The Impact of Health Facilities on Child Health

Eric R. Jensen
John F. Stewart

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MEASURE Evaluation
Carolina Population Center
University of North Carolina
at Chapel Hill
123 W. Franklin Street
Suite 304
Chapel Hill, NC 27516
Phone: 919-966-7482
Fax: 919-966-2391
measure@unc.edu
www.cpc.unc.edu/measure

Collaborating Partners:

Macro International Inc.
11785 Beltsville Drive
Suite 300
Calverton, MD 20705-3119
Phone: 301-572-0200
Fax: 301-572-0999
measure@macroint.com

John Snow Research and Training Institute
1616 N. Ft. Myer Drive
11th Floor
Arlington, VA 22209
Phone: 703-528-7474
Fax: 703-528-7480
measure_project@jsi.com

Tulane University
1440 Canal Street
Suite 2200
New Orleans, LA 70112
Phone: 504-584-3655
Fax: 504-584-3653
measure2@tulane.edu

Funding Agency:

Center for Population, Health
and Nutrition
U.S. Agency for
International Development
Washington, DC 20523-3600
Phone: 202-712-4959

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Eric R. Jensen[2]
John F. Stewart[3]

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[1] This project was funded by the United States Agency for International Development through the Measure-Evaluation Project. Correspondence to Jensen, Economics Dept., Box 8795, College of William and Mary, Williamsburg, VA 23187-8795 or eric_jensen@wm.edu.

[2] College of William and Mary
[3] University of North Carolina

The impact of health facilities on child health

Abstract:

Within-family resource allocation plays an important role in child health. Nutrition and other preventive activities make demands on scarce resources, as does the obtaining of curative care when children become ill. While previous work has found impacts of within-household resource allocation on child illness, little effect of such variables on subsequent treatment has been found, and utilization of treatment facilities is low in many developing areas. One possible reason is that treatment costs or quality vary, and these variations are not observable in respondent-based survey data.

We combine the 1993 Philippines DHS data with a facilities survey subsequently conducted for selected survey clusters in order to address in some detail the question of how facility characteristics, including their distance, density, and quality, affect the probability that children receive treatment for respiratory infections and diarrhea. Controlling statistically for the relationship between the initiating illness and subsequent treatment (or lack of it), we find that spending on secondary health facilities, such as hospitals and rural health units, is an important determinant of the probability that ill children receive curative care. Access, measured by respondents' travel times, also plays a role in obtaining treatment.

Where income is low, family resource allocation decisions may lead to unfavorable consequences for children. A case may be made that parents in many cases are fair, even altruistic, allocators of resources under certainty. Even so, poverty coupled with imperfect fertility control or other sources of uncertainty may lead to unsustainably large family sizes, with malnutrition, morbidity, and mortality consequences for children. For example, Jensen and Ahlburg (1999) argued that unwantedness, probably working through child nutrition, is an important determinant of child morbidity. In a group of eleven DHS surveys from Asia, Africa and Latin America and one NFHS state survey, they found a consistent impact of unwantedness on morbidity. In every case, the acute respiratory infection (ARI) morbidity of a child reported unwanted[4] at conception was increased by at least 10% compared to a wanted child, and in many cases, there were similarly large, statistically significant impacts of unwantedness on diarrheal disease.

If resource-availability constraints were in fact tested by unplanned or unwanted births, one would expect that not only the provision of food to children, but also other resource-intensive activities could be reduced as well. One such activity might be the treatment of sick children, either in formal medical settings or in traditional channels. Parents may be altruistic and spread the resource burden of unwantedness over family members, or the burden may be focused on the unwanted child. In either case, one would expect that if curative care makes intensive use of a scarce family resource, increased scarcity should be associated with decreased utilization of health care. Relative scarcity may exist where income is low, where resource demands within the family are high, or where curative care is expensive. The particular resources needed to provide children curative care may differ from the other inputs to children. Providing children nutrition requires income or land, for example. Providing them curative care

[4] They use this term to refer to births that were never wanted, but not to mistimed births.

may be waiting-time or travel-time intensive but, perhaps because of subsidies, not especially expensive.

Various measures of per-capita resource availability within the family, such as the wantedness of a child, the number of siblings, or the income of the family may therefore have implications for treatment. Unwanted children stretch family resources. All else constant, children with many siblings have fewer resources to be spent on them than would children with fewer siblings.[5] However, diseases like diarrhea and especially ARI are contagious, and curing one child carries an external benefit, which grows with the number of siblings. The net impact of increasing numbers of siblings on treatment therefore is ambiguous, according to whether the resource dilution or external benefit effect dominates. All else constant, if treatment requires a cash copayment or if travel to a service delivery point requires a cash payment, children from higher income families are more likely to be treated. The impact of income changes on within-family allocation of curative care is unambiguously positive.[6]

Our goal is to examine the choice to treat a sick child. The decision to seek medical care for a child depends on both demand and supply factors. We begin with the 1993 Demographic and Health Surveys (DHS) data (Philippines National Statistics Office and Macro International, 1994), also known as the Philippines National Demographic Survey. These data provide information about the family's characteristics and health care use patterns, but contain only limited information on treatment facilities. We therefore merge them with data collected by Stewart *et al.* (1997) as part of a study of family planning delivery costs. The key variables contained in this study are cost measures, and we are able to generate measures of resources per capita expended at various clinics. In addition, it is possible to generate some measures representing the quality of care at the facilities. While the focus of their study was family planning providers, almost all health facilities in the Philippines provided family planning, and

[5] If parents base their childbearing on the ability to support their children, this outcome may not obtain.

the key public facilities are all integrated providers of reproductive health and other health care. We then estimate multilevel regression models of treatment for ARI and diarrhea, contingent on illness.

1. Within-family allocations

Within a family, the notion that additional individuals are pressing against fixed resources is intuitively plausible. However, some have argued that resource constraints within the family are at least somewhat flexible. Kelley (1995) argues that if resource constraints do not bind too tightly, parents may be able to forgo their own consumption in favor of their children. Older children may be able to work, and to the extent that their net production is positive, their presence can ease resource constraints. Parents also can influence resource allocation to the advantage of more-favored children (Chen *et al.*, 1981), although this is a strategy which imposes costs, presumably observable, on less-favored children. In addition, parents may (or may not) be able to pass on a share of the costs of additional children to other parties, such as the larger kin grouping, depending on the institutional arrangements prevailing in the area (Desai 1995).

Work has branched in two directions toward analyzing the within-household impacts of large family sizes, often with a focus on education of children as the measure of resources allocated to them. One path focuses on the average well being within families, examining, for example, differences in average educational attainment of children as a function of numbers of siblings. One of the strongest impacts of sibsize on average educational attainment by family members is found in the work of Knodel, Havanon and Sittitrai (1990) for Thailand. This supports the resource dilution model of Judith Blake (1981), in that increasing competition amongst siblings for finite family resources in fact decreases average access to education. Other studies based on essentially similar conceptions of within-family allocation, such as Bauer *et al.*

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[6] This of course assumes that children are normal goods.

(1992) for the Philippines, typically find that children from large families receive less education than do children from small families. However, the effects are often negligibly small, and again, causality is difficult to infer.

It is plausible that parents with a preference for larger families are those who see less need to educate their children, and rather than reflecting a pure causal relationship, the correlation between family size and children's educational attainment is based in part on both variables' response to parental tastes and resource constraints (Becker and Lewis 1973). The unsuitability of empirical models which do not account for the endogeneity of fertility in parents' decisions lies at the heart of reviewers' criticisms of much of the work in the field (*e.g.*, King 1987, Kelley 1995). Models that pay more careful attention to the issue of statistical identification tend to find small effects of family size on household resource allocation. For example, Rosenzweig and Wolpin (1980) use a sample of twin births, and find a small impact of (their relatively pure measure of) exogenous fertility on subsequent educational attainment. Behrman and Wolfe (1987) use a sample of adult sisters toward similar statistical ends, with similar small educational impacts estimated. Work to date has generated little firm support for the notion that negative within-family consequences of family size on the welfare of family members are important, at least when measuring welfare by educational attainment.

Without controls for preferences, the impact of number of siblings on expenditures on children is indeterminate. The work of Rosenzweig and Wolpin (1980) is important in this context, because their focus on the exogenous impact of a twin birth on resource allocation is unique. It allows them to focus upon factors outside of the joint quality-quantity decision of parents in modeling resource allocation to children. Unfortunately, twins normally constitute only about one birth in one hundred, so this is a difficult methodology to extend to many surveys. For example, even a good-sized Demographic and Health Survey is unlikely to have detailed information on more than 50 or so sets of twins. Mothers report unplanned births to be much more common than multiple births. We therefore will employ instruments for wantedness and sibsize, and use them as exogenous determinants of the resources allocated to children.

While demand side factors are clearly crucial, the allocation decision must be made subject to supply side constraints; the availability and quality of services that are accessible to the family. In this study we will construct community level variables to proxy for the total amount of publicly provided heath care resources in the mother's community and the quality of those resources.

2. Study setting and data sources

The Philippines is an archipelagic, Southeast Asian country of approximately 65 million people. While Southeast Asia as a whole showed clear signs of social and economic development during the past two decades, these were generally absent in the Philippine case. Per capita income actually declined during the 1980s due largely to political instability, capital flight, and continuously high levels of population growth. Structural transformation of the economy has been slow, as evinced by a constant or declining proportion of the labor force employed in manufacturing since the 1970s.

Significant health problems can be noted on a number of fronts (cf. Herrin, et al., 1993). The Philippines was unable to achieve any measurable decline in infant mortality during the 1980s, a record which contrasts poorly with the other ASEAN countries. Malnutrition is common and infectious diseases continue to play a major role in the overall mortality and morbidity profiles. By the end of the 1980s government health statistics showed respiratory and diarrheal disease to both rank high among all causes of infant and childhood deaths. As of 1991, more than a third (34.2 percent) of all registered deaths to children under five years of age were attributed specifically to one of these two conditions (Health Intelligence Service, 1994, Tables 17 and 23). Major differentials in infant mortality also exist, with mortality rates being highest in rural areas (especially those located far from Metro Manila, the nation's capital), among poorer and less educated households, and for children born to older, high-parity women (Costello, 1988).

Results from the 1993 National Demographic Survey (National Statistics Office and Macro International Inc., 1994) show several problematic areas with regard to the proximate determinants of child survivorship. More than a third of all Filipino households do not have a flush toilet or an electrical connection. Less than 40 percent have access to potable water. Fertility rates have shown only a moderate decline in the past few decades; and current usage levels for modern contraceptives are low (at about 25 percent of all currently married women in the childbearing ages) (Perez and Palmore, 1995). One consequence of this latter pattern is that a large proportion of Filipino children has been reported as unwanted at the time of their birth.

Government efforts to control infectious disease have concentrated largely upon a Primary Health Care program that emphasizes immunizations, oral rehydration therapy and a network of village-level clinics, known as Barangay Health Stations. This approach has met with only moderate success, perhaps because of the limited resources being made available to the health sector. Total expenditures on health did not exceed 1.7 percent of the gross national product during the 1980s while government spending on health, as measured in constant monetary units and on a per capita basis, failed to show a measurable increase throughout this same period (Herrin et al., 1993, Table 3.1 and Figure 1.19). In recent years the Philippine health system has undergone a number of structural changes. These include the devolution, beginning in 1992, of primary health care service to local government and a major USAID program to use the NGO network to provide primary care through NGO sanctioned and supervised privately operated MCH/FP clinics.

3. Data and methods

The 1993 Philippines National Demographic Survey (Philippines National Statistics Office and Macro International 1994) is a nationally representative survey in the Demographic and Health Surveys series, in which 15,029 women were interviewed. Of these women, 8,961 were married at the time of the survey. Since only married women were asked questions on wantedness, health of the child, and so on, only children of married mothers are included in the analysis. For births in the five years preceding the sample, detailed information on immunization and health were collected. There were 8,803 births to respondents in the five years preceding the survey. Mothers were asked if these children had experienced diarrhea, or cough or fever in the two weeks preceding the survey, as well as what treatments the children were given. Since we are interested in resource constraints, including the intra-household effects of competition among siblings, only children with at least one surviving sibling are included in our sample. In our estimation subsample, 35% of children experienced ARI symptoms, and 7% experienced diarrhea in the two weeks preceding the mother's interview.

Many variables are familiar, but some bear further explanation. The first is our measure of permanent income or wealth. DHS surveys do not collect direct data on income. Instead, they use a collection of questions about asset ownership (vehicles and appliances), and housing quality (roof and floor materials). We have combined the responses to many of these questions, using factor analysis, into a single factor allowing us to control for variations in a fairly large number of asset variables.[7] This variable captures asset ownership, and as such is a proxy for permanent income. There are three variables constructed as provincial-level means: the mean incidence of fever/cough and diarrhea, and the mean travel time to health facilities. These are constructed using responses for children of every eligible respondent in the province except the

[7] The variables used in constructing this factor score are dummies for whether the household has electricity, a stove, a refrigerator, a television, a bicycle, a motorcycle, and a car.

reference birth, and therefore are indicative of the community-level conditions faced by the reference birth. Finally, the DHS question on wantedness comes in a section of the questionnaire extracting detailed information on recent births. The mother is asked whether she wanted the current birth at the time she became pregnant, whether she wanted the birth but would have preferred that it had come later, or whether she would have preferred that the birth had not occurred at all. Roughly 84% of births are classified as wanted at the time of pregnancy or at some future date, which is the definition of wantedness we employ. The unit of observation is the individual child.

The facilities survey of Stewart *et al.* (1997) provides information regarding the amount of resources devoted to and quality of health care service in the barangay containing the DHS cluster and the surrounding municipality. Conducted in the fall of 1996, it covers 253 facilities in 40 of the 750 clusters in the 1993 DHS. In a sampled municipality, all rural health units, at least one barangay health station, and any government hospital either within or nearby were included, as well as several types of private (for profit and NGO) providers. Facility managers were queried on staffing hours and wages, as well as other operational details. We use the resulting labor costs to calculate labor costs by facility type. Where cost information for more than one facility of a given type (barangay health station, for example) exists in a municipality, we calculate a municipality-level mean level of labor costs. The number of publicly funded facilities, disaggregated by type, was also collected as part of this project. We then use average labor costs, multiplied by the number of other facilities of that type, to calculate the total municipality expenditure, by facility type, for each type of public facility. Finally, we scale this to per-capita terms by dividing by the number of women of reproductive age living in the municipality. We also construct a facility quality score as a proxy for the physical capital in place at publicly operated health facilities.[8]

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[8] The variables used in constructing this factor score are five dummies for whether the facility has a

There are two pitfalls to this approach. First is a reduction in sample size, because of the narrower coverage of the facilities survey. After merging these data with the DHS data, we have a sample of just over 800 children. Of these, 284 showed symptoms of ARI and 60 had diarrhea in the two weeks preceding the survey. Second is an inability to say much about private sector characteristics. At least one of every type of public facility existing in each municipality was surveyed, and we have a count of the number of public facilities in each municipality. Our information on the private facilities at which the other children were treated is somewhat spottier. Private facilities were sampled only by convenience, and we have no count of the total number of private facilities. We therefore have no sense of the overall level of expenditures at private facilities in particular municipalities.

It clearly is not feasible to make comparisons between public and private providers in these circumstances. On the other hand, it is not clear that such comparisons would be especially meaningful, were the private-facility data to be available. Costs are difficult to compare between publicly funded and privately funded providers, as a for-profit provider may make more efficient use of resources than a public clinic. The comparison is difficult for-profit and nonprofit providers, for the same reason. Where output measures are available (c.f. Stewart and Guikey 1999), it of course is reasonable to make efficiency comparisons between different providers. The issue here is the use of partial information to make inferences about healthcare availability and quality in a geographic area. While a comparison of labor costs across public facilities in differing municipalities may say something about the level of public resources committed to

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diagnostic lab, a dental clinic, and working electricity, plumbing and telephone. The actual variable we use is this factor times 100, multiplied by the physical volume of the facility, measured in cubic feet per size of client population. We attempt to capture both quality and quantity of capital in this way.

particular areas, it is not clear that such a comparison would be meaningful if done for private providers.[9]

In using only public resource commitments in our empirical work, we are faced with a choice. We can limit our analysis of the determinants of utilization only to users of public facilities, or we can attempt to generalize to the population as a whole. We believe the latter to be the credible choice. In making generalizations to the population as a whole, we are making the implicit assumption that public and private facility placements roughly correspond to one another. While it may be the case that private facilities fill a gap left by the absence of public providers, it seems much more credible that some municipalities have relatively many health facilities, both public and private, and others have relatively few. For example, a public hospital may well have a cluster of private clinics in its immediate vicinity, while a relatively remote municipality may have little more than a barangay health station and perhaps an NGO. In order to be competitive, private facilities faced with high-quality public competition have themselves to be of higher quality, in order to attract patients. Therefore, not only numbers of facilities, public and private, but also their relative quality levels will cluster geographically.

There are potential timing problems with linking the DHS and Stewart *et al*. (1997) data. The DHS was done in late 1993, but the Stewart survey was done in mid-1996. It is unlikely that substantial changes, such as clinics opening or closing, happened in the intersurvey interval. Because we have dates at which surveyed clinics opened, it is straightforward to drop those that were surveyed by Stewart *et al.*, but had not yet opened at the time the DHS was administered.[10] More problematic are those facilities that may have closed after the DHS was administered, but

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[9] Of all ARI episodes in our data, 60% of those children treated were treated at public facilities, and the corresponding figure for diarrhea episodes is 59%. Public facilities treated the majority of cases, but clearly, private facilities are important in treatment of either disease.

[10] Stewart et al. asked when the clinic opened. 13 of the 189 public facilities surveyed opened in 1994 or 1995 (and 17 had missing values or “don’t know” answers and likely opened prior to 1993). These 13 facilities were dropped from our analysis.

before the Stewart *et al.* facilities survey took place. In an era of growing demand, and given that the window of time between the surveys is fairly short, it seems unlikely that too many public facilities would have closed down.

More problematic is the use of 1996 data on prices for service, staffing patterns (e.g., whether there was a doctor on staff), services offered, etc., to explain 1993 behavior. It seems unlikely that staffing patterns, for example, would remain fixed in all facilities over the three-year interval between surveys. In contrast, it does seem likely that most understaffed facilities in 1993 were still understaffed in 1996. In this case, most variation is between, rather than within, delivery points. This suggests that 1996 staffing data are statistically noisy proxies for 1993 staffing data. Under the assumption that the deviation of 1996 from true 1993 staffing is random, standard measurement error techniques, such as instrumental variables estimation, yield consistent parameter estimates. We therefore examine below results based on instruments for expenditures, as well as non-instrumented results.

Brief definitions, means and standard errors for variables used in subsequent analysis appear in Table 1.

(Table 1 about here)

4. Model

We estimate a model of treatment, conditional on illness, which incorporates information about health care facilities. We model two measures of child well-being as functions of child, family and community characteristics: odds of illness with either diarrhea, or fever or cough; and use of curative care for these. Pragmatic concerns dictate this strategy, as diarrhea and respiratory infections are the two illnesses most readily observed in the DHS data. However, we have already noted the sizeable contribution to infant and child mortality in the Philippines of these two diseases, so their policy importance is clear. We construct a model based upon the concept of a child-specific index of "child value", or parents' willingness to commit resources to a particular child. This index is posited to be a function of exogenous individual, household and community (including clinic characteristic) variables. Household resource commitments are measured directly by usage of health care, with associated monetary, time and other costs; and indirectly by the incidence of morbidity.

Define Z_j to be the index value for child *j*, where, for X a vector of family and child-specific values, such as age, educational attainment and wealth holding, *w* a scalar index of wantedness, and *s* a scalar count of sibsize,

$$(1)\ Z_j = f(X,w,s)$$

Define A to be a vector of variables measuring family access to health care of acceptable quality, and R to be a vector measuring risks of illness. Then the following conditions characterize the incidence of illness, curative care, and preventive care for living children:

$$(2)\quad Illness\ observed: I = 1\ if\ Z_1^* \geq Z_1 \mid X, w, s, R$$

$$(3)\quad Treatment\ observed: T = 1\ if\ Z_2^* \leq Z_2 \mid X, w, s, A, I = 1$$

where Z_j* denote unobserved threshold variables. Illness occurs if the index of child value, conditioned on child and family specific covariates and risks of illness, falls below an unobserved threshold value, and curative treatment occurs if child value, conditioned on access, covariates and illness, exceeds a minimum (unobserved) threshold. The presumption is that all else constant, wantedness is associated with decreased odds of illness and, as we have discussed previously, potentially increased odds of curative treatment. Sibsize is assumed to work in the opposite direction for child health, and (again as discussed previously) to have ambiguous effects on curative care usage. Family-level covariates associated with increased wealth, income, or socioeconomic status are expected to reduce illness and to exert positive impacts on treatment, and increases in accessibility (or quality of care) and risk of contagion are presumed to increase the odds of treatment and illness, respectively.

We employ a binary probit model with endogenous selection (van de Ven and van Praag 1981), to account for the nonrandom selection into child illness that must precede treatment. We employ a full-information estimator in which the parameters of a probit outcome equation and a probit selection equation are jointly estimated. We identify the model with the exclusion of access measures from the illness equation.

The differing levels of aggregation of the data – individual and municipality – imply that some account should be taken of the multilevel nature of the error structure. It is well known that the incorporation of covariates representing varying levels of aggregation into linear models creates downward bias in the variance estimators of some coefficients (Moulton 1990, Goldstein 1995, Rodriguez and Goldman 1995, Bryk and Raudenbush 1992). The key issue is that observations tied at some higher level of aggregation (*e.g.*, community characteristics in a model of individual behavior) are likely to share certain unobserved characteristics over observations in the same community, implying that the Gauss-Markov assumption of uncorrelated regression disturbances is likely to be violated. In a linear model, failure to account for such an error structure would lead to underestimates of standard errors and overstatement of *t* statistics. In a nonlinear model such as ours, all parameter estimators would be inconsistent. Therefore, in our statistical work, we explicitly allow for correlation between errors within municipalities. As mentioned above, we employ instruments for our facilities measures. We also instrument for wantedness and sibsize, because of potential simultaneity between these variables and child health.

5. Results

We have three main findings. First, the characteristics of provision points are important determinants of whether or not parents bring their ill children in for treatment. Facilities located in municipalities with higher labor expenditures on clinic staff are those where, all else constant, both ARI and diarrhea are more likely to be treated at a health facility. The quality of physical facilities also may play some role in the ARI treatment decision. Second, respondents' travel times to the nearest health facility influence treatment probabilities as well. A behavioral model consistent with these two findings is one in which parents care about ease of access, but also about other dimensions of quality of care. The expenditure variable, as the sum of labor expenditures per capita at government health facilities, measures both level and intensity differences in expenditures. One municipality may have high expenditures because there are many staff members, while another may have high expenditures because they have a mix of staff that favors more expensive personnel, such as physicians. Either may reasonably be interpreted as indicative of differences in quality, as may the factor score for physical facility characteristics we define. Our third main finding is that instrumenting for expenditures causes the coefficient roughly to double. The bias toward zero in the uninstrumented coefficients is consistent with classical measurement error in expenditures, which was our original reason for instrumenting. As we discuss below, other sources of inconsistency, such as endogenous program placement, may also account for the difference between the instrumented and non-instrumented results.

Because our focus is on treatment, we present a selected set of coefficients highlighting the results for access and for resources. We present only results from the treatment equation. Complete results, including representative estimates for the selection equations, are presented in the appendix. That said, we note that the key determinants of child illness were child age, with illness peaking around the age of weaning, and household income. As a test of the identifying restrictions excluding access variables from the selection equations, these variables were included in initial specifications of the illness equations. In no instance were their coefficients statistically different from zero at the 5% level. Similarly, there were no cases in which variables from the selection equations omitted from the treatment equations, (areal disease prevalence and household toilet facilities) were statistically significant, when inserted into the treatment equations.

Tables 2 through 5 present regression summaries for selected variables, for models of the treatment of ARI and diarrhea symptoms. In Table 2, we present several specifications for models of ARI treatment that rely only on labor expenditures. Table 3 is the comparable table for diarrhea. In Table 4, we add a facility quality score, as a proxy for capital, to the models of ARI treatment; and Table 5 is the comparable table for diarrhea treatment. We present the coefficients as marginal effects evaluated at sample means, with appropriately scaled standard errors. These marginal effects are interpreted as the change in the probability that an ill child receives treatment resulting from a unit change in the covariate, all else constant.[11] For each disease, we present several specifications. In the first, we measure access to treatment solely by reported travel time. These data all are available directly from the DHS. In the next several, we employ alternative measures of expenditure gleaned from the facilities survey data. We use municipality-level labor expenditures per capita for three groups of facilities. The first expenditure specification (column 3) uses labor expenditures at all publicly funded health provision points. The second (column 4) uses only labor expenditures on staff at primary provision points, namely, barangay health stations and maternal health centers. The last of this group, in column 5, uses only labor expenditures on staff at public provision points which, ideally, function as referral facilities. This includes public hospitals and rural health units. The next column combines the DHS access measure with the measure from column 3, all labor

[11] Note that unit change can be very large, as in the case of the wealth index or any of the categorical variables, or relatively small, as in the case of travel time.

expenditures on health personnel. The final four columns represent the same four expenditure specifications, except that instruments were employed for the expenditure variables.

The wantedness and number of siblings instruments in the underlying probit models were based on regressions on family and individual-level variables. These included the covariates of the treatment equation, as well as a dummy variable for whether the wife used prenatal care, dummy variables for region of residence, old-age support expected from kids, birthweight ranges, and whether the child was one of a multiple birth. The expenditures and capital proxy instruments use district-level data on local population size and dummy variables for whether the locality is in the Visayas or Mindanao.

Each cell presents the marginal effects and *p*-values (for tests against two-tailed alternatives) for the relevant expenditure variables. The model is estimated as a two-equation probit model with endogenous selection (through illness) into risk of treatment. Because probits are nonlinear, the marginal effect of a covariate varies according to where it is evaluated. We evaluate the marginal effects at sample means, and present the appropriate probability value for a two-tailed alternative hypothesis. A coefficient of .000 means that the coefficient rounds to less than .001, and a *p*-value of .00 means that the actual value is less than .005.

(Tables 2 - 5 here)

In Table 2, the estimated marginal effects of labor expenditures for the non-instrumented specifications generally are positive. The exception is when the expenditure variable constitutes labor expenditures on primary facility (barangay health center, barangay health station and maternal health center) staff. In neither specification in which it appears is primary facility labor expenditure a significant determinant of utilization for ARI. Expenditures on staff at secondary facilities, on the other hand, are highly statistically significant in the non-instrumented specification. In no instance are the estimated coefficients of expenditures statistically significant when instrumental variables are used for expenditures. In every case, however, this is because the coefficient is estimated much less precisely in the latter specification. For both secondary and total expenditures, the instrument's coefficient is twice as large as the non-instrumented coefficient. Our justification for instrumenting was the possibility of measurement error in expenditures, induced by the time lag between surveys. The relative magnitudes of the coefficients are consistent with classical measurement error[12], providing some justification for the use of instruments. The results for per-capita labor expenditures for all staff at all facilities mirror the results for secondary facilities, suggesting that staff expenditures at the secondary facilities drive the overall result. The introduction of travel time to the models slightly reduces the estimated effect of labor expenditures on utilization, but the own coefficient of this variable is not statistically significant.

The magnitudes of the partial effects are fairly small. The municipality mean total expenditure on health facility personnel per capita was about 12 pesos. While the resulting values are too far from the sample means to be completely credible, doubling a covariate and examining its impact through the marginal effect is a useful device. Using the marginal effect from the instrumental variables "all expenditures" specification, a doubling of labor expenditures would yield an increase in the proportion of children ill with ARI symptoms receiving treatment of 12*.004, or 0.048. The proportion of children ill with ARI symptoms who receive treatment in our data is roughly 0.48, implying that a doubling of labor expenditures would yield an increase of about 10% in treatment probabilities. We estimate that the partial effect for secondary facility labor expenditures is equally large. If so, this implies that the same 10% increase in treatment probabilities may be generated with a doubling only of these facilities' staffs.

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[12] Of course, other sources of inconsistency, such as endogenous program or staff placement, could also account for the difference between instrumented and non-instrumented coefficients.

Travel time is measured in minutes. To generate a comparable increase in treatment probabilities would require a reduction of about 50 minutes in mean travel time, given the estimated marginal effect for travel time of less than .001. Mean travel time is only about 40 minutes in our sample[13], a fact which highlights the difficulties both of increasing utilization through reducing travel times and of linear extrapolations far from the values at which functions are evaluated. A counterfactual simulation, based on the total expenditure coefficients, in which travel time was set to zero showed an increase of 3.5% in treatment probabilities.[14]

Looking across the different specifications in the first row of Table 3 shows a similar, though perhaps less statistically noisy pattern of marginal effects of labor expenditures per capita on treatment for diarrhea. Labor expenditures at primary facilities have no statistically significant impact on the probability a child receives diarrhea treatment. As with ARI treatment, labor expenditures at secondary facilities have partial effects that roughly mirror those of all labor expenditures. As with ARI treatment, the instrumented variables' partial effects are again roughly double those of their uninstrumented counterparts. The addition of travel time slightly reduces the magnitude of the partial effect of staffing expenditures on diarrhea treatment in the instrumented specification, but the travel time effect is itself highly significant. The marginal effects of most variables are somewhat larger for diarrhea treatment than for ARI treatment. Taking the estimated instrumental variable coefficient for all expenditures (0.009) and doubling expenditures yields an estimated increase of 0.12 in the proportion of children with diarrhea

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[13] Our sample is somewhat more urbanized than the full DHS sample, because of the distribution of surveyed facilities.

[14] We employ marginal effects throughout the paper in our discussion of results. The benefit is that they are easily discussed and compared. The cost is that, being linear approximations of nonlinear functions, their inaccuracy grows with distance from the sample means. So for example, if labor expenditures at all facilities were to double, our model yields a projected probability (based on this counterfactual) which is only a little over 4% greater than the baseline figure, and not the 10% of the marginal effect. Both are based on extrapolation far enough from our actual observations to be interpreted with caution. In the context of comparison with reductions in travel time, the important point may be that there is no ceiling on utilization increases through labor spending increases, as there must be (when travel time falls to zero) when decreasing travel times.

receiving treatment. The mean proportion receiving treatment in our data was 0.59, implying that a doubling in labor expenditures would yield roughly a 20% increase in the probability of receiving treatment for diarrhea.

Except for the impact of labor expenditures and travel time on treatment, the two diseases' treatments have very different determinants. Wealth, which is our proxy for permanent income, and mother's education both are significant determinants of treatment for ARI. ARI treatment often involved receiving an antibiotic. This may be relatively costly, and therefore would be more likely to occur where incomes are higher. Similarly, more educated mothers may better understand the principles of treating their children. On the other hand, in almost none of the specifications for ARI treatment were the number of siblings or sex of the child important determinants.

Diarrhea treatment seems to have little systematically driving it, apart from labor expenditures at facilities and access times, and perhaps wealth. There are several possible reasons for this. The first is that the sample is small. In the geographic areas for which we have cost data, only 60 children were ill with diarrhea in the pre-survey period. Of course, the coefficients of access and expenditures *were* statistically significant, so there may be other issues. Costello and Lleno (1995), who note that utilization in the Philippines of the correct curative protocol for diarrhea is low, raise one. Oral rehydration salts are very cheap, readily available, and easy to use, but only about one fourth of children with diarrhea received them. Over half of those treated received antibiotics or what the DHS coded as "other pills", which are expensive and no more effective (at best) than ORS for the treatment of diarrhea. Costello and Lleno conjecture that this is demand-driven, in that some parents insist on antibiotics if they are going to take their child in for treatment. We estimate a large, but often noisy, marginal effect for our income proxy in the diarrhea treatment equations, which is consistent with this sort of behavior in some fraction of the population.

A measure of total labor resources devoted to health care provision in the municipality is fairly straightforward to calculate, by counting labor units and applying some sort of unit cost. The more disaggregated the count, the more convincing the result. Capital, which consists of both equipment and physical space is more problematic. While inventories of equipment and measures of physical space were collected in the facilities survey, it was not deemed reasonable to try and construct a total value of capital stock variable. For these reasons, our analysis of the impact that capital at medical facilities had on the decision to seek care is limited to a proxy for the overall quality of the physical facilities, based upon a rotated factor score for several characteristics of publicly operated service providers in the municipality: the fractions with working electricity, functioning water supplies, operable telecommunications equipment, diagnostic laboratories, and dental clinics. Because we trust our labor estimates more than our capital estimates, we have separated results that make use of the capital proxy from those that do not. In tables 4 and 5, we repeat the analysis of Tables 2 and 3, but with a proxy for capital added in. This proxy is the factor score just described, multiplied by the volume of the facility, and divided by the size of the client population. In rough terms, we intend for the proxy to be the quality-weighted quantity of capital available per potential user. The overall mean of this variable is zero, and the standard deviation is .82. The mean value for hospitals 0.29, for maternal health centers 0.14, for rural health units 0.09, for barangay health centers –0.165, and for barangay health stations -0.56. As a rough proxy for the quantity and condition of the capital in place at various facilities, this seems to be a reasonable rank ordering.

Our previous results are largely robust to the addition of the capital proxy to the estimation. For ARI, Table 4 shows that increases in labor expenditures, particularly those at hospitals and rural health units, are associated with increases in treatment (the key exception being, as usual, the specification that relies on only primary facility labor expenditures). In every specifications, higher values of our capital proxy are associated with increases in the probability that a child receives treatment. However, the effect is rarely statistically significant. When we instrument for capital and labor expenditures, we again find marginal effects that are roughly twice the magnitude of the non-instrumented results, suggesting that measurement error or some other source of inconsistency is operating on our capital proxy as well as our labor proxy. The effects of the other covariates on ARI treatment are much the same as in the specifications which omit the capital proxy.

For diarrhea, Table 5 shows the same pattern as did Table 3. Estimates of the impact of labor expenditures are of comparable magnitude to those of Table 3, but often estimated more precisely than in the specification that omits capital. Again, the instrumented coefficients are substantially larger than those from the specification without instruments. Travel time impacts are of comparable size to the non-instrumented specification. Facility quality seems to play little role in diarrhea treatment, and, again as previously, the other covariates play no role in explaining diarrhea treatment.

6. Discussion

In the Philippines, as in many countries, utilization of health care is low. Roughly half of children aged 0-4 with diarrhea in the two weeks preceding the survey we employ were taken for care, even though oral rehydration solution, the recommended treatment protocol for most diarrhea, is extremely inexpensive and easy to administer. Only 61% of children aged 0-4 with symptoms of acute respiratory infection received medical care. Yet the Philippines follows the common model of cheap, easily available primary care, which, all else constant, should lead to high utilization, as fees, travel time, and other costs are all very low. We find that access costs do play some role, as travel time often has a statistically significant and negative coefficient in regressions of treatment probabilities. However, travel times are short, averaging less than an hour. Coupled with the small magnitude of the estimated effect of travel time on treatment, the potential role that reductions in travel time might play in increasing utilization seems small.

Our results are consistent with the contention that what goes on inside the clinics is an important determinant of utilization. Our measures of facility inputs, namely total labor expenditure and a factor score for facility quality, show substantial impacts on the probability that a sick child is taken in for treatment. Labor expenditures are municipality means, and so when high may reflect a high level of overall spending, or a mix of personnel skewed in favor of more expensive (and presumably better qualified) personnel. It seems likely that the latter is operating, as increasing overall spending while keeping staffing patterns the same is really just increasing the density of facilities, which would presumably be at least partially captured in the travel time variable. Another quality-related possibility suggested by our findings is that labor expenditures on primary care facilities do not affect utilization, but staff expenditures at referral centers do. The factor score we use as a proxy for capital is somewhat noisy, but even it may show some response to facility quality by parents. Taken together, our findings imply that the real access issue may be one of access to facilities that meet the quality standards of parents, rather than one of access to any facility at all.

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Table 1
Descriptive Statistics

Variable	Definition	Mean	Std. Deviation
ARI	Fever or cough in the 2 weeks preceding the survey	.346	.476
Diarrhea	Diarrhea in the 2 weeks preceding the survey	.073	.260
ARI treated	Equals 1 if modern ARI treatment received, 0 else	.618	.487
Diarrhea treated	Equals 1 if modern diarrhea treatment received, 0	.541	.502
Wealth	Factor score for wealth based on asset ownership	.178	.806
Wife's education	Wife's education, in years	9.25	4.70
Wife's age	Wife's age, in years	30.00	6.27
Husband's education	Husband's education, in years	8.39	3.65
Wanted child	Equals 1 if the child was reported wanted, either then or later, by the mother at the time of conception	.877	.329
Child age	Child's age, in years, at the survey date	2.40	1.39
Male	Equals 1 if the child was male	.52	.50
Water	Equals 1 if the household had access to piped water	.112	.316
Toilet	Equals 1 if the household had a flush toilet	.787	.410
Siblings	Number of living siblings (of the child)	2.16	2.20
Urban	Equals 1 if the household was in an urban area	.706	.456
Travel time	Mean travel time, in minutes, from survey cluster to nearest health facility, as reported by mothers	33.44	29.51
Mean labor expenditures per catchement area population, by facility type (pesos):			
BHS	Barangay Health Station	1.46	2.50
Hospital	Government hospital	2.97	8.61
RHU	Rural Health unit	2.70	4.92
MHC	Maternal Health Center	2.46	2.71
BHC	Barangay Health Center	2.99	4.02

Table 2
Selected regression results for ARI treatment, without capital proxy

		Actual expenditures				**Instrumented expenditures**			
Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time
Labor expenditures per capita		.002 (.00)	.004 (.36)	.002 (.00)	.002 (.05)	.004 (.18)	-.048 (.07)	.004 (.21)	.003 (.18)
Travel time	-.000 (.03)				-.000 (.18)				-.000 (.15)
Wealth	.092 (.00)	.085 (.00)	.093 (.08)	.092 (.00)	.072 (.01)	.072 (.01)	-.005 (.93)	.072 (.01)	.072 (.00)
Wife's education	.013 (.04)	.013 (.01)	.015 (.19)	.015 (.01)	.011 (.06)	.011 (.02)	.008 (.36)	.012 (.01)	.011 (.01)
Number of siblings	.041 (.19)	.030 (.14)	.047 (.37)	.031 (.25)	.031 (.29)	.021 (.53)	-.077 (.35)	.011 (.78)	.014 (.70)
Male child	.016 (.49)	.012 (.44)	.019 (.64)	.019 (.64)	.005 (.79)	.008 (.64)	.017 (.71)	.008 (.65)	.007 (.74)

Notes: The body of the table presents marginal effects, evaluated at the sample means, of a unit change in covariates on the probability of a child receiving treatment. The marginal effects are based upon the coefficients from the treatment regressions in a two-equation model of treatment, conditioned on illness. Probability values are presented in parentheses, and are appropriate for a two-tailed alternative hypothesis. Standard errors are robust, and based on a clustering correction reflecting the multilevel nature of the data. Full regression results are presented in the Appendix. There were 809 children in the sample, 284 of whom had ARI symptoms reported. Of these, 61% received treatment. Instruments for number of siblings and the wantedness status of the child (not presented here) were employed in all specifications.

Table 3
Selected regression results for diarrhea treatment, without capital proxy

		Actual expenditures				Instrumented expenditures			
Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time
Labor expenditures per capita		.005 (.01)	-.008 (.81)	.007 (.01)	.004 (.00)	.009 (.01)	.015 (.61)	.014 (.07)	.008 (.07)
Travel time	-.004 (.01)				-.003 (.00)				-.003 (.01)
Wealth	.132 (.04)	.131 (.05)	.205 (.19)	.155 (.07)	.091 (.01)	.124 (.06)	.085 (.47)	.149 (.22)	.128 (.03)
Wife's education	-.011 (.20)	-.004 (.65)	-.008 (.68)	-.004 (.73)	-.006 (.16)	-.007 (.43)	-.004 (.74)	-.008 (.55)	-.011 (.18)
Number of siblings	.104 (.19)	.095 (.22)	.056 (.75)	.109 (.25)	.101 (.03)	.055 (.38)	.053 (.68)	.049 (.65)	.089 (.17)
Male child	.082 (.13)	.081 (.11)	.114 (.34)	.100 (.12)	.060 (..02)	.097 (.09)	.050 (.58)	.124 (.23)	.102 (.06)

Notes: The body of the table presents marginal effects, evaluated at the sample means, of a unit change in covariates on the probability of a child receiving treatment. The marginal effects are based upon the coefficients from the treatment regressions in a two-equation model of treatment, conditioned on illness. Probability values are presented in parentheses, and are appropriate for a two-tailed alternative hypothesis. Standard errors are robust, and based on a clustering correction reflecting the multilevel nature of the data. Full regression results are presented in the Appendix. There were 822 children in the sample, 60 of whom had diarrhea symptoms reported. Of these, 54% received treatment. Instruments for number of siblings and the wantedness status of the child (not presented here) were employed in all specifications.

Table 4

Selected regression results for ARI treatment, with capital proxy

		Actual expenditures and facility scores				**Instrumented expenditures and facility scores**			
Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time
Labor expenditures per capita		.002 (.04)	.004 (.20)	.002 (.01)	.002 (.03)	.004 (.05)		.005 (.03)	.005 (.01)
Facility quality score	.012 (.17)	.001 (.91)	.006 (.74)	.010 (.45)	.009 (.40)	.016 (.14)		.023 (.02)	.023 (.02)
Travel time	-.001 (.04)				-.001 (.13)				-.000 (.51)
Wealth	.075 (.00)	.069 (.01)	.090 (.00)	.087 (.00)	.073 (.00)	.074 (.01)		.074 (.00)	.074 (.01)
Wife's education	.010 (.01)	.010 (.04)	.014 (.04)	.013 (.02)	.010 (.04)	.011 (.01)		.012 (.01)	.011 (.01)
Number of siblings	.042 (.09)	-.002 (.53)	.049 (.14)	.036 (.16)	.038 (.20)	.036 (.27)		.025 (.44)	.027 (.43)
Male child	.006 (.63)	.002 (.89)	.017 (.45)	.014 (.45)	.005 (.76)	.009 (.57)		.008 (.62)	.007 (.88)

Notes: The body of the table presents marginal effects, evaluated at the sample means, of a unit change in covariates on the probability of a child receiving treatment. The marginal effects are based upon the coefficients from the treatment regressions in a two-equation model of treatment, conditioned on illness. Probability values are presented in parentheses, and are appropriate for a two-tailed alternative hypothesis. Standard errors are robust, and based on a clustering correction reflecting the multilevel nature of the data. Full regression results are presented in the Appendix. There were 809 children in the sample, 284 of whom had ARI symptoms reported. Of these, 61% received treatment. Instruments for number of siblings and the wantedness status of the child (not presented here) were employed in all specifications. The IV estimator for primary facility expenditures was highly unstable, probably because the correlation between the instruments for expenditures and quality was 0.985, and the results are not reported for this column.

Table 5
Selected regression results for diarrhea treatment, with capital proxy

		Actual expenditures and facility scores				Instrumented expenditures and facility scores			
Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time
Labor expenditures per capita		.007 (.01)	.001 (.99)	.010 (.01)	.005 (.00)	.011 (.04)	.027 (.51)	.016 (.04)	.009 (.02)
Facility quality score	-.054 (.65)	-.069 (.51)	-.130 (.40)	-.058 (.60)	-.013 (.70)	-.029 (.77)	-.069 (.64)	-.026 (.81)	-.012 (.81)
Travel time	-.005 (.04)				-.003 (.00)				-.003 (.00)
Wealth	.170 (.18)	.188 (.08)	.227 (.26)	.197 (.09)	.103 (.01)	.150 (.14)	.144 (.25)	.166 (.17)	.137 (.01)
Wife's education	-.014 (.43)	-.005 (.73)	-.008 (.69)	-.004 (.77)	-.007 (.17)	-.008 (.56)	-.007 (.68)	-.009 (.58)	-.012 (.09)
Number of siblings	.125 (.39)	.122 (.33)	.056 (.77)	.127 (.31)	.113 (.02)	.060 (.54)	.081 (.64)	.049 (.65)	.093 (.08)
Male child	.107 (.31)	.117 (.15)	.129 (.35)	.128 (.13)	.069 (.01)	.119 (.17)	.094 (.41)	.138 (.17)	.109 (.02)

Notes: The body of the table presents marginal effects, evaluated at the sample means, of a unit change in covariates on the probability of a child receiving treatment. The marginal effects are based upon the coefficients from the treatment regressions in a two-equation model of treatment, conditioned on illness. Probability values are presented in parentheses, and are appropriate for a two-tailed alternative hypothesis. Standard errors are robust, and based on a clustering correction reflecting the multilevel nature of the data. Full regression results are presented in the Appendix. There were 822 children in the sample, 60 of whom had diarrhea symptoms reported. Of these, 54% received treatment. Instruments for number of siblings and the wantedness status of the child (not presented here) were employed in all specifications.

Table A1—Determinants of illness

Marginal Effect (*p*-value)	**ARI**	**Diarrhea**
Wealth	-.089 (.00)	-.038 (.04)
Wife's Education	-.003 (.59)	.002 (.45)
Wife's Age	-.004 (.29)	.000 (.87)
Husband's Education	.007 (.44)	.000 (.73)
Wanted Child	-.065 (.44)	.016 (.42)
Child Age	.045 (.34)	-.006 (.76)
Child Age Squared	-.018 (.05)	-.000 (.94)
Male	.048 (.02)	-.005 (.78)
Water	-.007 (.91)	-.024 (.32)
Toilet	.016 (.78)	.004 (.86)
Mean areal ARI prevalence	.824 (.00)	
Siblings	-.000 (.98)	-.000 (.95)
Mean areal diarrhea prevalence		.706 (.00)

Note: This table presents the marginal effect on child illness of the set of covariates used in the selection equations estimated jointly with the treatment equations presented subsequently. As such, they are representative of the underlying selection mechanism. Each selection equation, because it is estimated jointly with the parameters of an accompanying treatment equation, will differ from those presented here. Because they are of limited relevance to the paper, the separate selection equations are not presented.

Table A2 – ARI treatment, no IV for labor expenditures

Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time
Wealth	.092 (.00)	.085 (.00)	.093 (.08)	.092 (.00)	.072 (.01)
Wife's Education	.013 (.04)	.013 (.01)	.015 (.19)	.015 (.01)	.011 (.06)
Husband's Education	.010 (.21)	.008 (.17)	.010 (.38)	.010 (.13)	.006 (.22)
Wife's Age	-.002 (.72)	-.001 (.76)	-.002 (.81)	-.002 (.66)	-.000 (.95)
Wanted Child	.270 (.47)	.142 (.66)	.317 (.67)	.099 (.80)	.265 (.59)
Child Age	-.005 (.90)	-.015 (.62)	-.009 (.90)	-.013 (.74)	-.014 (.77)
Child Age Squared	.004 (.60)	.006 (.29)	.005 (.72)	.006 (.45)	.007 (.44)
Male	.016 (.49)	.012 (.44)	.019 (.64)	.017 (.44)	.005 (.79)
Siblings	.041 (.19)	.030 (.14)	.047 (.37)	.031 (.25)	.031 (.29)
Urban	-.085 (.07)	-.044 (.23)	-.073 (.33)	-.051 (.18)	-.037 (.28)
Labor Expenditures (vary by column)		.002 (.00)	.004 (.36)	.002 (.00)	.002 (.05)
Intercept	-.182 (.69)	-.118 (.75)	-.305 (.73)	-.072 (.88)	-.199 (.73)
Travel time	-.000 (.03)				-.000 (.18)

Table A3 – Diarrhea treatment, no IV for labor expenditures

Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time
Wealth	.132 (.04)	.131 (.05)	.205 (.19)	.155 (.07)	.091 (.01)
Wife's Education	-.011 (.20)	-.004 (.65)	-.008 (.68)	-.004 (.73)	-.006 (.16)
Husband's Education	.015 (.28)	.003 (.86)	.012 (.75)	.005 (.80)	.008 (.24)
Wife's Age	-.007 (.22)	-.003 (.63)	-.011 (.48)	-.005 (.58)	-.003 (.28)
Wanted Child	1.553 (.19)	1.473 (.20)	.833 (.74)	1.637 (.24)	1.486 (.04)
Child Age	-.082 (.45)	-.094 (.38)	-.151 (.57)	-.129 (.35)	-.060 (.21)
Child Age Squared	.018 (.45)	.021 (.36)	.026 (.64)	.027 (.36)	.016 (.16)
Male	.082 (.13)	.081 (.11)	.114 (.34)	.100 (.12)	.060 (.02)
Siblings	.104 (.19)	.095 (.22)	.056 (.75)	.109 (.25)	.101 (.03)
Urban	-.136 (.03)	-.022 (.64)	-.170 (.28)	-.032 (.58)	-.042 (.07)
Labor Expenditures (vary by column)		.005 (.01)	-.008 (.81)	.007 (.01)	.004 (.00)
Intercept	-.901 (.49)	-1.135 (.40)	-.073 (.98)	-1.224 (.50)	-1.119 (.15)
Travel Time	-.004 (.01)				-.003 (.00)

Table A4 –ARI treatment, with IV for labor expenditures

Marginal Effect (*p*-value)	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time
Wealth	.072 (.01)	-.005 (.93)	.072 (.01)	.072 (.00)
Wife's Education	.011 (.02)	.008 (.36)	.012 (.01)	.011 (.01)
Husband's Education	.005 (.30)	.013 (.30)	.005 (.35)	.006 (.16)
Wife's Age	-.000 (.95)	-.011 (.01)	-.000 (.91)	-.000 (.89)
Wanted Child	.127 (.81)	-1.754 (.21)	-.027 (.96)	.036 (.95)
Child Age	-.014 (.76)	-.002 (.97)	-.017 (.71)	-.012 (.67)
Child Age Squared	.006 (.45)	-.008 (.44)	.006 (.44)	.005 (.26)
Male	.008 (.64)	.017 (.71)	.008 (.65)	.007 (.74)
Siblings	.021 (.53)	-.077 (.35)	.011 (.78)	.014 (.70)
Urban	-.026 (.45)	-.031 (.74)	-.024 (.47)	-.039 (.21)
Labor Expenditures (vary by column)	.004 (.18)	-.048 (.07)	.004 (.21)	.003 (.18)
Intercept	-.107 (.86)	1.988 (.21)	.079 (.91)	.042 (.95)
Travel Time				-.000 (.15)

Table A5 –Diarrhea treatment, with IV for labor expenditures

Marginal Effect (*p*-value)	All expenditures	BHS, BHC and MHC expenditures only	RHU and hospital expenditures only	All expenditures with travel time
Wealth	.124 (.06)	.085 (.47)	.149 (.22)	.128 (.03)
Wife's Education	-.007 (.43)	-.004 (.74)	-.008 (.55)	-.011 (.18)
Husband's Education	.011 (.44)	.003 (.89)	.016 (.56)	.019 (.13)
Wife's Age	-.009 (.13)	-.003 (.78)	-.013 (.25)	-.011 (.05)
Wanted Child	.691 (.43)	.789 (.66)	.537 (.72)	1.189 (.22)
Child Age	-.126 (.21)	-.036 (.85)	-.185 (.34)	-.130 (.19)
Child Age Squared	.023 (.30)	.008 (.85)	.033 (.44)	.026 (.25)
Male	.097 (.09)	.050 (.58)	.124 (.23)	.102 (.06)
Siblings	.055 (.38)	.053 (.68)	.049 (.65)	.089 (.17)
Urban	-.081 (.03)	-.054 (.50)	-.102 (.13)	-.130 (.00)
Labor Expenditures (vary by column)	.009 (.01)	.015 (.61)	.014 (.07)	.008 (.07)
Intercept	-.2224 (.83)	-.552 (.79)	.093 (.96)	-.511 (.64)
Travel Time				-.003 (.01)

Table A6 – ARI with capital proxy, no instruments

Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures	RHU and hospital expenditures only	All expenditures with travel time
Wealth	.075 (.00)	.069 (.01)	.090 (.00)	.087 (.00)	.073 (.00)
Wife's Education	.010 (.01)	.010 (.04)	.014 (.04)	.013 (.02)	.010 (.04)
Husband's Education	.008 (.01)	.004 (.43)	.010 (.20)	.009 (.18)	.007 (.10)
Wife's Age	-.000 (.97)	.003 (.30)	-.002 (.76)	-.001 (.78)	-.000 (.99)
Wanted Child	.422 (.28)	.010 (.73)	.371 (.47)	.217 (.60)	.370 (.44)
Child Age	-.011 (.64)	-.021 (.55)	-.010 (.81)	-.014 (.69)	-.014 (.73)
Child Age Squared	.006 (.12)	.007 (.31)	.006 (.53)	.006 (.39)	.007 (.33)
Male	.006 (.63)	.002 (.89)	.017 (.45)	.014 (.45)	.005 (.76)
Siblings	.042 (.09)	-.002 (.53)	.049 (.14)	.036 (.16)	.038 (.20)
Urban	-.056 (.01)	-.031 (.22)	-.070 (.13)	-.048 (.20)	-.043 (.12)
Labor Expenditures (vary by column)		.002 (.04)	.004 (.20)	.002 (.01)	.002 (.03)
Facility Quality	.012 (.17)	.001 (.91)	.006 (.74)	.010 (.45)	.009 (.40)
Intercept	-.337 (.44)	.020 (.83)	-.354 (.52)	-.185 (.67)	-.312 (.57)
Travel Time	-.001 (.04)				-.001 (.13)

Table A7 – Diarrhea with capital proxy, no instruments

Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures	RHU and hospital expenditures only	All expenditures with travel time
Wealth	.170 (.18)	.188 (.08)	.227 (.26)	.197 (.09)	.103 (.01)
Wife's Education	-.014 (.43)	-.005 (.73)	-.008 (.69)	-.004 (.77)	-.007 (.17)
Husband's Education	.023 (.43)	.008 (.78)	.018 (.68)	.010 (.74)	.010 (.20)
Wife's Age	-.010 (.44)	-.005 (.66)	-.010 (.53)	-.007 (.59)	-.004 (.27)
Wanted Child	1.870 (.39)	1.882 (.30)	.889 (.75)	1.886 (.30)	1.660 (.03)
Child Age	-.138 (.57)	-.176 (.37)	-.227 (.46)	-.199 (.34)	-.075 (.22)
Child Age Squared	.028 (.59)	.036 (.37)	.039 (.5)	.040 (.35)	.019 (.17)
Male	.107 (.31)	.117 (.15)	.129 (.35)	.128 (.13)	.069 (.01)
Siblings	.125 (.39)	.122 (.33)	.056 (.77)	.127 (.31)	.113 (.02)
Urban	-.185 (.09)	-.037 (.59)	-.169 (.22)	-.050 (.49)	-.051 (.04)
Labor Expenditures (vary by column)		.007 (.01)	.001 (.99)	.010 (.01)	.005 (.00)
Facility Quality	-.054 (.65)	-.069 (.51)	-.130 (.40)	-.058 (.60)	-.013 (.70)
Intercept	-1.114 (.66)	-1.498 (.49)	-.292 (.93)	-1.445 (.51)	-1.261 (.12)
Travel Time	-.005 (.04)				-.003 (.00)

Table A8 – ARI with capital proxy, with instruments for labor and capital measures

Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures[15]	RHU and hospital expenditures only	All expenditures with travel time
Wealth	.075 (.00)	.074 (.01)		.074 (.00)	.074 (.01)
Wife's Education	.010 (.00)	.011 (.01)		.012 (.01)	.011 (.01)
Husband's Education	.008 (.01)	.007 (.13)		.007 (.13)	.008 (.25)
Wife's Age	-.000 (.97)	-.000 (.91)		-.001 (.89)	-.000 (.88)
Wanted Child	.422 (.28)	.303 (.54)		.141 (.77)	.185 (.72)
Child Age	-.011 (.64)	-.014 (.72)		-.018 (.64)	-.014 (.65)
Child Age Squared	.006 (.12)	.006 (.35)		.007 (.30)	.006 (.25)
Male	.006 (.63)	.009 (.57)		.008 (.62)	.007 (.88)
Siblings	.042 (.09)	.036 (.27)		.025 (.44)	.027 (.43)
Urban	-.056 (.01)	-.035 (.24)		-.036 (.22)	-.051 (.08)
Labor Expenditures (vary by column)		.004 (.05)		.005 (.03)	.005 (.01)
Facility Quality	.012 (.17)	.016 (.14)		.023 (.02)	.022 (.15)
Intercept	-.337 (.44)	-.301 (.60)		-.111 (.84)	-.129 (.82)
Travel Time	-.001 (.04)				-.000 (.51)

[15] The correlation between the instruments for labor expenditures and facility quality was .985 in this instance, making the estimator highly unstable.

Table A9 – Diarrhea with capital proxy, with instruments for labor and capital measures

Marginal Effect (*p*-value)	Travel time only	All expenditures	BHS, BHC and MHC expenditures	RHU and hospital expenditures only	All expenditures with travel time
Wealth	.170 (.18)	.150 (.14)	.154 (.25)	.166 (.17)	.137 (.01)
Wife's Education	-.014 (.43)	-.008 (.56)	-.007 (.68)	-.009 (.58)	-.012 (.09)
Husband's Education	.023 (.43)	.015 (.52)	.010 (.77)	.019 (.49)	.021 (.05)
Wife's Age	-.009 (.44)	-.011 (.25)	-.006 (.67)	-.014 (.21)	-.011 (.02)
Wanted Child	1.870 (.39)	.739 (.60)	1.204 (.62)	0.513 (.74)	1.25 (.12)
Child Age	-.138 (.57)	-.169 (.35)	-.108 (.72)	-.220 (.29)	-.145 (.11)
Child Age Squared	.028 (.59)	.031 (.43)	.021 (.73)	.039 (.39)	.028 (.16)
Male	.107 (.31)	.119 (.17)	.094 (.41)	.138 (.17)	.109 (.02)
Siblings	.125 (.39)	.060 (.54)	.081 (.64)	.049 (.65)	.093 (.08)
Urban	-.185 (.09)	-.104 (.05)	-.108 (.29)	-.018 (.04)	-.142 (.00)
Labor Expenditures (vary by column)		.011 (.04)	.027 (.51)	.016 (.04)	.009 (.02)
Facility Quality	-.054 (.65)	-.029 (.77)	-.069 (.64)	-.026 (.81)	-.012 (.81)
Intercept	-1.114 (.66)	-.213 (.90)	-.864 (.76)	.147 (.94)	-.544 (.54)
Travel Time	-.005 (.04)				-.003 (.00)