MAPPING SPATIAL VULNERABILITY OF THE ELDERLY TO A HEALTH PANDEMIC

Challenging the Engineering Community to develop more resilient cities

Manta Devi Nowbuth Dr
Head, Civil Engineering Department
Faculty of Engineering
University of Mauritius
Institution of Engineers, Mauritius
Casualties recorded worldwide, indicated that the elderly are most at risk to the COVID-19 disease.
AIM

To capture the challenges faced by the elderly during the COVID-19 health pandemic for better preparedness in the future.

OBJECTIVES

✓ To conduct field surveys with the Elderly
✓ To extract vulnerability indicators from CENSUS data
✓ To develop vulnerability maps at District, Ward and Village level
Placing thus, the Elderly in the category of those most at risk to this health pandemic.
Social Vulnerability Maps to support Health Risk Reduction Strategies
### CHEMIN GRENIER VILLAGE

<table>
<thead>
<tr>
<th>Location</th>
<th>South</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Middle Sized village</td>
</tr>
<tr>
<td>No. of Elderly</td>
<td>940</td>
</tr>
<tr>
<td>Total Population (2011)</td>
<td>12223</td>
</tr>
</tbody>
</table>

### REDUIT VILLAGE

<table>
<thead>
<tr>
<th>Location</th>
<th>Centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Small Village</td>
</tr>
<tr>
<td>No. of Elderly</td>
<td>831</td>
</tr>
<tr>
<td>Total Population (2011)</td>
<td>8846</td>
</tr>
</tbody>
</table>
23 Questions to assess the Coping Capacity of the Elderly to the health pandemic

- Access to basic needs
- Living Conditions
- Health Conditions
- Mobility
- Support facilities
- Communication Facilities
**KEY FINDINGS OF FIELD SURVEYS**

**INDICATORS REFLECTING LOW VULNERABILITIES**

- 54% Female Respondents
- 41% Respondents were aged below 70 years
- 75% had children
- 83% were retired
- 100% access to running water & electricity
- 92% access to phone
- 67% access to internet facilities
- 40% had their own transport
- 79% earned a monthly income between Rs. 10,000 to Rs. 20,000.
- 80% received social support – friends, family, neighbours

**INDICATORS REFLECTING HIGH VULNERABILITIES**

- 59% were educated up to primary level only
- 58% suffered from NCDs
- 18% find medium difficult to access to basic food needs
- 48% find access to cooking gas difficult to very difficult
- 27% were affected by reduced mobility
- 5% were living in poor housing conditions
- 34% considered the support fair to weak
- 28% faced difficulties to access medical care
- 44% found it difficult to cope with the pandemic
Vulnerability Indicators grouped into 4 FACTORS:

- Living Conditions
- Access to Basic Facilities
- Mobility
- Economic Conditions

Translated to the secondary data – *Census 2011*
LIVING CONDITIONS
- Buildings with >3 housing units in a building
- Buildings with >3 persons sharing a room
- No. of People either homeless or living in communal living
- No. of crudely divided housing units & Improved Housing units

ACCESS TO BASIC FACILITIES
- Housing units with poor sanitation facilities
- Housing units with no piped water supply or with no water supply facilities within remises
- Housing units with common bathroom
- Ease of access to health care centers
- No. of People depending on gas for cooking

MOBILITY
- No. of People aged 65 or above
- No. of People with a disability that can affect mobility
- No. of People with low level of literacy

ECONOMIC CONDITIONS
- No. of People not economically active
- Population Density

SOCIAL VULNERABILITY INDICATORS

WEIGHTAGE

SVI MAPS
- Combine values into Social Vulnerability Index values for each social indicator
- Rank the values and work out the percentiles
- Reclassify in 4 categories and display in GIS maps
PROCESS FOR DEVELOPING SVI MAPS

FIELD SURVEY DATA

MULTIVARIATE ANALYSIS

FOUR FACTORS

EXTRACT SOCIAL VULNERABILITY INDICATORS FROM CENSUS 2011 FOR EACH DISTRICT AND EACH OF THE 144 WARDS

NORMALISE EACH SOCIAL VULNERABILITY INDICATOR \( (X - \bar{X}) / (X_{\text{MAX}} - X_{\text{MIN}}) \)

APPLY A WEIGHTAGE TO EACH SOCIAL VULNERABILITY INDICATORS BASED ON RELATIVE IMPORTANCE

COMBINED ALL WEIGHTED SOCIAL VULNERABILITY INDICATORS FOR EACH DISTRICT OR EACH WARD

RANK THE FINAL RESULTS STARTING WITH THE SMALLEST VALUE

WORK OUT THE PERCENTILES \( (\text{Rank} - 1) / N - 1 \)
Where \( N \) is the number of Districts or Number of Wards

JOIN THE PERCENTILES DATA USING RESPECTIVE GIS MAPS

RECLASSIFY THE PERCENTILES IN 4 CATEGORIES:
- SMALL
- MEDIUM
- MEDIUM HIGH
- HIGH

DISPLAY USING DIFFERENT COLOUR FOR EACH OF THE 4 CATEGORIES
At district levels there can be enough facilities.
At community level, not everybody has the means to access all facilities.
THE CHALLENGE FOR THE ENGINEERING COMMUNITY

- Is the current developmental model of cities addressing the needs of the elderly, the needs of ageing societies, and the needs for the vulnerable groups?

- Are concerned authorities able to locate vulnerable groups quickly to provide support?

- Is the health care system adapted to reaching those with limited mobility?

- Full lock down periods during the health pandemic – What have we learnt?
RE-ENGINEERING SUPPORT SYSTEMS IN CITIES

- IT & Connectivity – Resilient systems

- Business which address the needs of the most vulnerable groups of the society (Ebusiness for food supplies, cooking gas supplies)

- Heath care that reach out to the vulnerable groups

- A more adapted transport system – easier access specially for those with reduced mobility

- The most vulnerable groups at the core of design of cities

- More Energy Intensive – hence more R&D on renewable energy systems
CONCLUDING REMAKS

LEAVE NO ONE BEHIND

MANY COUNTRIES EXPERIENCING AGEING POPULATION

MORE EFFICIENT SYSTEMS NEEDED TO REDUCE ADDITIONAL STRESS ON LIMITED RESOURCES

MAINSTREAMING CLIMATE CHANGE IMPACTS FOR RESILIENT INFRASTRUCTURES & FOR THE WELFARE OF THE COMMUNITY
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Manta Devi Nowbuth</td>
<td>Principal Investigator, Associate Professor, Head, Civil Engineering</td>
</tr>
<tr>
<td></td>
<td>Department, University of Mauritius</td>
</tr>
<tr>
<td>Dr. Smita Goorah</td>
<td>Medical Doctor &amp; Associate Professor, University of Mauritius</td>
</tr>
<tr>
<td>Mrs. Sandhya Gunness</td>
<td>Senior Lecturer, University of Mauritius</td>
</tr>
<tr>
<td>Mr. Ifaaz Goomanee</td>
<td>Research Assistant</td>
</tr>
<tr>
<td>Mr. Yudish Nundun</td>
<td>Research Assistant</td>
</tr>
<tr>
<td>Mr. Chitrasen Parbhunath</td>
<td>Research Assistant</td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

✓ The University of Mauritius
✓ The Mauritius Research and Innovation Council
✓ Statistics Mauritius
✓ The Institution of Engineers, Mauritius
Thanking you for your attention