VECTOR CONTROL IN URBAN AND PERI-URBAN INDIA

by
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IFCS-VI, Meridien Hotel
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Dakar, Senegal
## INDIA: Rural-Urban Distribution

<table>
<thead>
<tr>
<th>Population Type</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Population</td>
<td>742,490,639</td>
<td>72.2%</td>
</tr>
<tr>
<td>Urban Population</td>
<td>286,119,689</td>
<td>27.8%</td>
</tr>
</tbody>
</table>

### Urban Population

- **Highest**: Goa - 49.76%
- **Lowest**: H.P. - 9.30%

### UT Population

- **Highest**: Delhi - 93.18%
- **Lowest**: Dadar & Nagar Haveli - 22.89%

*GOI, CENSUS- 2001*
National Vector Borne Diseases Control Programme (formerly NMEP/NAMP)

Integrated Disease Control

1. Malaria (Urban Malaria Scheme)
2. Dengue /DHF
3. Chikungunya virus
4. Lymphatic Filariasis
5. Japanese encephalitis
6. Kala-Azar

Anopheles stephensi  Aedes aegypti  Culex quinquefasciatus
National Vector Borne Disease Control Programme
URBAN MALARIA SCHEME-1971-72

• Town with 50,000 or more population
• API 2 or above
• Town should implement civic bye-laws

1971-72: 23 Towns
1972-73: 05 Towns
Till 1976-77: 28 Towns
1977-78: 38 Towns
1978-1979: 37 Towns
1979-80: 12 Towns
1980-81: 17 Towns

Total Towns with UMS functioning: 131

2007 Cases in India: 1,476,562
UMS: 108,075 (7.32%)
INTEGRATED VECTOR MANAGEMENT
(Urban Malaria Scheme)

- Source Reduction, filling, streamlining, channelising, desilting, deweeding, trimming of drains, water disposal and sanitation, empty water container once in a week, etc.
- Recurrent anti-larval measures like Temephos & Fenthion
- Observance of a dry day in a week-rarely followed
- Biological Control-Guppy & Gambusia Fishes & Bio-larvicides (*Bacillus thuringiensis* & *Bacillus sphaericus*)
- Minor Engineering Works
- Malathion Thermal Fogging, Aerosol Space Spray
- IRS in Peri-urban settlements
- Intensive vector surveillance for *Aedes aegypti*
- Repellents-Deet/Neem oil, Coils, mats, vaporizers
- Anti-parasitic measures-EDPT in Malaria Clinics
- IEC campaigns
INDIA: Population growth, from 443 million in 1960 to 1,004 million in 2000

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban Population ('000s)</th>
<th>Level of Urbanisation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>330.12</td>
<td>31</td>
</tr>
<tr>
<td>2010</td>
<td>380.21</td>
<td>33</td>
</tr>
<tr>
<td>2015</td>
<td>435.11</td>
<td>36</td>
</tr>
<tr>
<td>2025</td>
<td>565.80</td>
<td>43</td>
</tr>
<tr>
<td>2030</td>
<td>634.05</td>
<td>46</td>
</tr>
</tbody>
</table>

Projected India’s Urban Population
<table>
<thead>
<tr>
<th>Year</th>
<th>India (+s)</th>
<th>UMS (+s)</th>
<th>% +ves UMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>2,660,057</td>
<td>174,101</td>
<td>6.55</td>
</tr>
<tr>
<td>1998</td>
<td>2,222,748</td>
<td>144,300</td>
<td>6.49</td>
</tr>
<tr>
<td>2000</td>
<td>2,019,065</td>
<td>172,231</td>
<td>8.53</td>
</tr>
<tr>
<td>2001</td>
<td>2,055,023</td>
<td>155,877</td>
<td>7.59</td>
</tr>
<tr>
<td>2002</td>
<td>1,842,019</td>
<td>133,931</td>
<td>7.27</td>
</tr>
<tr>
<td>2003</td>
<td>1,673,165</td>
<td>139,502</td>
<td>8.34</td>
</tr>
<tr>
<td>2004</td>
<td>1,725,783</td>
<td>150,910</td>
<td>8.74</td>
</tr>
<tr>
<td>2005</td>
<td>1,816,569</td>
<td>89,543</td>
<td>4.93</td>
</tr>
<tr>
<td>2006</td>
<td>1,685,109</td>
<td>85,270</td>
<td>5.06</td>
</tr>
<tr>
<td>2007</td>
<td>1,476,562</td>
<td>108,075</td>
<td>7.32</td>
</tr>
</tbody>
</table>
Average ratio of reported to estimated malaria cases = 36,766/4119 i.e. 9 times
71 malarial deaths/3.1 million population (average 22 deaths/million pop/yr)
Chikungunya and Dengue - Indian Ocean update. Status as of 17 March 2006

Data Source: WHO/EPR
Map Production: Public Health Mapping and GIS Communicable Diseases (CDS), World Health Organization.

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.
Dengue/DHF SPREAD IN 22 STATES

India
2006 12,317 184

Delhi
2003 2,882 35
2004 606 3
2005 1,023 9
2006 3,366 65
2007 548 1
2008 July 60
SPREAD OF CHIKUNGU NYA IN INDIA

Chikungunya 2007
1821 cases in 17 states
LYMPHATIC FILARIASIS IN 250 Distts 20 states 40m cases
Urban Water Supply Through Tankers
Hyderabad, India: Women struggle through a crowd to reach a mobile water tanker in a slum area.
Photograph: Mahesh Kumar/AP
Rural-Urban Migration in India

• Rural Population which Migrated to Urban Areas

25% of the country's poor live in urban areas
31% of the urban population is poor

• Traditional rural-urban migration- to improve opportunities and lifestyles. In 1991, 39 million people migrated in rural-urban patterns of which 54% were female.

• Seasonal urban migration- for jobs in industry, harvesting season etc.
## NUMBER OF MIGRANTS BY PLACE OF LAST RESIDENCE – INDIA 2001

<table>
<thead>
<tr>
<th>Category</th>
<th>Migrations by Place of birth</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Total Population</td>
<td>1,028,610,328</td>
</tr>
<tr>
<td>B.</td>
<td>Total Migrations</td>
<td>307,149,736</td>
</tr>
<tr>
<td>B.1</td>
<td>Migrants within the state of enumeration</td>
<td>258,641,103</td>
</tr>
<tr>
<td>B.11</td>
<td>Migrants from within the districts</td>
<td>181,799,637</td>
</tr>
<tr>
<td>B.12</td>
<td>Migrants from other districts of the state</td>
<td>76,841,466</td>
</tr>
<tr>
<td>B.2</td>
<td>Migrants from other states in India</td>
<td>42,341,703</td>
</tr>
<tr>
<td>B.3</td>
<td>Migrants from other countries</td>
<td>6,166,930</td>
</tr>
</tbody>
</table>
RURAL URBAN MIGRATION
SLUMS

• Slum data was collected for cities/towns having 50,000 population or more based on 1991 census.

• Population of slums is 40,297,341 (40 million or 4%) from the 607 cities/towns reporting slums.

• More interestingly it comes to ~22% of the total population of these cities (178,393,941).

• This means that almost quarter of Indian cities live in slums. And sadly 5,531,062 (5 million) of this population are young children (0-6 age group).
### Increasing share of GDP from Urban centers

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP by Urban Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>29%</td>
</tr>
<tr>
<td>1990-91</td>
<td>55%</td>
</tr>
<tr>
<td>2001-02</td>
<td>60%</td>
</tr>
</tbody>
</table>

Thus urban centers (25%) generates 60% country's total GDP.

Large inequality of resources especially income in urban centers.

This is one of the reasons for origin of slums.
WHO-SEARO BUILDING, NEW DELHI
Asia's largest slum, Dharavi, lies on prime property right in the middle of India's financial capital, Mumbai. It is home to more than a million people. Many are second-generation residents, whose parents moved in years ago.
Neem Based Repellent

No. of An. culicifacies collected on human bait

Hours

18-19 19-20 20-21 21-22 22-23 23-24 24-01 01-02 02-03 03-04 04-05 05-06

Neem cream
Vanishing cream

Azadirachta indica

Mosquito Coil
## Poverty and Malaria in India

<table>
<thead>
<tr>
<th>Years</th>
<th>% malaria cases in BPL states</th>
<th>% vivax cases in BPL states</th>
<th>% falciparum cases in BPL states</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>29.67</td>
<td>29.24</td>
<td>30.89</td>
</tr>
<tr>
<td>2000</td>
<td>69.57</td>
<td>49.28</td>
<td>88.37</td>
</tr>
</tbody>
</table>

Below Poverty Line Population in 1999-2000: India 26.1%
NE States: Assam 33.47; Manipur 28.54; Meghalaya 33.87;
Nagaland 32.67 and Tripura 34.44 Population Below Poverty Line

BYPASS DESERT COOLER
Fig. Impact of weekly spraying of *Bacillus thuringiensis israelensis* (H-14, Strain 164) on anopheline breeding in the construction sites.
A comparison of percentage habitat positivity and density/10 dips of anophelines in the construction sites between experimental (B. sphaericus sprayed) and control (Temephos sprayed) area in Panaji, Goa, India [Kumar et al. 1994 JAMCA, 10(4): 534-539].
A comparison of slide positivity rate (SPR) and monthly parasite incidence (MPI) between *B. sphaericus* sprayed area and the temephos-sprayed control area.

[Kumar et al. 1994: JAMCA, 10(4): 534-539.]
Fig. Impact of introduction of *Aplocheilus blocki* on the immature population of *Anopheles stephensi* in Candolim PHC in Goa, India.

% Habitat Positive

% Habitat Positive  

Per Dip density

Pre-treatment  

Post-treatment

Hab. Pos.  

$ t = 5.19, p < 0.01$

Density / Dip  

$ t = 3.57, p < 0.01$
Applying expanded polystyrene beads to control mosquito breeding.
Photos: Devastating Earthquake in Gujarat
Sinking Water Table-Hand Pumps Dry
Man hole covers used in mosquito proofing
Water Harvesting Structures Provide Immense Opportunities for Disease Vectors to Breed.
• RESEARCH & DEVELOPMENT

• Bypass Desert Cooler
• Replacing chemicals by Bt/Bs/Fishes/Neem Oil
• Health Cards FOR migrants
• Mass Production and Release of Fishes
• Mosquito Proofing of RWH structures
• Expanded polystyrene beads
• Organized Solid Waste Disposal
• Covering of drains
• Land reclamation
• Resource and employment generation (plantations, carp culture)

• ACTION REQUIRED

• 24X7 Water Supply
• Health Impact Assessment
• “Bhagidari”-Sharing responsibility with citizens
• Adoption of uniform legislative and building bylaws
• Integrated vector management
• Integrated pest management in horticulture and peri-urban agriculture
• Awareness campaigns
THANK YOU