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# Where in Health Sector Do We See ODA Being Effective? With Special Reference to Eight Health Indicators*

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*Analysis for aid effectiveness has become a hot topic of Millennium Development Goal area. While many studies seek to evaluate ODA effectiveness at macro-level or micro-level, this paper attempts to fill the gap by reproducing the analysis at meso-level. The authors tested aid effectiveness in health sector with special reference to eight health indicators. Comparing the effect of the same 'aid' on various health indicators, we found interesting results that the statistical degree and the significance of aid vary in health indicators.*

***Keywords: Health, ODA (Official Development Assistance), Aid, MDGs (Millennium Development Goals)***

## 1. INTRODUCTION

Aid effectiveness has been one of the main research topics for years in the field of development studies. On a greater scale, the evidence is controversial that aid promotes growth (Burnside and Dollar, 2000; Burnside and Dollar, 2004a; Hansen and Tarp, 2001; Dalgaard et al., 2004; Burnside and Dollar, 2004b). On a smaller scale, a number of program evaluation reports show its success in development assistance. However, there are few studies that evaluate aid effectiveness at the meso-level. This paper aims to fill this gap of previous studies. To limit the scope of our research, we analyze the aid effectiveness with special reference to health sector which are traditionally believed to perform with very low improvements.

Despite the numbers of global humanitarian actions and aid for health improvement, the performance of health sector has shown a very slow and little improvement. Given the importance and increasing awareness of global health issues, seven among fifteen MDG targets are dedicated for the health related matters. This decision surely helped to increase Development Assistance for Health Sector (DAH, hereafter)[1] massively (see Figure 1). This paper attempts to analyze the effectiveness of DAH in the improvement of health performances. More specifically, first we look at how we could interpret ODA in health sector and its effectiveness; second, whether we look at how different indicators shows different outcomes; third, at why the difference occurs; and fourth, consider what are the implications the results may have.

Mishra and Newhouse found that DAH is effective in improving infant mortality rate in recipient countries over the period of 1973-2004 (Mishra and Newhouse, 2007). Although infant mortality rate is the representative indicator for health performance of a country, we

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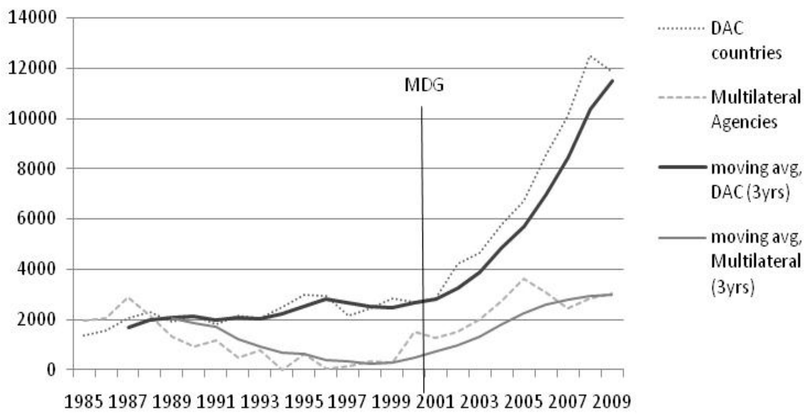
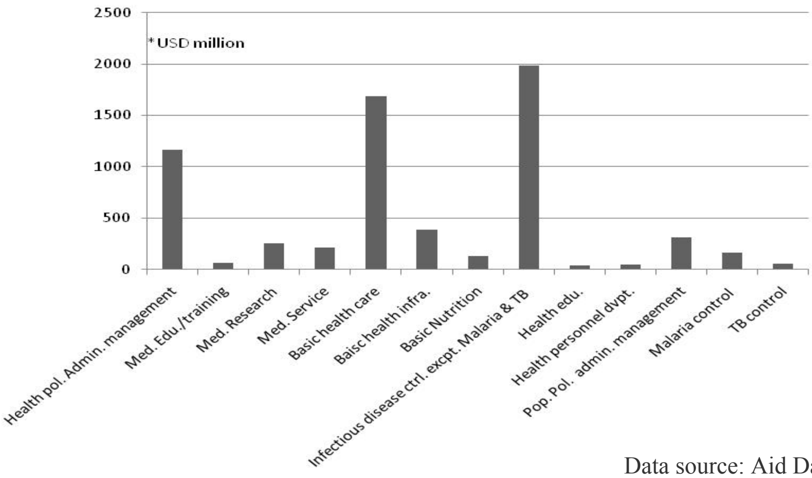
[1] For the sake of analysis and data consistency, this paper limits the scope of aid as ODA. Hence, Development Assistance for Health (DAH) is also limited for ODA for health sectors.

**Figure 1.** Trends in DAH and Millennium Development Goal




Data source: OECD CRS

**Figure 2.** Composition of DAH (average 2004~08)




Data source: Aid Data

attempted to test it with different health indicators. The reason is that the DAH has various components within itself (see figure 2). Therefore, we brought seven other health indicators into our research; Child mortality rate, Maternal mortality rate, Tuberculosis incidence, Tuberculosis death rate, Tuberculosis treatment success rate, Malaria case reported, and Malaria caused death reported. It is to see whether aid effectiveness is consistent throughout various health indicators; and if not, what makes the difference in their outcomes.

## 2. DATA AND METHODOLOGY

The data set for DAH is extracted from OECD CRS and Aid Data[2] (Findley et al., 2010). DAH per capita is used for the aid variables. The results do not change between the two data sets. We ran regressions by each code and combination of codes related to health sector; Code 120, health, code 130 population policies and reproductive health, and code 140, water and sanitation. Each code of 120,130,140; sum of 120 and 130; sum of 120, 130, and 140 are all tested. In case of Malaria and TB indicators, more specified aid amount targeted for Malaria (code 12262) and TB (code 12263) are also tested. Aid disbursement may have given truer estimation but it is not reported in this paper for two reasons. First, there is high correlation between aid disbursement and commitment data. Second, it is available only for a small number of recipients and limited time period. Therefore, we used commitment data for statistical purpose. Health indicators are adopted from many sources, including WDI, WHO, UNDP, and IHME. Infant Mortality Rate, Child Mortality Rate, Maternal Mortality Rate (per 1,000 person), Malaria case reported (absolute number), Malaria caused death reported (absolute number), Tuberculosis incidence rate (per 100,000 persons), TB caused death rate (per 100,000 persons), and TB success rate (% of reported case) with period from 1990 to 2008 over approximately 150 recipient countries. Two limitations lied here with the data set. First, a longer period from the 1970s would allow truer estimation by using more techniques of regression analysis. However, we allowed only from the 1990s where TB and Malaria data comes available. Second, the number of recipient countries is around 150 countries in Infant mortality rates but much less is reported for TB and Malaria. Assuming that the data is either not reported (missing value) or the country is free from the disease, we took five-year averages for all the indicators and DAH in order to neutralize the temporal variations.

Below is the bench mark equation (1). Health performance of period $t$ in country $i$ is defined as $H_{it}$. $H_{it}$ is the produced result from the sum of effects of health performance of previous period ($t$-1); amount of aid committed to the recipient in previous period ($t$-1) again in order to see the effect of aid needs a time lag; initial GDP of the given period as economic proxy; HIV rates of the period as health proxy and also because it has significant influence on health performance; and population as demographic proxy; country fixed effect and time fixed effects used. Depending on the indicators, additional controls (AC) are used such as fertility rate, distribution of insecticide treated nets (ITN), shares of agricultural area.[3]

$$\ln H_{it} = \ln H_{it-1} + \ln Aid_{it-1} + \ln iGDP_{it} + \ln HIV_{it} + \ln Pop_{it} + (U_i) + V_t + (A) + \varepsilon_{it}$$
$$\ln H_{it} - \ln H_{it-1} = \ln Aid_{it-1} + \ln iGDP_{it} + \ln HIV_{it} + \ln Pop_{it} + (U_i) + V_t + (A) + \varepsilon_{it}$$

Equation (2) is simply moving $H_{it-1}$ from right hand to left hand side since health

[2] The Aid Data is easier to manage in the extraction process according to the purpose codes. In this paper, both CRS and Aid data are used for DAH description and trends; and only CRS purpose code is reported for regression in this paper. The regression results from Aid Data does not change those from CRS in its signs or the significance level.

[3] We tried to include and test as many additional control variables as possible but the data was insufficient to run a proper regression. Additional controls of ITN distribution and share of agricultural area turned out to be insignificant. We reported only fertility rate that is consistent and the results that are significant.

performance of given period is mostly explained by the performance of the previous period in equation (1). We used simple OLS estimation with fixed effects, and additional controls. Time fixed effect $V_t$ is used in order to control universal time trends and temporal variations. For example, if there is a universal disease for a certain year, then it will bias the results if time fixed effects is not included. Country fixed effect $U_i$ is also tested but the model losses explanatory power due to limited data period after controlling country specific variations in equation (2). For example, it will control country specific events like war or region specific diseases. Also, we need to control the effect of overall improvement of the country. It could be partly influenced by the total ODA inflow into a country. Using country fixed effect is used in order to control these factors. We have tested with the variable of total ODA inflow, however, not reported in this paper because it has partial correlation with GDP per Capita and with DAH.

## 3. RESULTS

### 3.1. Infant Mortality Rate (IMR)

Infant mortality rate is the number of death of infant under one-year old per 1000 live births. IMR average in 1950-55 was 152, which dropped down to 52 in 2000-2005 average. Infant mortality rates have significantly declined today except in LDCs. World IMR is 49.4 according to the UN in 2006 being Angola with IMR 180, the highest rate. IMR improvement usually follows after living standard and economic development of one's country. Therefore, it has been the most common proxy for health performance or living standard in development and economic literatures. Similar index to IMR, we brought Child Mortality Rate (CMR) and Maternal Mortality Rate (MMR) for comparison. CMR is the number of death of infant under five. It is considered to be more complicated to control than IMR, because one's health care in congenital and neonatal stage can significantly influence one's health performance when they grow. MMR is the number of maternal deaths per 1,000 women of reproductive age in the population (generally defined as 15–44 years of age). Improvements in the MMR is again much more complicated than CMR. Simply put, when a mother is not healthy or malnourished when she is younger, it is harder for her to become healthier when she becomes an adult especially when she conceives a child. As Mishra and Newhouse found that aid was effective in the improvement of the IMR, we expected the similar results for CMR and MMR but possibly to lesser degree.

If our hypothesis is correct, the sign of the coefficient of aid in IMR, CMR and MMR should be negative and significant. Table 1 shows the regression results for IMR, CMR and MMR compared which supports our hypothesis. Across all mortality rates above, the coefficient of lagged log of aid per capita has a negative sign with 1% significance level. It means more aid is likely to reduce mortality rates. Time fixed effect does not change signs or significance of aid but reduces its magnitude by negligible amount. In model (2) of IMR, aid effectiveness still marginally significant at 5% level. Additional control does not affect the results. With the same controls, the coefficient of aid for CMR is also negative and significant at 1% level. The coefficient of aid in MMR is also negative but marginally significant compared to IMR or CMR. The above result suggests that doubling the current level of aid per capita may reduce IMR by at most 1.38%; CMR by 1.45%; and MMR by 1.79%. It is still encouraging although the coefficients of the mortality rates are small in its

**Table 1. DAH effectiveness in Mortality rates**

| | (1) | (1) | (2) | (2) | (2) | (1) | (1) | (2) | (2) | (1) | (1) | (2) | (2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IMR | IMR FE | IMRd | IMRd FE | IMRd AC | CMR | CMR FE | CMRd | CMRd FE | MMR | MMR FE | MMRd | MMRd FE |
| Aid (-1) | -0.020*** | -0.016*** | -0.013** | -0.011** | -0.014*** | -0.021*** | -0.021*** | -0.0175*** | -0.0175*** | -0.018** | -0.015* | -0.026*** | -0.023*** |
| | (-3.499) | (-3.050) | (-2.145) | (-2.113) | (-2.437) | (-3.516) | (-3.445) | (-2.768) | (-2.805) | (-2.241) | (-1.946) | (-3.225) | (-2.917) |
| MR (-1) | 1.040*** | 1.034*** | | | | 1.013*** | 1.010*** | | | 0.941*** | 0.942*** | | |
| | (-64.579) | (-67.164) | | | | (106.446) | (105.852) | | | (73.328) | (75.405) | | |
| iGDP | -0.002 | 0.001 | -0.017*** | -0.012** | 0.012 | 0.010 | 0.009 | -0.001 | 0.002 | -0.042*** | -0.034*** | -0.001 | 0.007 |
| | (-0.188) | (-0.157) | (-2.786) | (-2.175) | (-1.425) | (0.315) | (0.881) | (-0.076) | (0.242) | (-3.567) | (-2.937) | (-0.132) | (0.837) |
| HIV rate | 0.024*** | 0.026*** | 0.028*** | 0.031*** | 0.019*** | 0.036*** | 0.037*** | 0.040*** | 0.041*** | 0.080*** | 0.081*** | 0.061*** | 0.062*** |
| | (-5.282) | (-5.945) | (-6.073) | (-7.229) | (-4.021) | (6.535) | (6.750) | (7.945) | (8.266) | (10.714) | (11.145) | (9.515) | (9.971) |
| pop | -0.019*** | -0.017*** | -0.021*** | -0.018*** | -0.018*** | -0.022*** | -0.022*** | -0.025*** | -0.024*** | -0.012* | -0.009 | -0.011 | -0.008 |
| | (-4.278) | (-3.878) | (-4.338) | (-3.889) | (-3.839) | (-4.390) | (-4.309) | (-4.691) | (-4.403) | (-1.741) | (-1.354) | (-1.569) | (-1.176) |
| Fert | | | | | 0.110*** | | | | | | | | |
| | | | | | (-5.228) | | | | | | | | |
| $R^2$ | 0.98 | 0.98 | 0.21 | 0.35 | 0.28 | 0.99 | 0.99 | 0.25 | 0.28 | 0.99 | 0.99 | 0.25 | 0.30 |
| Obs. | 309 | 309 | 277 | 277 | 275 | 306 | 306 | 274 | 274 | 306 | 306 | 306 | 306 |

Note: IMR: infant mortality rate, CMR: Child mortality rate, MMR: maternal mortality rate, FE: time fixed effect, ~d: $lnH_{it}$-$lnH_{it-1}$, AC: additional control, Parenthesis is t-value, * is significant at 10% level, ** is significant at 5% level, *** is significant at 1% level

magnitude.

### 3.2. Malaria

We chose to look into Malaria and compare it with mortality rates. Malaria is an important cause of death and illness especially in tropical countries and has not been controlled very effectively. Malaria control requires an integrated approach, including prevention (primarily vector control) and prompt treatment with effective anti-malaria drugs. I used both Malaria incidence and Malaria caused death. In 2008, there were an estimated 243 million cases of malaria worldwide. The majority of cases were in the African region (85%), followed by the South-East Asia region (10%) and the Eastern Mediterranean region (4%). Malaria accounted for an estimated 863,000 deaths in 2008, of which 89% were in the African region, followed by the Eastern Mediterranean (6%) and South-East Asia (5%) regions. The majority (85%) of deaths were in children under five years of age (WHO, 2010b).

Unlike mortality rates, aid turned out to be ineffective on Malaria control. The results are consistent across all specifications for both Malaria incidence and Malaria caused death, with fixed effects and additional control or without (see table 2). We went for another experiment for Malaria to see direct effect of aid targeting Malaria control. We extracted code 12262, aid assigned only for Malaria control from total DAH to see if it does have effects indeed. It also did not. Two implications can be drawn here. First, more money is needed for Malaria control. It is always controversial how much will be ‘enough’ to bring effective control but the discussion is beyond the scope of our research. Second, control of Malaria itself has very complicated nature, which we are more inclined to for an interpretation of aid ineffectiveness of Malaria reduction. Malaria is a disease transmitted through parasites called plasmodia reside in malaria mosquito. Men are the host, mosquito is the vector and plasmodium is the agent. Consequently, Malaria control needs to be conducted though all three-way integrated approach – the host, the vector, and the agent control. As for the host control, there is prevention and treatment mechanism. The first intervention as prevention, insecticide-treated

**Table 2. DAH effectiveness in Malaria control**

| | (1) MalC | (1) MalC FE | (2) MalCd | (2) MalCd FE | (2) MalCd AC | (2) MalCd AC FE | (1) MalD | (1) MalD FE | (2) MalDd | (2) MalDd FE | (2) MalDd AC | (2) MALDd AC FE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aid (-1)** | -0.024 | -0.022 | -0.052 | -0.042 | -0.052 | -0.044 | 0.07 | 0.054 | 0.074 | 0.040 | 0.079 | 0.037 |
| | (-0367) | (-0.327) | (-0.710) | (-0.597) | (-0.700) | (-0.609) | (-0.626) | (-0.462) | (-0.588) | (0.311) | (-0.629) | (0.289) |
| **Mal(-1)** | 0.885*** | 0.886*** | | | | | 0.888*** | 0.881*** | | | | |
| | (-27.189) | (-27.114) | | | | | (-22.188) | (-22.377) | | | | |
| **iGDP** | -0.224*** | -0.225*** | -0.108 | -0.074 | -0.126 | -0.142 | -0.246** | -0.280** | -0.099 | -0.094 | -0.013 | 0.005 |
| | (-3.178) | (-3.171) | (-1.486) | (-1.019) | (-1.286) | (-1.4887) | (-2.231) | (-2.545) | (-0.908) | (-0.865) | (-0.088) | (0.039) |
| **HIV rate** | 0.03 | 0.028 | -0.019 | -0.018 | -0.016 | -0.001 | 0.223*** | 0.229*** | 0.099 | 0.104 | 0.072 | 0.072 |
| | (-0.641) | (-0.602) | (-0.413) | (-0.404) | (-0.325) | (-0.025) | (-3.001) | (-3.147) | (-1.557) | (1.649) | (-1.016) | (1.038) |
| **pop** | 0.014 | 0.009 | -0.013 | -0.054 | -0.014 | -0.066 | 0.169** | 0.140* | 0.106 | 0.075 | 0.126 | 0.095 |
| | (-0.259) | (-0.167) | (-0.244) | (-1.011) | (-0.270) | (-1.211) | (-2.026) | (-1.681) | (-1.182) | (0.835) | (-1.367) | (1.037) |
| **Fert** | | | | | -0.072 | -0.307 | | | | | 0.347 | 0.403 |
| | | | | | (-0.271) | (-1.100) | | | | | (-0.934) | (1.072) |
| **$R^2$** | 0.93 | 0.93 | 0.02 | 0.09 | 0.02 | 0.11 | 0.9 | 0.91 | 0.03 | 0.08 | 0.04 | 0.09 |
| **Obs.** | 133 | 133 | 124 | 124 | 123 | 123 | 130 | 130 | 121 | 121 | 121 | 121 |

Note: MalC: Malaria case incidence, MalD: Malaria caused death, FE: time fixed effect, ~d: $lnH_{it}$-$lnH_{it-1}$, AC: additional control, Parenthesis is t-value, * is significant at 10% level, ** is significant at 5% level, *** is significant at 1% level

bed-nets (ITN), mosquito repellent, and indoor residual spraying (IRS) can be useful to protect men from mosquito bites. Meanwhile, there is no guarantee purchase and the distribution of ITN and IRS are correlated to the use of them and thus effective as malaria control. In many cases in malaria risk area, people are not very aware or educated of the necessity and the proper use of nets; aid spent for the purchase and distribution of ITN is often wasted. This is probably why additional control of distribution of ITN yields no significant effects.[4] Besides the prevention of mosquito bites, early diagnosis and treatment is also important to reduce malaria caused death rate. On the treatment side, it is very complicated as well. Malaria is caused by infection of red blood cells with protozoan parasites of the genus Plasmodium. The parasites are inoculated into the human host by a feeding female anopheline mosquitos. The four Plasmodium species that infect humans are P. falciparum, P. vivax, P. ovale and P. malariae. In addition, human infections with the monkey malaria parasite, P. knowlesi, have also been increasingly reported. Increasingly also some types of malaria including P. vivax is resistant to Cloroquine. So it is essential to diagnose the types and to use the correct treatment methods. It is also crucial for Malaria infected patients to take anti-malaria drugs such as Chloroquine or Primaquine promptly (for some cases, the critical time line is 48 hours). Quick diagnosis kit and sufficient distribution of anti-malaria drug are useful in this respect.

However, most of Malaria prevalent countries are concentrated in sub-Saharan areas which are mostly LDCs. Naturally; they do not have sufficient medical system for prompt treatment and early diagnosis. The second intervention is to control mosquito. Malaria is often called as 'disease of the poor' because Malaria mosquito cannot breed or live in contaminated water. Since it lives only in clean water, mostly malaria occurs in rural area with large agricultural environment. Therefore, in order to control the vector, prevention of water-logging and killing larvae is required. We also used the share of agricultural area as

[4] Therefore, not reported in the paper.

additional variable, but it did not have significant effect. The reason may be that not all the countries with large agricultural area are not in malaria risk area, to name one the Netherlands. Third intervention is to control parasite which is not very easy. Besides, there's no effective vaccine for Malaria developed so far. Such embedded characteristic of malaria complicated the control mechanism, and is to be blamed for aid ineffectiveness regarding Malaria control.

### 3.3. Tuberculosis(TB) incidence, TB caused death, TB success rate

The estimates of the global burden of disease caused by TB in 2009 are as follows: 9.4 million incident cases (range 8.9 million–9.9 million), 14 million prevalent cases (range, 12 million–16 million), 1.3 million deaths among HIV-negative people (range, 1.2 million–1.5 million) and 0.38 million deaths among HIV-positive people (range, 0.32 million–0.45 million). Most cases were in the Southeast Asia (35%), African (30%) and Western Pacific regions (20%) to give a brief overview (WHO, 2010a). Being a good reason that TB is also a concern in global health issues, we also examined the case of Tuberculosis. It provided a good comparison and evidence from what we could observe difference between mortality rates and malaria indicators. There were three indicators regarding Tuberculosis which we expected to find some clues on the differences among the indicators.

Same models and specifications are used for three indicators of TB: TB incidence (per 100,000), TB caused death (per 100,000), and TB success rate (% of reported case). Table 3 summarizes the regression results. Interestingly, the coefficient for aid with respect to TB success rate is insignificant while TB incidence and TB death are. Fixed effects and additional control does not change the results. Comparing the three indicators of TB, it shows similar pictures that we observe between mortality rates and malaria we observed. TB case incidence and TB caused death is relatively easier to control than TB success rates. Therefore, the regression suggests that aid is effective in TB case incidence and TB caused death but not in TB treatment success rates.

Table 3. DAH effectiveness in Tuberculosis control

| | (1) TBC | (1) TBC FE | (2) TBCd | (1) TBD | (1) TBD FE | (2) TBDd | (1) TBS | (1) TBS FE | (2) TBSd | (2) TBSd AC | (2) TBSd AC FE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aid(-1)** | -0.029*** | -0.028*** | -0.028*** | -0.038*** | -0.036*** | -0.026** | -0.002 | -0.006 | 0.012 | 0.013 | 0.016 |
| | (-3.632) | (-3.435) | (-2.968) | (-3.376) | (-3.267) | (-2.326) | (-0.261) | (-0.610) | (-0.448) | (-0.501) | (-0.598) |
| **TB(-1)** | 0.987*** | 0.992*** | | 0.976*** | 0.982*** | | 0.104*** | 0.087*** | | | |
| | (-73.592) | (-73.795) | | (-56.865) | (-57.609) | | (-4.423) | (-3.678) | | | |
| **iGDP** | -0.061*** | -0.053*** | -0.049*** | -0.072*** | -0.062*** | -0.053*** | -0.020** | -0.027*** | -0.011 | 0.017 | 0.008 |
| | (-6.182) | (-5.250) | (-5.234) | (-5.005) | (-4.269) | (-4.486) | (-2.167) | (-2.850) | (-0.398) | (-0.424) | (-0.193) |
| **HIV rate** | 0.062*** | 0.061*** | 0.060*** | 0.062*** | 0.061*** | 0.056*** | -0.033*** | 0.035*** | -0.001 | 0.011 | -0.001 |
| | (-8.537) | (-8.513) | (-8.420) | (-5.563) | (-5.545) | (-6.205) | (-4.453) | (-4.776) | (-0.096) | (-0.504) | (-0.042) |
| **pop** | -0.021*** | -0.020*** | -0.026*** | -0.027*** | -0.026*** | -0.028*** | -0.008 | -0.009 | 0.007 | 0.011 | 0.012 |
| | (-2.871) | (-2.762) | (-3.341) | (-2.786) | (-2.673) | (-2.900) | (-1.104) | (-1.241) | (-0.350) | (-0.482) | (-0.536) |
| **Fert** | | | | | | | | | | 0.108 | 0.039 |
| | | | | | | | | | | (-0.994) | (-0.341) |
| **$R^2$** | 0.97 | 0.97 | 0.33 | 0.97 | 0.97 | 0.23 | 0.15 | 0.19 | 0.01 | 0.01 | 0.02 |
| **Obs.** | 307 | 307 | 275 | 307 | 307 | 275 | 264 | 264 | 239 | 237 | 237 |

Note: TBC: Tuberculosis incidence, TBD: Tuberculosis caused death, TBS: Tuberculosis treatment success rate, FE: time fixed effect, AC: additional control. ~d: $lnH_{it}-lnH_{it-1}$, Parenthesis is t-value, * is significant at 10% level, ** is significant at 5% level, *** is significant at 1% level

This can be interpreted that TB incidence and TB caused death tends to decrease as overall health environment of the country is improving (by aid for noticeable portion). It suggests that doubling the current level of aid per capita reduces TB incidence and TB caused death by 1.93% and 2.47% respectively. However, the effectiveness of aid has not been significant in improving TB treatment success rates. When a patient is diagnosed as TB, consumption of drug for 3-4 weeks infectiousness of TB almost disappears. However, the patient must take drugs continuously without cession, everyday, until TB is proved to be successfully terminated, which varies from several months to years depending on patients and significance of the disease. If the patient skips or stops taking drug, he or she will have to restart the treatment from the beginning and will also have greater chance to bear resistance to the drug.

TB success rate is very low in LDCs. Assuming the case of the LDC again, the hurdles of TB control lies in every stage of intervention; i) a patient come to the medical center when the symptom got really aggravated which is more costly; ii) either it is too far and too costly to travel to medical centers where diagnosis, treatment and the provision of anti-TB drug are available; iii) worse is the case if the patient needs to pay for the drug. He/she will be very much likely to stop the medication when he/she feels better due to financial reason. Or even in some case, the patients sell residual drugs to earn money for food or family living expenses; iv) rarely the case is local provision of drug ceased for somehow reasons, and patients can’t continue medication. In sum, patients’ awareness of the treatment of the disease and willingness for complete success to get well are important to control the disease together with accessibility to the diagnosis and medication. Besides this, increasing difficulty to TB success rate is Multi-drug Resistance (MDR) or Extensive drug Resistance (XDR) partly caused by above mentioned problems.

Above results across eight health indicators is partly related to current debates on donor’s coordination and the improvement of health systems. Malaria is a high burden but neglected disease (Shiffman, 2006). Tuberculosis has improved but still high burden in LDCs. The Global Fund for Tuberculosis, AIDS, and Malaria (GF) was born in response to that needs. It is promising that aid for such disease is rapidly increasing. However, what matters in an equally important way is the system of allocation and implementation. DAH injected in recipient countries somehow improved general health performances of the country though it has been very marginal – where we see aid being effective in more general indicators like IMR. On the other hand, the ineffectiveness of aid in more specific issues like Malaria or TB treatment success rate can be interpreted as aid being uncoordinated or having not good enough strategies in controlling the disease. If the disease has a complicated mechanism to control which we cannot do anything to change it, what we can do is design the implementation and programs to be more specific to break the chains of complexity. In case of Malaria, for example, distribution of ITN is better to be followed by sufficient education for basic knowledge of malaria for the population in malaria risk area – such as how to prevent from biting, why it is important to use ITN and IRS, or finding out and fill in any water logging in their neighboring area. In case of TB success rate, directly observed treatment (DOT)[5] has been conventional wisdom of TB treatment. However, DOT is insufficient. Introducing some incentive structure for patients on the termination of disease and for health practitioner on patients’ performance seems to be more useful than only using

[5] Patients’ taking drugs on site where medical staff observes.

DOT, together with more accessibility of treatment sites and drugs.[6] We leave the job of finding out what strategy is more efficient or how to design the implementation to studies of program/impact evaluation and experts/practitioners of each area.

## 4. ROBUSTNESS CHECK AND LIMITS

We ran regression with aid per GDP instead of aid per capita, and the result was the same with very marginal changes in coefficients. DAH is also disaggregated for further verification by each code of 120, health, 130, population policies and reproductive health, and 140, water and sanitation. Below is a summary of regression results run by each codes.

Our expectation for aid code 120 still effective was for IMR, TB case incidence and TB caused death. Aid code 120 in CMR and in MMR was insignificant, which can be interpreted due to their more complexity compared to IMR. Results met our expectations except with aid effectiveness of code 120 being marginal in TB caused death. Malaria did not have aid effectiveness in our previous regressions and so as in the regressions by each code as also expected. The results also proves that code 130 and 140 by itself do not have much effect on health performances because they are relatively indirect input. Neither the sum of 130 and 140 does in accordance. We also disaggregate aid into direct input factors for a test. Aid for TB (code 12263) and aid for Malaria (code 12262) in corresponding indicators, however, turned out to be insignificant. Part of the reasons was already explained in the previous sections on TB and Malaria. In the technical side of the study, using GMM or IV controls could have been a must-check; however, the observation has insufficient number of periods to do so. The results presented here are to get some insights from what we have in our hands though it might be less precise.

**Table 4. DAH effectiveness by each code in health indicators**

| | IMR | CMR | MMR | MalC | MalD | TBC | TBD | TBS |
|---|---|---|---|---|---|---|---|---|
| 120 | -0.016*** | -0.003 | -0.011 | 0.003 | 0.119 | -0.029*** | -0.022* | 0.012 |
| | (-2.374) | (-0.484) | (-1.262) | (0.006) | (1.421) | (-3.353) | (-1.843) | (1.139) |
| 130 | -0.003 | -0.004 | 0.001 | -0.108 | 0.058 | -0.004 | -0.016** | 0.001 |
| | (-0.648) | (-0.917) | (0.147) | (-1.212) | (0.856) | (-0.780) | (-2.344) | (0.117) |
| 140 | -0.005 | -0.009* | 0.002 | 0.005 | 0.124* | -0.008 | -0.002 | -0.001 |
| | (-1.129) | (-1.843) | (0.252) | (0.114) | (1.806) | (-1.186) | (-0.223) | (-0.813) |

[6] In some cases, medical practitioner gets deposits from patients and gives it back when the patient is diagnosed to be successfully cured. In some other cases, health practitioner gets incentives as the patient appear at the hospital when he/she is told to do so and take medication as it is instructed. When local health staff is rewarded with incentives, they try very hard to make sure the patients understand and do appear next time for the succession of treatment. Both had increased the treatment ratio significantly. However, such program has not been internationally recognized. (the author's personal observation in Bangladesh)

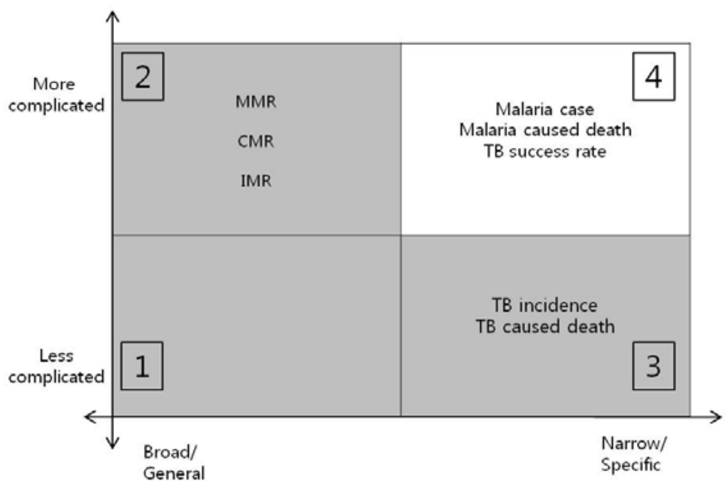
For all the health indicators used in this study, additional controls do not change the results; fertility rates for all indicators did not change the results; distribution rates of ITN and agricultural area for Malaria turned out to be insignificant. One of the hot-topics today in DAH is improving health system in order to increase effectiveness of health aid. Unfortunately, we could not find a data on health system of sufficient number of countries and periods. It is also valuable research to include variables of MDR and XDR in the empirical analysis. Those remain a good challenge of future research when the data become more available.

## 5. IMPLICATION AND DISCUSSION

The effectiveness of DAH has been in question for years. This paper analyzed DAH to see whether it has been effective or not, in which area (indicators/targets), and why? Our general hypothesis was that aid may show effectiveness for most representative health indicators rather than indicators for more specifically targeted disease or those embedded with complicated control mechanism. The authors analyzed aid effectiveness using the same ‘aid’ comparing eight health indicators.

Figure 3 is a diagram of DAH effectiveness and the nature of health indicators in summary of regression results – shaded area yields aid effectiveness; intuitively, DAH is expected be effective in category area (1); health indicators which are more general than specific or targeted disease that lie in category (2), DAH is likely to be effective (IMR, CMR, and MMR); Health indicators that are more specific but relatively easier to control that lie in category (3), DAH is also likely to be effective (TB incidence and TB caused death); finally, as for the health indicators with specific/targeted disease with complicated mechanism that lie in non-shaded area category (4), DAH is likely to be ineffective (Malaria incidence, Malaria caused death, TB treatment success rate).

**Figure 3.** DAH effectiveness and the nature of indicators



Analysis of the aid effectiveness at macro-level, with regard to growth, is too broad while program evaluation seems too narrow to measure overall aid effectiveness. Even in the health sector analysis, we see overall improvement of the sector itself, and have not shown the consistent. We believed that the meso-level approach will give us better understanding of the sector effectiveness of aid. The comparison amongst eight indicators shows interesting results that even in the health sector, we may need to break it down to further level. Our analysis on these few critical specific health indicators exhibits a picture that is similar to macro and micro paradox.

Among many, we chose the health sector which has been considered as very difficult area to achieve tangible improvements. We adopted eight health indicators to measure and compare the DAH effectiveness and found the followings; DAH has been effective in general improvement of health sectors though coefficient is relatively small. However, it has not been so in more specific disease controls. The outcome depends on the nature of that specific disease control. Although we are well aware of major limitation of our dataset being inconsistent and complete dropping of the big number of samples, this analysis could at least open up new area of discussion in this field. We expect to conduct a similar study in the future when the data for these health indicators give us longer time period and wider availability.

How to improve the performances is mostly by increasing the effectiveness of each projects and aid programs, of course. Indeed, it is in the field of program evaluation to figure out the design and strategies for more effective aid. Our study does not go into details but suggests that the effectiveness of the same aid can also differ across different indicators even within the same sectors and with same aid.

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