Note on the Methodology used to predict Unit Costs for Patient Services
WHO-CHOICE 2011
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In 2011 the WHO Department of Health Systems Financing produced updated estimates of the cost of hospital bed-days and outpatient visits at different types of facilities as part of the WHO-CHOICE project. This note provides an overview of the methodology used. More detailed documentation will be forthcoming in 2011.

WHO estimates of facility unit costs

As countries' use of technology evolves, so do their costs. The need to update the previous round of estimates was prompted by the expectation that inputs (including technology), prices and production efficiency all change over time. In 2008, the original set of WHO-CHOICE cost estimates was updated to reflect 2005 price levels. This was done by substituting new input values for the independent variables in the original 2000 regression analysis. However it was recognized that a new round of data collection was required in order to assess to what extent changes in policy practices and technology may have affected cost structures. New data was collected from 30 countries representing 13 WHO epidemiologic regions, with the majority of data obtained through contracts with local data providers.

A new logarithmic model was developed to fit the new dataset, following a Cobb-Douglas production function. Estimates were produced for year 2007. In order to produce estimates for 2008, the model was updated with WHO data for GDP per capita and WHO data for exchange rates to US$ and I$, using 2008 base-year values.

Table 1. Regression model for Inpatient Unit Cost

Variable	Regression coefficient	95% confidence interval
Natural log of GDP per capita (PPP)	1.192[***]	[1.111, 1.272]
Natural log of occupancy rate	-0.0201[**]	[-0.0340, -0.00623]
Natural logarithm of ALOS	-0.600[***]	[-0.649, -0.550]
Natural logarithm of total inpatient admissions	0.0252[*]	[0.00471, 0.0457]
Dummy variable for level 3 facilities	-0.204[***]	[-0.275, -0.132]
Dummy variable for teaching hospitals	0.257[***]	[0.163, 0.351]
Dummy variable for public level hospitals	-0.144[***]	[-0.182, -0.107]
Dummy variable for private level hospitals	0.110[***]	[0.0710, 0.148]
Dummy variable for observations in Brazil	-1.638[***]	[-1.694, -1.583]
Constant	-4.277[***]	[-5.035, -3.519]
Observations	3407	
R^2	0.76	
Adjusted R^2	0.76	

$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2. Regression model for Outpatient Unit Cost

Variable	Coefficient	95% confidence interval
Natural log of GDP per capita (PPP)	0.865***	[0.826, 0.905]
Natural logarithm of outpatient visits	-0.0142*	[-0.0272, -0.00119]
Natural log of visits per provider per day (nurses, GPs)	-0.0412***	[-0.0578, -0.0246]
Dummy variable for urban location of the facility	0.352***	[0.268, 0.435]
Dummy variable for public level hospitals	-0.290***	[-0.330, -0.249]
Dummy variable for private level hospitals	0.0532*	[0.00479, 0.102]
Dummy variable for level 2 facilities	0.208***	[0.144, 0.271]
Dummy variable for level 3 facilities	0.304***	[0.213, 0.395]
Dummy variable for level 4 facilities	0.348***	[0.279, 0.417]
Dummy variable for observations in Colombia	0.628***	[0.542, 0.713]
Dummy variable for observations in Brazil	-1.563***	[-1.656, -1.470]
Dummy variables for type 3 facilities in Brazil	-0.245***	[-0.337, -0.153]
Constant	-4.534***	[-4.797, -4.271]
Observations	9028	
R^2	0.658	
Adjusted R^2	0.658	

$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Values reflect a set of standard assumptions

The updated database allows the user to access the WHO estimates of unit costs for 2007 and 2008 base-year values. This is a database of estimated costs that, in principle, can be thought of as 'average' values of unit costs for the country, based on specific assumptions regarding the organization of health services that may appear artificial in some settings (e.g. the distinction between hospital levels and providers of inpatient and outpatient services). In addition, the user should bear in mind that the properties of these estimated costs may not always be reflected by a given set of observations for the corresponding country. Thus, the unit costs presented here are those for public facilities, operating at the 80% percentile of a sample of similar such facilities in terms of capacity utilization and output. This is consistent with previous rounds of WHO-CHOICE unit cost estimates for which a 80% capacity level has been assumed. Moreover the assumption for outpatient costs is that the facilities are located in urban areas.

The table on Inpatient Unit Costs presents the estimated cost per hospital bed-day. These estimates represent only the "hotel" component of hospital costs, i.e., excluding the cost of drugs and diagnostic tests but including costs such as personnel, capital and food costs.

The table on Outpatient Unit Costs presents the estimated cost per outpatient visit, and include all cost components except drugs and diagnostics. [Note that the updated estimates are not differentiated for different levels of population coverage].

Estimates are presented in international dollars, local currency units and US$, for base-years 2007 and 2008.

Estimates based on user-defined parameters

Using the model, the user may derive estimates based on other assumptions than those used for the WHO estimates, for example for facilities that are private for profit or private not for profit, or facilities located in rural areas. The user may also make other assumptions for the predictor variables (e.g., average length of stay, number of patients seen per provider per day, etc), than those used for the WHO estimates which are estimated for the 80th percentile of the variables on facility utilization and output.

The section on Inpatient Unit Costs presents the estimated cost per hospital bed-day. These estimates represent only the "hotel" component of hospital costs, i.e., excluding the cost of drugs and diagnostic tests but including costs such as personnel, capital and food costs.

The section on Outpatient Unit Costs presents the estimated cost per outpatient visit, and include all cost components except drugs and diagnostics.

Estimates are presented in international dollars, local currency units and US$, for base-years 2007 and 2008.

Definition of facility levels

a. Health centres with outpatient services only (no beds)
b. Health centres with beds
c. Primary-level hospital: Hospitals intended primarily for treating simple cases (e.g. "district hospital")
d. Secondary-level hospital: Hospitals intended primarily for treating referral cases (e.g. "specialist hospital")
e. Teaching hospital: Hospitals intended primarily for treating referral cases, with a teaching component (e.g. "teaching hospital")

For further information on definition of hospital levels, reference can be made to Barnum and Kutzin, Public Hospitals in Developing Countries, Hopkins, 1993:

 * Primary-level hospital: Have few specialities, mainly internal medicine, obstetetrics-gynecology, paediatrics, general surgery or just general practitioners; limited laboratory services are available for general but not for specialized pathological analysis; bed size ranging from 30-200 beds; often referred to as district hospitals or first level referral.

* Secondary-level hospital: Highly differentiated by function with five to ten clinical specialities; bed size ranging from 200-800 beds; often referred to as provincial hospital.

- Tertiary-level hospital: Highly specialized staff and technical equipment, e.g., cardiology, ICU and specialized imaging units; clinical services are highly differentiated by function; might have teaching activities; bed size ranging from 300-1,500 beds; often referred to as central, regional or tertiary level hospital.

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