Can Ethiopia Finance the Continued Development of Its Primary Health Care System If External Resources Decline?

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INTRODUCTION

Global health progress has benefited from a rapid and large increase in development assistance for health beginning in the 1990s and extending to the mid 2010s. Development assistance for health was around seven billion USD in 1990 and exceeded 30 billion USD by 2015 globally (2015...
Recent evidence suggests, however, that this trend has leveled off or slightly declined in aggregate. Individual countries benefited in different ways from these increased financial flows. In some sub-Saharan African countries, external funds make up a large share of total health spending or of total government health spending. In Ethiopia, the 2010 National Health Accounts (NHA) estimated that external funds accounted for 50% of total health expenditure, of which 63% went toward total government health expenditure. In addition, within countries, external funds could be an even larger share of government spending on specific services. For example, in Ethiopia, external funding is estimated to make up 73% of government primary health care spending (authors’ estimates using data collated from Ethiopia Federal Ministry of Health), reflecting the priority given by external funders to supporting Ethiopia’s successful efforts to achieve the health-related Millennium Development Goals by 2015.

Ethiopia has received international praise for its focus on developing primary health care services with a bottom-up strategy that emphasized community engagement through volunteer community health workers, lower-level facilities with locally recruited health extension workers, and development of health centers and primary hospitals. The country has ambitious plans to advance toward universal health coverage through a primary health care approach, continuing to strengthen this system by expanding coverage, quality, and scope of services.

External partners have been a major source of funding for Ethiopia’s government primary care system. External resources for health increased since 1995 from six million USD to 883 million USD in 2014 (2012 USD). However, Ethiopia is now experiencing a decline in some external support for health. For example, cuts in Global Fund (GFATM) and the President’s Emergency Plan for AIDS Relief (PEPFAR) funding for the country resulted in decreases of their support by 50% by 2012 from a 2010 peak. Despite this, overall external support was still increasing through 2014.

Domestically, Ethiopia has benefited from rapid economic growth, with an average of 9% real growth in gross domestic product (GDP) from 1999 to 2012. It is deemed one of the fastest growing economies in Africa. The government of Ethiopia (GoE) has increased its funding for health from own resources over this period as well, almost doubling public health expenditure from 1995 to 2011 (2012 USD), although government spending from own sources still is relatively low at 4.4% of GDP in 2011.

The GoE recognizes the need to increase domestic resource mobilization for health and has stated this as one of the key goals in its recent health financing strategy and health sector plan. Working with Ethiopia’s Federal Ministry of Health, a research team from Harvard T.H. Chan School of Public Health developed a health financing projection model to explore the implications of future trends in external funding on Ethiopia’s primary health care spending and the potential for domestic resources to sustain the growth of Ethiopia’s primary health care system. We empirically estimate scenarios exploring Ethiopia’s ability to finance its primary health care system through the development of a projection model for resources mobilized and costs. The work presented in this article provides empirical data on an important question: Can Ethiopia finance the needed health investments to sustain its health progress in primary health care? This question has relevance beyond Ethiopia because other developing economies are also facing changes in the availability of external resources while they seek to achieve future health gains.

**SETTING AND METHODS**

A more detailed report on this work is available in Berman et al., which provides specific content on the current health financing trends (according to the National Health Accounts) and comparison with other lower-income countries with a focus on sub-Saharan Africa, trends in economic development and general government expenditures, more detail on the resource mobilization projections and their assumptions, and a step-by-step process for the cost function approach. This section provides details of the different elements of the model starting with the conceptual framework of the projection model, estimating spending on primary care (versus non-primary care), highlighting the methods and assumptions projecting future spending and estimating future costs of government primary care, and comparing the future cost estimates with the Ethiopian Federal Ministry of Health’s estimates of primary care costs according to their five-year health sector plan.

**Study Setting**

Ethiopia is the second most populous sub-Saharan African nation, with an estimated population of 99.4 million people in 2016. Assuming an annual average population growth of 2%, Ethiopia’s health system will have to serve 62% more people by 2035 compared to 2012 levels (authors’ estimates based on the estimated population growth from the Central Statistical Agency; Table 1). Over the last 20 years, the Ethiopian government has focused on rapidly expanding its public health system with a focus on primary care service
“Primary care” for this model is based on the Ethiopian Federal Ministry of Health’s (FMOH) working definition. Primary care is defined as all health services delivered by health care providers located at the woreda (district) level or below. This is defined in Ethiopia as the primary health care unit (PHCU) that provides preventive, preventative, outpatient curative care services, and some inpatient services (in some health centers and recently established “primary hospitals”). PHCU providers include health posts, health centers, and primary hospitals, as well as health promotion and education activities of volunteer community health workers known as the “health development army.” In addition, we include outpatient primary care services offered at secondary and tertiary facilities (hospitals) and an estimate of the share of health system administration costs at federal, regional, and woreda levels associated with these services.

“Nonprimary care” consists of providers of specialized care (e.g., elderly and mental health), research and education training institutions, pharmacies, and suppliers of medical supplies. It also includes FMOH’s definition of secondary and tertiary health care services (excluding the outpatient primary care services offered at these facilities). An estimate of the share of health system administration costs at federal and regional levels associated with these services was also included.

The model explores two projection periods. One time period is the short term of five years, aligned with the Health Sector Transformation Plan (HSTP; 2016–2020). The second time period is aligned with the government’s strategic planning period of 20 years (2016–2035).

**Estimating Actual Spending on Government-Provided Primary Care**

Current actual spending on government provided primary care is based on Ethiopia’s 2010–2011 NHA. Figure 2 shows the shares of spending from different financing sources going to primary care providers (as defined above). The main funders of government primary care are government itself, households, and “rest of the world.” Sixty-four percent of total health expenditures went to primary care and the remaining 36% was for nonprimary care. We combined the NHA breakdowns on sources, providers, and health care functions to estimate the shares of government, household, and rest of the world primary care spending that went to government primary care providers.

Monetary values of projections are presented in nominal Ethiopian birr (ETB) to avoid complications of estimating
changes in exchange rates between ETB and the USD. This allows for inflation to be easily removed and obtain real values in ETB as well as estimate the purchasing power parity for ease of comparing values across countries. In some cases, monetary values are also presented in current USD using the 2015 exchange rate of 20.7 ETB to 1 USD in parentheses after reported ETB.

Projecting Future Resource Mobilization for Government Primary Care

The health care finance projection model makes estimates using two approaches and for each approach, two scenarios for future resources mobilized from different financing sources for government primary care. The two approaches are referred to as historically based and the GDP-based...
projections. The historically based projections extrapolate previous trends in expenditure growth for financing sources—government, external, household out-of-pocket (OOP), and other private. We modify these trends based on certain assumptions. For the GDP-based approach, we assume that the financing sources will grow based on projected growth rates for GDP according to the International Monetary Fund (IMF) Article IV Consultations and estimates of expenditure elasticities in relation to GDP growth. (The GDP growth rates used in Berman et al. are slightly different than the more up-to-date estimates used for this article.) Because we are particularly interested in the impact of changes in external financing, we incorporate explicit assumptions about that source of funding.

Table 2 presents the data sources used under each projection approach, main assumptions, and more detail about the two scenarios. For each scenario, we are primarily interested in the impact of changes in external contributions for health and therefore the two scenarios will be referred to as external current and external decrease for each projection approach. For external current funding, we assume growth only at the current U.S. level of inflation from 2011 (i.e., no growth in real international value). For the external decrease scenario, we assume the external current scenario until 2020, at which time a gradual reduction to 50% of 2020 levels would occur by 2035.

Reflecting increased attention to domestic resource mobilization, we assume that government health expenditure would increase to the highest historical level of 6.7% of general government expenditure (GGE) by 2025 and remain at that proportion through 2035 for both resource mobilization scenarios. Household OOP spending is based on past average per capita health spending on primary health care services and population projections, whereas other private spending assumptions are based on the previous trends for the historically based approach. For the GDP-based approach, household OOP is based on the estimated elasticity of health spending for low-income countries (LICs) in sub-Saharan Africa and influenced by assumed GDP growth. In Ethiopia, private health sector development is mainly an urban phenomenon in a predominantly rural setting. The elasticity of health spending for “other private” (for-profit and not-for-profit health spending not including households) in Ethiopia used the real GDP growth estimates from the World Bank World Development Indicators DataBank and other private expenditures from the NHAs was 0.42. According to Avila et al., the elasticity of health spending for other private among LICs in sub-Saharan African countries was 1.26. We used the estimated elasticity of other private health spending using Ethiopian data given that the Ethiopian private health sector is not expanding as rapidly compared to other LICs within sub-Saharan Africa and with continued emphasis on the government health system in strategies and policies for the future health sector development. Table 3 summarizes the annual nominal ETB growth rate in the different quantities estimated for total health expenditure. A fixed percentage allocation for each financing source is used to obtain resources mobilized for primary care.

We find that our resource mobilization model is not that different from the health expenditures documented in the most recent NHA (2013–2014) released in 2017. Total health expenditure in 2013–2014 was 49.6 billion birr, whereas our estimates were lower at 35.4 billion birr and 40.3 billion birr under the historical approach and GDP-based approach, respectively. However, the methods used to calculate the more recent figures may include quantities not included in our figures.

### Estimating Future Resource Needs (Costs) of Government Primary Care

Our main approach to estimating the resource need forward-looking projection was to develop a cost function. Data from the FMOH’s annual woreda-based planning exercise provided estimates of annual spending in PHCUs for 808 woredas for 2011, the most recent year of data availability at the time of this study. We combined this information with other woreda-level data on population and outputs and coverage of key primary care services to identify a regression model that predicted costs based on key essential primary care services at the woreda level. The model specification consists of primary care per capita costs, key coverage indicators (that provided the best predictive model according to the adjusted $R^2$), socioeconomic status (in the form of the poverty rate or percentage of people living below the poverty line), and control for regional variations.

$$y_{2011} = \alpha + \beta_1 \ln SBA_{2011} + \beta_2 PMTCT_{2011} + \beta_3 OPD_{2011} + \beta_4 LLIN_{2011} + \beta_5 Poverty_{2011} + \beta_6 RegDum_{ri} + \cdots + \beta_{15} RegDum_{ri} + \epsilon_i$$

All data in the model were from 2011 and at the woreda level ($i$). This was the model with the best goodness of fit (highest adjusted $R^2$). On the left-hand side of the equation, the dependent variable ($y$) is the natural log of primary care costs per capita. Per capita costs were used in order to account for population. The natural log was taken because
that variable was not normally distributed, and this violated a model assumption that all variables are normally distributed. The same was done for skilled birth attendants (lnSBA), which is the percentage of eligible mothers whose delivery was attended by an SBA. All other variables used in this model were normally distributed. Preventative and promotive care offered within the primary care system include the percentage of eligible people counseled and tested on the prevention of mother-to-child transmission (PMTCT) of the human immunodeficiency virus and the percentage of long-lasting insecticide nets (LLIN) distributed based on the number of eligible population. The outpatient department rate per capita (OPD) accounts for basic curative services offered within the primary care system. This is controlled for socioeconomic status, or the percentage of people living below the poverty line (Poverty) of a woreda (i) and regional fixed effects with a regional dummy (RegDum) for each region, r, at the woreda level i. Summary statistics of the variables used in this model are reported in the Appendix.

This model was used to project future costs based on changes in key parameters—health coverage, socioeconomic status, population growth, scope of services, and inflation—forecasted over 20 years. Adjustments were also made to include some future capital expenditures for health facilities.

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### TABLE 2. Summary of Key Inputs for Historically Based and GDP-Based Projection Approaches under the Resource Mobilization Model

|                         | Historically Based Approach                                                                 | GDP-Based Approach                                                                 |
|-------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Data sources            | Based on five rounds of NHA data trends by financing source that occurred over the 15-year time period (1996–2011). | NHA 5 (2010–2011) is used as the baseline expenditure and then builds in assumptions on projected GDP growth rates obtained from Ethiopia’s Ministry of Finance and Economic Cooperation and the IMF via “Article IV Consultation”. |
| Main approach assumptions| Historical resources mobilized are equal to expenditures. Not tied to potential influencing factors for health financing such as GDP growth, with the exception of OOP, which is tied to population growth. Estimated allocations for primary care and nonprimary care for each financing source are assumed to remain constant over time. | Variable annual GDP growth projections are used. The estimated average GDP growth rate over 20 years is 15% (9% inflation and 7% real growth). Government health expenditure assumed to gradually increase to previous highest share of general government expenditure of 6.7% by 2035 from 4.4% in 2011. External resource contribution not tied to GDP; built-in assumptions of stagnation or reduction over time. Household OOP based on elasticity of health spending from Avila et al.16 Other private expenditures based on authors’ estimated Ethiopian elasticity of health spending (although not used in the final government primary care model). Estimated allocations for primary care and nonprimary care for each financing source are assumed to remain constant over time. |
| External current        | External contributions remain at the current 2011 levels and increase only by 1.83%, or average US inflation. Government health contributions gradually increase to 6.7% of GGE by 2025 and maintain until 2035, with an average annual increase of 12%. Current trajectory of spending for OOP based on average per capita household contributions for services from Purvis et al.15 and population growth from the Central Statistical Agency.13 Current trajectory of spending for other private. OOP experiences an average annual increase of 7%. Other private experiences an average annual increase of 6%. | External contributions are not tied to GDP growth rates and are the same as the historically based approach. Government contributions gradually increase to 6.7% of GGE by 2025 and maintain until 2035, with an average annual increase of 19%. OOP elasticity of spending for health is 1.098, with an average annual increase of 12%. Other private elasticity spending for health is 0.42, with an average annual increase of 7%. |
| External decrease       | External funding is same as external current scenario until 2020, which gradually decreases to 50% less by 2035. Government, OOP, and other private health contributions are the same as the external current scenario. | External contributions are not tied to GDP growth rates and are the same as the historically based approach. Government, OOP, and other private contributions are the same as the external current scenario under the GDP-based approach. |
not captured in 2011 expenditure data, although other key factors, such as future quality improvements, are not modeled.

The cost function estimates for primary care are also compared to a recent government costing exercise that was produced for Ethiopia’s 2015–2020 HSTP in Table 4. The HSTP costing was developed using the World Health Organization’s OneHealth tool and is based on normative service cost estimates for a standard set of services to be provided in contrast to our cost function approach, which is based on reported actual expenditures. It provides two costing scenarios: base case and best case. The base case scenario is based on achieving the government’s priority primary care targets from 2016 to 2020, and the best case scenario is based on achieving all targets in the HSTP as well as having high coverage of noncommunicable disease interventions by 2020.

These two approaches are likely to give different results. The cost function approach is based on actual spending on services adjusted for increases in coverage, scope, and time-varying factors. This estimate incorporates any underspending from existing gaps in utilization, quality differences, and scale and scope efficiencies in delivery. In addition, the woreda-based costs probably suffer from data quality problems. Data quality concerns consist of possible reporting errors in the HMIS (e.g., due to multistep aggregation from paper-based records before data are entered electronically) and incomplete woreda data on spending because of off-budget spending or incomplete spending foregoing.

### RESULTS

Applying our methods, approaches, and scenarios, we produced two sets of cost and resource mobilization projections. The first projection focuses on the five-year planning period for HSTP, whereas the second presents the longer planning period of 20 years.

### Primary Care Financing and Cost Projections (2016–2020)

The first set of projections uses the HSTP costings and the cost model estimates and compares them with the two resource mobilization approaches. Figure 3 shows the resource mobilization results for both the historical and GDP-based approaches, where within the first five years the external decrease scenario is the same as the external current scenario as described in the Methods section. This suggests that, even if external resources remained at the previous high levels in 2011 (adjusted for annual inflation), Ethiopia may only raise about half the estimated funds needed to meet HSTP objectives from increases in domestic resource mobilization excluding household contributions.

The graph on the right-hand side in Figure 3 adds estimates of household OOP spending that finance user fees in government primary health care facilities into the resource mobilization projections. Ethiopia has a robust system of collecting fees for “nonexempt” services (services not provided free of cost to all). These fees are retained by facilities and...
worsheds and are used mainly to purchase consumables for primary care. Incorporating these estimates in the projections shows that Ethiopia is less likely to be successful in financing continued delivery of primary care without household contributions even if external funding remains at 2011 levels (adjusted for inflation). Using the historical approach, even including household OOP, primary care financing does not reach the resources needed for the HSTP costing scenarios. If domestic resource mobilization and household OOP align more with GDP growth and both government and household spending contribute, domestic funds may be sufficient to finance the “best” case HSTP cost projections toward the end of the projection period.

Ethiopia is currently rapidly expanding a program of community-based health insurance (CBHI), which would create a prepaid fund at the district level with some external government subsidies. This major new initiative is to pool and channel household contributions largely in support of primary care by covering user fees charged at government health facilities. It would entitle members to use government services without user fees, essentially substituting prepayment for out-of-pocket spending at the time of service use. Early evidence indicates a reduction in user fees being paid by CBHI members, and this has reduced the effect of impoverishment among CBHI households because of its reduction in payment at the time of service use. This risk pooling approach does not substantially alter our modeling incorporating out-of-pocket spending in domestic resource mobilization. It would only do so if it has a large effect on demand for services, raising overall program costs. This may happen, but we did not incorporate expectations to that effect in our model.

One can compare these projections to estimates of spending on government primary care, of which 24% was from government’s own funds, 66% was from external funds, and 9% was from household out-of-pocket payments under the historical approach and spending ETB 29.07 billion (1.41 billion USD), or ETB 306 per capita (14.8 USD per capita), under the GDP-based approach, of which 18% was from government’s own funds, 35% from external sources, and 47% from household out-of-pocket payments. At the end of the period in 2020, including household out-of-pocket contributions, we project that this amount would be ETB 19.780 billion (957 million USD) using the historical approach and ETB 44.47 billion (2.15 billion USD) using the GDP-based approach, an increase in nominal terms of 29% and 53%, respectively. In 2020, the projected shares for different financing sources would be 34% government, 55% external, and 11% household using the historical approach and 26% government, 25% external, and 50% household using the GDP-based approach. If government wants to achieve our cost function level of spending without household spending, domestic resource mobilization for health would have to increase an annual average of 135% for both historical-based scenarios and 53% for both GDP-based scenarios in addition to the already assumed increased in government health spending over a five-year period (2016–2020). The additional amount of government funding needed to cover household contributions is even greater for both projections under the two HSTP cost scenarios.

**Primary Care Financing and Cost Projection over a 20-Year Period (2016–2035)**

This next set of projections follows an approach similar to that of the previous section except that it covers a longer period of time, we now only use our cost model projections because there are no normative cost estimates going this far ahead in time, and we are able to show the effects of

![5-year Projection with Household Contributions](image1)

![5-year Projection without Household Contributions](image2)

**FIGURE 3.** Five-year Projection Period Estimates (2016–2020).
sustaining or decreasing external resources. Of course, there are many uncertainties in this longer-term projection. Figure 4 shows the 20-year projection without incorporating household out-of-pocket spending and with incorporating it. Both graphs suggest that the effects of maintaining external funding at current real levels or decreasing it does not matter that much given robust projections of economic growth in Ethiopia. Without government incorporating contributions from households (either out-of-pocket user fees or CBHI contributions), the future sustainability of primary care services will depend largely on significant economic growth and more ambitious channeling of that growth into government funding for primary care as shown in the GDP-based approach scenarios. Under the historical approach, Ethiopia would have an average annual deficit of 8.08 billion ETB (391 million USD) and 11.47 billion ETB (555 million USD) under the external current and external decrease scenarios, respectively, even with the inclusion of household contributions. Only under the GDP-based approach is Ethiopia likely to be able to finance primary health care expansion with continued efforts to supplement government funding with household contributions. Although our estimates of GDP growth accord with official government projections, it should be noted that this assumes a long-sustained period of rapid growth, which, because of the compounding of growth year on year, produces a high level of increased government revenue. This is a very optimistic projection. Under the historical approach, the Ethiopian government would need to increase health spending by an additional 91% and 120% for the external current and external decrease scenarios, respectively, over the 20-year period (2016–2035). This means that government health spending would have to be 8.4% of total government spending for the external current scenario and 9.4% for the external decrease scenario by 2035 under the historical approach. These quantities are a large increase for Ethiopia but have been attained by other sub-Saharan African countries.

**DISCUSSION AND CONCLUSION**

After several decades of robust economic growth, Ethiopia is still a relatively poor country. Despite these constraints, it has advanced substantially in developing a widely accessible government primary health care system that has produced substantial improvements in key health outcomes. Ethiopia took advantage of significant increases in external funding to support these efforts beginning in the 2000s and continuing to the mid 2010s. These external funds enabled the GoE to keep its own domestic spending on health care at modest levels and to focus its own-generated resources on other priorities while continuing to develop primary care services.

In recent years, the situation is changing as total external funding to health in Ethiopia is leveling off or declining. The GoE has recognized this situation and called for increased domestic resource mobilization to support the government health care system with a focus on primary care. Literature suggests that a government can increase fiscal space for health in five ways without jeopardizing its fiscal position or crowding out spending on other priority sectors to accomplish development goals. This can be done through (1) sufficient and sustained economic growth allowing greater revenue generation and low levels of debt; (2) increasing the share of health spending within the overall government budget; (3) raising new revenue earmarked for the health sector; (4) improving efficient use of health expenditures; and (5) increasing development assistance for health. Ethiopia can realistically increase funding through economic growth and efficiency gains, along with some reallocation of the general budget going to health, amid the decline in some external funding. Given Ethiopia’s low income and limited tax-paying population, new dedicated taxes are unlikely to offer much advantage and, in addition, the government has not shown interest to increase the share of taxes in the economy overall.

Our modeling of future costs and resource mobilization for primary health care suggests that Ethiopia can substantially
support the further development of primary care services but that this is unlikely through “business as usual”; that is, only by extending historical trends of government financing. Rather, it is likely that three complementary strategies within the fiscal space framework will be needed to assure sustained progress in primary care. First, government must sustain robust economic growth and increase its own contributions to primary care through increased allocations of own-generated resources, which have been underused up until now given the large flows of external funds supporting primary care. Raising Ethiopia’s government contributions even to levels similar to comparator country averages will provide important additional support. Some of this is already occurring, as made evident in the latest NHA (2013–2014), which shows an increase in government spending on health by more than 200% and a slight increase in the share of general government spending going to health compared to the previous NHA (2010–2011). Second, in keeping with government policy to not overly burden the economy with new taxes, government could expand mechanisms for citizen contributions to primary health care through formal risk-pooling mechanisms like CBHI. Third, government could improve efficient use of health expenditures at all levels of the health care system, potentially freeing up resources to provide the same level of care with less resources or increase service outputs or scope without increasing spending. The combination of increased government funding for primary care and increased household funding, with continued economic growth and efficiency gains, offers a high probability of being able to sustain primary care progress, including expanding coverage and scope of primary care services even in the face of even large declines in external support. It is promising that these strategies, increased government funding for health from own-generated resources, increased citizen contributions through formal risk-pooling, and seeking efficiency gains, are already part of the GoE’s health financing policies going forward. However, some government strategies, such as development of social health insurance that would provide significant increased funding for inpatient services, might also result in pressures on government to shift funding away from primary health care unless managed well.

Our modeling suggests that there are plausible paths going forward to sustain health for a still poor country like Ethiopia anticipating declining external support. External partners should be encouraged by Ethiopia’s timely adoption of sound strategies to maintain progress. Ethiopia and its partners should accelerate their efforts to collaborate on short- and medium-term strategies to achieve a transition in financing health with minimal disruption to the positive progress that has been and is being made.

NOTES

[a] Ethiopia’s most recent NHA was not included in this work because it was released in the fall of 2017, after this study was completed.

[b] In some instances, regions used their own treasury funds to provide additional financial resources directly to health centers. Unique cases such as this are not captured in the primary care cost model, and this is a caveat within this projection, leading the model to underestimate such costs.

[c] The historical approach estimates are most likely underestimating the amount of household health spending for public primary care services, whereas the GDP approach is likely overestimating it with optimistic high economic growth rates. We think that household health spending for public primary care services is in between these two projected estimates.

DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

The authors declare that they have no competing interests. The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views of the organizations listed.

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### APPENDIX

**Summary Statistics for Variables in Cost Model**

| Variable   | N   | Mean   | Median | Minimum | Maximum | Standard Deviation |
|------------|-----|--------|--------|---------|---------|--------------------|
| y          | 712 | 5.046  | 5.000  | 2.763   | 7.171   | 0.446              |
| lnSBA      | 21,398 | -0.937 | -0.830 | -4.605  | 0.000   | 0.827              |
| PMTCT      | 21,762 | 0.867  | 1.000  | 0.000   | 1.000   | 0.296              |
| OPD        | 20,748 | 1.129  | 0.760  | 0.000   | 6.848   | 1.123              |
| LLIN       | 21,759 | 0.554  | 0.730  | 0.000   | 1.000   | 0.447              |
| Poverty    | 18,720 | 0.167  | 0.140  | 0.002   | 0.862   | 0.102              |

*N = number of observations. y = natural log of primary care costs per capita, dependent variable. lnSBA = natural log of skilled birth attendants, which is the percentage of eligible mothers whose delivery was attended by an SBA. PMTCT = percentage of eligible people counseled and tested on the prevention of mother-to-child transmission of the human immunodeficiency virus. OPD = outpatient department rate per capita. LLIN = percentage of long-lasting insecticide nets distributed based on the number of eligible population. Poverty = percentage of people living below the poverty line.*