Water Supply, Sanitation, and Public Health in Mumbai

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Source: Field Survey on water supply, sanitation and associated health impacts in urban poor communities- a case from Mumbai City, India.
Mumbai: Background

- Largest metropolitan area in India, 5th largest in the world
- Population: ~20 million
- About half of the population lives in slums- “urban poor”
Water Supply and Sanitation

- Govt. provides 3 billion liters/day
- Only 65% of the requirement is met
- Urban Poor
  - Get 1/3\textsuperscript{rd} the supply compared to the rest (45 liters per capita per day)
  - US- ~260 liters/c.d. household consumption

- 90% of city and 40-50% of suburbs have sewerage systems
  - But most urban poor do not have access to it
  - Less than 1/3\textsuperscript{rd} the requirement for public toilets is met
  - 90% waste water (2.2 billion l/d) is collected
    - 0.1 billion is treated
    - 1 billion to oceans
    - Rest in creeks/waterways
Survey

- Three slum areas
  - Malad- Near polluted storm water drain
  - Rajiv Gandhi Nagar- Creek marshland in Dharavi (new)
  - Mukund Nagar- Old and crowded area in Dharavi
- “Pavement dweller” areas
- Volunteers interviewed people
  - Socio-economic
  - Infrastructure
  - Environmental health
  - Behavior and awareness
- Some water sample analysis
Water Supply in Slums

- Private water taps in houses:
  - 41% houses in Mukund Nagar
  - 9-14% in Malad & Rajiv Gandhi Nagar
  - 2% in pavement dwellers

- How people obtain water:
  - 74% from public taps
  - 10% buy water from vendors
  - 7% buy from neighbors
  - 7% steal water

- Common taps
  - Houses per tap:
    - Mukund Nagar - 11
    - Rajiv Gandhi Nagar - 20
    - Malad - 28
  - Water is supplied for 4 hrs per day

- Water consumption is 30-40 liters/capita/day
Water Quality & Treatment

- Quality of tap water:
  - People assert that water is sometimes dirty
  - Only 5-15% people boil their water
  - BMC says 10-13% water supplied is contaminated
  - Tap water analysis was OK

- Surrounding water:
  - High levels of E. coli
Drainage Facilities

- Sewerage connections
  - 6% houses in Mukund Nagar
  - None in other areas

- Toilets
  - No private toilets
  - No toilet in Malad slum
  - 129 people/toilet in Rajiv Gandhi Nagar
  - 93 people per toilet in Mukund Nagar
  - 101 people/toilet for pavement dwellers
Impact on Health

- 35-45% families in slums, >50% among pavement dwellers have at least one person ill
- Water-related diseases (diarrhea, malaria, typhoid, etc.) account for 26-32% of all diseases
- Children share 2/3rd of all disease burden

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Point prevalence rate (PPR) of short duration and chronic diseases in urban poor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Malad</td>
</tr>
<tr>
<td>Families with at least one member sick at the time of survey, %</td>
<td></td>
</tr>
<tr>
<td>SDM (Short duration)</td>
<td>29</td>
</tr>
<tr>
<td>MM (Chronic)</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
</tr>
<tr>
<td>Share among SDM, %</td>
<td></td>
</tr>
<tr>
<td>Water related</td>
<td>27</td>
</tr>
<tr>
<td>Fever (unknown)</td>
<td>20</td>
</tr>
<tr>
<td>Cold and others</td>
<td>53</td>
</tr>
</tbody>
</table>
## Incidence of Water Borne Diseases

**Table 4** Prevalence rate of some selected water-borne diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>Malad</th>
<th>RGN</th>
<th>MN</th>
<th>PD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhoea</td>
<td>94</td>
<td>287</td>
<td>334</td>
<td>614</td>
</tr>
<tr>
<td>Typhoid</td>
<td>36</td>
<td>38</td>
<td>46</td>
<td>68</td>
</tr>
<tr>
<td>Cholera</td>
<td>3</td>
<td>26</td>
<td>7</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Jaundice</td>
<td>0</td>
<td>30</td>
<td>13</td>
<td>68</td>
</tr>
<tr>
<td>Malaria</td>
<td>59</td>
<td>26</td>
<td>44</td>
<td>126</td>
</tr>
<tr>
<td>Intestinal worms</td>
<td>98</td>
<td>1</td>
<td>133</td>
<td>353</td>
</tr>
</tbody>
</table>
Correlations with Socio-Economic Factors

Table 5  Pearson's correlation coeff. matrix (partial) of some selected parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Place</th>
<th>Family income per capita</th>
<th>Living space per capita</th>
<th>House condition (structure)</th>
<th>No. of households sharing one tap</th>
<th>Per capita water consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per capita water consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malad</td>
<td>0.28</td>
<td>0.22</td>
<td>0.13</td>
<td>0.12 (-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RGN</td>
<td>0.12</td>
<td>0.28</td>
<td>0.06</td>
<td>0.15 (-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MN</td>
<td>0.38</td>
<td>0.04</td>
<td>0.04</td>
<td>0.07 (-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PD</td>
<td>0.2</td>
<td>0.26</td>
<td>0.30</td>
<td>-0.28*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total annual cases of water-related diseases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malad</td>
<td>-0.08</td>
<td>0.02 (-)</td>
<td>-0.1</td>
<td>-0.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RGN</td>
<td>-0.08</td>
<td>0.04 (-)</td>
<td>-0.03</td>
<td>-0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MN</td>
<td>-0.17</td>
<td>0.01 (-)</td>
<td>-0.02</td>
<td>-0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PD</td>
<td>-0.15</td>
<td>-0.15</td>
<td>-0.27</td>
<td>-0.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(-) Reverse relationship to that expected; *“Distance of water source” versus “per capita water consumption”
Conclusions

- Higher incidence of water and sanitation related disease in slum and pavement dweller areas
- Environmental problems include location near polluted sites, lack of sanitation, poor personal hygiene, poverty, lack of environmental education
- Pavement dwellers suffer the most
- Problem lies in huge slum population, ~ 10 million
- Provide safe and adequate water and sanitation facilities