Sub-national Perspectives on Aid Effectiveness: Impact of Aid on Health Outcomes in Uganda

Tonny Odokonyero, Alex Ijjo, Robert Marty, Tony Muhumuza, Godfrey Owot Moses

Abstract:

While the health sector has attracted significant foreign aid, evidence on the effectiveness of this support is mixed. By combining household panel data with a unique geographically-referenced foreign aid data, this paper uses a Difference-In-Differences approach to investigate the contribution of aid on key health outcomes in Uganda. We find that even though aid was not targeted to localities with the worst health conditions, health aid achieved an overall significant impact in reducing both disease severity and burden. However, the impact is most robust for disease burden compared to severity. In addition, we observe increased aid effectiveness if resources are channeled to locations that are closer to communities in need, given ease of access to health services. From a policy perspective, the results point to the need for development partners to better target aid to sub-national areas with higher disease prevalence. Moreover, aid ought to be channeled as close to intended beneficiaries as possible, thus offering additional advantage of driving the Universal Health Coverage strategy of “close to client” health system.

JEL Classification: F35, I10, I15, I18

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Tonny Odokonyero
Economic Policy Research Centre
Correspondence to:
todokonyero@eprcug.org

Alex Ijjo
Economic Policy Research Centre
Correspondence to:
aijjo@eprcug.org

Robert Marty
College of William & Mary
Correspondence to:
ramarty@email.wm.edu

Tony Muhumuza
United Nations Development Program
Correspondence to:
tony.muhumuza@undp.org

Godfrey Owot Moses
Gulu University
Correspondence to:
owotmoses@yahoo.com

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AidData:

info@aiddata.org

www.aiddata.org

AidData – a joint venture of the College of William and Mary, Development Gateway and Brigham Young University – is a research and innovation lab that seeks to make development finance more transparent, accountable, and effective. Users can track over $40 trillion in funding for development including remittances, foreign direct investment, aid, and most recently US private foundation flows all on a publicly accessible data portal on AidData.org. AidData's work is made possible through funding from and partnerships with USAID, the World Bank, the Asian Development Bank, the African Development Bank, the Islamic Development Bank, the Open Aid Partnership, DFATD, the Hewlett Foundation, the Gates Foundation, Humanity United, and 20+ finance and planning ministries in Asia, Africa, and Latin America.

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1. Introduction

Health is a key component of human capital that strongly influences labour productivity and economic growth (Gallup and Sachs, 2001; Wagner, Barofsky & Sood, 2015). Various health indicators formed part of the Millennium Development Goals (MDGs) and will continue to be critical in the Post-2015 Development Agenda. Since the start of MDG implementation in 2000, over US$200 billion in external financing has been invested to improve health outcomes in low-income countries—with US$35.9 billion invested in 2014 alone (Dieleman et al; 2014). At the same time, from 2000 to 2015 across the globe, the incidence of malaria fell by 37 percent, malaria mortality rate fell by 58 percent, and the number of new HIV infections dropped by 40 percent (United Nations, 2015).

Despite significant increases in aid and improvements in health outcomes, empirical evidence remains inconclusive to the extent that aid has caused improvements (Rajan, 2005; Quibria, 2010). A number of studies using cross-country data fail to find aid associated with improvements in various health indicators, including infant mortality and life expectancy (Williamson, 2008; Wilson, 2011; Gebhard et al., 2008). Wilson (2011) argues that aid has merely gone to countries that have experienced health gains, rather than aid promoting those health gains. In light of empirical evidence failing to show aid impacts, scholars have condemned health aid as an ineffective policy tool and have placed greater emphasis on domestic efforts in improving health outcomes (Williamson, 2008).

Cross-country level analyses failing to find health aid to be effective is notable in light of studies showing that certain health interventions can effectively reduce a number of diseases common in low-income countries. For example, insecticide-treated bed nets can effectively reduce malaria (Demombynes & Trommlerová, 2014; Flaxman et al., 2010), deworming medication reduces intestinal helminthes (Miguel and Kremer, 2004), medical male circumcision reduces the risk of HIV (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007), and water filters reduces diarrhea (Brown, Sobsey, & Loomis, 2008). However, much of this evidence comes from randomized controlled trials. Such studies can powerfully show what interventions work and why; however, they don't reveal whether donor dollars allocated to these efforts have been effective (Wilson, 2011).

Aid may fail to be effective due to donor dollars never reaching intended beneficiaries, corruption siphoning off aid flows for personal gain, aid crowding out government expenditure to improve development outcomes, or projects simply being poorly designed or implemented (Wilson, 2011). For aid to reduce poverty and catalyze growth, scholars have argued that aid must be preceded by proper planning and favorable policy regimes (Quartey, 2005; McGillivray & Ouattara, 2005; Gomanee et al., 2005; Fagernas & Roberts, 2004; Burnside & Dollar, 2000). However, other literature downplays this assertion on the basis of limited evidence (Clemens et al, 2004; Mosley & Suleiman, 2007; Ram, 2004).

Additionally, scholars have argued that effectiveness of foreign aid requires appropriate targeting, based on the needs of developing countries (Thiele et al., 2007).

The empirical studies failing to find health aid impacts suggests that, on average among developing countries, health aid efforts have been ill-planned and targeted, and have not been supplemented with favorable policy regimes. However, other cross-country evidence rebukes this view—finding health aid to be effective. Mishra and Newhouse (2007) find a significant—albeit small—association between aid and improvement in infant mortality rates. In addition, Bendavid and Bhattacharya (2014) find health aid associated with higher life expectancy and lower under-five mortality rates, where they observe the association to be strongest between 2000 and 2010—after implementation of the MDGs. Other scholars corroborate these results, finding aid to effectively reduce infant mortality (Croghan et al., 2006; Gyimah-Brempong & Bonn, 2015).

Mixed evidence within the cross-country literature suggests that other approaches are needed to evaluate aid impacts. To this end, an emerging literature has begun to use sub-national foreign aid data to evaluate donor dollars. Sub-national data provide an advantage over cross-country data as cross-country analyses may fail to control for differences across countries, leading to spurious relations between aid and outcomes (Rajan & Subramanian, 2008). Moreover, by identifying areas that did and did not receive aid within countries, sub-national data allow for quasi-experimental techniques to gauge aid impacts. Using these data, scholars have found a positive association between aid and development (Dreher & Lohmann, 2015), and some evidence that aid corresponds to small reductions in conflict levels (van Weezel, 2015). In regards to the health sector, De and Becker (2015) find aid associated with reducing disease severity and diarrhea prevalence.

In this paper, we combine nationally-representative survey data and geographically-referenced aid data to conduct the first sub-national impact evaluation of aid in Uganda. Specifically, we examine the extent that aid improves health infrastructure, whereby better health infrastructure should translate into improved recovery times from illness. Taking advantage of our ability to identify areas that did and did not receive aid, we employ a Difference-in-Differences approach with panel data fixed-effects regressions to minimize treatment effect estimation bias that may arise from the possibility of unobserved individual heterogeneity and time invariant individual characteristics, as well as endogeneity in the treatment variable. The study aims to provide further insight on sub-national level aid impacts, drawing a distinction with preceding analyses that rely on macro and cross-country level data.

Despite the level of external support to the health sector, evidence on the impact of aid on health outcomes in Uganda remains anecdotal. Uganda has achieved progress on health related MDGs; however, health indicators are still poor in comparison to desirable global health standards. In particular, indicators on maternal and child health, malaria, HIV/AIDs, and nutrition remain poor. For example, Uganda has one of the highest maternal mortality ratios in Sub-Saharan Africa (Ssengooba et al; 2003) at 438 deaths per 100,000 live births, and substantial HIV/AIDS and malaria burdens (Uganda Bureau of Statistics and ICF International, 2012; MoH, 2010). Due to the need to make significant future progress, it is useful to examine the contribution of aid to progress that Uganda has already experienced. Evaluating aid impacts will allow policy makers and development partners to better understand aid's potential role in achieving health-related Sustainable Development Goals, and to guide practitioners to improve targeting of health aid.

Our results suggest that aid has contributed to improving health outcomes, but improved targeting of aid could enhance effectiveness in the future. In particular, we find that aid was not targeted to localities with the worst health conditions. In addition, we find that health aid significantly reduces both disease burden and severity—but results are most robust for disease burden. Lastly and more compelling, as we spatially restrict the extent that aid potentially reaches individuals, the estimated impact of aid increases. These findings point to the need for development partners to better target aid to sub-national areas with higher disease prevalence, and—within sub-national areas—to channel aid as close as possible to vulnerable communities to allow for ease in accessibility.

The rest of the paper is organized as follows: the next section details the data and methods of analysis, sections three and four provide descriptive and empirical results respectively, and section five concludes.

2. Data

We combine the socio economic modules of the 2005/06 Uganda National Household Survey (UNHS) and the 2011/12 Uganda National Panel Survey (UNPS). The surveys are nationally representative, and periodically implemented by the Uganda Bureau of Statistics. The modules capture data on major development (including public health) matters at a micro level, such as; household economic dynamics, socio-demographics, health status, and education. We create a balanced panel of 10,354 individuals who were interviewed in both surveys. Analysis was conducted at individual level, since data on health outcome were captured for individuals.

The surveys contain spatial locations in each enumeration area, which allows for matching the data with other geographically-referenced data. With this unique feature, we combine[1] survey data with geographically-referenced foreign aid data produced by AidData. The foreign aid dataset includes aid projects recorded in Uganda's Aid Management Platform. Overall, it includes 74 health aid projects spread across 545 locations, representing over US$590 million in health aid from 19 donors (see Appendix 1 for amount of health aid compared to other sectors). We only use projects designated as

[1] Data are combined using the ArcGIS software.

health sector projects, and restrict the years of the data to projects that started at some point from 2006 to 2010[2]. Restricting aid information to 2006-2010 ensures that projects included in the analysis do not bias survey responses in 2005/6 but could have affected responses in the 2011/12 survey.

2.1 Accounting for Geographic Precision of AidData

AidData codes each aid project with a geographic precision code that references the spatial extent of the project. The codes indicate aid being channeled to a specific location (i.e. sub-county or an exact location), county, district, region, or the country as a whole. We exclude projects coded at the regional and country-wide levels as these are too ambiguous to reliably distinguish which areas or individuals actually benefitted from aid.[3] This leaves us with 168 project locations - 51 at the district level, 18 at the county level, and the majority (99) that went to specific locations.

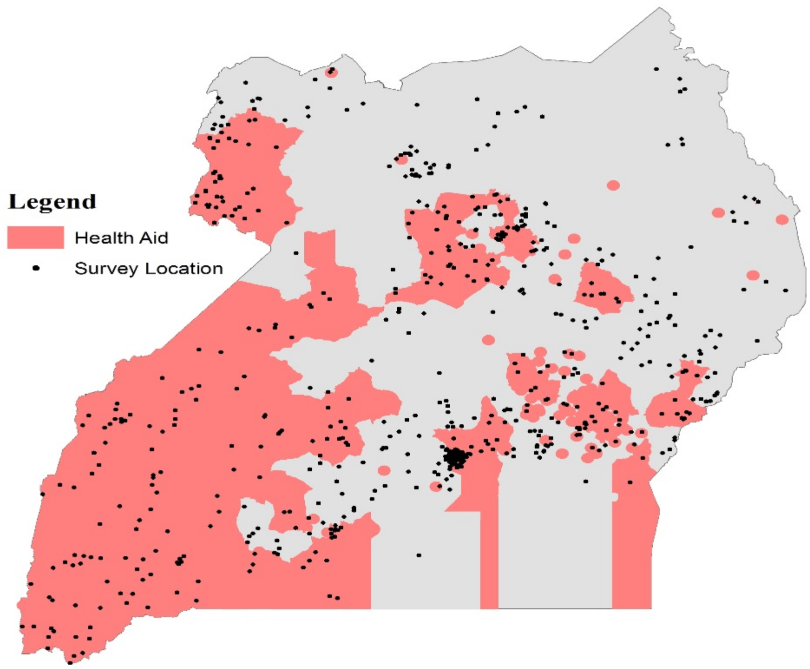
All individuals within districts or counties that received district or county-level aid were coded as receiving aid. For aid that went to a specific location, we estimated the average distance within which aid projects may have benefitted individuals. The household survey data provides insight into the distance from which people benefit from health centers. Specifically, the household survey data show that the average distance those who were sick traveled to receive treatment was 4.47 kilometers - kms (Std. Dev. = 23.32 kms). Similarly, the Uganda Bureau of Statistics (UBOS) reports that 5 km is the average distance to the nearest government health unit (UBOS, 2010), and, from the policy view point, Uganda's Health Sector Strategic & Investment Plan (HSSIP) targets a radius of within 5 km walking distance as a measure of accessibility to health facilities. Accordingly, we use a 5 km "buffer" radius from an aid location to serve as our main point of analysis - where each individual within 5 km from an aid project that went to an exact location is coded as receiving aid. However, two additional buffers – 3 km (as in UBOS, 2014)[4] and 7 km were computed to carry out a sensitivity analysis to check the robustness of the impact of health aid on health outcomes.

Despite the granularity of the data, it is difficult to distinguish which individuals actually received aid on the basis of geo-coded data. This uncertainty increases as precision codes represent larger areas. For example, it is likely that aid that was reported as going to a district did not benefit all individuals within it. However, our data can be viewed as delineating individuals who resided in areas that received aid, and such individuals form the treatment group in our analysis. Consequently, we hypothesize that individuals in areas that received aid, *on average*, should show improved health outcomes (see figure 1 - location of survey areas and foreign aid).

[2] More specifically, we look at the "effective date" of the aid project. As defined by the metadata for the dataset, the effective date refers to the "project start date at approval."

[3]One regional-level project was dropped and seven country-level projects were dropped during analysis.
[4] On average, the distance to a health facility dropped from 4.8 kms in 2009/10 to 3.2 kms in 2012/13.

Figure 1. Location of health aid and survey areas



Map shows aid buffered at 5 km radius for aid allocated to a specific location.

2.2 Empirical Approach

Our estimation procedure follows a Difference-in-Differences (Diff-in-Diff) analytical framework premised on panel data methodology, with three approaches: (1) the simple Diff-in-Diff estimator based on t-tests, (2) Diff-in-Diff estimation with Ordinary Least Squares (OLS) regression, and (3) Diff-in-Diff estimation with Fixed-Effects (FE) regression. The procedure we used for the Diff-in-Diff regressions follow as below:

Let health outcome be represented by;

$$h_{it} = \beta_0 + \beta_1 Y_{it} + \beta_2 AID_i + \beta_3 T12 + \gamma AID_i * T12 + \varepsilon_{it} \text{ .... (1)}$$

Where the measure of health outcome is given by h_{it}. We use two health outcome metrics to gauge the extent that aid improved recovery times from illness (thus indicating improvements in health infrastructure) - disease severity and disease burden. Disease severity in the case of this study is indicated by the number of days that an individual reported suffering due to illness in the preceding 30 days prior to being surveyed, whereas disease burden is proxied by the number of days lost owing to illness, where “lost” refers to number of days an individual reported not working due to illness (i.e. days of productivity lost due to illness). Our definition of burden is in line with that of the World Health Organization (WHO), which measures time or years of life lost because of the time lived in less than full health condition or state.

Y_{it} represents a set of control variables that could also impact health outcomes including; age, use of mosquito net, rural-urban location, education (schooling), number of rooms occupied by household, access to water (measured by distance to nearest water source), regional location, gender, and ownership of assets (such as clothes, shoes, mobile phones, bicycles, motorcycles).

AID is a binary variable that equals 1 if individual i was in an area that received health aid (treated individuals), and 0, otherwise. We test whether individuals located within the areas where health aid was channeled to benefited from aid (i.e. if those who received aid recorded health gains).

$T12$ is a dummy that equals 1 if year t is 2011/12, and 0, otherwise. Accordingly, 2005/06 was our baseline year, and the end-line was 2011/12.

We estimate this model (equation 1) at the individual level. Our analysis is conducted in two steps to gauge improvements in health infrastructure—proxied by improvements in recovery times from illness. First, we estimate the impact of health aid on the sub-sample of only the individuals who fell sick in both 2005/06 and 2011/12. In the next step, we evaluate the impact of health aid based on full sample (considering all individuals captured in the data in both 2005/06 and 2011/12, regardless of whether an individual fell sick or not). We analyse sub and full samples separately to allow disentangling whether aid effects are powerful enough to be picked up in the entire population, in order to deal with any potential "dilution effect". For the full sample analysis, we include sick in the set, Y_{it}, to control for whether an individual fell sick or not. Doing so allows the interpretation to remain consistent between the two analyses—specifically, of examining improvements in recovery times from illness. We weigh observations in all regressions by taking into account survey weights, and employ clustered standard errors. Standard errors are clustered at the household level for OLS models, and at individual level for fixed effect models due to individual fixed effects.

The main parameter of interest is γ, which is the Diff-in-Diff estimator and it is an indicator of whether aid recipient individuals fared better or worse than the untreated individuals (i.e. comparison group) between the two time periods of 2005/06 and 2011/12. The Diff-in-Diff estimator is computed after controlling for original individual characteristics and trends. The rest of the parameters that may be of interest are; β_2 – which measures whether the treated individuals are generally worse or better off, and β_3 – which estimates the trend which reveals whether the health outcomes of all individuals in the sample deteriorated or ameliorated between the two waves of the household survey.

Due to the possibility of unobserved time invariant individual characteristics that may bias the Diff-in-Diff estimator, we further implement a Diff-in-Diff Fixed-Effects regression (as specified in equation 2 below). Note that in Uganda, most health aid is generally channeled to relatively well-established health facilities (such as referral and general hospitals, and Health Centre IVs). As a result, individuals in communities surrounding such established health care facilities could have better health conditions than people in areas with poorly established health care facilities (such as Health Center IIs and most Health Center IIIs). This potential unobserved heterogeneity between individuals may bias the Diff-in-Diff estimator, as distance to types of health facilities may influence both aid allocation and health outcomes. The treatment (explanatory) variable AID_i is therefore likely to face endogeneity issues. Use of the Diff-in-Diff FE regression (equation 2) remedies this potential bias, such that the permanent effect of being an aid recipient individual (located where aid is channeled) is substantially minimized. The fixed effect Diff-in-Diff equation is:

$$h_{it} = \beta T12 + \gamma AID_i * T12 + \delta_i + \varepsilon_{it} \qquad (2)$$

Where δ_i is the individual fixed effect. As with equation 1, we estimate equation 2 at the individual level.

3. Descriptive Evidence

At end-line (2011/12), the age in the sample was relatively young, averaging at 27 years. There was also a balance in the gender grouping, with about 50 percent comprising of females. After buffering and applying survey weights, the treated observations were 63, 65, and 67 percent of the total considering the 3, 5, and 7 kilometer radii respectively. The individuals who reported that they fell sick in 2005/06 and 2011/12 were 4185 and 2318 respectively.

Table 3.1 shows that between 2005 and 2011 health and other socio-economic conditions improved. Disease prevalence declined by 11 percentage points, and disease burden and disease severity declined by 0.35 and 0.91 days (or 20.5 and 24.7 percent), respectively. The prevalence of mosquito nets nearly tripled, increasing from 16% of the population sleeping under a mosquito net in 2005 to 45% in 2011. Socio-economic indicators improved, too. The households where every member had at least one pair of shoes increased by nearly 10 percentage points, and people lived about 0.5 kilometers closer to a water source.

Table 3.2 shows aid commitments by donors for health aid allocated between 2006 and 2010. Aid was allocated from Western donors (e.g., Austria and the U.S.), Non-Western (e.g., China and Japan), and multilateral institutions (e.g., the World Bank and the European Union). In total, US$126.6 million was committed to Uganda. The largest bilateral donor was the United States, which allocated close to US$120 million primarily towards HIV/AIDs and tuberculosis related projects (see Appendix 2 for list of aid projects).

Approximately 65 percent of the population lived in areas that received aid (using the 5 km buffer). Results suggest that while aid reached some localities with the worst health conditions, aid was not preferentially targeted to these areas (see Table 3.1 for average values and Appendix 3 for distributions of select variables). The areas that received aid had 6.5 percentage points lower disease prevalence compared to areas that did not receive aid. In addition, disease severity was slightly lower in areas that received aid, but the difference between areas that received and did not receive aid was not significantly different. According to mosquito net usage and disease burden, aid went to areas with greater need; however, the difference in values was not significantly different. Consequently, living in an area with the worst health conditions did not appear to increase one's chances of receiving aid.

According to socio-economic and demographic characteristics, health aid was allocated to better-off areas. Areas that received aid had, on average, 0.7 more rooms in their houses, 10 percentage points higher prevalence of owning shoes, and 6 percentage points higher prevalence of owning two sets of clothes. Approximately 14% of those who received aid lived in urban areas—indicating that most individuals who received aid lived in rural areas. There is some evidence, though, that living in an urban area improved ones' chance of receiving aid. Individuals that received aid lived in urban areas by 3 percentage points more than individuals who did not receive aid; however, there was no significant difference between the two groups.

Table 3.1. Health, socio-economic and demographic statistics

	Sample By Year			2005 (Base Year)		
	2005	2011	p-value	Aid	No Aid	p-value
Health						
Disease Prevalence	0.380	0.272	0.000	0.354	0.419	0.001
Disease Burden	1.742	1.385	0.004	1.809	1.640	0.242
Disease Severity	3.746	2.833	0.000	3.707	3.806	0.670
Mosquito Net	0.160	0.452	0.000	0.150	0.175	0.369
Socio-Economic						
Urban	0.122	0.178	0.001	0.137	0.101	0.284
Dist. To Water (km)	1.059	0.499	0.003	0.941	1.237	0.516
Number Rooms	4.756	3.191	0.000	5.006	4.377	0.002
Own Clothes	0.854	0.871	0.250	0.878	0.818	0.018
Own Shoes	0.428	0.525	0.000	0.469	0.366	0.007
Mobile Phone	0.162	0.638	0.000	0.168	0.153	0.594
Bicycle	0.496	0.444	0.002	0.477	0.526	0.214
Motor Cycle	0.024	0.082	0.000	0.026	0.021	0.568
Demographic						
Age	24.514	26.938	0.000	24.285	24.861	0.151
Gender (Male)	0.498	0.495	0.597	0.495	0.502	0.553
Formal Schooling	2.260	2.315	0.000	2.289	2.216	0.035

Source: Author's computation from UNHS (2005/6), UNPS (2011/12). For descriptive statistics by aid, aid with the 5-km buffer was used.

Table 3.2. Aid commitments by donor

Donor	Commitments (US $)
Austria	673,711
China	2,355,916
European Union	3,943,676
World Bank	4,538,977
Japan	786,515
Norway	-
Spain	-
United States of America	114,270,388
Total	**126,569,183**

Source: AidData Aid Project Database. Values are 2011 US Dollars. Projects are only those considered in the analysis. Projects were listed for Norway and Spain, but with no dollar values.

4. Empirical Results - Impact of Health Aid

In this section, results of the analysis of impact of health aid on health outcomes are presented, with disease severity and burden as health outcome indicators. Results from simple Diff-in-Diff estimation (Appendix 4) reveal no significant relation between aid and disease burden but a positive and significant relation between aid and disease severity. Consequently, the results suggest that aid has no impact on disease burden but worsens disease severity. These results are consistent across aid radii (i.e. when aid recipients are spatially restricted using the radii of 3, 5, and 7 kilometers).

However, we are mindful that the simple Diff-in-Diff analysis does not control for other factors that might have considerable influence on an individual's health outcomes. Consequently, we do not strongly rely on the above findings. To further investigate this relationship, table 4.1 displays results of the Diff-In-Diff with OLS regression, controlling for other variables that might have strong explanatory powers on health outcomes. For the sub-sample of individuals who fell sick in both time periods, the impact is statistically significant for disease burden but not severity. When health aid channeled to exact locations is buffered within the radii of 3, 5, and 7 kilometers, we find significant reductions in disease burden by about 28, 25, and 21 percent respectively.

According to these findings, health aid more strongly impacts disease burden than disease severity in the sub-population of those who fell sick. Since disease burden is indicated by the number of days individuals did not work due to illness, the results suggest that health aid is an important ingredient for boosting the productivity of labour. Therefore, medical care and treatment services offered through health aid can significantly reduce the number of days lost to illness for an individual who falls sick. Quickening recovery time from illness boosts labour productivity since people are made able to gainfully or productively work, given improved health conditions. Consequently, results present strong evidence that services offered through health aid projects can effectively avert poor health status – in particular, by reducing chances of sick people becoming bed-ridden for longer periods, thus permitting individuals to be able to actively execute labour market functions.

Table 4.1. Results from Diff-in-Diff with OLS regressions

	Sub-Sample (Only sick)			Full Sample		
	3km	5km	7km	3km	5km	7km
			Disease severity			
Aid Impact	-0.0851	-0.0828	-0.0787	-0.0437**	-0.0415**	-0.0392**
	(0.0615)	(0.0620)	(0.0621)	(0.0178)	(0.0180)	(0.0179)
Observations (weighted)	8303016	8303016	8303016	25163084	25163084	25163084
R-squared	0.085	0.085	0.0841	0.886	0.886	0.886
			Disease burden			
Aid Impact	-0.2775***	-0.2493***	-0.2133**	-0.0808**	-0.0807**	-0.0814**
	(0.0908)	(0.0917)	(0.0936)	(0.0314)	(0.0322)	(0.0325)
Observations (weighted)	6106601	6106601	6106601	25122753	25122753	25122753
R-squared	0.087	0.086	0.0843	0.567	0.567	0.567

Source: Author's computation from UNHS (2005/06), UNPS (2011/12), & AidData Geo-coded data (2014); disease severity and burden are computed in natural logarithm. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels respectively. Robust standard errors in parentheses

Interestingly, the estimated aid impacts increase as we spatially restrict aid beneficiaries in terms of the radius within which individuals are expected to benefit from health aid (table 4.1). In particular, aid is associated with reducing disease burden by 28 percent when aid channeled to a specific location is buffered within the 3 km radius, 25 percent for the 5 km radius, and 21 percent for the 7 km radius. Moreover, the statistical significance of the effect drops at the furthest distance (7 kms). The findings suggest that, on average, individuals further away from the location of an aid project benefit less than those who are closer. While this result is to be expected, it is notable how quickly the effect diminishes as aid radii are expanded. In particular, as aid radii are expanded by 2 kms, the effect diminishes by approximately 3 percentage points. Findings indicate that the closer health aid projects are channeled to communities, the greater the impact of aid on disease burden. These results imply that channeling aid at the grassroots level (or closer to communities) is critical for effectiveness, given the associated minimal resource leakages and delivery points.

In what follows, and to test robustness of the above results, we implement a Diff-in-Diff Fixed Effects (FE) regression which potentially takes into account unobservable time invariant characteristics (table 4.2).

Table 4.2. Results from Diff-in-Diff with FE regressions

	Sub-Sample (Only sick)			Full Sample		
	3km	5km	7km	3km	5km	7km
			Disease severity			
Aid Impact	-0.1009	-0.0749	-0.0250	-0.0314**	-0.0310**	-0.0195
	(0.0717)	(0.0722)	(0.0727)	(0.0145)	(0.0146)	(0.0146)
Observations (weighted)	8920613	8920613	8920613	27840398	27840398	27840398
R-squared (within)	0.025	0.024	0.023	0.877	0.877	0.877
rho	0.9134	0.9135	0.9137	0.7177	0.7178	0.7181
			Disease burden			
Aid Impact	-0.2345**	-0.1414	-0.0208	-0.0504**	-0.0529**	-0.0391*
	(0.1048)	(0.1074)	(0.1074)	(0.0220)	(0.0222)	(0.0223)
Observations (weighted)	6557885	6557885	6557885	27798525	27798525	27798525
R-squared (within)	0.024	0.018	0.014	0.534	0.534	0.534
rho	0.9372	0.9346	0.9314	0.8111	0.8110	0.8112

Source: Author's computation from UNHS (2005/06), UNPS (2011/12), & AidData Geo-coded data (2014); Severity and burden are in log. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels respectively. Robust standard errors in parentheses

In the sub-sample, aid exhibits no significant effect on reducing disease severity (Table 4.2). However, aid is associated with reducing disease burden by 23 percent, but the relation is only significant using the 3 km radius. For longer distances of the 5 and 7 km radii, the effect of health aid in reducing disease burden is insignificant. These results still strongly emphasize the importance of targeting aid at the lowest level possible – that is, for aid to yield the desired health outcome, it must be targeted fairly close to intended beneficiaries.

Disease severity and burden are significantly reduced when the full sample is considered, for both the OLS and FE regressions (tables 4.1 and 4.2 – full sample). The estimators are smaller in the full sample fixed-effects models compared to the sub sample; however, this is expected as the full sample considers both those who did and did not fall sick. Under the fixed-effects model, there is no significant relation between aid and disease severity for the 7-km radius. However, aid is associated with significantly reducing disease severity for the 3 and 5 km radii, which shows that health aid can reduce the number of days of suffering from illness but the effect is more effective for smaller distances. Consistent with results in the OLS model, the effect of aid on reducing disease burden is lower using the 7 km radius than using the 3 or 5 km radii. This implies that the impact of health aid on disease burden is stronger for the shorter distances (with easy access to health aid services) of 3 and 5 km radii. The results highlight that a prime determinant of aid effectiveness is ease of access and proximity to health aid services, as results using the 7 km radius are consistently smaller and less significant than the 3 and 5 km radii.

Overall, we find consistent results that show health aid is instrumental in reducing disease burden both in the sub-population of those who are sick and the entire population. The relation between health aid and disease severity is less robust, as it is only significant using the full sample. Nevertheless, all impacts are stronger for individuals closer to aid projects.

Across all results, aid has a stronger impact on reducing disease burden than disease severity. We propose two possible explanations for this. First, disease burden is a less subjective indicator of the magnitude of disease, and thus may better pick up on impacts. The number of days one did not work because they were ill is a distinct number. However, the number of days one suffers is more subjective. For example, does one consider suffering from illness when they feel mildly sick or when the illness reaches a certain magnitude of inconvenience? Consequently, disease burden may show a more strong relationship with aid because it is a more consistent measure - it measures the same "degree of magnitude of illness" between people. However, disease burden still suffers some degree of subjectivity. Some people may be more likely than others to "tough it out" and work despite being sick, but the degree of subjectivity is likely less than that of disease severity.

Secondly, people are more likely to seek medical treatment when a disease proves especially harmful. With disease severity, a person indicating that they were ill for a certain number of days may simply indicate having a minor illness—one that proves inconvenient but may not be worth seeking medical treatment for. With disease burden—when the illness is bad enough to prevent one from working—a person may be more likely to seek medical treatment. If aid effectively bolsters health infrastructure, it will primarily benefit those who seek medical treatment. Moreover, effective aid will translate into those who seek medical treatment recovering quicker than those who did not receive aid—all else equal.

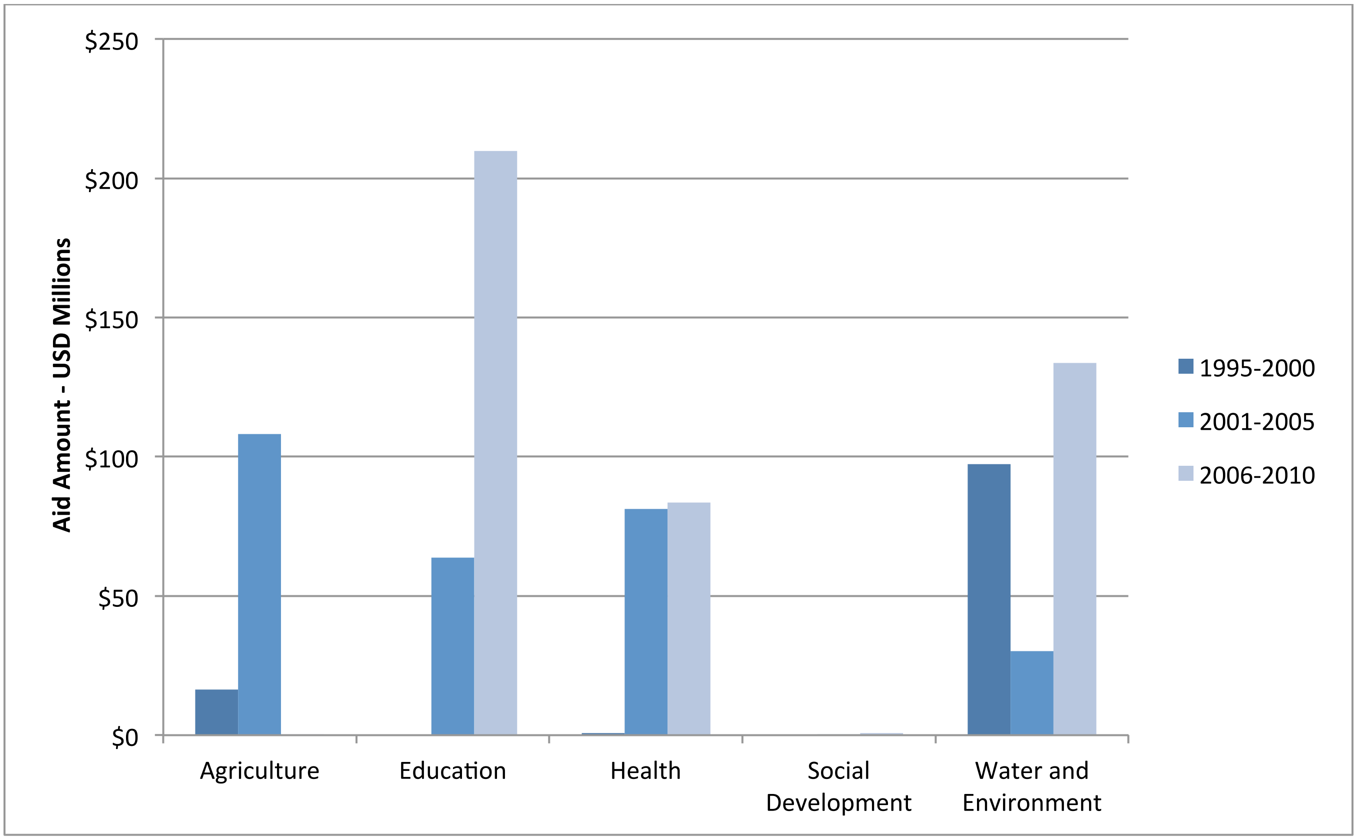
5. Conclusion

This paper uses the Difference – in – Differences approach with data from Uganda's national panel survey and geo-coded data from AidData to investigate the impact of health aid on health outcomes. Results from descriptive statistics suggest that aid was not targeted to areas with individuals with the worst health conditions, pointing to the need for development partners to better target aid into areas with higher disease prevalence. However, Difference-in-Differences results show beneficial impacts of aid. In the sub-population of individuals who fell sick in both time periods of analysis, we find that health aid reduces disease severity and disease burden but the impact is more consistently robust for disease burden - measured by days of productivity lost owing to disease.

More importantly for the sub-population of those who fell sick, the impact of health aid in reducing disease burden is more powerful when we restrict those in areas who potentially received aid to be closer to aid projects. This suggests that aid works more effectively in reducing disease burden if channeled to locations closer to intended beneficiaries, and highlights the importance of ease in accessibility of the health services provided through aid projects. When the whole population based on full sample is considered, we find significant effects of health aid on both disease severity and burden. Even for the full sample, we still find consistent results showing that individuals closer to health aid projects experienced greater reductions in disease severity and burden. Our findings suggest that health aid can reduce disease burden and severity more effectively if channeled in such a way that it is made to reach those who are in need, in local communities (grass roots). Moreover, channeling aid to the lowest level possible offers an additional advantage of driving the Universal Health Coverage strategy of promoting primary healthcare through the "close to client" health system.

Appendicies

Appendix Table 1. Trend of foreign aid disbursements for Uganda



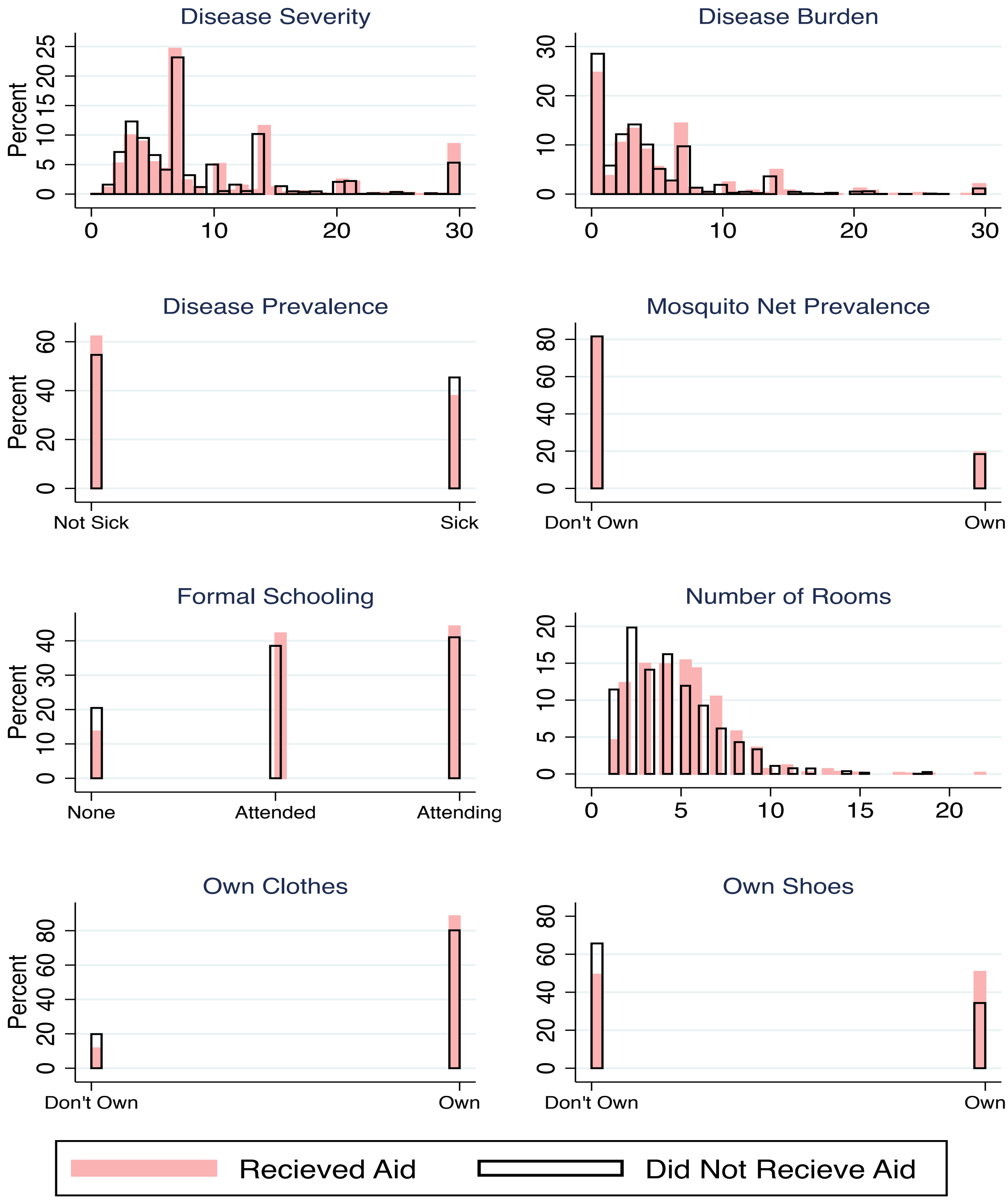
Source: AidData (1995 – 2010)

Appendix Table 2: List of aid projects

Project Title	Donor	Commitments	Number of Project Locations
Ecological Rehabilitation Of Holy Family Hospital In Nyapea	Austria	$673,711	1
Experts For Hospital Construction	China	$106,255	1
Donor Support To The Health Sector	China	$2,249,661	1
Securing A Stronger Future For Poor And Disadvantaged Groups At High Risk Of Mortality And Morbidity In 18 Districts In Uganda	European Union	$1,000,615	18
Improving Access And Quality Of Reproductive Health Services For Oyam District-Uganda	European Union	$2,943,062	1
Sexual And Reproductive Health	World Bank	$4,538,977	23
The Project For Improvement Of Palliative Care Services For People Living With HIV/AIDS	Japan	$42,145	1
The Project For Construction Of A General Ward At St. Lucia Kagamba Health Centre	Japan	$49,131	1
The Project For Improving Garbage Collection In Fort Portal Municipality	Japan	$65,118	1
The Project For Construction Of A General Ward At Mbaare Health Centre, Isingiro District	Japan	$73,214	1
The Project For Construction Of Maternity Block At Tapac Health Center	Japan	$75,498	1
The Project For Construction Of A Maternity Ward At St. Paul'S Health Centre	Japan	$79,635	1
The Project For Improving Access To Basic Health Services, Through Equipping Health Centres In Nebbi District	Japan	$99,458	3
The Project For Construction Of Training Center For Strengthening Midwives' Capacity	Japan	$100,272	1
The Project For Extension To The Maternity Ward At Bwindi Community Hospital	Japan	$100,958	1
The Project For Improvement Of Outpatient, Maternal, And Child Health Services At Pope John's Hospital Aber	Japan	$101,086	1
Market Vendors AIDS Project Phase II	Norway	-	5
Rehabilitation And Construction Of Itojo And Kawolo Hospitals	Spain	-	2
Community Based HIV/AIDS Prevention, Care, And Support Services	United States of America (USA)	$5,159,916	15
Targeted HIV/AIDS& Laboratory Services Program (Thalas)	USA	$20,228,346	7
SUSTAIN (HIV/AIDS)	USA	$32,692,276	16
District Based HIV/AIDS - TB Program (Star-EC)	USA	$56,189,850	66

Source: AidData Aid Project Database. Commitment values are 2011 US Dollars. Projects are only those considered in the analysis. Projects were listed for Norway and Spain, but with no dollar values. Data was more limited for disbursements, so only commitment data is shown.

Appendix 3: Distributions of select variables by aid allocation



Distributions based on baseline, 2005/06, survey data, and aid using the 5km buffer. Distributions for disease burden and severity are only for those who fell sick. Percent refers to percent of total for each group (e.g., percent of total that received aid).

Appendix Table 4: Results from simple Diff-in-Diff based on t-tests

	Sub-Sample (Only sick)			Full Sample		
	3km	5km	7km	3km	5km	7km
			Disease severity			
Aid Impact	0.13**	0.14***	0.17***	0.097***	0.096***	0.12***
	(0.055)	(0.056)	(0.056)	(0.031)	(0.031)	(0.032)
Observations	2302	2302	2302	8744	8744	8744
			Disease burden			
Aid Impact	0.049	0.048	0.084	0.013	0.011	0.032
	(0.054)	(0.054)	(0.055)	(0.024)	(0.024)	(0.024)
Observations	2283	2283	2283	8708	8708	8708

Source: Author's computation from UNHS (2005/06), UNPS (2011/12), & AidData Geo-coded data (2014); Both severity and burden were computed in natural logarithm, hence interpretation of the double difference is in terms of percentage change. ***, ** and * represent statistical significance at the 1, 5 and 10 percent levels respectively. Observations were not weighted with the simple Diff-in-Diff. Standard errors in parentheses.

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