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Does Health Aid Improve Child Health?

Micro Evidence from Uganda

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Abstract

In 2017, the Organisation for Economic Co-operation and Development (OECD) estimated that more than $10 billion worth of foreign aid commitments to developing countries were directed at the health sector. A large share of this health aid targets Sub-Saharan African countries that continue to display some of the lowest levels of development worldwide. Yet, the evidence on the effectiveness of health aid in improving health outcomes in developing countries is inconclusive. In this paper, I investigate the effect of development assistance to health on infant mortality, as well as immunisation rates, in Uganda, thus further exploring whether immunisation programs are an important channel through which foreign aid can improve child health. Geocoded aid project data on the district level from the *AidData* initiative is combined with individual-level data from the Demographic and Health Surveys (DHS) to construct a micro panel where identification is established using within-mother variation. The sub-national approach is informative as small-scaled development interventions are taken into account – a dimension which has been neglected in the cross-country literature examining aggregate aid measures. In addition, the use of mother fixed effects accounts for time(mother)-invariant unobserved variables and minimises any bias arising from confounding factors affecting child health outcomes. The results suggest that health aid is ineffective in improving child health. The impact is, however, heterogenous across sub-groups of the sample and seems to depend on both project frequency and the origin of aid flows.

Keywords: Foreign Aid, Health, Infant Mortality, Immunisation, Fixed Effect

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List of Abbreviations

DAC	Development Assistance Committee
DHS	Demographic and Health Surveys
DiD	Difference-in-Differences
DPT	Diphtheria-Pertussis-Tetanus
FE	Fixed Effect
GAVI	Global Alliance for Vaccines and Immunization
GDP	Gross Domestic Product
HDI	Human Development Index
HIV	Human Immunodeficiency Viruses
IDA	International Development Association
LPM	Linear Probability Model
NGO	Non-Governmental Organization
ODA	Official Development Assistance
OECD	Organisation of Economic Co-operation and Development
RCT	Randomised Control Trial
SDG	Sustainable Development Goal
SSA	Sub-Saharan Africa
UAMP	Uganda Aid Management Platform
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Programme
UNICEF	United Nations Children’s Fund
WDI	World Development Indicator
WHO	World Health Organization

1. Introduction

A child born in Sub-Saharan Africa (SSA) faces the lowest chances of survival worldwide. 1 in 13 children in this region died before his or her fifth birthday in 2017, the vast majority from preventable causes and treatable diseases (UNICEF 2018). Sustainable Development Goal 3 calls for the end of preventable deaths of newborns and children under 5 years of age by 2030, but Sub-Saharan Africa is not on track to reach even the least ambitiously set target, which demands greater efforts from countries themselves, as well as the international community. In 2017, the Organisation for Economic Co-operation and Development (OECD) estimated that more than $10 billion[1] worth of foreign aid commitments to developing countries were directed at the health sector. A large share of this aid is channelled to Sub-Saharan Africa, which continues to be at the centre of foreign aid activity (OECD 2019a). Has this ambitious aid agenda, which for many of the targeted countries comprise a sizable share of GDP, resulted in improved health for children?

The effectiveness of foreign aid is one of the most widely discussed topics within development economics. Clearly, knowledge of where aid flows do the most good and what type of development projects that are the most effective is crucial for both donors and recipients. The large strand of research studying the effect of aid on economic development has failed to reach any strong conclusions concerning the performance of aid. Until recently, the foreign aid literature focused almost exclusively on the impact on economic growth. However, the restructuring of international development efforts and an emphasis on the monitoring of results have motivated other outcome variables, such as health and education. The existing literature also largely relies on cross-country examinations, while research into the effect of aid at the sub-national level is scarce. The 2019 *Financing for Sustainable Development* report acknowledges the lack of evidence concerning the allocation and effectiveness of development assistance at the sub-national level and calls for further disaggregation, recognising the need to "better match sectoral ODA flows to SDG outcomes", to more successfully be able to track how aid affects specific development goals (United Nations IATF on FfD 2019: 83). Taking a sub-national approach has several benefits, not least in picking up the impact of small-scaled development interventions.

[1] Official donors, total. For DAC countries, this number is $6 billion.

Like many other countries in Sub-Saharan Africa, Uganda continues to face health-related development challenges and is largely dependent on development assistance. In 2017, Uganda received over $2 billion worth of ODA, which corresponds to approximately 8 percent of GDP (OECD 2019b). Uganda has a Human Development Index (HDI) of 0.516, which positions it at place 162 out of the world's 189 countries and territories (UNDP 2018). In 2018, infant mortality stood at 43 deaths per 1,000 live births, which is below the regional average of 51.5 deaths per 1,000 live births but above the world average of 29.4 (UBOS 2018; World Bank 2019). The general stability of Uganda ensuring adequate data quality and availability coupled with its continuing development challenges and dependence on foreign aid disbursements similar to many other countries in Sub-Saharan Africa makes the country a suitable choice for a sub-national study of the performance of health aid.

This study aims at investigating whether health aid activity has improved child health in Uganda. Specifically, I examine the effect on infant mortality and receipt of essential vaccines, thus further exploring whether immunisation is an important health mechanism through which development assistance can promote better child health. It is reasonable to assume that the aid effect, if any, will be negative in terms of mortality while positive in terms of immunisation. These outcome variables have previously been used in studies on foreign aid and health. Infant mortality is a precise measure with few errors and is therefore commonly used as a measure of the overall health of a country (Mishra & Newhouse 2009). Vaccination campaigns have historically been popular as development projects (GAVI 2019). But even though global immunisation coverage has improved significantly since 2000, coverage for many routine vaccines remain far below target (WHO 2018a). Furthermore, it has been shown that aiming for complete immunisation coverage is crucial for improvements in public health (Aaby et al. 1995; Kristensen et al. 2000; WHO 2018b). This suggests that immunisation could constitute a relevant proxy for child health.

For the empirical analysis, I use a micro panel dataset covering the 122 districts of Uganda. By using the retroactive fertility aspect of country-specific Demographic and Health Surveys (DHS), combined with geocoded data on foreign aid activity from the *AidData* initiative, I compare the health outcomes of children born to the same mother before and after recorded health aid activity in a district. The inclusion of mother fixed effects allows to control for unobservable characteristics at the family level and for the effect of changes in the demographic composition. This study finds no convincing evidence of any positive impact of health aid on child health, neither on infant mortality nor on immunisation. The impact is, however, heterogenous across sub-groups of the sample. In addition, the results suggest that the effectiveness of health aid is, to some extent, sensitive to the number of projects and the characteristics of the donor. The findings support previous research concluding that foreign aid is unsuccessful in improving health outcomes, see for example Mukherjee and Kizhakethalackal (2013), Williamson (2008) and Wilson (2011), as well as studies illustrating how donors' allocation strategies matter for aid effectiveness, see for example Murdie and Hicks (2013). However, the findings contrast research suggesting that development assistance improves health outcomes, see for example Gyimah-Brempong (2015), Kotsadam et. al (2018) and Mishra and Newhouse (2009).

The remainder of this paper is organised as follows. Chapter two presents the relevant theoretical background on health and foreign aid. Chapter three discusses previous literature both in terms of empirical findings and methodological frameworks. Chapter four presents the data used in the empirical analysis and describes the construction of the main variables used. Chapter five introduces the empirical models. Chapter six presents the results of the main empirical investigation and the supporting analyses. Chapter seven provides a discussion of the results in the context of previous literature and the limitations of the study. Chapter eight concludes.

2. Theoretical Background

In this chapter, I explore why focusing on health is crucial for economic growth and development, the determinants of health in developing countries, as well as the theoretical link between foreign aid, health and growth.

2.1. Health, Growth and Development

Why is good health important for countries' development processes? In the sense that human capital corresponds to characteristics that augment the productivity of a worker, it is understandable why it is argued that health is a special form of human capital. Similar to investments in education, individuals can invest in their health to later collect the returns on their investment in the form of "healthy time" – which can be spent increasing labour earnings – as well as in the form of improved probability of survival referred to as the statistical value of life (Becker 2007; Grossman 1972). Thus, like any other form of human capital, health enters the individual's utility maximisation problem. Evidently, good health improves the life quality of the individual, increases the potential to escape poverty and may positively impact other key aspects of development, such as education (Becker 2007). Considering the young population of many developing countries, child health may be seen as particularly important for long-term development (Jack & Lewis 2009).

A healthy population is both more productive and can work longer. Accepting that economic growth is achieved by a combination of physical capital investment, human capital accumulation and technological progress, the human-capital view of health suggests a link between health and economic growth (Barro & Sala-i-Martin 2003; Becker et al. 1990). A healthy workforce – similarly to an educated workforce – promotes growth both directly, and indirectly through positive spill over effects; however, the causality between income and health is likely to run in both directions (Jack & Lewis 2009). In addition, a healthy population reduces the health care expenditure burden of the state (Feeny & Ouattara 2013). While the health-growth relationship finds theoretical foundation, it follows from the development targets of multilateral donors that the importance of health and well-being reaches beyond economic growth.

2.2. Health in the Developing World

Despite the crucial role of health, it is possible that the demand for health may exceed the available, or affordable, supply. Fayissa and Gutema (2005) introduce a model where the level of health of the population in a developing country can be seen as a function of economic (Y), social (S) and environmental (V) factors, as described by

$$h = F(Y, S, V)$$

Fayissa and Gutema (2005) suggest that the health indicator of choice – often infant mortality or life expectancy – can be explained by a combination of Y, S and V, which are macro-level variables such as GDP, health expenditure, quality and accessibility of health care delivery, food availability, illiteracy rates, urbanisation rates and CO_2 emissions. Moreover, Cutler et al. (2006) stress the importance of micro-level factors such as childhood environment, mother's education, access to safe drinking water and immunisation against infectious childhood diseases. Surely, the overall health of a population depends on a wide range of variables, and it is reasonable that foreign aid may impact social, economic as well as environmental aspects.

2.3. Foreign Aid

The general objective of foreign aid is to improve the economic development and welfare of developing countries (OECD 2018). According to the Development Assistance Committee (DAC) of the OECD, foreign aid activity is defined as "projects and programmes, cash transfers, deliveries of goods, training courses, research projects, debt relief operations and contributions to non-governmental organisations" (OECD n.d.). Commonly, foreign aid is measured in Official Development Assistance (ODA), which covers all official resource flows without commercial interest to developing countries.

On the theory of the aid-growth relationship, Rajan and Subramanian (2008) confirm that development assistance has the potential to either help bring a developing country to its potential steady-state growth rate faster, or boost the ultimate long-term growth rate. The three previously introduced channels of growth – investments in physical capital, human capital and technology – are all impacted by foreign aid. In terms of physical capital, considering aid flows are more often than not tied to specific infrastructure investments such as road or energy networks, foreign aid flows directly increase the capital stock of the recipient country (Hansson 2007). Development assistance targeting both the quantity and quality of human capital inputs augments the human capital stock, an important determinant of growth (Bils & Klenow 2000; Krueger & Lindahl 2001). On technology, Romer (1993) argues that inadequate technology originates from both an idea gap and an object gap; the workforce lacks the technological know-how required to operate more advanced technology and such technology or the infrastructure to facilitate its use may be altogether absent. Both of these gaps may be reduced by foreign aid.

The theoretical relationship between overall foreign aid flows and health is quite straightforward, in that aid relaxes the government's budget constraint and allows for more funds to be allocated to the health sector; the main use of foreign aid is to bridge the investment-savings gap in the public health sector (Gomanee et al. 2005; Masud & Yontcheva 2005). Foreign aid can also directly impact health through development interventions aimed directly at the health sector, such as immunisation campaigns and medical services delivery (Mishra & Newhouse 2009).

While there is a theoretical foundation suggesting that foreign aid is beneficial to both growth and health outcomes in developing countries, external dependence on development assistance is perhaps not all good. Concerning such an aggregate measure as economic growth, it is highly plausible that aid effectiveness is conditional; Dalgaard et al. (2004) state that in the presence of parameters for e.g. policy environment and domestic saving patterns, the effect of aid on growth is ambiguous. Moreover, if aid is mainly used for consumption, poverty might be alleviated in the short run while the long-run effect is negligible. While this might be a reason to focus the empirical research on disaggregated development outcomes such as health, foreign aid to the health sector may simply replace domestic health spending, leaving total investment unchanged (Hansson 2007; Wilson 2011). In addition, dependence on foreign aid flows can result in a volatile public health system that suffers from the fragmentation and lack of reliability and continuity of development funds (Vassall & Martínez-Álvarez 2011). Also, a large number of projects funded by different donors not only creates fragmentation, but increases the transaction costs for recipients of foreign aid (European Commission 2004).

All in all, while theory suggests that foreign aid should be able to positively impact both growth and health outcomes, the presence of many confounding factors weakens the theoretical relationship and calls for empirical exploration.

3. Previous Literature

The empirical literature on the motivations, consequences and effectiveness of development aid is vast. In this section, I build on the theoretical background and discuss the contribution of previous studies both in terms of findings as well as methodological approaches. I start by briefly reviewing studies on the allocation of aid and the effect on growth before turning to the effect of foreign aid on health outcomes.

3.1 The Allocation of Foreign Aid

Aid allocation is far from random, which has motivated a range of different identification strategies to overcome endogeneity issues. The allocation of aid has been argued to depend on both donor and recipient characteristics; donors tend to consider colonial ties and own political and strategic motives, as well as the level of development and policy environment of the recipient country (Alesina & Dollar 2000; Boone 1996). In terms of bilateral aid flows, McKinlay and Little (1978a; 1978b) provide evidence for the hypothesis of aid as foreign policy rather than altruistic donation; France and the United Kingdom largely allocate aid to their former colonies and current important trade partners while the United States tend to consider strategic, often military, interests (Alesina & Dollar 2000; McKinlay & Little 1979). In contrast, multilateral aid flows have been shown to be directed based on more humanitarian grounds (Maizels & Nissanke 1984). This division seems intuitive considering the diverse membership base and largely needs-based development agendas of multilateral organisations (European Commission 2018; UNDP 2017). To safeguard local ownership, it is common for multilateral aid to be implemented outside the public sector through NGOs or civil society groups (European Commission 2004).

3.2. Foreign Aid and Growth

Whether development assistance actually promotes economic growth and development is a fundamental source of disagreement within development economics. Studies that find slight positive impacts on growth – at least in the presence of favourable institutional environments or democracy – such as Burnside and Dollar (2000) and Svensson (1999), have been obscured by the number of studies suggesting that the acceleration of foreign aid disbursements has been an immense failure. Most critique centres around the fundamental notion that money going in does not necessarily result in improved economic performance on the other side, due to a number of recipient-specific factors. Easterly (2007) notes how aid might have the opposite effect depending on political incentives, citing the possibility of a resource curse[2] in which the need for governmental accountability is reduced. Hudson and Mosley (2001) point out the obvious paradox that as long as poverty levels are used to determine aid allocation, recipient governments have few incentives to implement poverty-reducing policies. Furthermore, Rajan and Subramanian (2005) argue that aid flows can weaken the domestic currency and, thus, the international market competitiveness while Bjørnskov (2010) shows that aid exacerbates income inequality. In light of these scepticisms concerning the benefits of foreign aid, recent results range from finding either no effect of foreign aid on growth (Easterly et al. 2003; Rajan & Subramanian 2005) to possibly even negative impacts (Hansson 2007).

All in all, there is no consensus on the causal relationship between foreign aid and economic growth, predominantly due to the empirical challenge of overcoming simultaneity bias as well as the choice of explanatory variables, illustrating the somewhat unclear theoretical connection between aid and growth. Conventionally, instrumental variables such as donor characteristics, geographical location, or poverty threshold for aid receipt eligibility have been used (Bruckner 2013; Galiani et al. 2017; Rajan & Subramanian 2005). However, even if one can convincingly argue to have found a credible instrument, the impact of aid risks being lost in the "noise" of large, cross-country, analyses with growth as dependent variable (Bourguignon & Sundberg 2007).

3.3. Foreign Aid, Health and Development

As discussed, the mechanisms through which foreign aid affect growth are ambiguous. Subsequently, the aim of current multilateral donors has shifted towards more specific targets with the implementation of the development goals[3], realising the limitations of GDP as a measure of human development (UNDP 2010). In addition, recognising the reality of poor institutional quality in many parts of the developing world, donors often differentiate between aid going straight to the national treasury – budget support – and aid in the form of development projects targeting a specific development issue in a specific geographical context (European Commission 2004). Looking at the effect on growth is perhaps not very informative for

[2] See e.g. Herb (2005) and Hinnebusch (2006) for a political science perspective on how large inflows of foreign aid can be equated to oil revenues in terms of external rent.
[3] Millennium Development Goals (2000) and the Sustainable Development Goals (2015).

development purposes. Instead, we could focus our attention to aid effectiveness in specific social sectors set out by multilateral donors such as education, health, or gender equality.

As highlighted in chapter two, the importance of good health for both individual prosperity and aggregate development cannot be understated. Presumably, the centrality of health for the development process coupled with ease of measurement and data availability explain why using health indicators as outcome variables has become increasingly popular (Gomanee et al. 2005). Masud and Yontcheva (2005) suggest that aid decreases infant mortality; however, this result is conditional on aid flows originating from Non-Governmental Organisations (NGOs) and, thus, does not apply to bilateral aid. Moreover, Arndt et al. (2015: 6) find that an annual inflow of aid corresponding to 5 percent of GDP reduces infant mortality with 14 in every 1,000 births and conclude that outcomes should perhaps be "valued independently of their contribution to growth".

3.4. Targeted Foreign Aid and Health

Another body of research departs from the notion of total aid flows and instead focus on the impact of development assistance to specific sectors, so called targeted foreign aid. This type of aid refers to funds earmarked for a certain purpose, such as health, education or infrastructure. The literature exploring targeted aid is quite recent and generally relies on cross-country analyses; one of the first was Mishra and Newhouse (2009), who find a negative, although relatively small in magnitude, correlation between health aid and infant mortality but no significant effect of overall aid – suggesting that there is some rationale in studying the effects of targeted foreign aid. Other papers indicating that an inflow of health aid improves health outcomes include Feeny and Ouattara (2013) and Gyimah-Brempong (2015), who use both mortality and immunisation rates as proxies for child health. Additionally, analogous to the literature on aid and growth, it is possible that the presence of a favourable institutional environment is significant for both the allocation and performance of health aid (Farag et al. 2013; Fielding 2011). Nonetheless, others argue that there is no causal relationship between health aid flows and health outcomes (Kizhakethalackal et al. 2013; Mukherjee & Kizhakethalackal 2013; Wilson 2011; Williamson 2008). Again, the result of cross-country studies on the effect of health aid is inconclusive.

In contrast, research on the micro level using randomised control trials (RCTs) diverge from the inconclusive findings of cross-country studies, and generally conclude that smaller development interventions can be effective. In the area of health projects, Björkman and Svensson (2009) identify improved health outcomes, such as reduced child mortality and increased child weight, following the introduction of community-based monitoring of health care providers in Uganda, and Miguel and Kremer (2004) discover that a deworming program administered in Kenya improved health and school participation among children. RCTs have high internal validity because of their randomised nature, but arguably suffer from limited external validity; the extent to which such programs can be expected to deliver similar results in other contexts, countries or periods is questionable.

The debate on the effectiveness of foreign aid has not been resolved. While there is some agreement that development indicators are more suitable as outcome variables than economic growth, much of the diverging empirical results stem from lack of agreement on the appropriate econometric method to capture the causal effect of aid. Few studies have attempted to find a middle way, adopting an intermediate perspective where large cross-country variations are avoided while the external validity issue is also considered. De and Becker (2015) try to assess the effectiveness of targeted foreign aid at the sub-national level. Using geocoded aid data from Malawi, they employ an instrumental variables-approach and propensity score matching together with a difference-in-differences (DiD) design to conclude that health aid has been effective in decreasing disease severity. A recent paper by Kotsadam et al. (2018) uses geocoded aid data from Nigeria and applies both a DiD-design as well as a model with mother fixed effects. They find that foreign aid reduces the probability of infant death, but the impact is heterogenous across different groups. The recent publication of geocoded aid project data for additional countries makes further research using sub-national variation in aid activity attractive.

4. Data

In this chapter, I introduce the data used in the empirical analysis. Additionally, the sample selection process and choice of dependent and independent variables are described in detail together with some descriptive statistics of the main variables.

4.1. Health Outcomes

The micro data on child health and all other characteristics of mothers and babies comes from the Demographic and Health Surveys for Uganda (DHS Program 2006; 2011; 2016). Survey rounds from 2006, 2011 and 2016 are used, to align with the timeframe of the foreign aid flows. In the DHS, a nationally representative sample of women aged 15-49 are interviewed about their child-bearing history, personal characteristics, survival status of their children etc. Mothers give detailed information about date of birth and date of death, if applicable, of all their children ever born (up to 20 children). This retroactive aspect of the surveys allows for the creation of a panel of children. In addition, the dataset includes information about a large set of child health characteristics provided by mothers; for instance, whether the child was vaccinated against a certain disease and the number of vaccine doses given. Mothers provide vaccination history for all children born in the last three years before the survey (up to 6 children).

The chosen proxies for child health are infant mortality and immunisation against DPT (combined Diphtheria-Pertussis-Tetanus), Polio and Measles. Infant mortality is an informative measure of the overall health level of a country. An infant's survival is sensitive to many health-related determinants and the link between cause and effect is rather immediate, compared to other mortality rates (Currie & Walker 2011; Mustafa & Odimegwu 2008). In addition, the retrospective structure of the DHS gives a methodological advantage in the creation of this variable (Kudamatsu 2012). To measure individual-level infant mortality, a dummy variable is created that takes on the value 1 if the child died within 12 months of being born and 0 otherwise. Previous research[4] suggests that around 50% of babies dying before turning one actually die within the first month of being born, suggesting that the determinants of death within the first month of life are different from those for the rest of the first year. Therefore, a

[4] See for example Kudamatsu (2012) and Welander (2016).

dummy variable for neonatal mortality – defined as death before the age of one month – is used as alternative outcome variable in certain specifications.

I also generate a dummy for immunisation, which takes on the value 1 if the child received the relevant vaccine dose and 0 otherwise. Diphtheria, Pertussis, Tetanus, Polio and Measles are some of the deadliest diseases among children in Sub-Saharan Africa, but also some of the most easily preventable (UNICEF 2019). Vaccines have been available for a long time and have been successful in eradicating these diseases in many parts of the world (WHO 2018a). While there are many other important vaccines that perhaps have received greater focus in later years, DHS coverage for other vaccines is either missing or the answer rate is irregular. Where several vaccine doses are practice, receipt of the first dose is used as the first dose for all three vaccines is administered close to birth. The use of immunisation as proxy for child health makes intuitive sense. Arguably, immunisation is a rather cost-effective policy, especially in places with low coverage, and the results are easily monitored (Feeny & Ouattara 2013; Lu et al. 2006).

Each observation in the DHS belongs to a cluster, which refers to a grouping of households that participated in the survey for a specific survey round. Through an extended application process, the GPS coordinates for each cluster are available for researchers. Since the empirical analysis largely relies on geographical precision (where the aid project was implemented), clusters with missing or incorrect GPS information are dropped. These correspond to 3.4 percent of the total number of observations. After dropping babies born within 12 months of the day of interview (we cannot know whether they survived their first year of life) and babies belonging to mothers that were not permanent residents of their survey cluster, the DHS sample contains 104,096 children born between 1970 and 2015 belonging to 23,771 mothers. The sample infant mortality rate is 7.6% and the neonatal mortality rate is 3.2%, indicating that 42% of infant deaths occurred within the first month of life, which is in line with previous studies. Figure 1 plots yearly mean infant and neonatal mortality for the sample. The dashed lines indicate the period of active health aid projects. The general trend is decreasing for both mortality measures. Figure 2 presents the corresponding plot for the immunisation variables. All vaccines show an increasing trend, approaching universal coverage towards the end of the studied period.

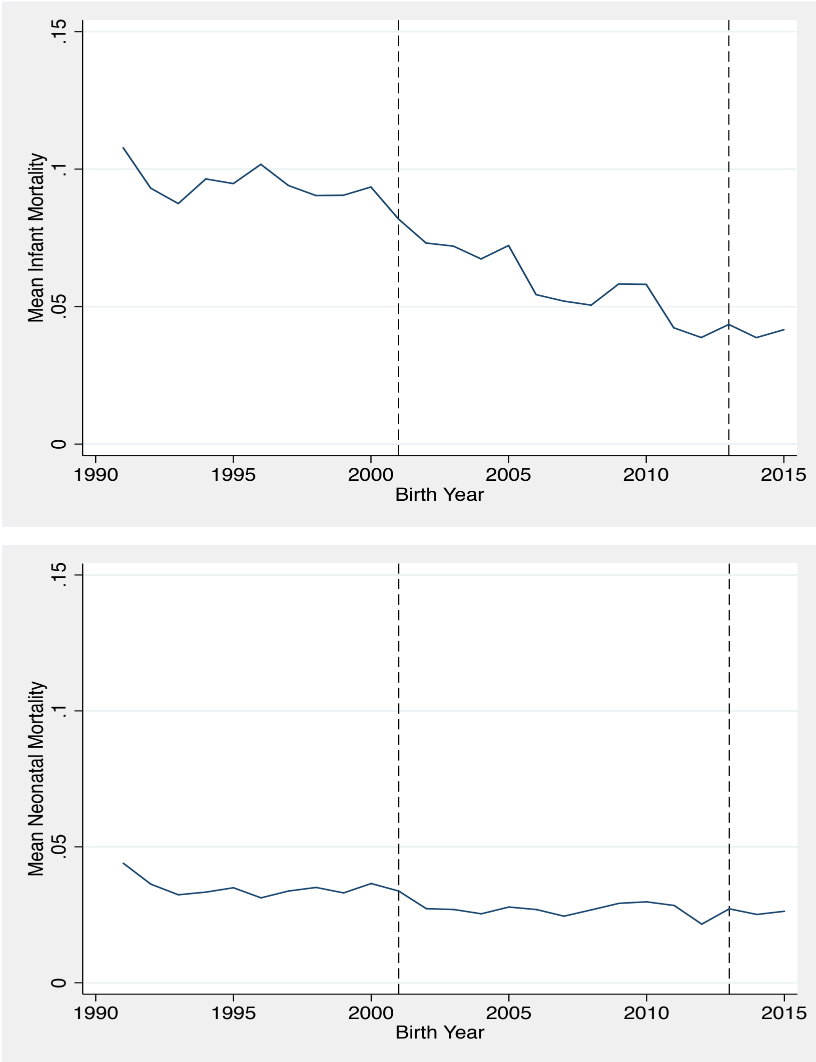

Figure 1. Yearly Infant and Neonatal Mortality (percent).

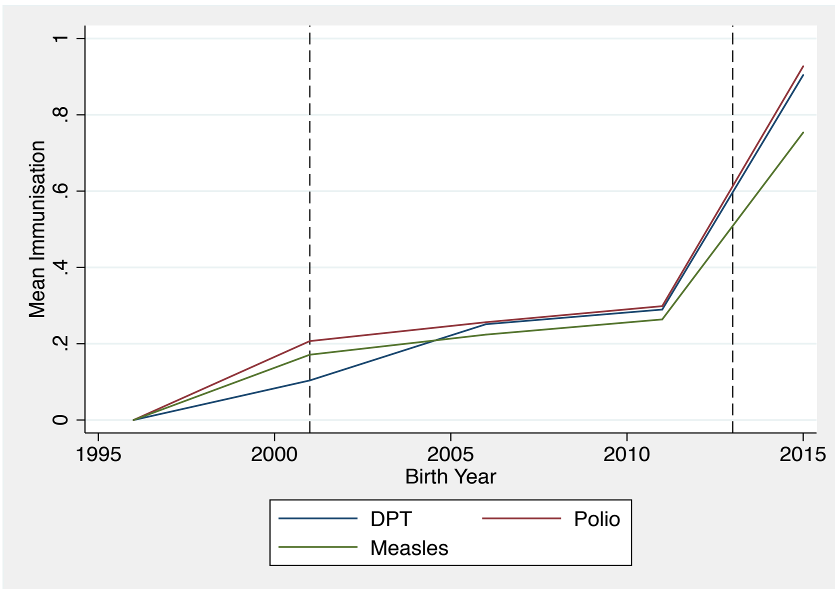

Figure 2. Mean Immunisation (5-year intervals) (percent).

Table A.1 (see Appendix A) presents descriptive statistics for the health outcome variables across different sub-groups of the sample as well as for the control variables (see Section 5.1. for further information on covariates). As expected, infant mortality is higher among boy infants and among children whose mothers are poor, have no formal education or live in rural areas. It has previously been shown that the mother's education and rural/urban residency are strong determinants of infant mortality, see for example Yaya et al. (2017). Poverty is in my case defined as not being in possession of any of the following durable goods: radio, television, refrigerator, bicycle, motorcycle/scooter, car/truck. The same pattern remains true for neonatal mortality, except for the poor/non-poor sub-group. Among the three vaccines, the Polio vaccine has the widest coverage in the sample. Generally, immunisation is more common among children born to mothers with formal education and who reside in urban areas.

In my empirical analysis, I control for mother fixed effects. Doing so, it is those mothers giving birth both before and after health aid receipt that contribute to the identification of the effect of health aid on child health outcomes. There are 12,126 such mothers in the sample (approximately 51 percent of all mothers).

4.2. Foreign Aid

The geocoded data on foreign aid activity comes from Uganda's Aid Management Platform (UAMP) and is collected from the *AidData* initiative – a collaboration between William & Mary, Development Gateway and Brigham Young University, whose aim is to enhance the tracking and monitoring of development assistance to ultimately improve the performance of foreign aid programs (AidData 2016). Using this database instead of commonly used data sources such as the OECD-DAC database or the World Development Indicators (WDI) carries several advantages. Instead of solely covering ODA, information from *AidData* also includes projects that consist of loans and grants that are both ODA and non-ODA; consequently, a wider range of foreign aid disbursements is available. Moreover, the inclusion of the number and location of development projects rather than only the amount of $ transferred adds another dimension.

The dataset for Uganda covers 565 projects across 2,426 locations from 56 donors between 1978 and 2016. Over $12 billion worth of commitments and almost $7.7 billion worth of disbursements are included in the geocoded dataset. The projects are disaggregated into 12 sectors. The largest sectors in terms of number of project locations are health, government and civil society, social infrastructure and services, and education. Since the focus of this study is the effect of sectoral health aid, only projects specifically targeting health are used. However, it is probable that there are spill over effects to health from development projects in other sectors, such as water and sanitation. Upon inspection of the individual health projects, it becomes clear that most projects have rather broad objectives such as child health or HIV/AIDS prevention. Since it cannot be ruled out that all projects could in some way affect both immunisation and, especially, mortality rates, no projects within the health category are discarded based on theme.

Most projects have information on the start year of transactions and end year of transactions. Since the analysis examines the health outcomes of children born to the same mother before and after recorded aid activity, the timing of aid receipt is crucial. If both strands of time information are missing, the project is dropped. Projects implemented in 2016 or later are also dropped as no DHS information is available for these years.

In accordance with the AidData coding rules[5], the project locations are sorted based on 8 precision categories where category 1 corresponds to an exact point location while categories 6, 7 and 8 all correspond to country-level precision, as presented in Table 1.

Table 1. Aid Data Precision Categories.

Precision Category	**Location Type**	**Location Example**	**Project Included (Yes/No)**	**Percent**
1	Exact location	Populated place	Yes	43.24
2	Up to 25 km from point	Up to 25 km away from ↑	Yes	5.41
3	Second-order administrative division (ADM2)	District	Yes	51.35
4	First-order administrative division (ADM1)	Province	No	-
5	Coordinates are estimated or location larger than ADM1	National Park	No	-
6	Independent political entity (country)	Country	No	-
7	Sub-country info unavailable (country)	Country	No	-
8	Seat of administrative division (country)	National/local capital	No	-

[5] See Strandow et al. (2011).

For the purpose of this study, only projects with precision category 1-3 are kept, where precision category 3 reflects second-order administrative division (ADM2). In this way, district-level precision is ensured and aid flows going straight to the government in the form of budget support, coded as category 8, are excluded. This type of aid activity cannot be incorporated as it is not possible to know the geographical details of government foreign aid spending. While it would be possible to perform the analysis using only projects with exact point locations, looking at more specific geographical areas than districts is not suitable as the DHS clusters are randomly displaced within districts to ensure the confidentiality of survey respondents. In addition, this would limit the list of applicable aid projects even further.

The cleaned dataset on foreign health aid activity in Uganda contains 407 projects implemented between 2001 and 2013, totalling more than $300 million worth of commitments and originating from 10 different donors – most projects being administered by the United States, the International Development Association (IDA), the United Kingdom and the European Union. As of 2017, Uganda has 122 districts split over 4 regions (UBOS 2018). Figure 3 shows the distribution of health aid projects across districts. Notably, 15 districts have no recorded aid activity over the studied period. Further, the distribution is centred around one to four projects per district, with a few districts totalling over 10 active projects. The capital district of Kampala records the highest number of health aid projects: 21. The distribution is less skewed when examining the number of projects in relation to district population, but sizeable differences remain. Table B.1 (see Appendix B) gives the full list of Ugandan districts together with the total number of projects and the number of projects per 100,000 people.

The projects in the dataset are active between 1 to 7 years. The average duration of a project is 5.1 years; the duration distribution is available in Figure 4.

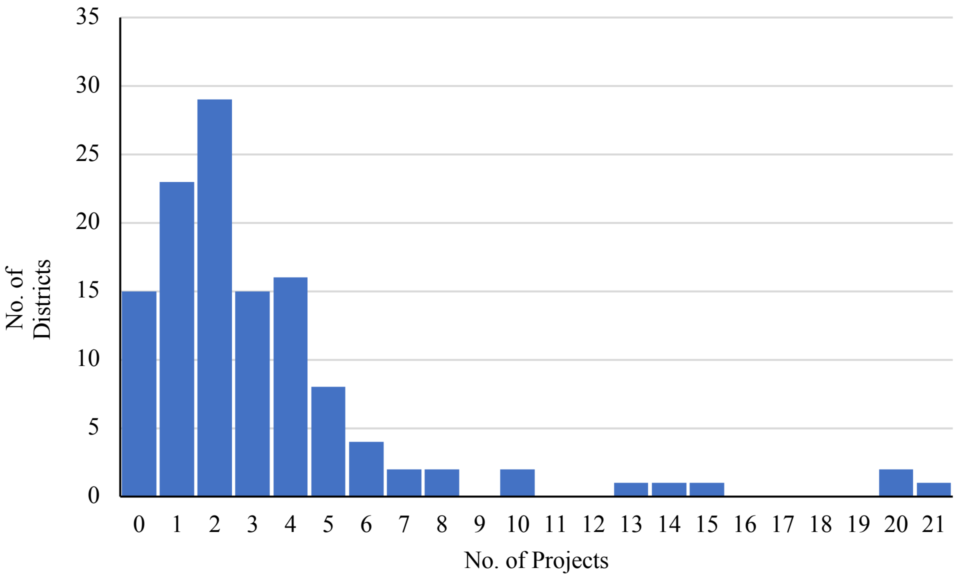

Figure 3. Distribution of Health Aid Projects Across Districts.

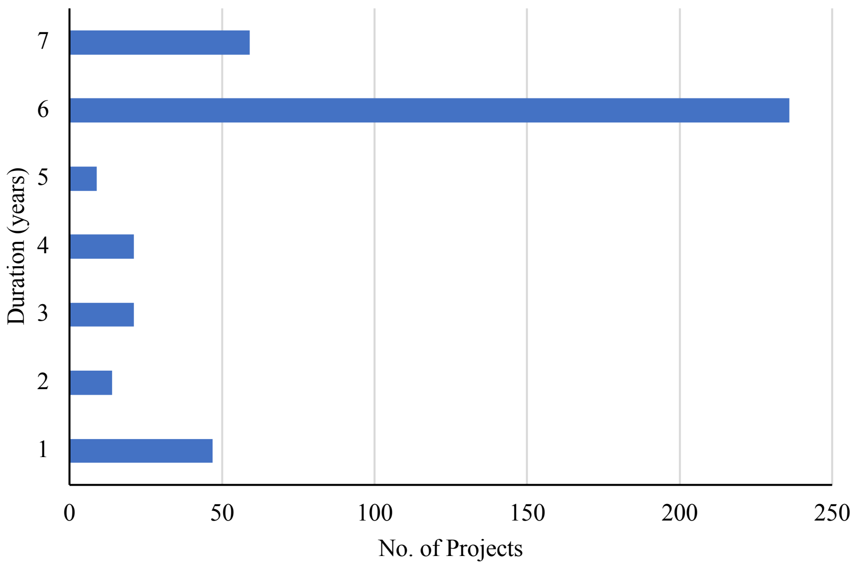

Figure 4. Project Duration.

It is not only the number of health aid projects that differ across districts, but also the geographical distribution of projects, as illustrated in Figure 5. The Central, Eastern and Western regions are overrepresented in terms of number of project locations. Notably, these regions host some of the largest cities in Uganda, such as Kampala, Kira Town and Mbabara. In addition, the Northern region borders both the Democratic Republic of the Congo (DRC) and South Sudan, regions experiencing severe civil unrest and disease outbreak. In general, districts close to these border regions record few aid projects. To ensure projects deliver tangible results, it is reasonable to focus project activity to areas with larger population densities, more developed infrastructure and where security risks are less extensive (European Commission 2004). The remaining projects are more or less evenly distributed, meaning no region is left without any health aid activity. Approximately 18 percent of projects are implemented by multilateral organisations (in green), while the remaining projects originate from bilateral donors (in red). In this dataset, bilateral aid refers to funds originating from the government of a specific donor while multilateral aid is distributed through an international or intergovernmental organisation.

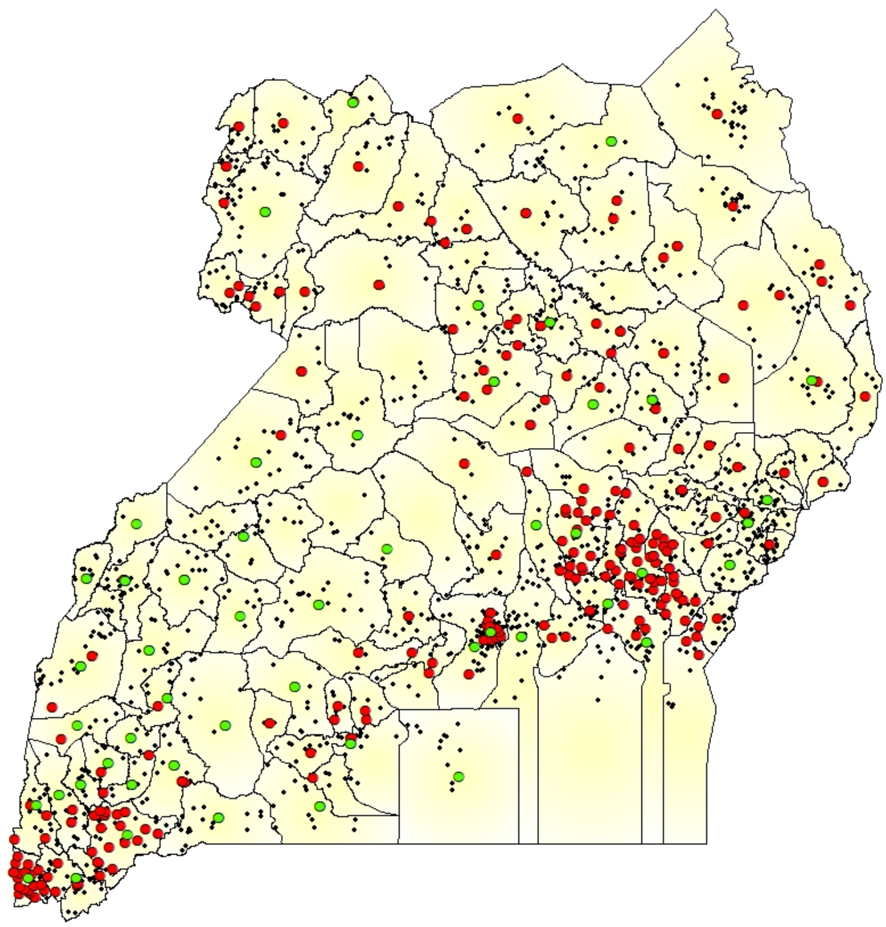

Figure 5. Geographical Distribution of Health Aid Projects by District. Green (multilateral donor), red (bilateral donor). Black diamonds represent clusters in the DHS.

5. Method

In the absence of an experimental design, any empirical analysis on the relationship between foreign aid and health outcomes may suffer from endogeneity. As previously discussed, aid is not randomly allocated; it is reasonable to assume that districts with, on average, more difficult health challenges are more likely to be selected for a development project and, in addition, more likely to receive a larger amount of funding. This implies that it is not suitable to just compare individuals exposed to different levels of health aid. Moreover, there is a selection issue since families living in districts that received health aid are likely to differ from families living in districts that did not, both in observed and unobserved ways. Children from poor families with parents without formal education are less likely to be healthy, no matter the presence of health aid. Thus, an empirical strategy to examine the impact of aid should aim at minimising any bias arising from these issues.

This section explains the empirical strategy I have chosen to study the relationship between health aid and child health. First, I introduce the main model before explaining the methodological strategies of the supporting analyses.

5.1. Empirical Specification

To investigate the impact of health aid on child health, I follow the approach taken by Kudamatsu (2012) and Welander (2016), who estimate the effect of democratisation and debt relief, respectively, on infant and neonatal mortality using within-mother variation.

I estimate the following linear probability model (LPM)

$$health_{imady} = \alpha_m + \beta_{ay} + \gamma_1 Aid_{dy-1} + \delta_d Trend_{dy} + \boldsymbol{x'}_{imady}\boldsymbol{\theta} + \varepsilon_{imady} \qquad (1)$$

where the dependent variable $health_{imady}$ is a dummy that equals one if baby *i* born to mother m of birth cohort (five-year) a in district d in year *y* dies before reaching one year of age (or one month when neonatal mortality is used as outcome variable). As an alternative, I also let the dependent variable be a dummy that equals one if the child received the relevant vaccination dose. Because the dependent variable in all specifications follows a Bernoulli distribution, the coefficient estimate γ_1 should be interpreted as a probability. The linear probability model is preferred because of its straightforward interpretation of the coefficient estimates compared to other possible models for binary dependent variables, such as a fixed effects logit model (Angrist & Pischke 2009; Kudamatsu 2012; Verbeek 2017).

The independent variable Aid_{dy-1} is a dummy variable equal to one if district d had at least one health aid project in year $y-1$. The aid variable is lagged one period, as it is likely that the effect of foreign aid on health is not instantaneous. For instance, if district d had a health project that started in year 2005 and ended in 2009, the aid dummy is switched on from 2006 through to 2010. The one-period lag is common within the foreign health aid literature.[6] In addition, this setup reduces problems of reverse causality between the health outcomes and the aid variable (Mishra & Newhouse 2009).

α_m represents mother fixed effects, so that the impact of health aid is estimated by taking the difference in the child health outcome variable for children of the same mother over time. In some specifications, the mother fixed effect is replaced by a district fixed effect, α_d, to compare the model with within-mother variation to one with within-district variation. In addition, I include mother's-birth-cohort (five-year) by child's-birth-year fixed effects, β_{ay}. The inclusion of β_{ay} ensures the comparison of mothers of the same five-year birth cohort across districts while controlling for the effect of a mother's age at birth. β_{ay} is replaced by a simple birth-year fixed effect, β_y, in some estimations.

I also control for district-specific linear time trends in $\delta_d Trend_{dy}$ to account for general improvements in child health and trend differences in child health outcomes across districts. It is possible that child health has improved differently over time across districts, an effect that I wish to eliminate from the analysis. $\boldsymbol{x}'_{imady}$ is a vector of exogenous covariates that includes a girl dummy, a dummy for multiple births (i.e. twins, triplets etc.), dummies for quarter of birth (quarter one is the reference) and dummies for each birth order from the second to the ninth and one for birth order ten and higher (birth order one is the reference). ε_{imady} is the error term. For γ_1 to return consistent estimates, the error term must be strictly exogenous and can, consequently, not be correlated with the aid variable in any time period when the same mother gives birth. To account for within-district correlations of ε_{imady}, standard errors are clustered at the district level (Bertrand et al. 2004; Kudamatsu 2012).

[6] See for example Mishra and Newhouse (2009) and Wilson (2011).

The fixed effects model used is one without an obvious time dimension. Instead of allowing to control for time-invariant unobserved factors, the model exploits data on siblings. Controlling for mother fixed effects allows to remove the effect of mother-specific factors – whether observable or unobservable – that remain constant across siblings. Thus, it is possible to minimise any bias arising from factors affecting child health outcomes at the family level, such as genetics (to a certain extent), family background and childhood environment. Essentially, siblings act as each other's counterfactuals, facilitating a causal interpretation of γ_1, and improving upon cross-sectional estimates (Angrist & Pischke 2009).

As described in chapter 4, the vaccination history data goes only six years back in time while mothers provide information on the survival status of all their children ever born. Thus, the panel of children for the immunisation analysis is smaller than for the mortality analysis, which may render the use of within-mother variation inappropriate. Therefore, some specifications in the immunisation analysis instead use the following linear probability model (LPM)

$$health_{igady} = \alpha_g + \beta_{ay} + \gamma_1 Aid_{dy-1} + \delta_d Trend_{dy} + \boldsymbol{x}'_{igady}\boldsymbol{\theta} + \varepsilon_{igady} \qquad (2)$$

where α_g is no longer a mother fixed effect, but a mother-group fixed effect. A mother group is defined by a mother's birth cohort, residency (district and whether the area is urban or rural), education, and poverty status. Thus, instead of comparing children born to the same mother, I am comparing children born to mothers who are similar based on observable characteristics. These results are not perfectly comparable to the findings using within-mother variation. They do, however, account for the fact that it is possible that mothers giving birth both before and after health aid are different from other mothers.

5.2. Heterogenous Effects

In line with the goals of development actors, policies are often centred around reaching the poorest communities and the most vulnerable first. In addition, the results of the baseline model may be driven by certain sub-groups of the sample. Therefore, I also investigate whether there are heterogenous effects of health aid by interacting Aid_{dy-1} with the following child – and mother-specific characteristics: gender of the child, and the mother's poverty status, education and residency. For this purpose, I estimate the following specification

$$health_{imady} = \alpha_m + \beta_{ay} + \gamma_1 Aid_{dy-1} + \gamma_2 Aid_{dy-1} \times Characteristic_i + \delta_d Trend_{dy} + \boldsymbol{x'}_{imady}\boldsymbol{\theta} + \varepsilon_{imady} \quad (3)$$

where γ_1 and γ_2 together give the effect of aid on the sub-group.

5.3. Project Frequency

As seen in Figure 2 and discussed throughout chapter 4, the aid data is quite unevenly distributed across districts. 15 districts have no recorded aid projects, while several districts, especially in the Eastern and Western regions, have more than five projects. Many of these projects are active during the same or overlapping periods. Considering the uneven distribution of projects allowing for variation in the aid variable, I want to further investigate whether the number of active health aid projects matter for the child health outcomes.

Therefore, I redefine the baseline model in Equation (1) and estimate the following specification

$$health_{imady} = \alpha_m + \beta_{ay} + \gamma_1 Aid1_{dy-1} + \gamma_2 Aid2_{dy-1} + \delta_d Trend_{dy} + \boldsymbol{x'}_{imady}\boldsymbol{\theta} + \varepsilon_{imady} \quad (4)$$

where $Aid1_{dy-1}$ is a dummy variable equal to one if district *d* had between one to five health aid projects in year $y-1$ while $Aid2_{dy-1}$ is a dummy variable equal to one if district *d* had *more* than five health aid projects in year $y-1$. Again, both aid variables are lagged one period. This specification permits to separate the treatment effects for individuals residing in districts with different project intensity, while allowing to test whether the treatment effects differ.

5.4. Donor Characteristics

Previous research has highlighted the diverging motivations of aid allocation, largely depending on the donor's status as bilateral or multilateral entity. There is some agreement that multilateral donors tend to better consider recipient needs (Masud & Yontcheva 2005; Maizels & Nissanke 1984). Consequently, it is possible that bilateral and multilateral aid projects are not equally successful in improving health outcomes. To explore whether the child health outcomes respond differently depending on the origin of health aid flows, I re-estimate Equation (4) where $Aid1_{dy-1}$ is now a dummy variable equal to one if district *d* had a multilateral health aid project in year $y-1$ while $Aid2_{dy-1}$ is a dummy variable equal to one if district d a bilateral health aid project in year $y-1$. Again, both aid variables are lagged one period.

6. Results

In this section, I present the results of the empirical analysis. First, I give the main results concerning mortality followed by the results on the immunisation variables from the linear probability models in Equations (1) an (2) in section 5.1. I then present the results of the analyses on heterogenous effects, project frequency and donor characteristics.

6.1. Main Results

6.1.1. Mortality

Table 2 presents the results on mortality. All estimations include exogenous covariates as specified in section 5.1. ($\boldsymbol{x'}_{imady}$) and district-specific linear time trends. The estimations in columns (1)-(3) focus on infant mortality while those in columns (4)-(6) focus on neonatal mortality. Columns (1) and (4) show the results of the within-district model while the other columns apply mother fixed effects. All columns except columns (3) and (6) include mother's-birth-cohort (five-year) by child's-birth-year fixed effects; columns (3) and (6) instead use the simple birth-year fixed effect. The majority of exogenous covariates are significant (mainly at the one percent level) and behave similarly across regressions. Boys are less likely to survive their first year than girls, and so are children born in a multiple birth, firstborns, and children born in the first quarter. The behaviour of the covariates is in line with previous micro research on African countries, see for example Kudamatsu (2012) and Kotsadam et al. (2018). The results on the linear time trends are mixed, suggesting that the improvement in child health seen nationwide is not evident across districts.

Across estimations, the results suggest little improvement in mortality rates following health aid activity. The within-district model in column (1) displays a negative coefficient on health aid activity that would suggest that the probability of a baby dying before reaching one year of age decreases by 0.25 percentage points the year after recorded health aid activity. However, the coefficient is not significant. When turning to the model with within-mother variation, the effect virtually disappears. The choice of cohort/birth-year fixed effect seems to be of minor importance. Additionally, the results on neonatal mortality would suggest an increase in the probability of neonatal death of between 0.14 and 0.35 percentage points, however, the coefficients are all insignificant with the "wrong" sign. Thus, on the basis on the results, I am unable to claim that health aid reduces infant mortality.

Table 2. Impact of Health Aid on Infant and Neonatal Mortality

Dependent Variable	(1) Infant Mortality	(2) Infant Mortality	(3) Infant Mortality	(4) Neonatal Mortality	(5) Neonatal Mortality	(6) Neonatal Mortality
Health Aid Activity	-0.00247	-0.00066	-0.00076	0.00142	0.00347	0.00333
	(0.00348)	(0.00380)	(0.00384)	(0.00234)	(0.00230)	(0.00230)
Exogenous Covariates	YES	YES	YES	YES	YES	YES
District FE	YES	NO	NO	YES	NO	NO
Mother FE	NO	YES	YES	NO	YES	YES
Cohort-Birth-Year FE	YES	YES	NO	YES	YES	NO
Birth-Year FE	NO	NO	YES	NO	NO	YES
District-Specific Linear Trends	YES	YES	YES	YES	YES	YES
Number of Districts	122	122	122	122	122	122
Number of Mothers	23,771	23,771	23,771	23,771	23,771	23,771
Observations	104,096	104,096	104,096	104,096	104,096	104,096

Notes: Robust standard errors clustered at the district level in parentheses.
Significance level: *** p<0.01, ** p<0.05, * p<0.1.

6.1.2. Immunisation

The results in Table 2 suggest no significant reduction in infant mortality following health aid activity. It is reasonable to assume that the impact of health interventions on a health input such as vaccines is more direct than that on mortality – which is only impacted through mechanisms such as immunisation. I, therefore, turn to the results for the immunisation variables.

Table 3 presents the results on the three chosen vaccines: Diphtheria-Pertussis-Tetanus (DPT), Polio and Measles. All estimations include exogenous covariates as specified in section 5.1. ($\boldsymbol{x'}_{imady}$), district-specific linear time trends and mother's-birth-cohort (five-year) by child's-birth-year fixed effects. Columns (1), (4) and (7) present the results from the model with district fixed effects while columns (2), (5) and (8) use within-mother variation. Columns (3), (6) and (9) show the findings of the adjusted model in Equation (2) where mother groups rather than mothers provide the source of variation. The exogenous covariates behave somewhat differently across regressions. Generally, boys and girls have the same probability of receiving vaccines and babies born in a multiple birth are less likely to be vaccinated. For the within-mother model, the coefficients on the birth order dummies suggest that firstborns are less likely to be vaccinated. In addition, the trend variables suggest an improvement in vaccination rates in all districts over time. In contrast, no such patterns can be seen in the estimations controlling for district or mother-group fixed effects.

Similarly to the findings for infant mortality, the results on DPT, Polio and Measles vaccines indicate no noteworthy effect of health aid on the probability of vaccination. For DPT and Polio, the coefficients when controlling for district fixed effects in columns (1) and (4) are positive and increase by about 0.1 percentage points when mother fixed effects are controlled for in columns (2) and (5), but no estimation provides significant results. Had they been significant, they would have implied between 2.9 and 4.5 additional vaccinations per 1,000 children. The coefficients on Measles vaccine are small and insignificant. Additionally, there is only a small difference between the results using mother-group and mother fixed effects, which suggests that the insignificant results of the within-mother analysis are not due to insufficient panel size.

Table 3. Impact of Health Aid on Receipt of Essential Vaccines

Dependent Variable	(1) DPT	(2) DPT	(3) DPT	(4) Polio	(5) Polio	(6) Polio	(7) Measles	(8) Measles	(9) Measles
Health Aid Activity	0.00182	0.00292	0.00108	0.00391	0.00454	0.00387	-0.00046	-0.00016	-0.00024
	(0.01075)	(0.00722)	(0.01128)	(0.01311)	(0.00946)	(0.01345)	(0.01043)	(0.00759)	(0.01047)
District FE	YES	NO	NO	YES	NO	NO	YES	NO	NO
Mother FE	NO	YES	NO	NO	YES	NO	NO	YES	NO
Mother-Group FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Number of Districts	122	122	122	122	122	122	122	122	122
Number of Mothers	23,771	23,771	23,771	23,771	23,771	23,771	23,771	23,771	23,771
Number of Mother Groups	10,309	10,309	10,309	10,309	10,309	10,309	10,309	10,309	10,309
Observations	104,096	104,096	104,096	104,096	104,096	104,096	104,096	104,096	104,096

Notes: All estimations include exogenous covariates, cohort(five-year)-birth-year fixed effects and linear district-specific time trends.
Robust standard errors clustered at the district level in parentheses.
Significance level: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

6.2. Heterogenous Effects

Table 4 and 5 show the results of the distributional analysis introduced in section 5.2. Here I am interested in whether health aid affects girl and boy infants, and children whose mothers are categorised as poor, uneducated or living in rural areas, differently. Table 4 focuses on mortality while Table 5 focuses on the immunisation variables. The F-statistics test *Health Aid* + *Health Aid* × *Characteristic = 0* with the P-value displayed in parentheses.

In Table 4, Panel A presents the results for infant mortality while panel B presents the results for neonatal mortality. Generally, the insignificant estimates of health aid on infant mortality hold across the sub-samples. There is a significant difference between the coefficients for girl and boy infants, but none of the estimates are significantly different from zero. The findings in columns (2) and (3) suggest no effect of health aid no matter the mother's poverty or educational status. However, health aid is significantly related to an *increase* in infant mortality among urban mothers and insignificantly related to a small decrease among rural mothers. The results for neonatal mortality in panel B suggest that the only heterogenous effect present is that of boy and girl infants. There is no effect of health aid on boy infants, however, girl infants are about 0.77 percentage points *more* likely to die within the first month of life, which is significant at the one percent level. Additionally, the probability of death within the first month of life *increases* by approximately 1.2 percentage points for children born to mothers residing in urban areas.

Panels A, B and C in Table 5 display the findings for DPT, Polio and Measles vaccines, respectively. The findings are largely in line with the results of the main analysis. The probability of receiving essential vaccines does not increase following health aid. For the DPT vaccines, there is a significant difference between the estimates for mothers with and without primary schooling, but none of the coefficients are significantly different from zero. This is also the case for the Polio vaccine among the poor/non-poor and educated/non-educated sub-groups. For the Measles vaccine in panel C, not only is there a significant difference between the estimates for mothers categorised as poor and non-poor and with and without primary education, but health aid is related to a *decrease* in the probability of receiving the first shot of vaccine among children born to poor and uneducated mothers. The coefficients suggest that children in these sub-groups are between 2.1 and 2.3 percentage points less likely to be vaccinated, which translates into about 2-3 percent of the sample means. This implies, on average, between 50-80 fewer children vaccinated within the sub-samples.

All in all, the distributional analysis provides no further evidence for any beneficial impact of health aid. Instead, some sub-samples seem to experience higher mortality and lower immunisation probabilities following health aid activity.

Table 4. Heterogenous Effects of Health Aid on Infant and Neonatal Mortality

Dependent Variable	A. Infant Mortality			
	(1)	(2)	(3)	(4)
Child/Mother Characteristic	Girl Child	Poor Mother	Uneducated Mother	Rural Mother
Health Aid	-0.00425	-0.00206	-0.00169	0.01247*
	(0.00446)	(0.00434)	(0.00408)	(0.00676)
Health Aid × Characteristic	0.00716*	0.00464	0.00431	-0.01521**
	(0.00387)	(0.00664)	(0.00607)	(0.00697)
F-statistic (P-value)	(0.4771)	(0.6692)	(0.6689)	(0.4923)
Number of Districts	122	122	122	122
Number of Mothers	23,771	23,771	23,771	23,771
Observations	104,096	104,096	104,096	104,096
Dependent Variable	**B. Neonatal Mortality**			
	(1)	(2)	(3)	(4)
Child/Mother Characteristic	Girl Child	Poor Mother	Uneducated Mother	Rural Mother
Health Aid	-0.00075	0.00300	0.00354	0.01022*
	(0.00295)	(0.00269)	(0.00250)	(0.00544)
Health Aid × Characteristic	0.00840***	0.00157	-0.00030	-0.00782
	(0.00276)	(0.00408)	(0.00362)	(0.00567)
F-statistic (P-value)	(0.0018)	(0.1996)	(0.3568)	(0.3297)
Number of Districts	122	122	122	122
Number of Mothers	23,771	23,771	23,771	23,771
Observations	104,096	104,096	104,096	104,096

Note: All estimations include mother fixed effects, cohort (five-year)-birth-year fixed effects, exogenous controls and district-specific linear time trends.
F-statistic (P-value) tests Health Aid + Health Aid × Characteristic = 0.
Robust standard errors clustered at the district level in parentheses.
Significance level: *** p<0.01, ** p<0.05, * p<0.1

Table 5. Heterogenous Effects of Health Aid on Immunisation

Dependent Variable	A. DPT			
Child/Mother Characteristic	(1) Girl Child	(2) Poor Mother	(3) Uneducated Mother	(4) Rural Mother
Health Aid	0.00158	0.00660	0.00643	-0.00327
	(0.00820)	(0.00806)	(0.00780)	(0.01606)
Health Aid × Characteristic	0.00267	-0.01219	-0.01458*	0.00717
	(0.00449)	(0.01017)	(0.00841)	(0.01540)
F-statistic (P-value)	(0.5373)	(0.5786)	(0.3822)	(0.5855)
Number of Districts	122	122	122	122
Number of Mothers	23,771	23,771	23,771	23,771
Observations	104,096	104,096	104,096	104,096
Dependent Variable	B. Polio			
Health Aid	0.00154	0.01197	0.01098	-0.01371
	(0.01012)	(0.01129)	(0.01057)	(0.01723)
Health Aid × Characteristic	0.00597	-0.02465*	-0.02683**	0.02114
	(0.00474)	(0.01260)	(0.01031)	(0.01773)
F-statistic (P-value)	(0.4252)	(0.2482)	(0.1355)	(0.4517)
Number of Districts	122	122	122	122
Number of Mothers	23,771	23,771	23,771	23,771
Observations	104,096	104,096	104,096	104,096
Dependent Variable	C. Measles			
Health Aid	-0.00287	0.00981	0.00642	-0.00193
	(0.00808)	(0.00896)	(0.00824)	(0.01610)
Health Aid × Characteristic	0.00538	-0.03306***	-0.02738***	0.00205
	(0.00385)	(0.00937)	(0.01027)	(0.01670)
F-statistic (P-value)	(0.7405)	(0.0053)	(0.0442)	(0.9885)
Number of Districts	122	122	122	122
Number of Mothers	23,771	23,771	23,771	23,771
Observations	104,096	104,096	104,096	104,096

Note: All estimations include mother fixed effects, cohort(five-year)-birth-year fixed effects, exogenous controls and district-specific linear time trends.
F-statistic (P-value) tests Health Aid + Health Aid × Characteristic = 0.
Robust standard errors clustered at the district level in parentheses.
Significance level: *** p<0.01, ** p<0.05, * p<0.1.

6.3. Project Frequency

Table 6 presents the results of the project frequency analysis. The F-statistics test *Health Aid (1-5 projects) = Health Aid (>5 Projects)* with the P-value displayed in parentheses. Notably, the findings for mortality in columns (1) and (2) suggest that children living in districts with more than five health aid projects simultaneously active are *more* likely to die both within the first year and the first month of life than children exposed to less project intensity. Having more than five projects is significantly related to a 1.5 percentage point increase in the probability of infant death and to a 1.1 percentage point increase in the probability of neonatal death. This translates into between 11-15 additional deaths per 1,000 live births. In addition, the coefficients on project intensity are significantly different from each other. In contrast, the number of projects seems to be of less importance for vaccines, as there is no significant difference between estimates and no coefficient is significantly different from zero. The coefficients on *Health Aid (>5 Projects)* are, nonetheless, negative for all vaccines. Thus, there are signs that also the probability of vaccination could be negatively impacted by higher project intensity. Altogether, the findings in Table 6 imply that more aid in the form of project frequency is not positively related to child health. However, it should be noted that it is uncommon for a district to record more than five projects.

Table 6. Project Frequency.

Dependent Variable	(1) Infant Mortality	(2) Neonatal Mortality	(3) DPT	(4) Polio	(5) Measles
Health Aid (1-5 Projects)	-0.00418	0.00165	0.00647	0.00576	0.00371
	(0.00399)	(0.00251)	(0.00751)	(0.00926)	(0.00750)
Health Aid (>5 Projects)	0.01483*	0.01148***	-0.01264	-0.00085	-0.01717
	(0.00765)	(0.00418)	(0.01452)	(0.02422)	(0.01647)
F-statistic (P-Value)	(0.0244)	(0.0379)	(0.2102)	(0.7865)	(0.2084)
Number of Districts	122	122	122	122	122
Number of Mothers	23,771	23,771	23,771	23,771	23,771
Observations	104,096	104,096	104,096	104,096	104,096

Note: All estimations include mother fixed effects, cohort(five-year)-birth-year fixed effects, exogenous controls and district-specific linear time trends.
F-statistic (P-value) tests Health Aid (1-5 projects) = Health Aid (>5 Projects).
Robust standard errors clustered at the district level in parentheses.
Significance level: *** p<0.01, ** p<0.05, * p<0.1.

6.4. Donor Characteristics

Table 7 shows the findings of the disaggregated analysis based on donor characteristics. The F-statistics test *Multilateral Aid = Bilateral Aid* with the P-value in parentheses. The results on mortality in columns (1) and (2) give certain indication that multilateral aid somewhat outperforms bilateral aid. While the coefficients on infant mortality are not significantly different from zero, they are significantly different from each other (at the ten percent level) and multilateral aid is negatively related to the probability of death within the first year of life while bilateral aid is positively related. Concerning neonatal mortality, both coefficients are positive but the coefficient for bilateral aid is significantly larger and suggests a 0.8 percentage point increase in the probability of neonatal death following health aid. The two aid estimates are, however, not significantly different from each other. There is no significant effect of either multilateral or bilateral aid on the three vaccine variables, and there is no significant difference between the estimates. While this issue has not been frequently explored empirically, there is some evidence that bilateral aid is less effective in improving health outcomes, possibly because of bilateral donors' preference for state involvement in service provision (Dietrich 2016; Masud & Yontcheva 2005). While the findings in Table 7 perhaps do not confirm or reject this conclusion, they suggest that the origin of health aid flows may be of importance.

Table 7. Impact of Health Aid with Donor Characteristics.

Dependent Variable	(1) Infant Mortality	(2) Neonatal Mortality	(3) DPT	(4) Polio	(5) Measles
Multilateral Aid	-0.00372	0.00165	0.00084	0.00273	-0.00136
	(0.00470)	(0.00281)	(0.00838)	(0.01106)	(0.00984)
Bilateral Aid	0.00747	0.00830**	0.00843	0.00932	0.00300
	(0.00522)	(0.00363)	(0.00795)	(0.00885)	(0.00781)
F-statistic (P-value)	0.0921	0.1334	0.4084	0.5278	0.7229
Number of Districts	122	122	122	122	122
Number of Mothers	23,771	23,771	23,771	23,771	23,771
Observations	104,096	104,096	104,096	104,096	104,096

Note: All estimations include mother fixed effects, cohort(five-year)-birth-year fixed effects, exogenous controls and district-specific linear time trends.
F-statistic (P-value) tests Multilateral Aid = Bilateral Aid.
Robust standard errors clustered at the district level in parentheses.
Significance level: *** p<0.01, ** p<0.05, * p<0.1.

7. Discussion

The empirical results of this paper suggest very little to no positive effect of health aid on child health outcomes. Neither infant mortality nor immunisation rates show any convincing improvement following aid activity; a child born in a district receiving health aid in the previous period is no more likely to survive his or her first year of life or receive relevant vaccinations than a child born in a non-aid receiving district, on average. On the contrary, the supporting analysis indicates that certain sub-groups of the sample are actually slightly worse off. Thus, while there are small signs of improvements for some groups, the overall effect is close to zero. The finding that the effect of foreign aid is negligible is not uncommon, see for example Easterly et al. (2003), Mukherjee and Kizhakethalackal (2013), Rajan and Subramanian (2005), Wilson (2011) and Williamson (2008).

It might be that health aid projects implemented in Uganda over the period 2001 to 2013 have been ineffective or have not targeted the child health outcomes chosen in this paper. Development projects could be badly planned or badly implemented, or outside factors may have affected their success. In addition to the theoretical discussion in chapter 2, possible explanations for the ineffectiveness of aid range from too much fragmentation in the allocation and implementation process to large administrative costs and aid funds disappearing in the hands of corrupt elites (Easterly & Pfutze 2008; Masud & Yontcheva 2005). In addition, Thiele et al. (2007) suggest that sectoral aid tends to be directed towards causes politically powerful, such as HIV/AIDS prevention, while other common diseases receive far less attention. This could explain why the immunisation variables show no significant improvement.

Importantly, even if the results had shown overall greater statistical significance, it should be noted that the estimated coefficients are very small. For instance, the 0.07 percentage point reduction in the probability of infant death suggested by the within-mother model in column 2 of Table 2 would only translate into 0.7 fewer infant deaths per 1,000 children. While every life counts, this would most likely not be perceived as effective use of $300 million. This is also the case for the pioneering study of Mishra and Newhouse (2009); the impact of health aid is positive and significant – but economically small. Whatever the reason, the results suggest that the decline in infant mortality observed during the period shown in Figure 1 is not due to foreign development assistance targeting the health sector. Instead, improvements in child health must be explained by other factors, such as development of the domestic health care system, better preventive measures against infectious diseases such as mosquito bed nets, and generally improved living standards.

Moreover, the insignificant results of the main analysis might be driven by heterogenous effects across different sub-groups of the sample, which is to a certain degree confirmed by the distributional analysis is section 6.2. If some groups experience an improvement in child health following health aid while other groups experience a deterioration, the overall impact is naturally close to zero. The main issue is perhaps that the vulnerable groups often at the forefront of development discussions, such as groups characterised by extreme poverty and lack of the most basic education, seem to benefit even less from health aid than other groups. The theory that aid is not actually targeting communities most in need is supported by Briggs (2017), Esser and Keating-Bench (2011), Kotsadam et al. (2018) and Wilson (2011). Kotsadam et al. (2018) show that aid projects tend to be established in locations with on average lower infant mortality than non-aid areas and Wilson (2011: 2032) affirms that health aid "appears to be following success, rather than causing it".

The allocation of aid has attracted a large amount of research, supposedly due to its importance for aid effectiveness, and it has been suggested that multilateral donors are better at considering recipient needs (Maizels & Nissanke 1984; Masud & Yontcheva 2005). This is in line with the findings in section 6.4, where bilateral aid performs worse than multilateral aid for the mortality estimates. Another reason why multilateral aid may be more effective is related to the theoretical considerations concerning the fungibility of health aid, where in the presence of development aid, the government chooses to spend funds previously reserved for the health sector elsewhere. However, Murdie and Hicks (2013) suggest that aid channelled through NGOs actually increases public health spending, mainly by affecting the domestic policy-making climate. The use of non-state actors in the dissemination of aid flows is more common among multilateral donors (European Commission 2004; Masud & Yontcheva 2005).

It is difficult to explain why children born to urban mothers experience an increase both in the probability of infant and neonatal death following health aid activity. However, several urban areas are located in districts with high project frequencies. For instance, the capital district of Kampala has 21 aid projects. It seems reasonable that donors are more likely to establish development projects in areas with larger population densities and better infrastructure. The results in Table 7 suggest that the number of projects is positively correlated with both infant and neonatal mortality. Consequently, it is possible that children in urban areas are worse off because of the larger number of projects they are exposed to. Nonetheless, only 16 percent of the sample resides in urban areas, meaning that the magnitude of the effect is modest. It is perhaps not straightforward why more development projects reduce aid effectiveness, but it is not unlikely that one well-coordinated aid activity is more efficient than several separate interventions, implemented by different donors, on a relatively small area (European Commission 2004).

It is possible that the variation in infant mortality and immunisation receipt over the studied period is too small, especially within the groups created by the several layers of fixed effects. While the infant mortality rate has declined during the studied period, it started out much lower than during the 1970s and 1980s. Arguably, interventions targeting the most obvious causes of infant death have already been implemented, which could explain why it is more difficult to pick up an effect when the mortality rate is relatively low. The fact that the micro data chosen for the analysis is not able to find evidence in favour of health aid should, consequently, perhaps not be interpreted as the inefficiency of health aid overall.

In addition, limitations of the data and empirical model provide further reasons why we can perhaps not completely dismiss foreign aid. The sub-national approach limits the aid data to projects at the district level, effectively neglecting national level aid, and is, thus, not completely representative of all health aid to Uganda. It is also reasonable that aid to other sectors could impact child health, not least in improving living standards. Since the full portfolio of aid disbursements is not included, any general conclusions on the effectiveness of development assistance should be made with care. It is also assumed that aid projects are equally effective and use an equal amount of development funds in all years of implementation; lack of detail in the aid data prevents any other assumption. Moreover, since the data on child health relies on mothers recalling the dates of birth and death (if applicable) and vaccination history of their children, there could be a recall bias if mothers remember incorrectly. However, if this bias exists it is probably small. In general, survey data is more sensitive to this type of bias than other types of data, for example census data.

Furthermore, it is practically impossible to overcome the endogeneity issue of aid, which limits the extent to which a relationship can be interpreted as causal. However, the insignificant results reduce the likelihood of this issue since it is improbable that endogeneity is concealing any positive impact of aid and suggests that reverse causality is not present. Endogeneity is mainly a problem if the aid variable is correlated with the unobserved factors collected in the error term. For endogeneity to bring the coefficient close to zero, health aid would have to be positively correlated with unobserved factors that increase infant mortality and decrease vaccinations. As noted by Wilson (2011), this seems an unlikely scenario, considering donors should aim to allocate aid where the prospects for aid effectiveness are greatest. Nonetheless, the scenario is not impossible since the motivations of, especially bilateral, donors are somewhat unclear.

Ultimately, this study of the impact of health aid on child health using Ugandan micro data join those who previously have found that foreign aid is not being effective. However, the small scope of the study as well as the limitations discussed should not be overlooked. To be able to make any firm judgement on the effectiveness of health aid, further research could aim to expand the study to include more countries as geocoded aid data becomes available and increase the number of health mechanism outcomes to investigate whether health aid has an impact on a variable not used in this paper. It could also be worthwhile to investigate whether the distance to development projects is important; Kotsadam et al. (2018) add a limited spatial analysis to their study. Furthermore, it is of interest to explore whether the amount of aid matters at the sub-national level, which has not been done in this paper. Donors are undoubtedly interested not only in whether aid works, but what another dollar can buy.

8. Conclusion

In this paper, I investigate the impact of health aid on a number of key child health outcomes in Uganda using health aid projects implemented between 2001-2013. In a first stage, I analyse whether the presence of at least one health aid project decreases infant mortality and increases the probability of immunisation against several childhood diseases in a targeted district. Micro-level data on mothers and children from the Demographic and Health Surveys (DHS) is combined with geocoded data on foreign aid projects targeting the health sector to construct a micro panel where identification is established using within-mother variation.

By comparing the health outcomes of children born to the same mother before and after recorded aid activity, the results suggest that health aid has no significant impact on neither infant mortality nor immunisation against Diphtheria, Pertussis, Tetanus, Polio and Measles. Many of the coefficients have the expected signs, but are very small. Thus, it must be concluded that the probability of an infant dying before turning one year of age and the probability of a child receiving the first dose of essential vaccines do not change following the implementation of health aid projects. The supporting analyses indicate that there are certain distributional effects of health aid – some sub-groups of the sample are negatively impacted. In addition, presence of more than five projects in a district is related to an increase in the probability of both infant and neonatal death while bilateral aid tends to perform worse than projects actualised by multilateral donors.

The main contribution of this paper concerns the methodology, which departs from the commonly used cross-country variations and aggregate measures of both foreign aid and health, to instead employ sub-country variation in health aid and micro-level data on child health outcomes. This method ensures that the effect of local-level aid is not neglected while the use of micro health data allows to control for a wide array of confounding factors.

In conclusion, by continuing the exploration of the relationship between targeted foreign aid and health, preferably at the sub-national level as geocoded data becomes available, further research could strive to determine whether the insignificant impact of health aid holds in other countries and for additional health mechanisms. The monitoring of results should continue to be at the centre of development policy to guarantee the most effective use of donor resources and the most beneficial impact on recipient communities.

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Appendix A

Table A.1. Descriptive Statistics of Main Variables.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Infant Mortality					
All	104,096	0.0764	0.2656	0	1
Girl	51,704	0.0687	0.2530	0	1
Boy	52,392	0.0840	0.2774	0	1
Mother is poor	28,821	0.0840	0.2774	0	1
Mother is not poor	75,275	0.0735	0.2609	0	1
Mother has no formal education	25,770	0.0994	0.2992	0	1
Mother has at least primary	78,326	0.0688	0.2532	0	1
Rural mother	87,368	0.0795	0.2706	0	1
Urban mother	16,728	0.0600	0.2374	0	1
Neonatal mortality					
All	104,096	0.0322	0.1765	0	1
Girl	51,704	0.0271	0.1625	0	1
Boy	52,392	0.0372	0.1892	0	1
Mother is poor	28,821	0.0311	0.1737	0	1
Mother is not poor	75,275	0.0326	0.1776	0	1
Mother without formal education	25,770	0.0372	0.1893	0	1
Mother has at least primary education	78,326	0.0305	0.1720	0	1
Rural Mother	87,368	0.0329	0.1784	0	1
Urban mother	16,728	0.0283	0.1659	0	1
Girl	104,096	0.4967	0.5000	0	1
Multiple Birth	104,096	0.0300	0.1705	0	1
Birth Order	104,096	3.5629	2.3927	1	18
Quarter of Birth	104,096	2.4552	1.0862	1	4

Table A.1. Cont'd.

DPT Vaccine					
All	104,096	0.1249	0.3306	0	1
Girl	51,704	0.1267	0.3326	0	1
Boy	52,392	0.1232	0.3286	0	1
Mother is poor	28,821	0.1254	0.3312	0	1
Mother is not poor	75,275	0.1247	0.3304	0	1
Mother has no formal education	25,770	0.0891	0.2849	0	1
Mother has at least primary education	78,326	0.1367	0.3435	0	1
Rural mother	87,368	0.1211	0.3263	0	1
Urban mother	16,728	0.1448	0.3519	0	1
Polio Vaccine					
All	104,096	0.1510	0.3580	0	1
Girl	51,704	0.1529	0.3599	0	1
Boy	52,392	0.1491	0.3562	0	1
Mother is poor	28,821	0.1482	0.3553	0	1
Mother is not poor	75,275	0.1521	0.3591	0	1
Mother has no formal education	25,770	0.1113	0.3145	0	1
Mother has at least primary education	78,326	0.1641	0.3703	0	1
Rural mother	87,368	0.1488	0.3559	0	1
Urban mother	16,728	0.1626	0.3690	0	1
Measles Vaccine					
All	104,096	0.1289	0.3351	0	1
Girl	51,704	0.1309	0.3373	0	1
Boy	52,392	0.1269	0.3329	0	1
Mother is poor	28,821	0.1264	0.3323	0	1
Mother is not poor	75,275	0.1299	0.3361	0	1
Mother has no formal education	25,770	0.0952	0.2935	0	1
Mother has at least primary education	78,326	0.1400	0.3470	0	1
Rural mother	87,368	0.1260	0.3318	0	1
Urban mother	16,728	0.1443	0.3514	0	1

Appendix B

Table B.1. Uganda Health Aid Projects by District.

District	Region	No. of projects	% of total projects	Population in 2014	No. of projects per 100,000 people
ABIM	Northern	4	0.98	107,966	3.70
ADJUMANI	Northern	1	0.25	225,251	0.44
AGAGO	Northern	2	0.49	227,792	0.88
ALEBTONG	Northern	4	0.98	227,541	1.76
AMOLATAR	Northern	3	0.74	147,166	2.04
AMUDAT	Northern	1	0.25	105,769	0.95
AMURIA	Eastern	2	0.49	270,928	0.74
AMURU	Northern	2	0.49	186,696	1.07
APAC	Northern	10	2.46	368,626	2.71
ARUA	Northern	5	1.23	782,077	0.64
BUDAKA	Eastern	1	0.25	207,597	0.48
BUDUDA	Eastern	0	0.00	210,173	0.00
BUGIRI	Eastern	10	2.46	382,913	2.61
BUHWEJU	Western	2	0.49	120,720	1.66
BUIKWE	Central	3	0.74	422,771	0.71
BUKEDEA	Eastern	2	0.49	203,600	0.98
BUKOMANSIMBI	Central	2	0.49	151,413	1.32
BUKWO	Eastern	2	0.49	89,356	2.24
BULAMBULI	Eastern	0	0.00	174,513	0.00
BULIISA	Western	2	0.49	113,161	1.77
BUNDIBUGYO	Western	3	0.74	224,387	1.34
BUNYANGABU	Western	0	0		
BUSHENYI	Western	3	0.74	234,443	1.28
BUSIA	Eastern	1	0.25	323,662	0.31
BUTALEJA	Eastern	2	0.49	244,153	0.82
BUTAMBALA	Central	1	0.25	100,840	0.99
BUTEBO	Eastern	2	0.49		
BUVUMA	Central	0	0	89,890	0.00
BUYENDE	Eastern	5	1.23	323,067	1.55
DOKOLO	Northern	1	0.25	183,093	0.55
GOMBA	Central	1	0.25	159,922	0.63
GULU	Northern	4	0.98	275,613	1.45
HOIMA	Western	6	1.47	572,986	1.05

Table B.1. cont'd.

District	Region	No. of projects	% of total projects	Population in 2014	No. of projects per 100,000 people
IBANDA	Western	3	0.74	249,625	1.20
IGANGA	Eastern	15	3.69	504,197	2.98
ISINGIRO	Western	3	0.74	486,360	0.62
JINJA	Eastern	5	1.23	471,242	1.06
KAABONG	Northern	2	0.49	167,879	1.19
KABALE	Western	3	0.74	331,335	0.91
KABAROLE	Western	8	1.97	469,236	1.70
KABERAMAIDO	Eastern	4	0.98	215,026	1.86
KAGADI	Western	0	0	351,033	0.00
KAKUMIRO	Western	0	0	293,108	0.00
KALANGALA	Central	1	0.25	54,293	1.84
KALIRO	Eastern	5	1.23	236,199	2.12
KALUNGU	Central	2	0.49	183,232	1.09
KAMPALA	Central	21	5.16	1,507,080	1.39
KAMULI	Eastern	13	3.19	486,319	2.67
KAMWENGE	Western	4	0.98	414,454	0.97
KANUNGU	Western	5	1.23	252,144	1.98
KAPCHORWA	Eastern	2	0.49	105,186	1.90
KASESE	Western	5	1.23	694,987	0.72
KATAKWI	Eastern	2	0.49	166,231	1.20
KAYUNGA	Central	4	0.98	368,062	1.09
KIBAALE	Western	3	0.74	140,947	2.13
KIBOGA	Central	1	0.25	148,218	0.67
KIBUKU	Eastern	0	0	202,033	0.00
KIRUHURA	Western	2	0.49	328,077	0.61
KIRYANDONGO	Western	0	0	266,197	0.00
KISORO	Western	20	4.91	281,705	7.10
KITGUM	Northern	3	0.74	204,048	1.47
KOBOKO	Northern	2	0.49	206,495	0.97
KOLE	Northern	2	0.49	239,327	0.84
KOTIDO	Northern	1	0.25	181,050	0.55
KUMI	Eastern	2	0.49	239,268	0.84
KWEEN	Eastern	0	0	93,667	0.00

Table B.1. cont'd.

District	Region	No. of projects	% of total projects	Population in 2014	No. of projects per 100,000 people
KYANKWANZI	Central	0	0	214,693	0.00
KYEGEGWA	Western	1	0.25	281,637	0.36
KYENJOJO	Western	4	0.98	422,204	0.95
KYOTARA	Central	1	0.25		
LAMWO	Northern	1	0.25	134,371	0.74
LIRA	Northern	5	1.23	408,043	1.23
LUUKA	Eastern	5	1.23	238,020	2.10
LUWERO	Central	1	0.25	456,958	0.22
LWENGO	Central	4	0.98	274,953	1.45
LYANTONDE	Central	1	0.25	93,753	1.07
MANAFWA	Eastern	0	0	353,825	0.00
MARACHA	Northern	2	0.49	186,134	1.07
MASAKA	Central	2	0.49	297,004	0.67
MASINDI	Western	3	0.74	291,113	1.03
MAYUGE	Eastern	8	1.97	473,239	1.69
MBALE	Eastern	6	1.47	488,960	1.23
MBARARA	Western	6	1.47	472,629	1.27
MITOOMA	Western	2	0.49	183,444	1.09
MITYANA	Central	2	0.49	328,964	0.61
MOROTO	Northern	3	0.74	103,432	2.90
MOYO	Northern	4	0.98	139,012	2.88
MPIGI	Central	2	0.49	250,548	0.80
MUBENDE	Central	3	0.74	684,348	0.44
MUKONO	Central	3	0.74	596,804	0.50
NAKAPIRIPIRIT	Northern	4	0.98	156,690	2.55
NAKASEKE	Central	0	0	197,373	0.00
NAKASONGOLA	Central	1	0.25	181,795	0.55
NAMAYINGO	Eastern	4	0.98	215,443	1.86
NAMISINDWA	Eastern	1	0.25		
NAMUTUMBA	Eastern	14	3.44	252,557	5.54
NAPAK	Northern	2	0.49	142,224	1.41
NEBBI	Northern	4	0.98	396,794	1.01
NGORA	Eastern	1	0.25	141,919	0.70
NTOROKO	Western	1	0.25	67,005	1.49
NTUNGAMO	Western	20	4.91	483,841	4.13

Table B.1. cont'd.

District	Region	No. of projects	% of total projects	Population in 2014	No. of projects per 100,000 people
NWOYA	Northern	2	0.49	133,506	1.50
OMORO	Northern	0	0	160,732	0.00
OTUKE	Northern	0	0	104,254	0.00
OYAM	Northern	6	1.47	383,644	1.56
PADER	Northern	3	0.74	178,004	1.69
PAKWACH	Northern	1	0.25		
PALLISA	Eastern	0	0	386,890	0.00
RAKAI	Central	3	0.74	516,309	0.58
RUBANDA	Western	7	1.72	196,896	3.56
RUBIRIZI	Western	2	0.49	129,149	1.55
RUKIGA	Western	1	0.25		
RUKUNGIRI	Western	4	0.98	314,694	1.27
SERERE	Eastern	1	0.25	285,903	0.35
SHEEMA	Western	4	0.98	207,343	1.93
SIRONKO	Eastern	2	0.49	242,421	0.83
SOROTI	Eastern	7	1.72	296,833	2.36
SSEMBABULE	Central	2	0.49	252,597	0.79
TORORO	Eastern	4	0.98	517,080	0.77
WAKISO	Central	4	0.98	1,997,418	0.20
YUMBE	Northern	1	0.25	484,822	0.21
ZOMBO	Northern	2	0.49	240,081	0.83
Total		**407**	**100.00**	**34,634,650**	