PUBLIC HEALTH CARE SPENDING AS A DETERMINANT OF HEALTH STATUS: A PANEL DATA ANALYSIS OF SSA AND MENA

By

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• To Examine the distributional Impact of government intervention through public spending on the welfare of its citizens; Health Expenditure and Health Outcomes in the case of this paper

• Health Outcome here has been measured in terms of health status, using three indicators:
  – Life Expectancy at birth (years)
  – Infant Mortality Rate (per 1000 live births)
  – Under-five Mortality rate (per 1000)
Health Expenditure and Health Status in sub-Saharan Africa

- Tables 1 and 2 reveal the situation in terms of numbers in SSA as compared with MENA other regions of the world.
### Table 1. Health Expenditure, Access to health services and risk factors in Health in sub-Saharan Africa and other Regions of the World

<table>
<thead>
<tr>
<th></th>
<th>World Low income countries</th>
<th>Middle income countries</th>
<th>High Income countries</th>
<th>Europe</th>
<th>Sub-Saharan Africa</th>
<th>Middle East &amp; N. Africa</th>
<th>Latin America &amp; the Caribbean</th>
<th>East Asia &amp; the Pacific</th>
<th>South Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Expenditure as % of GDP 1990-97</td>
<td>5.4</td>
<td>4.5</td>
<td>4.4</td>
<td>9.6</td>
<td>8.9</td>
<td>2.7</td>
<td>4.7</td>
<td>6.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Health Expenditure Per Capita ($) 1990-97</td>
<td>9.3</td>
<td>4.3</td>
<td>5.9</td>
<td>10.2</td>
<td>9.1</td>
<td>6.0</td>
<td>4.6</td>
<td>7.0</td>
<td>4.7</td>
</tr>
<tr>
<td>Access to safe Water % of population 1990</td>
<td>74</td>
<td>66</td>
<td>76</td>
<td>89</td>
<td>81</td>
<td>53</td>
<td>59</td>
<td>34</td>
<td>72</td>
</tr>
<tr>
<td>Access to improved sanitation facilities % of population 1990</td>
<td>75</td>
<td>69</td>
<td>79</td>
<td>116</td>
<td>117</td>
<td>47</td>
<td>..</td>
<td>34</td>
<td>44</td>
</tr>
<tr>
<td>Child immunization rate % of children under age one (Measles) 1997</td>
<td>45</td>
<td>30</td>
<td>47</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Tuberculosis incidence per 100,000 people 1997</td>
<td>83</td>
<td>74</td>
<td>93</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Prevalence of HIV % of Adults 2001</td>
<td>72</td>
<td>60</td>
<td>86</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Average annual population growth rate 1980-01</td>
<td>136</td>
<td>211</td>
<td>119</td>
<td>24</td>
<td>75</td>
<td>136</td>
<td>22</td>
<td>193</td>
<td>83</td>
</tr>
<tr>
<td>01-15</td>
<td>145</td>
<td>233</td>
<td>107</td>
<td>18</td>
<td>74</td>
<td>145</td>
<td>17</td>
<td>190</td>
<td>72</td>
</tr>
<tr>
<td>Tuberculosis incidence per 1997</td>
<td>2000</td>
<td>0.10</td>
<td>0.67</td>
<td>0.19</td>
<td>0.64</td>
<td>0.67</td>
<td>0.19</td>
<td>0.64</td>
<td>0.64</td>
</tr>
<tr>
<td>Prevalence of HIV % of Adults 1997</td>
<td>1.27</td>
<td>2.29</td>
<td>0.67</td>
<td>0.19</td>
<td>0.64</td>
<td>0.67</td>
<td>0.19</td>
<td>0.64</td>
<td>0.64</td>
</tr>
<tr>
<td>Average annual population growth rate 1980-01</td>
<td>1.5</td>
<td>2.1</td>
<td>1.4</td>
<td>0.7</td>
<td>0.3</td>
<td>1.0</td>
<td>1.5</td>
<td>0.8</td>
<td>1.3</td>
</tr>
<tr>
<td>01-15</td>
<td>1.0</td>
<td>1.5</td>
<td>0.8</td>
<td>0.3</td>
<td>0.0</td>
<td>1.0</td>
<td>1.5</td>
<td>0.8</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Table 2. Indicators of Health Status in SSA and other Regions of the World

<table>
<thead>
<tr>
<th></th>
<th>Life Expectancy at birth (Years)</th>
<th>Infant mortality rate Per 1000 live births 1980 1997 2001</th>
<th>Under five mortality rate Per 1,000 1980 1997 2001</th>
<th>Adult Mortality rate Male per 1000 1980 1997 00/01</th>
<th>Female per 1000 1980 1997 00/01</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>63 67 67</td>
<td>78 56 56</td>
<td>121 79 81</td>
<td>247 274 234</td>
<td>312 255 165</td>
</tr>
<tr>
<td>Low income countries</td>
<td>53 59 59</td>
<td>109 82 80</td>
<td>171 118 121</td>
<td>327 274 312</td>
<td>312 255 256</td>
</tr>
<tr>
<td>Middle income</td>
<td>66 69 70</td>
<td>55 34 31</td>
<td>80 43 38</td>
<td>230 199 207</td>
<td>161 137 127</td>
</tr>
<tr>
<td>countries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High income</td>
<td>74 77 78</td>
<td>12 6 5</td>
<td>15 7 7</td>
<td>174 133 128</td>
<td>91 66 66</td>
</tr>
<tr>
<td>countries</td>
<td>74 77 78</td>
<td>13 5 4</td>
<td>16 6 6</td>
<td>172 128 125</td>
<td>83 59 58</td>
</tr>
<tr>
<td>Europe</td>
<td>48 51 46</td>
<td>118 91 105</td>
<td>192 147 171</td>
<td>486 428 520</td>
<td>403 375 461</td>
</tr>
<tr>
<td>Sub-Saharan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle East &amp; N.</td>
<td>58 67 68</td>
<td>94 49 44</td>
<td>134 63 54</td>
<td>248 190 193</td>
<td>207 164 143</td>
</tr>
<tr>
<td>Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America &amp;</td>
<td>65 70 71</td>
<td>61 32 28</td>
<td>84 41 34</td>
<td>225 189 229</td>
<td>151 116 124</td>
</tr>
<tr>
<td>&amp; Caribb.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Asia &amp; the</td>
<td>64 69 69</td>
<td>53 37 34</td>
<td>79 47 44</td>
<td>222 183 184</td>
<td>180 148 129</td>
</tr>
<tr>
<td>Pacific</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Asia</td>
<td>54 62 63</td>
<td>115 77 71</td>
<td>176 100 99</td>
<td>279 219 252</td>
<td>292 212 202</td>
</tr>
</tbody>
</table>

Earlier researchers have used either the Benefit Incidence Analysis (BIA) method or the econometric technique to investigate the distributional impact of public spending on the welfare of the citizens. The econometric technique was adopted for the analysis in this paper.
The Model employed derives essentially from Filmer and Pritchett (1999).

As follows:

\[ \text{Health Status}_i = \beta_0 + \beta_1 \text{RGDPPC} + \beta_2 \text{HEXTGDP} + \beta_3 \text{PHYS} + \beta_4 \text{FELIT} + \beta_5 \text{IMMS} + \beta_6 \text{HOSPBED} + \mu_i \]

Where;

Health Status\(_i\) = Infant mortality/under five mortality rate/life expectancy at birth

RGDPPC = Real Per Capita GDP

FELIT = Female literacy rate (% of female aged > 15 years)

HEXTGDP = Public expenditure on health as a percentage of GDP

PHYS = Population per Physician

IMMS = Immunization for measles (% of children aged < 12 months)

HOSPBED = Hospital beds per 1000 people

\(\mu\) = Stochastic disturbance term to capture omitted variables

\(\beta\)s are the parameters to be estimated.
Variables

- **Dependent variables:**
  - Life Expectancy at Birth (LIFE):
  - Infant Mortality Rate (IMORT):
  - Under Five Mortality Rate (UFMORT):
Explanatory Variables

• Real Gross Domestic Product per Capita (RGDPPC):
• Ratio of Public Expenditure on Health to GDP (HEXTGDP)
• Female literacy rate (FELIT)
• Immunization for Measles (IMMS):
• Population per Physician (PHYS):
• Hospital beds per 1000 people (HOSPBED):
Data and Data Sources

• Pooled, multi-country annual time series data for the period 1980 to 2003 for 45 SSA and 12 MENA countries are used for the empirical analysis.

• The Major source of the data is the World Bank, World Development Indicators 2004, Online.
  – Serious problems of missing data points. Had to then use 3-year non-overlapping averages for all the variables.
Results
Table 3. Results of Estimated Equations (Random Effects model)

<table>
<thead>
<tr>
<th></th>
<th>Estimates</th>
<th>( \rho ) Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Life Expectancy at birth</td>
<td>3.593</td>
<td>7.5927</td>
</tr>
<tr>
<td></td>
<td>(0.0000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Under-five mortality rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant mortality rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real GDP per capita</td>
<td>0.00109</td>
<td>-0.23404</td>
</tr>
<tr>
<td></td>
<td>(0.2891)</td>
<td>(0.0059)</td>
</tr>
<tr>
<td>Health expen. As a ratio of</td>
<td>0.0367</td>
<td>-0.3492</td>
</tr>
<tr>
<td>GDP</td>
<td>(0.0353)</td>
<td>(0.0113)</td>
</tr>
<tr>
<td>Hospital Bed</td>
<td>0.0562</td>
<td>-0.0342</td>
</tr>
<tr>
<td></td>
<td>(0.0843)</td>
<td>(0.0178)</td>
</tr>
<tr>
<td>Immunization against measles</td>
<td>0.0313</td>
<td>-0.38102</td>
</tr>
<tr>
<td></td>
<td>(0.0826)</td>
<td>(0.1344)</td>
</tr>
<tr>
<td>Female literacy rate</td>
<td>0.1127</td>
<td>-0.38167</td>
</tr>
<tr>
<td></td>
<td>(0.2051)</td>
<td>(0.1592)</td>
</tr>
<tr>
<td>Physician per population</td>
<td>-0.0097</td>
<td>0.03515</td>
</tr>
<tr>
<td></td>
<td>(0.0820)</td>
<td>(0.0378)</td>
</tr>
<tr>
<td>No. of observations</td>
<td>1080</td>
<td>1080</td>
</tr>
<tr>
<td>No. of countries</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>( \hat{R}^2 )</td>
<td>0.979611</td>
<td>0.9552</td>
</tr>
</tbody>
</table>

Source: Author’s computations

**NOTE:** The numbers in the parentheses below the parameter estimates are the \( \rho \) – values. A \( \rho \) – value that exceeds 0.10 indicates that the parameter estimate is not significant at 1%, 5% and 10% levels.
Table 4. Results of Estimated Equations for Middle East and North Africa (MENA) (Random Effects model)

<table>
<thead>
<tr>
<th></th>
<th>Estimates and ρ Values</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Life Expectancy at birth)</td>
<td>Under-five mortality rate</td>
<td>Infant mortality rate</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>6.683</td>
<td>3.743</td>
<td>0.521</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td>(0.08)</td>
<td>(0.00)</td>
<td></td>
</tr>
<tr>
<td>Real GDP per capita</td>
<td>0.055</td>
<td>-0.179</td>
<td>-0.016</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.03)</td>
<td>(0.04)</td>
<td></td>
</tr>
<tr>
<td>Health expen. As a ratio of GDP</td>
<td>1.314</td>
<td>-0.032</td>
<td>-0.021</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.07)</td>
<td>(0.14)</td>
<td></td>
</tr>
<tr>
<td>Hospital Bed</td>
<td>0.739</td>
<td>-1.275</td>
<td>-0.003</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.11)</td>
<td>(0.06)</td>
<td></td>
</tr>
<tr>
<td>Immunization against measles</td>
<td>0.019</td>
<td>-0.151</td>
<td>-0.181</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.31)</td>
<td>(0.29)</td>
<td></td>
</tr>
<tr>
<td>Female literacy rate</td>
<td>1.138</td>
<td>-0.005</td>
<td>-0.109</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.22)</td>
<td>(0.83)</td>
<td>(0.052)</td>
<td></td>
</tr>
<tr>
<td>Physician per population</td>
<td>1.246</td>
<td>1.175</td>
<td>0.080</td>
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<tr>
<td></td>
<td>(0.02)</td>
<td>(0.00)</td>
<td>(0.15)</td>
<td></td>
</tr>
<tr>
<td>No. of observations</td>
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<td>720</td>
<td>720</td>
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<tr>
<td>No. of countries</td>
<td>12</td>
<td>12</td>
<td>12</td>
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</tr>
<tr>
<td>Ŕ²</td>
<td>0.87520</td>
<td>0.76259</td>
<td>0.91367</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s computations

NOTE: The numbers in the parentheses below the parameter estimates are the ρ – values. A ρ – value that exceeds 0.10 indicates that the parameter estimate is not significant at 1%, 5% and 10% levels.
Conclusions

• Health Expenditure as defined is a significant determinant of Health Status in SSA and MENA.

• So also are: Availability of physicians, female literacy and Child immunization.

• Income, Not significant as a determinant of Life Expectancy and Infant Mortality rate in SSA; on the other hand, turn out as significant determinant of Health Status (as defined) for MENA.