(0.607)	(2.040)
/cut3	-0.07	1.002***	-.656**	-0.09	1.261**	.9*	1.572**	0.202
	(0.122)	(0.349)	(0.296)	(0.151)	(0.554)	(0.487)	(0.623)	(2.045)
/cut4	1.906***	2.677***	1.066***	2.052***	2.896***	2.651***	3.074***	2.242
	(0.125)	(0.387)	(0.301)	(0.156)	(0.680)	(0.587)	(0.674)	(2.099)
/var(_cons[hid])	.666***	.727***	.283***	.768***	0.524	.831*	0.323	1.4*
	(0.043)	(0.208)	(0.096)	(0.058)	(0.450)	(0.444)	(0.234)	(0.740)
Observations	12521	2069	1633	8819	842	1227	1060	1009
Households	6802	1825	1134	4862	812	1193	985	937

Figure C6: Wellbeing in Disabled Households, Mental Impairments



Note: The statistics shown are for only those with mental impairments.

Figure C7: Washington Group Measures of Disability Prevalence



Note: The WG measures have varying cut-offs based on the level of difficulty. Disability1 = some difficulty in any domain (least restrictive). Disability2 = some difficulty in two domains/a lot/cannot in any domain (more conservative). Disability3 = a lot/cannot do in any domain (recommended). Disability4 = Cannot do in any domain (most restrictive).

Table C6: Family Structure and Wellbeing by Wealth Status

	(1)	(2)	(3)	(4)	(5)	(6)
	Low		Middle		High	
	M1	M2	M1	M2	M1	M2
Panel A: Disabled households						
Family structure: Ref=Head						
Spouse	0.064	0.070	-.129*	-0.08	-.12*	-0.084
	(0.063)	(0.064)	(0.077)	(0.076)	(0.069)	(0.075)
Son	0.022	0.002	0.215	0.165	-0.142	-0.158
	(0.117)	(0.122)	(0.152)	(0.154)	(0.128)	(0.136)
Daughter	-0.067	-0.04	0.002	-0.064	-0.126	-0.172
	(0.114)	(0.118)	(0.146)	(0.150)	(0.135)	(0.138)
Grandchild	0.069	0.031	-0.117	-0.086	0.046	-0.03
	(0.212)	(0.211)	(0.249)	(0.272)	(0.215)	(0.235)
Elder	0.085	0.171	0.359	0.413	0.059	-0.215
	(0.171)	(0.190)	(0.239)	(0.272)	(0.171)	(0.218)
Other	0.019	-0.004	0.153	0.234	-0.108	-0.085
	(0.135)	(0.140)	(0.199)	(0.228)	(0.137)	(0.151)
_cons	2.774***	2.894***	3.547***	3.647***	3.081***	2.798***
	(0.929)	(1.024)	(0.342)	(0.345)	(0.325)	(0.364)
Observations	1923	1773	951	858	1239	1070
Households	1046	992	448	426	557	522
Panel B: Non-disabled households						
Family structure: Ref=Head						
Spouse	0.034	0.028	0.061	.075*	-0.048	-0.055
	(0.032)	(0.032)	(0.045)	(0.045)	(0.035)	(0.036)
Son	-0.087	-0.077	-0.115	-0.055	-.125*	-0.121
	(0.065)	(0.066)	(0.103)	(0.102)	(0.075)	(0.077)
Daughter	-.17**	-.169**	-0.133	-0.11	-0.091	-0.079
	(0.072)	(0.073)	(0.118)	(0.119)	(0.074)	(0.076)
Grandchild	0.108	0.129	0.108	0.104	-0.177	-0.164
	(0.150)	(0.151)	(0.166)	(0.155)	(0.144)	(0.157)
Elder	0.176	0.18	0.111	0.048	-0.134	-0.113
	(0.135)	(0.140)	(0.232)	(0.227)	(0.122)	(0.144)
Other	-.177**	-.155*	-0.013	0.059	-.193***	-.192***
	(0.088)	(0.091)	(0.141)	(0.141)	(0.071)	(0.073)
_cons	3.833***	3.697***	3.336***	3.219***	3.536***	3.466***
	(0.565)	(0.548)	(0.404)	(0.405)	(0.160)	(0.172)
Observations	4273	4137	1840	1755	3106	2926
Households	2407	2344	980	949	1624	1569

Note: Other explanatory variables are controlled for but not reported in the Table. See additional notes in Table 3.8

Thesis Conclusion

The three chapters presented in this thesis have contributed to expanding the knowledge base and understanding of people with disabilities in Uganda. Using unique datasets and alternative methodologies, the thesis has focused on the wellbeing of this marginalised group. The first chapter evaluated the short-term effects of a medical intervention that gifted lower limb orthotic devices to adults with disabilities. One year after the intervention, evidence was found on the gendered effects of changes in functional mobility and labour market outcomes. Men experienced an improvement in their functional independence, with an increased level of monthly earnings which was partly attributed to a job change or a switch from self- to wage employment. In contrast, a small change or a reduction in functional levels and a slight increase in earnings was observed among women. The positive effects of the intervention on both mobility and earnings appeared even stronger when the intensity of equipment use was considered.

The second chapter considered the long-term effects of the intervention by focussing on the levels and implications of orthosis failure on wellbeing. Six years after the intervention, the study found evidence that 37% of the respondents were still using their orthotic devices and the peak time of orthosis failure falls within an average of 4.8 years after the intervention. Female respondents, the elderly and those that were seen twice during the intervention had a lower risk of orthosis failure than their respective counterparts. Findings also showed that not using an orthotic equipment is negatively associated with wellbeing while access to follow-up care is positively correlated with being functionally independent.

The final chapter explored the determinants of subjective wellbeing using a unique sample of disabled and non-disabled adults and their family members.

Importantly, the analysis finds that disability and experiences of discrimination are negative correlates of wellbeing, while feelings of personal safety, and access to mobile phone technologies have positive wellbeing effects. However, the observed effects are heterogeneous. We also find that education and household wealth have positive interactive effects on the disability-wellbeing nexus, while the use of mobile phone technologies may positively buffer the discrimination-wellbeing relationship. For a given level of household income and disability status, wellbeing is not always evenly distributed within a household due to a person's relationship to the household head. An important conclusion from this investigation is that generally, most of the drivers of intrahousehold wellbeing inequalities in disabled households are disability-based regardless of the income status of the household.

Despite Uganda's impressive record on the social inclusion of people with disabilities, characteristics between people with disabilities and able-bodied individuals remain far from even. This thesis serves to highlight that the use of rehabilitative care and having a positive social climate work favourably to enhance the functional independence, social inclusion, and overall wellbeing of people with disabilities. This thesis builds on the argument that the lack of access to social protection compounds the challenges that people with disabilities face, especially women. Relative to men, women with disabilities face multiple disadvantages because of both their disability and their gender. Women are often treated as second class citizens in terms of access to essential services; and generally, they are still seen as the primary caregivers within a household, and as such, are responsible for many household tasks that those with a disability may find difficult to complete. In the developing world for example, when water is not piped to the home, the burden of fetching often falls disproportionately on women; while the traditional method of cooking on a three-stone cooking fire is a task that someone with a severe disability could struggle. It follows from this that more targeted help to women with disabilities is required to ensure they benefit from appropriate interventions.

In developed countries with relatively strong social protection systems, people with disabilities are more likely to receive special treatment and a variety of benefits that enables them to belong and participate in society.

At a micro-level, this thesis empirically documented a couple of policy levers that can potentially level the playing field for this group of marginalized individuals in a developing world. Alongside encouraging access to and use of rehabilitative care, intrahousehold arrangements need to be considered in the design of interventions aimed at addressing economic and social problems that improve people's wellbeing. Amidst an undeveloped social protection system in place to cater for disability needs, the inclusion of people with disabilities in Uganda's social protection policy and planning would ensure the attainment of the sustainable agenda which truly leaves no one behind.

While this thesis serves as a steppingstone for future research, a number of factors have limited the analysis presented. Data on people with disabilities in developing countries is generally difficult to find. With appropriate data, more rigorous analysis that addresses the concerns of generalizability and endogeneity may be applied. The analysis in the first two empirical essays is based on a relatively narrow sample of people with disabilities, namely, those with lower limb disabilities. Hence the effects of a medical intervention may be heterogeneous across other categories of people with disabilities. The data used in the third essay covers a more representative sample of people with disabilities with a larger geographic coverage, however, more elaborative comparisons across different forms of disability was impossible given the small sample sizes. Moreover, some comparisons were made with non-disabled groups which is not entirely representative of the Ugandan non-disabled adult population. Instruments for endogenous discrimination perceptions and the lack of data on the use of assistive devices, personality traits and labour market indicators were not available for the analysis of subjective wellbeing determinants and intrahousehold dynamics. We leave these open for future investigations.

Bibliography

Abdullahi, A. M., Orji, R., Rabiu, A. M., & Kawu, A. A. (2020). Personality and Subjective Well-Being: Towards Personalized Persuasive Interventions for Health and Well-Being. *Online journal of public health informatics*, 12(1).

Abubakar, A., Bridges, S., Gaggero, A., & Owens, T. (2021). Disability in Uganda: A medical intervention to measure gendered impacts on functional independence and labour-market outcomes. *Oxford Development Studies*, 49(4), 324–336.

Al Ju'beh, K. (2017). *Disability Inclusive Development Toolkit*. CBM. Germany.

Ali, M. A., Alam, K., & Taylor, B. (2020). Determinants of ICT usage for healthcare among people with disabilities: The moderating role of technological and behavioural constraints. *J Biomed Inform*, 108, 103480.

Altman, R. (1998). *Uganda Prosthetic/Orthotic Needs Assessment-Leahy War Victims Fund Report*. Report, USAID.

Araar, A. & Duclos, J.-Y. (2007). DASP: Distributive Analysis Stata Package. *PEP, World Bank, UNDP and Université Laval*.

Arifin, N., Hasbollah, H. R., Hanafi, M. H., Ibrahim, A. H., Abdul Rahman, W. A., & Aziz, R. C. (2017). Provision of prosthetic services following lower limb amputation in malaysia. *The Malaysian journal of medical sciences: MJMS*, 24(5), 106.

Aujla, I. & Needham-Beck, S. (2020). Subjective well-being among young dancers with disabilities. *International Journal of Disability, Development and Education*, 67(5), 563–570.

Azizan, N. H. & Mahmud, Z. (2018). Determinants of subjective well-being: A systematic review. *Environment-Behaviour Proceedings Journal*, 3(7), 135.

Banks, L. M., Hameed, S., Abu Alghaib, O., Nyariki, E., Olenja, J., Kulsum, U., Karim, R., & Shakespeare, T. (2021a). "it is too much for us": Direct and indirect costs of disability amongst working-aged people with disabilities in dhaka, bangladesh and nairobi, kenya. *Journal of Human Development and Capabilities*, (pp. 1–24).

Banks, L. M., Pinilla-Roncancio, M., Walsham, M., Van Minh, H., Neupane, S., Mai, V. Q., Neupane, S., Blanchet, K., & Kuper, H. (2021b). Does disability increase the risk of poverty 'in all its forms'? comparing monetary

and multidimensional poverty in vietnam and nepal. *Oxford Development Studies*, (pp. 1–15).

Banks, L. M., Walsham, M., Neupane, S., Neupane, S., Pradhananga, Y., Maharjan, M., Blanchet, K., & Kuper, H. (2019). Access to social protection among people with disabilities: Mixed methods research from tanahun, nepal. *The European Journal of Development Research*, 31(4), 929–956.

Barazzetta, M., Appleton, S., & Owens, T. (2019). Hedonic adaptation to treatment: Evidence from a medical intervention. *The Journal of Development Studies*, 56(3), 613–629.

Barlott, T., Adams, K., & Cook, A. (2016). Increasing participation in the information society by people with disabilities and their families in lower-income countries using mainstream technologies. *Universal Access in the Information Society*, 15(2), 189–198.

Basaza, R. (2020). *The Journey to Universal Health Insurance Coverage: What Are the Lessons for Uganda and the Other LMIC?* United States: United States: Nova Science Publishers, Inc.

Bayliss, L. E., Culliford, D., Monk, A. P., Glyn-Jones, S., Prieto-Alhambra, D., Judge, A., Cooper, C., Carr, A. J., Arden, N. K., & Beard, D. J. (2017). The effect of patient age at intervention on risk of implant revision after total replacement of the hip or knee: a population-based cohort study. *The Lancet*, 389(10077), 1424–1430.

Becker, G. S. (1964). *Human Capital*. New York: Columbia University Press or The National Bureau of Economic Research.

Beleza, M. L. (2003). *Discrimination against women with disabilities*. Strasbourg: Council of Europe.

Benbow, A. (2007). Mental illness, stigma, and the media. *Journal of Clinical Psychiatry*, 68(Suppl 2), 31–35.

Bergstrom, T. C. (1997). A survey of theories of the family. *Handbook of population and family economics*, 1, 21–79.

Bischoff, H. A., Stähelin, H. B., Monsch, A. U., Iversen, M. D., Weyh, A., Von Dechend, M., Akos, R., Conzelmann, M., Dick, W., & Theiler, R. (2003). Identifying a cut-off point for normal mobility: a comparison of the timed 'up and go'test in community-dwelling and institutionalised elderly women. *Age and ageing*, 32(3), 315–320.

Blanchflower, D. G. & Oswald, A. J. (2004). Well-being over time in Britain and the USA. *Journal of Public Economics*, 88(7-8), 1359–1386.

Bloom, H. S. (1984). Accounting for no-shows in experimental evaluation designs. *Evaluation review*, 8(2), 225–246.

Boarini, R., Comola, M., Smith, C., Manchin, R., & De Keulenaer, F. (2012). What makes for a better life?: The determinants of subjective well-being in OECD countries–Evidence from the Gallup World Poll. *OECD Statistics Working Papers, 2012/03, OECD Publishing.*

Bohannon, R. W. (1997). Comfortable and maximum walking speed of adults aged 20—79 years: reference values and determinants. *Age and ageing*, 26(1), 15–19.

Bolt, V. J. & Bird, K. (2003). The intrahousehold disadvantages framework: A framework for the analysis of intra-household difference and inequality. *CPRC Working Paper No 32, Manchester: Chronic Poverty Research Centre, University of Manchester.*

Bordini, B., Stea, S., De Clerico, M., Strazzari, S., Sasdelli, A., & Toni, A. (2007). Factors affecting aseptic loosening of 4750 total hip arthroplasties: multivariate survival analysis. *BMC musculoskeletal disorders*, 8(1), 1–8.

Brereton, F., Clinch, J. P., & Ferreira, S. (2008). Happiness, geography and the environment. *Ecological Economics*, 65(2), 386–396.

Bridges, S., Gaggero, A., & Owens, T. (2018). Labour market and intra-household dynamics in urban Tanzania. *African Journal of Agricultural and Resource Economics*, 13(2), 107–126.

Browne Graves, S. (1999). Television and prejudice reduction: When does television as a vicarious experience make a difference? *Journal of Social issues*, 55(4), 707–727.

Bárcena-Martín, E., Blázquez, M., & Moro-Egido, A. I. (2020). Intra-household arrangements: How important are they in terms of male-female subjective well-being? *Journal of Economic Psychology*, 80.

Carew, M. T., Colbourn, T., Cole, E., Ngafuan, R., Groce, N., & Kett, M. (2019). Inter- and intra-household perceived relative inequality among disabled and non-disabled people in Liberia. *PLoS One*, 14(7), e0217873.

Chang, H. Y., Chiou, C. J., & Chen, N. S. (2010). Impact of mental health and caregiver burden on family caregivers' physical health. *Arch Gerontol Geriatr*, 50(3), 267–71.

Cheah, B. C. (2009). Clustering standard errors or modeling multilevel data. *University of Columbia*, (pp. 2–4).

Chib, A. & Shi, J. (2018). Structured imaginings: Social media as a tool to reduce intergroup prejudice. *Intercultural Communication Studies*, 27(2).

Chou, K. L., Cacioppo, J. T., Kumari, M., & Song, Y. Q. (2014). Influence of social environment on loneliness in older adults: Moderation by polymorphism in the CRHR1. *Am J Geriatr Psychiatry*, 22(5), 510–8.

Clark, A., Etilé, F., Postel-Vinay, F., Senik, C., & Van der Straeten, K. (2005). Heterogeneity in reported well-being: evidence from twelve European countries. *The Economic Journal*, 115(502), C118–C132.

Clark, A. E., Frijters, P., & Shields, M. A. (2008). Relative Income, Happiness, and Utility: An Explanation for the Easterlin Paradox and Other Puzzles. *Journal of Economic Literature*, 46(1), 95–144.

Clark, A. E. & Oswald, A. J. (2002). A simple statistical method for measuring how life events affect happiness. *international Journal of Epidemiology*, 31(6), 1139–1144.

Cook, T. D., Campbell, D. T., & Shadish, W. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin Boston, MA.

Cowell, F. (1995). *Measuring Inequality*. 2nd ed. Hemel Hempstead: Harvester Wheatsheaf.

Craze, J. (2012). A boost for women's health in Uganda. New Internationalist. https://newint.org/features/web-exclusive/2012/06/12/womens-health-uganda. Retrieved 30th Nov. 2021.

Culliford, D., Maskell, J., Judge, A., Arden, N. K., & Group, C. S. (2013). A population-based survival analysis describing the association of body mass index on time to revision for total hip and knee replacements: results from the UK general practice research database. *BMJ open*, 3(11), e003614.

Cummins, R. A., McCabe, M. P., Romeo, Y., Reid, S., & Waters, L. (1997). An initial evaluation of the comprehensive quality of life scale–intellectual disability. *International Journal of Disability, Development and Education*, 44(1), 7–19.

da Silva, R., Rizzo, J. G., Gutierres Filho, P. J. B., Ramos, V., & Deans, S. (2011). Physical activity and quality of life of amputees in southern brazil. *Prosthetics and Orthotics International*, 35(4), 432–438.

Daley, A., Phipps, S., & Branscombe, N. R. (2018). The social complexities of disability: Discrimination, belonging and life satisfaction among Canadian youth. *SSM Popul Health*, 5, 55–63.

Dammeyer, J. & Chapman, M. (2018). A national survey on violence and discrimination among people with disabilities. *BMC Public Health*, 18(1), 355.

Damásio, M. J., Henriques, S., & Costa, C. (2012). Belonging to a community: forms of technological mediated belonging. *Observatorio (OBS*)*.

Davie-Smith, F., Coulter, E., Kennon, B., Wyke, S., & Paul, L. (2017). Factors influencing quality of life following lower limb amputation for peripheral arterial occlusive disease: A systematic review of the literature. *Prosthetics and orthotics international*, 41(6), 537–547.

Davies, C., Briggs, A., Lorgelly, P., Garellick, G., & Malchau, H. (2013). The "hazards" of extrapolating survival curves. *Medical Decision Making*, 33(3), 369–380.

De Vreyer, P. & Lambert, S. (2021). Inequality, Poverty, and the Intra-Household Allocation of Consumption in Senegal. *The World Bank Economic Review*, 35(2), 414–435.

Deeming, C. (2013). Addressing the Social Determinants of Subjective Wellbeing: The Latest Challenge for Social Policy. *J Soc Policy*, 42(3), 541–565.

Dercon, S. & Singh, A. (2013). From Nutrition to Aspirations and Self-Efficacy: Gender Bias over Time among Children in Four Countries. *World Development*, 45, 31–50.

Diener, E. (2006). Guidelines for national indicators of subjective well-being and ill-being. *Journal of happiness studies*, 7(4), 397–404.

Disabled World (2018). Disability news: Africa. (online) Disabled World https://www.disabled-world.com/news/africa/. Retrieved 10th Mar. 2020.

Djuikom, M. A. & van de Walle, D. P. (2018). Marital Shocks and Women's Welfare in Africa. World Bank Policy Research Working Paper Series 8306 https://documents1.worldbank.org/curated/en/154211516215200599/pdf/WPS8306.pdf. Retrieved 25th Jan. 2019.

Donelly, B. (2020). It takes a village to kill a child': Uganda's hidden children. https://interactive.aljazeera.com/aje/2020/uganda-hidden-children/index.html. Retrieved 14th Jan. 2022.

Doss, C. (2013). Intrahousehold bargaining and resource allocation in developing countries. *The World Bank Research Observer*, 28(1), 52–78.

Elrod, C. S. & DeJong, G. (2008). Determinants of utilization of physical rehabilitation services for persons with chronic and disabling conditions: an exploratory study. *Archives of physical medicine and rehabilitation*, 89(1), 114–120.

Entman, R. M. & Rojecki, A. (2010). *The black image in the white mind.* University of Chicago Press.

Fafchamps, M. & Kebede, B. (2012). *Subjective Well-Being, Disability and Adaptation: A Case Study from Rural Ethiopia*, book section Chapter 7, (pp. 161–180). Palgrave Macmillan.

Ferrer-i-Carbonell, A. & Frijters, P. (2004). How important is methodology for the estimates of the determinants of happiness? *The economic journal*, 114(497), 641–659.

Filmer, D. (2008). Disability, poverty, and schooling in developing countries: results from 14 household surveys. *The World Bank Economic Review*, 22(1), 141–163.

Finzen, A. (2017). *Stigma and stigmatization within and beyond psychiatry*, (pp. 29–42). Springer, Cham.

Forghany, S., Sadeghi-Demneh, E., Trinler, U., Onmanee, P., Dillon, M. P., & Baker, R. (2018). The influence of staff training and education on prosthetic and orthotic service quality: A scoping review. *Prosthetics and orthotics international*, 42(3), 258–264.

Frey, B. S. & Stutzer, A. (2002). What can economists learn from happiness research? *Journal of Economic literature*, 40(2), 402–435.

Friedman, B., Veazie, P. J., Chapman, B. P., Manning, W. G., & Duberstein, P. R. (2013). Is personality associated with health care use by older adults? *The Milbank Quarterly*, 91(3), 491–527.

Friedman, C. (2020). The relationship between disability prejudice and disability employment rates. *Work*, 65(3), 591–598.

Fuhrer, M. J., Jutai, J. W., Scherer, M. J., & DeRuyter, F. (2003). A framework for the conceptual modelling of assistive technology device outcomes. *Disability and rehabilitation*, 25(22), 1243–1251.

Fuller-Rowell, T. E., Evans, G. W., & Ong, A. D. (2012). Poverty and health: the mediating role of perceived discrimination. *Psychol Sci*, 23(7), 734–9.

Gailey, R., McFarland, L. V., Cooper, R. A., Czerniecki, J., Gambel, J. M., Hubbard, S., Maynard, C., Smith, D. G., Raya, M., & Reiber, G. E. (2010). Unilateral lower-limb loss: Prosthetic device use and functional outcomes in servicemembers from Vietnam war and OIF/OEF conflicts. *J Rehabil Res Dev*, 47(4), 317–32.

Gallagher, P., Allen, D., & MacLachlan, M. (2001). Phantom limb pain and residual limb pain following lower limb amputation: a descriptive analysis. *Disability and rehabilitation*, 23(12), 522–530.

Gandy, O. & Matabane, P. W. (1989). Television and social perceptions among african americans and hispanics. *Handbook of international and intercultural communication*, (pp. 318–348).

Garson, G. D. (2019). *Multilevel Modeling: Applications in STATA®, IBM® SPSS®, SAS®, R, & HLMTM*. Sage Publications.

Geertzen, J. H. (2008). Moving beyond disability. *Prosthetics and orthotics international*, 32(3), 276–281.

George, L. K. (2010). Still happy after all these years: Research frontiers on subjective well-being in later life. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 65(3), 331–339.

Graham, C. & Pozuelo, J. R. (2017). Happiness, stress, and age: How the u curve varies across people and places. *Journal of Population Economics*, 30(1), 225–264.

Greyling, T. (2018). Internet access and its relationship to subjective well-being in a developing region. *South African Journal of Economic and Management Sciences*, 21(1), 1–12.

Groce, N., Kett, M., Lang, R., & Trani, J.-F. (2011). Disability and poverty: The need for a more nuanced understanding of implications for development policy and practice. *Third World Quarterly*, 32(8), 1493–1513.

Groce, N. E., Banks, L. M., & Stein, M. A. (2014). Surviving polio in a post-polio world. *Social Science & Medicine*, 107, 171–178.

Groce, N. E. & Trani, J. (2009). Millennium development goals and persons with disabilities. *Lancet*, 374(9704), 1800–1801.

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *The Journal of Political Economy*, 80(2), 223–255.

Guldemond, N. A., Leffers, P., Schaper, N. C., Sanders, A. P., Nieman, F. H., & Walenkamp, G. H. (2005). Comparison of foot orthoses made by podiatrists, pedorthists and orthotists regarding plantar pressure reduction in the netherlands. *BMC musculoskeletal disorders*, 6(1), 1–9.

Hackett, R. A., Steptoe, A., Lang, R. P., & Jackson, S. E. (2020). Disability discrimination and well-being in the United Kingdom: a prospective cohort study. *BMJ Open*, 10(3), e035714.

Haddad, L., Hoddinott, J., & Alderman, H. (1997). *Intrahousehold resource allocation in developing countries: models, methods and policies*. Baltimore, MD: John Hopkins University Press.

Haddad, L. & Kanbur, R. (1990). How serious is the neglect of intra-household inequality? *Economic Journal*, 100(402), 866–881.

HAN, J. H. (2020). The effects of personality traits on subjective well-being and behavioral intention associated with serious leisure experiences. *The Journal of Asian Finance, Economics and Business*, 7(5), 167–176.

Harriss-White, B. (1996). The Political Economy of Disability and Development: with special reference to India. *United Nations Research Institute for Social Development*, Discussion Paper no 73, i–iv.

Hart, G. (1992). Imagined unities: Constructions of" the household" in economic theory. *Understanding economic process*, (pp. 111–129).

Hasan, N., Ashraf, M., Ahmed, E., Hasan, M. R., & Bhattacharjee, V. (2017). The impact of information and communication technology (ICT) on the lives of disabilities: a case in Bangladesh. *International Journal on Disability and Human Development*, 16(3).

Hawkley, L. C. & Cacioppo, J. T. (2010). Loneliness matters: a theoretical and empirical review of consequences and mechanisms. *Ann Behav Med*, 40(2), 218–27.

Headey, B. & Wearing, A. J. (1992). *Understanding happiness: A theory of subjective well-being*. Longman Cheshire.

Heckman, J. J. & Singer, B. (1986). Econometric analysis of longitudinal data. *Handbook of econometrics*, 3, 1689–1763.

Helliwell, J. F., Layard, R., & Sachs, J. (2019). *World happiness report 2019*. New York: Sustainable Development Solutions Network.

Henderson, C., Corker, E., Lewis-Holmes, E., Hamilton, S., Flach, C., Rose, D., Williams, P., Pinfold, V., & Thornicroft, G. (2012). England's time to change antistigma campaign: one-year outcomes of service user-rated experiences of discrimination. *Psychiatric Services*, 63(5), 451–457.

Hewitt, J. (2018). *Disability, development and financial exclusion: A study of the socio-economic barriers to accessing microfinance encountered by people with physical disabilities in Kampala, Uganda.* Phd thesis, University of Nottingham, UK.

Hirsh, A. T., Dillworth, T. M., Ehde, D. M., & Jensen, M. P. (2010). Sex differences in pain and psychological functioning in persons with limb loss. *The Journal of Pain*, 11(1), 79–86.

Hoaglund, F., Jergesen, H., Wilson, L., Lamoreux, L., & Roberts, R. (1983). Evaluation of problems and needs of veteran lower-limb amputees in the San Francisco Bay Area during the period 1977-1980. *Journal of rehabilitation R&D*, 20(1), 57–71.

Holmes, P., Hunt, A., & Stone, I. (2010). An analysis of new firm survival using a hazard function. *Applied Economics*, 42(2), 185–195.

Holt-Lunstad, J., Robles, T. F., & Sbarra, D. A. (2017). Advancing social connection as a public health priority in the United States. *Am Psychol*, 72(6), 517–530.

Hoogeveen, J. G. (2005). Measuring welfare for small but vulnerable groups: Poverty and disability in Uganda. *Journal of African Economies*, 14(4), 603–631.

Hsieh, N. & Waite, L. (2019). Disability, Psychological Well-Being, and Social Interaction in Later Life in China. *Res Aging*, 41(4), 362–389.

Hughes, K., Bellis, M. A., Jones, L., Wood, S., Bates, G., Eckley, L., McCoy, E., Mikton, C., Shakespeare, T., & Officer, A. (2012). Prevalence and risk of violence against adults with disabilities: a systematic review and meta-analysis of observational studies. *The Lancet*, 379(9826), 1621–1629.

Hussain, S. (2011). Toes that look like toes: Cambodian children's perspectives on prosthetic legs. *Qualitative Health Research*, 21(10), 1427–1440.

Investor Alliance for Human Rights (n.d.). Sector-Wide Risk Assessment: Information, Communications and Technology (ICT) - Salient Issue Briefing: Discrimination. *Engaging the ICT Sector on Human Rights.* https://investorsforhumanrights.org/sites/default/files/attachments/2020-03/Investor%20Alliance_Salient%20Issue_%20Discrimination.pdf. Retrieved 30th Nov. 2021.

ISO (2020). Prosthetics and orthotics - Vocabulary - Part 1: General terms for external limb prostheses and external orthoses. (ISO 8549-1:2020). https://www.iso.org/standard/79495.html. Retrieved 24th Jan. 2022.

Izzo, M. V. (2012). Universal Design for Learning: Enhancing Achievement of Students with Disabilities. *Procedia Computer Science*, 14, 343–350.

Jenkins, S. P. (1995). Easy estimation methods for discrete-time duration models. *Oxford bulletin of economics and statistics*, 57(1), 129–138.

Jenkins, S. P. (2005). Survival analysis. *Unpublished manuscript, Institute for Social and Economic Research, University of Essex, Colchester, UK*, 42, 54–56.

Jensen, J., Craig, J., Mtalo, L., & Zelaya, C. (2004). Clinical field follow-up of high density polyethylene (hdpe)-jaipur prosthetic technology for trans-tibial amputees. *Prosthetics and orthotics international*, 28(3), 230–244.

Jensen, R. T. (2004). Do private transfers 'displace'the benefits of public transfers? Evidence from South Africa. *Journal of Public Economics*, 88(1-2), 89–112.

Jones, M. K. (2008). Disability and the labour market: a review of the empirical evidence. *Journal of Economic Studies*.

Julin, J., Jämsen, E., Puolakka, T., Konttinen, Y. T., & Moilanen, T. (2010). Younger age increases the risk of early prosthesis failure following primary total knee replacement for osteoarthritis: a follow-up study of 32,019 total knee replacements in the Finnish Arthroplasty Register. *Acta orthopaedica*, 81(4), 413–419.

Juretić, J. & Živčić Bećirević, I. (2013). Social anxiety, beliefs about expressing emotions and experiencing positive emotions. *New insights into anxiety disorders*, (pp. 189).

Järnhammer, A., Andersson, B., Wagle, P. R., & Magnusson, L. (2018). Living as a person using a lower-limb prosthesis in Nepal. *Disability and Rehabilitation*, 40(12), 1426–1433.

Kalugina, E., Sofer, C., & Radtchenko, N. (2009). Intra-household inequality in transitional Russia. *Review of Economics of the Household*, 7(4), 447–471.

Kam, S., Kent, M., Khodaverdian, A., Daiter, L., Njelesani, J., Cameron, D., & Andrysek, J. (2015). The influence of environmental and personal factors on participation of lower-limb prosthetic users in low-income countries: prosthetists' perspectives. *Disability and Rehabilitation: Assistive Technology*, 10(3), 245–251.

Kamrad, I., Henricsson, A., Karlsson, M. K., Magnusson, H., Nilsson, J.-A., Carlsson, A., & Rosengren, B. E. (2015). Poor prosthesis survival and function after component exchange of total ankle prostheses: An analysis of 69 cases in the Swedish Ankle Registry. *Acta orthopaedica*, 86(4), 407–411.

Kavuma, R. M. (2009). Uganda's healthcare system explained. The Guardian. https://www.theguardian.com/katine/2009/apr/01/uganda-healthcare-system-explained. Retrieved 30th Nov. 2021.

Kenney, L., Ssekitoleko, R., Chadwell, A., Donovan-Hall, M., Morgado Ramirez, D., Holloway, C., Graham, P., Cockroft, A., Deere, B., & McCormack, S. (2019). *Prosthetics services in Uganda: a series of studies to inform the design of a low cost, but fit-for-purpose, body-powered prosthesis*. WHO Global Report on Assistive Technology (GReAT) Consultation, 22-23 August. http://usir.salford.ac.uk/id/eprint/52174/. Retrieved 20th Feb 2020.

Kett, M. & Kidd, S. (2020). Harnessing their potential - the state of disability in Uganda: Summary report. MGLSD https://www.developmentpathways.co.uk/wp-content/uploads/2020/09/Summary-Report-Disability-Uganda-Final-26th-August.pdf. Retrieved 4th Dec. 2021.

Kett, M., Lang, R., & Trani, J. (2009). Disability, development and the dawning of a new convention: a cause for optimism? *Journal of International Development*, 21(5), 649–661.

Khosravinasr, S. (2017). *A model for prediction of IT based assistive technology abandonment among people with disability*. Phd thesis, University of Illinois at Urbana-Champaign.

Kiefer, N. M. (1988). Economic duration data and hazard functions. *Journal of economic literature*, 26(2), 646–679.

Kilpatrick, Q. K. & Taylor, J. (2018). Racial/Ethnic Contrasts in the Relationships between Physical Disability, Perceived Discrimination, and Depressive Symptoms. *J Racial Ethn Health Disparities*, 5(6), 1238–1246.

Kim, S. (2015). A study of the impact of discrimination experience on life satisfaction in Korean women with severe disabilities. *International Journal of Humanities and Social Sciences*, 9(9), 3205–3209.

Klasen, S. & Lahoti, R. (2021). How serious is the neglect of intra-household inequality in multidimensional poverty and inequality analyses? Evidence from India. *Review of Income and Wealth*, 67(3), 705–731.

Kollamparambil, U. (2021). Subjective Wellbeing Inequality Between Cohabiting Partners: Does a Household Kuznets Curve Exist? *Journal of Happiness Studies*, 22(6), 2653–2675.

Krajewski, C., Burazeri, G., & Brand, H. (2013). Self-stigma, perceived discrimination and empowerment among people with a mental illness in six countries: Pan European stigma study. *Psychiatry research*, 210(3), 1136–1146.

Krauss, A. (2012). *External influences and the educational landscape: Analysis of political, economic, geographic, health and demographic factors in Ghana*, volume 49. New York: Springer Science & Business Media.

Krnjacki, L., Priest, N., Aitken, Z., Emerson, E., Llewellyn, G., King, T., & Kavanagh, A. (2018). Disability-based discrimination and health: findings

from an Australian-based population study. *Australian and New Zealand journal of public health*, 42(2), 172–174.

Krstić, G., Litchfield, J., & Reilly, B. (2007). An anatomy of male labour market earnings inequality in Serbia, 1996–2003. *Economic systems*, 31(1), 97–114.

Kuwert, P., Knaevelsrud, C., & Pietrzak, R. H. (2014). Loneliness among older veterans in the United States: results from the National Health and Resilience in Veterans Study. *Am J Geriatr Psychiatry*, 22(6), 564–9.

Lancaster, T. (1990). *The econometric analysis of transition data*. Cambridge, UK: Cambridge University Press.

Larsen, K., Petersen, J. H., Budtz-Jørgensen, E., & Endahl, L. (2000). Interpreting parameters in the logistic regression model with random effects. *Biometrics*, 56(3), 909–914.

Lee, B. J. & Yoo, M. S. (2015). Family, school, and community correlates of children's subjective well-being: An international comparative study. *Child Indicators Research*, 8(1), 151–175.

Lee, D. J. & Costello, M. C. (2018). The effect of cognitive impairment on prosthesis use in older adults who underwent amputation due to vascular-related etiology: A systematic review of the literature. *Prosthetics and orthotics international*, 42(2), 144–152.

Lee, P. S., Leung, L., Lo, V., & Xiong, C. (2008). The perceived role of ICTs in quality of life in three Chinese cities. *Social Indicators Research*, 88(3), 457–476.

Lenker, J. A. & Paquet, V. L. (2004). A new conceptual model for assistive technology outcomes research and practice. *Assistive Technology*, 16(1), 1–10.

Lins, L. & Carvalho, F. M. (2016). SF-36 total score as a single measure of health-related quality of life: Scoping review. *SAGE Open Medicine*, 4, 1–12.

Litchfield, J., Reilly, B., & Veneziani, M. (2012). An analysis of life satisfaction in Albania: An heteroscedastic ordered probit model approach. *Journal of Economic Behavior & Organization*, 81(3), 731–741.

Loeb, M. E., Eide, A. H., & Mont, D. (2008). Approaching the measurement of disability prevalence: the case of Zambia. *Alter - European Journal of Disability Research*, 2(1), 32–43.

Longhi, S. & Nandi, A. (2015). *A practical guide to using panel data*. London: London: Sage Publications Inc.

Lusardi, M. M., Fritz, S., Middleton, A., Allison, L., Wingood, M., Phillips, E., Criss, M., Verma, S., Osborne, J., & Chui, K. K. (2017). Determining risk of falls in community dwelling older adults: a systematic review and meta-analysis using posttest probability. *Journal of geriatric physical therapy (2001)*, 40(1), 1–36.

Lwanga-Ntale, C. & McClean, K. (2004). The face of chronic poverty in Uganda from the poor's perspective: constraints and opportunities. *Journal of Human Development*, 5(2), 177–194.

Magnusson, L. & Ahlström, G. (2012). Experiences of providing prosthetic and orthotic services in Sierra Leone–the local staff's perspective. *Disability and rehabilitation*, 34(24), 2111–2118.

Magnusson, L. & Ahlström, G. (2017). Patients' satisfaction with lower-limb prosthetic and orthotic devices and service delivery in Sierra Leone and Malawi. *BMC health services research*, 17(1), 1–13.

Magnusson, L., Ghosh, R., Jensen, K. R., Göbel, K., Wågberg, J., Wallén, S., Svensson, A., Stavenheim, R., & Ahlström, G. (2019). Quality of life of prosthetic and orthotic users in South India: a cross-sectional study. *Health and quality of life outcomes*, 17(1), 1–12.

Malawer, M. M. & Chou, L. B. (1995). Prosthetic survival and clinical results with use of large-segment replacements in the treatment of high-grade bone sarcomas. *The Journal of bone and joint surgery. American volume*, 77(8), 1154–1165.

Masset, E. & White, H. (2004). Are chronically poor people being left out of progress towards the millennium development goals? a quantitative analysis of older people, disabled people and orphans. *Journal of Human Development*, 5(2), 279–297.

Matsen, S. (1999). A closer look at amputees in Vietnam: a field survey of Vietnamese using prostheses. *Prosthetics and orthotics international*, 23(2), 93–101.

Mauro, V., Biggeri, M., & Grilli, L. (2015). Does community-based rehabilitation enhance the multidimensional well-being of deprived persons with disabilities? a multilevel impact evaluation. *World Development*, 76, 190–202.

May-Teerink, T. (1999). A survey of rehabilitative services and people coping with physical disabilities in Uganda, East Africa. *International Journal of Rehabilitation Research*, 22(4), 311–316.

McGillivray, J., Lau, A., Cummins, R., & Davey, G. (2009). The utility of the personal wellbeing index intellectual disability scale in an Australian sample. *Journal of Applied Research in Intellectual Disabilities*, 22(3), 276–286.

MGLSD (2020). *Situational Analysis of Persons with Disabilities in Uganda*. Kampala: Ministry of Gender, Labour and Social Development.

Michal, M., Wiltink, J., Grande, G., Beutel, M. E., & Brähler, E. (2011). Type D personality is independently associated with major psychosocial stressors and increased health care utilization in the general population. *Journal of affective disorders*, 134(1-3), 396–403.

Miller, G. H., Marquez-Velarde, G., Williams, A. A., & Keith, V. M. (2020). Discrimination and Black Social Media Use: Sites of Oppression and Expression. *Sociology of Race and Ethnicity*, 7(2), 247–263.

Milner, A., Taouk, Y., Disney, G., Aitken, Z., Rachele, J., & Kavanagh, A. (2018). Employment predictors of exit from work among workers with disabilities: A survival analysis from the household income labour dynamics in Australia survey. *PloS one*, 13(12), e0208334.

Mitra, S. (2018). *Disability, Health and Human Development*. Palgrave MacMillan.

Mitra, S., Posarac, A., & Vick, B. (2013). Disability and poverty in developing countries: a multidimensional study. *World Development*, 41, 1–18.

Mizunoya, S., Mitra, S., & Yamasaki, I. (2018). Disability and school attendance in 15 low-and middle-income countries. *World Development*, 104, 388–403.

Mont, D. (2007). *Measuring disability prevalence*. Social Protection Discussion Paper 0706. Washington, DC: The World Bank.

Moraros, J. & Hodge, W. (1993). Orthotic survey. Preliminary results. *Journal of the American Podiatric Medical Association*, 83(3), 139–148.

Morelli, S. A., Lee, I. A., Arnn, M. E., & Zaki, J. (2015). Emotional and instrumental support provision interact to predict well-being. *Emotion*, 15(4), 484.

Moscoso-Porras, M. G. & Alvarado, G. F. (2018). Association between perceived discrimination and healthcare–seeking behavior in people with a disability. *Disability and health journal*, 11(1), 93–98.

Mulholland, S., Packer, T., Laschinger, S., Olney, S., & Panchal, V. (1998). The mobility needs of women with physical disabilities in India: A functional perspective. *Disability and rehabilitation*, 20(5), 168–178.

Mulumba, M., Nantaba, J., Brolan, C. E., Ruano, A. L., Brooker, K., & Hammonds, R. (2014). Perceptions and experiences of access to public healthcare by people with disabilities and older people in Uganda. *International journal for equity in health*, 13(1), 1–9.

Nair, A., Hanspal, R., Zahedi, M., Saif, M., & Fisher, K. (2008). Analyses of prosthetic episodes in lower limb amputees. *Prosthetics and orthotics international*, 32(1), 42–49.

Narang, I. & Jape, V. (1982). Retrospective study of 14,400 civilian disabled (new) treated over 25 years at an Artificial Limb Centre. *Prosthetics and orthotics international*, 6(1), 10–16.

Neves, B. B., Amaro, F., & Fonseca, J. R. (2013). Coming of (old) age in the digital age: ICT usage and non-usage among older adults. *Sociological Research Online*, 18(2), 22–35.

Nolan, A., McCrory, C., & Moore, P. (2019). Personality and preventive healthcare utilisation: Evidence from the Irish Longitudinal Study on Ageing. *Preventive Medicine*, 120, 107–112.

Nunes, M. A., Campos-Neto, I., Ferraz, L. C., Lima, C. A., Rocha, T. O., & Rocha, T. F. (2014). Adaptation to prostheses among patients with major lower-limb amputations and its association with sociodemographic and clinical data. *Sao Paulo Medical Journal*, 132, 80–84.

Nyirenda, M., Newell, M. L., Mugisha, J., Mutevedzi, P. C., Seeley, J., Scholten, F., & Kowal, P. (2013). Health, wellbeing, and disability among older people infected or affected by HIV in Uganda and South Africa. *Glob Health Action*, 6, 19201.

Okello, T. R., Magada, S. M., Atim, P., Ezati, D., Campion, A., Moro, E. B., Huck, J., Byrne, G., Redmond, A., & Nirmalan, M. (2019). Major limb loss (MLL): an overview of etiology, outcomes, experiences and challenges faced by amputees and service providers in the post-conflict period in Northern Uganda. *Journal of Global Health Reports*, 3(e2019028).

Oksuzyan, A., Petersen, I., Stovring, H., Bingley, P., Vaupel, J. W., & Christensen, K. (2009). The male–female health–survival paradox: A survey and register study of the impact of sex-specific selection and information bias. *Annals of epidemiology*, 19(7), 504–511.

Oswald, A. J. & Powdthavee, N. (2008). Does happiness adapt? a longitudinal study of disability with implications for economists and judges. *Journal of public economics*, 92(5-6), 1061–1077.

Owens, T. & Torrance, S. (2016). 'I Know My Rights, but Am I Better Off?': Institutions and Disability in Uganda. *The Journal of Development Studies*, 52(1), 22–35.

Palmer, M. & Harley, D. (2012). Models and measurement in disability: an international review. *Health Policy and Planning*, 27(5), 357–364.

Palmer, M. G. (2014). Inequalities in universal health coverage: evidence from Vietnam. *World Development*, 64, 384–394.

Paradies, Y., Ben, J., Denson, N., Elias, A., Priest, N., Pieterse, A., Gupta, A., Kelaher, M., & Gee, G. (2015). Racism as a Determinant of Health: A Systematic Review and Meta-Analysis. *PLoS One*, 10(9), e0138511.

Pascoe, E. A. & Smart Richman, L. (2009). Perceived discrimination and health: a meta-analytic review. *Psychological bulletin*, 135(4), 531.

Perese, E. F. (2016). Stigma, Poverty, and Victimization: Roadblocks to Recovery for Individuals With Severe Mental Illness. *Journal of the American Psychiatric Nurses Association*, 13(5), 285–295.

Pitt, M. M. & Rosenzweig, M. R. (1990). Estimating the Intrahousehold Incidence of Illness: Child Health and Gender-Inequality in the Allocation of Time. *International Economic Review*, 31(4), 969–989.

Podsiadlo, D. & Richardson, S. (1991). The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society*, 39(2), 142–148.

Pontarollo, N., Orellana, M., & Segovia, J. (2020). The Determinants of Subjective Well-Being in a Developing Country: The Ecuadorian Case. *Journal of Happiness Studies*, 21(8), 3007–3035.

Putz, C. & Glickman, M. (2019). Measuring disability: comparing approaches. *Comparison of the Equality Act Measure of Disability Used in Great Britain to the United Nations Recommended Measures of Disability, Based on the Opinions and Lifestyle Survey in January*.

Radchenko, N. (2016). Welfare Sharing Within Households: Identification from Subjective Well-being Data and the Collective Model of Labor Supply. *Journal of Family and Economic Issues*, 37(2), 254–271.

Rand, J. A., Trousdale, R. T., Ilstrup, D. M., & Harmsen, W. S. (2003). Factors affecting the durability of primary total knee prostheses. *J Bone Joint Surg (Am)*, 85(2), 259–265.

Ribohn, U. (2013). Human rights for persons with disabilities; an evaluation of the work plan. *Sida Decentralised Evaluation*, Citat 2013(30).

Rishworth, A., Elliott, S. J., & Kangmennaang, J. (2020). Getting Old Well in Sub Saharan Africa: Exploring the Social and Structural Drivers of Subjective Wellbeing among Elderly Men and Women in Uganda. *Int J Environ Res Public Health*, 17(7).

Ritter, M. (2009). The Anatomical Graduated Component total knee replacement: a long-term evaluation with 20-year survival analysis. *The Journal of bone and joint surgery. British volume*, 91(6), 745–749.

Roberts, B., Browne, J., Ocaka, K. F., Oyok, T., & Sondorp, E. (2008). The reliability and validity of the SF-8 with a conflict-affected population in northern Uganda. *Health and quality of life outcomes*, 6(1), 1–10.

Rodriguez, L. (2016). Intrahousehold Inequalities in Child Rights and Well-Being. A Barrier to Progress? *World Development*, 83, 111–134.

Roffman, C. E., Buchanan, J., & Allison, G. T. (2014). Predictors of non-use of prostheses by people with lower limb amputation after discharge from rehabilitation: development and validation of clinical prediction rules. *Journal of Physiotherapy*, 60(4), 224–231.

Rohwerder, B. (2018). Disability stigma in developing countries. *K4D Helpdesk Report. Brighton, UK: Institute of Development Studies.*

Rojas, M. (2011). *Intra-household arrangements and adult health satisfaction: Evidence from Mexico*, (pp. 132–153). Springer.

Sahn, D. E. & Younger, S. D. (2009). Measuring intra-household health inequality: explorations using the body mass index. *Health Econ*, 18 Suppl 1, S13–36.

Sarracino, F. (2013). Determinants of subjective well-being in high and low income countries: Do happiness equations differ across countries? *The Journal of Socio-Economics*, 42, 51–66.

Scherer, M. J. (2014). From people-centered to person-centered services, and back again. *Disability and Rehabilitation Assistive Technology*, 9(1), 1–2.

Schifter, L. A. (2016). Using survival analysis to understand graduation of students with disabilities. *Exceptional Children*, 82(4), 479–496.

Sexton, S., Shangali, H., & Munissi, B. (2012). *The impact of training personnel to the minimum standards ISPO category I & II: Tanzania Training Centre for Orthopaedic Technologists. Prosthetics & Orthotics Impact Assessment East Africa: Tanzania, Kenya and Uganda*. International Society for Prosthetics and Orthotics, Rue du Luxembourg BE-1000 Brussels, Belgium.

Shankar, P., Grewal, V., Agrawal, S., & Nair, S. V. (2020). A study on quality of life among lower limb amputees at a tertiary prosthetic rehabilitation center. *Medical Journal Armed Forces India*, 76(1), 89–94.

Sibitz, I., Provaznikova, K., Lipp, M., Lakeman, R., & Amering, M. (2013). The impact of recovery-oriented day clinic treatment on internalized stigma: Preliminary report. *Psychiatry research*, 209(3), 326–332.

Sightsavers (2016). *Economic independence of people with disabilities: supplementary evidence review*. Report, Sightsavers.

Simoes, N., Crespo, N., & Moreira, S. B. (2016). Individual determinants of self-employment entry: What do we really know? *Journal of economic surveys*, 30(4), 783–806.

Singer, J. D. & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. Oxford, England: Oxford University Press.

Singh, R., Hunter, J., Philip, A., & Tyson, S. (2008). Gender differences in amputation outcome. *Disability and rehabilitation*, 30(2), 122–125.

Sizemore, D. S. & Milner, W. T. (2004). Hispanic media use and perceptions of discrimination: Reconsidering ethnicity, politics, and socioeconomics. *Sociological quarterly*, 45(4), 765–784.

Smith, P. & Phillips, T. (2006). Collective belonging and mass media consumption: unraveling how technological medium and cultural genre shape the national imaginings of australians. *The Sociological Review*, 54(4), 818–846.

Soltani, S., Takian, A., Sari, A. A., Majdzadeh, R., & Kamali, M. (2019). Financial barriers to access to health services for adult people with disability in iran: the challenges for universal health coverage. *Iranian Journal of Public Health*, 48(3), 508.

Spruit-van Eijk, M., van der Linde, H., Buijck, B. I., Zuidema, S. U., & Koopmans, R. T. (2012). Geriatric rehabilitation of lower limb amputees: a multicenter study. *Disability and rehabilitation*, 34(2), 145–150.

Strauss, J. & Thomas, D. (1998). Health, nutrition, and economic development. *Journal of economic literature*, 36(2), 766–817.

Subervi-Velez, F. A. (1979). Mass Media Exposure and Perceived Discrimination Among Latinos in Chicago. *Paper Presented to the Minorities Division, Association for Education in Journalism, Houston, Texas*.

Sutin, A. R., Stephan, Y., Carretta, H., & Terracciano, A. (2015). Perceived discrimination and physical, cognitive, and emotional health in older adulthood. *Am J Geriatr Psychiatry*, 23(2), 171–9.

Swartz, L., Hunt, X., Watermeyer, B., Carew, M., Braathen, S. H., & Rohleder, P. (2018). Symbolic violence and the invisibility of disability. *African Safety Promotion: A Journal of Injury and Violence Prevention*, 16(2), 21–30.

Swedo, E. A., Sumner, S. A., Hillis, S. D., Aluzimbi, G., Apondi, R., Atuchukwu, V. O., Auld, A. F., Chipimo, P. J., Conkling, M., & Egbe, O. E. (2019). Prevalence of violence victimization and perpetration among persons aged 13–24 years—Four Sub-Saharan African countries, 2013–2015. *Morbidity and Mortality Weekly Report*, 68(15), 350.

Syropoulos, S. (2020). Personal safety and positive life outcomes: Cross-national evidence from the World Values Survey. *Peace and Conflict: Journal of Peace Psychology*, 26(3), 281.

Tavakol, M. & Dennick, R. (2011). Making sense of Cronbachs alpha. *International Journal of Medical Education*, 2, 53–55.

Thirumurthy, H., Zivin, J. G., & Goldstein, M. (2008). The economic impact of aids treatment: labor supply in Western Kenya. *Journal of human resources*, 43(3), 511–552.

Thomas, P. A., Liu, H., & Umberson, D. (2017). Family relationships and well-being. *Innovation in aging*, 1(3), 1–11.

Thompson, S. (2018). Mobile technology and inclusion of persons with disabilities. *K4D Emerging Issues Report.*, Brighton, UK: Institute of Development Studies.

Tolhurst, R., Amekudzi, Y. P., Nyonator, F. K., Squire, S. B., & Theobald, S. (2008). "He will ask why the child gets sick so often": The gendered dynamics of intra-household bargaining over healthcare for children with fever in the Volta Region of Ghana. *Social science & medicine*, 66(5), 1106–1117.

Tripney, J., Roulstone, A., Vigurs, C., Hogrebe, N., Schmidt, E., & Stewart, R. (2015). Interventions to Improve the Labour Market Situation of Adults with Physical and/or Sensory Disabilities in Low-and Middle-Income Countries: A Systematic Review. *Campbell Systematic Reviews*, 11(1), 1–127.

Uganda Bureau of Statistics (2013). Uganda National Panel Survey 2011/2012 – Wave III Report, Kampala, Uganda. UBOS. https://www.ubos.org/wp-content/uploads/publications/10_2018UNPS_Report_2011_12_wave3.pdf. Retrieved 4th Jan. 2018.

Uganda Bureau of Statistics (2016). The National Population and Housing Census 2014 – Main Report, Kampala, Uganda. UBOS. https://uganda.unfpa.org/sites/default/files/pub-pdf/CENSUS%202014%20Final%20Results_0.pdf. Retrieved 4th Jan. 2018.

Uganda Bureau of Statistics (2017). *Uganda National Household Survey Report 2016-17*. Report, UBOS,.

Uganda National Panel Survey (2012). Uganda - National Panel Survey 2011-2012, Ref: UGA_2011_UNPS_v01_M. Dataset downloaded from https://microdata.worldbank.org/index.php/catalog/2059/get-microdata. Retrieved 3rd Dec. 2018.

United Nations (2018a). Prejudice and Discrimination: Barriers to social Inclusion. *United Nations Department for Economic and Social Affairs, Social Development Brief #4* https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2018/02/RWSS-Policy-Brief-Option-4_6Feb.pdf. Retrieved 25th Jan. 2022.

United Nations (2018b). Realization of the sustainable development goals by, for and with persons with disability: UN Flagship Report on Disability and Development, 2018. *United Nations Department for Economic and Social Affairs* https://www.un.org/development/desa/disabilities/wp-content/uploads/sites/15/2018/12/UN-Flagship-Report-Disability.pdf. Retrieved 25th Dec. 2019.

Ustun, T. B., Kostanjesek, N., Chatterji, S., Rehm, J., & World Health Organization (2010). Measuring health and disability: manual for WHO Disability Assessment Schedule (WHODAS 2.0)/edited by TB Ustun, N. Kostanjsek, S. Chatterji, J. Rehm. World Health Organization: Geneva, Switzerland. https://apps.who.int/iris/handle/10665/43974. Retrieved 15th Mar. 2019.

Van Brakel, W. H., Poetsma, P. A., Tam, P. T., & Verhoeff, T. (2010). User satisfaction and use of prostheses in ICRC's special fund for the disabled project in Vietnam. *Asia Pacific Disability Rehabilitation Journal*, 21, 70–91.

Van Praag, B. M. & Baarsma, B. E. (2005). Using happiness surveys to value intangibles: The case of airport noise. *The Economic Journal*, 115(500), 224–246.

Van Praag, B. M., Frijters, P., & Ferrer-i Carbonell, A. (2003). The anatomy of subjective well-being. *Journal of Economic Behavior & Organization*, 51(1), 29–49.

Van Rooy, G., Amadhila, E. M., Mufune, P., Swartz, L., Mannan, H., & MacLachlan, M. (2012). Perceived barriers to accessing health services among people with disabilities in rural northern Namibia. *Disability & Society*, 27(6), 761–775.

Vittersø, J. (2001). Personality traits and subjective well-being: Emotional stability, not extraversion, is probably the important predictor. *Personality and Individual Differences*, 31(6), 903–914.

Vogel, J., Theorell, T., Svallfors, S., Christoph, B., & Noll, H.-H. (2003). European welfare production: Institutional configuration and distributional outcome. *Social Indicators Research*, (pp. 325–598).

Walter, J. H. J., Ng, G., & Stoltz, J. J. (2004). A patient satisfaction survey on prescription custom-molded foot orthoses. *Journal of the American Podiatric Medical Association*, 94(4), 363–367.

Wandera, S. O., Ntozi, J., & Kwagala, B. (2014). Prevalence and correlates of disability among older Ugandans: evidence from the Uganda National Household Survey. *Glob Health Action*, 7, 25686.

Ward-Griffin, C. & McKeever, P. (2000). Relationships between nurses and family caregivers: partners in care? *Advances in Nursing Science*, 22(3), 89–103.

Ware, J. E., Kosinski, M., Dewey, J. E., & Gandek, B. (2001). How to score and interpret single-item health status measures: a manual for users of the SF-8 health survey. *Lincoln, RI: QualityMetric Incorporated*, 15(10), 5.

Wei, L. & Gao, F. (2017). Social media, social integration and subjective well-being among new urban migrants in China. *Telematics and Informatics*, 34(3), 786–796.

Wen, P.-S., Randolph, M. G., Elbaum, L., & De la Rosa, M. (2018). Gender differences in psychosocial and physical outcomes in Haitian amputees. *American Journal of Occupational Therapy*, 72(3), 1–8.

WHO (1999). *Prosthetics and Orthotics services in Developing countries – a discussion document in 1999*. Report, World Health Organisation: Geneva, Switzerland.

WHO (2011). *Joint position paper on the provision of mobility devices in less-resourced settings: a step towards implementation of the Convention on the Rights of Persons with Disabilities (CRPD) related to personal mobility.* WHO Library Cataloguing-in-Publication Data, World Health Organisation: Geneva, Switzerland.

WHO (2013a). Classifications: International classification of functioning, disability and health (icf). World Health Organization: Geneva, Switzerland. http://www.who.int/classifications/icf/en/.

WHO (2013b). *Transforming and Scaling Up Health Professionals' Education and Training: World Health Organization Guidelines*. Report 280 No.: 9789241506502. World Health Organization: Geneva, Switzerland. https://apps.who.int/iris/bitstream/handle/10665/93635/9789241506502_eng.pdf;jsessionid=0A529E80143E05DE739F2441BFFF3BC9?sequence=1. Retrieved 15th August 2019.

WHO (2015). *WHO Global Disability Action Plan 2014-2021: Better health for all people with disability.* Report, World Health Organisation: Geneva, Switzerland.

WHO (2018). Assistive technology fact sheet. World Health Organization: Geneva, Switzerland. https://www.who.int/news-room/fact-sheets/detail/assistive-technology. Retrieved 23rd May 2020.

WHO & World Bank (2011). *World Report on Disability.* Report, Geneva: World Health Organization.

Williams, D. R., Lawrence, J. A., Davis, B. A., & Vu, C. (2019). Understanding how discrimination can affect health. *Health Serv Res*, 54 Suppl 2, 1374–1388.

Wolf, S. L., Catlin, P. A., Gage, K., Gurucharri, K., Robertson, R., & Stephen, K. (1999). Establishing the reliability and validity of measurements of walking time using the emory functional ambulation profile. *Physical Therapy*, 79(12), 1122–1133.

World Bank (2007). *Social analysis and disability: a guidance note incorporating disability-inclusive development into bank-supported projects*. Report, Washington DC: World Bank.

World Bank (2016). The Uganda Poverty Assessment Report 2016 (ACS18391). Washington DC: World Bank. https://thedocs.worldbank.org/en/doc/381951474255092375-0010022016/original/UgandaPovertyAssessmentReport2016.pdf. Retrieved 5th Jan. 2022.

World Bank (2021a). World Development Indicators Database. Washington DC: World Bank. https://data.worldbank.org/country/uganda. Retrieved 4th Nov. 2021.

World Bank (2021b). World Economic Forum Global Competitiveness Index (2017-2019), GCI 4.0: Mean years of schooling. Washington DC: World Bank. https://tcdata360.worldbank.org/indicators/h22a4bb2b?country=UGA&indicator=41393&countries=BRA&viz=line_chart&years=2017,2019. Retrieved 4th Nov. 2021.

Yanai, Y. (2016). Analysis of Clustered Data. Paper Presented at the Kobe Scientific IR/CP Seminar, May 27, 2016 http://yukiyanai.github.io/teaching/rm1/contents/R/clustered-data-analysis.html. Retrieved 17th Jan. 2022.

Yang, C. C., Tsai, J. Y., & Pan, S. (2020). Discrimination and Well-Being Among Asians/Asian Americans During COVID-19: The Role of Social Media. *Cyberpsychol Behav Soc Netw*, 23(12), 865–870.

Yeo, R. & Moore, K. (2003). Including disabled people in poverty reduction work:"Nothing about us, without us". *World development*, 31(3), 571–590.

Zeng, Y., Brasher, M. S., Gu, D., & Vaupel, J. W. (2016). Older parents benefit more in health outcome from daughters' than sons' emotional care in China. *Journal of aging and health*, 28(8), 1426–1447.

Zheng, X. & Lu, H. (2021). Does ICT change household decision-making power of the left-behind women? A Case from China. *Technological Forecasting and Social Change*, 166.

Zziwa, S., Babikako, H., Kwesiga, D., Kobusingye, O., Bentley, J. A., Oporia, F., Nuwematsiko, R., Bachani, A., Atuyambe, L. M., & Paichadze, N. (2019). Prevalence and factors associated with utilization of rehabilitation services among people with physical disabilities in kampala, uganda. a descriptive cross sectional study. *BMC public health*, 19(1), 1–11.