Health risks of sanitation workers associated with fecal sludge management in India

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Research Focus

• Identifying the opportunities and barriers related to fecal sludge reuse in agriculture (specially on the farmer’s side)

• Developing a framework to estimate the potential amount of Phosphorous that can be recovered from a typical Indian town

• Quantifying the health risks along the fecal sludge reuse value chain

• Relationship between caste system and sanitation work
Methods and study sites

Fieldwork
• Semi structured interviews and field observations
• Photo documentation
• Sample selection based on convenience sampling / snowball sampling

Analysis
• QMRA
• Critical analysis of how hereditary occupations have been bureaucratized, even as they remain sites of stigma

Study sites
- Bangalore, Mangalore, Dharwad, Guntur, Lucknow, Agra, ...
Classification and Origin of sanitary workers

Classification
• Street cleaning
• Hauling solid waste
• Handling human waste
  – Mechanical servicing
  – Manual servicing
  – Manual Scavenging

Primarily belong to the Dalit community (22% of Indian population) and sanitation workers belong mostly to Balmiki sub community
How is the work done?
Collection
Collection
Disposal
Disposal
Manual servicing

Photo Credit: Sudharak Olwe
Manual servicing

Photo Credit: Sudharak Olwe
Manual Scavenging
Manual Scavenging
Disposal
FSM Opportunities

• Achieving safe and sustainable sanitation
• Creating new employment opportunities
• Increasing the revenue for the utilities
• Strengthening the water and food security
• Reducing the caste barriers
• Minimizing substance abuse
FSM Barriers

- Rapid urbanization
- Lack of regulatory bodies focusing on FSM
- Lack of infrastructure to treat the sludge
- Labor and technology
- Lack of collateral free financing options for truck purchase
- Religious reasons and caste based social taboos
- Health Risks
What are the major sources of risks to the health of sanitation workers?
Major sources of health risk

• Pathogens
• Alcohol, Tobacco, and other intoxicants (including opioids)
Dysentery and Alcoholism
Pathogen vs Alcohol – Relative Risk
Accidental Pathogen ingestion

- Method: Quantitative Microbial Risk Assessment (QMRA)
- Source of ingestion data: From Mattioli et al (2015) as a starting point
- Adjustments and assumptions based on field observations and interviews
- Probability of mortality and morbidity will be converted into DALYs (Peterson et al 2006 or Eqn 2 from Symonds et al 2014)

\[
DALY = \sum_{i=1}^{n} P(ill \mid inf) \times P(outcome_i \mid ill) \times Duration_i \times Severity_i
\]

Where \( n \) is the total number of outcomes considered
- \( P(ill \mid inf) \) is the probability of illness given infection
- \( P(outcome_i \mid ill) \) is the probability of outcome \( i \) given illness
- \( Duration_i \) is the duration (years) of outcome \( i \)
- \( Severity_i \) is the severity weighting for outcome \( i \)

\[
DB = P_{ill} \cdot B \cdot S_f
\]

where \( P_{ill} \) is the annual probability of illness, \( B \) is the estimated burden of disease per case of illness (DALYs per case), and \( S_f \) is the susceptible fraction of the population. The annual prob-
Alcohol Consumption Data

- Sample size: 172 sanitation workers from six cities
- Percentage of people who consume alcohol: 87% (all male)
- Number of drinks per day:
  - Mean – 5
  - Median – 4.5
  - Range – 3 to 8
- Average age of the workers – 27 years (Range - 14 – 41 years)
- Each drink is at least 40% alcohol by volume (ABV) or 80-proof
Quantifying alcoholic risk

Risks:
• Increased risk of injuries and death during work
• Increased risk to the public
• Increased probability of domestic abuse / violence
• The risk is compounded further by tobacco consumption

Challenges in quantifying the risks:
• Dose response relationship for alcohol
• Alcohol related population attributable fractions for several different causes of death and disease
The Change!
What is changing?

Mechanization
• Reduction in alcoholism

Participation from other castes
• Financial incentives
• Urbanization invisibility

Legislation
• The Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993
• The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act 2013 or M.S. Act 2013
What remains to change?

The caste based undercurrent

- Pan South-Asian phenomenon
- Sanitary workers are invisible privileged Indian populace

Efforts to eradicate manual practices and rehabilitate workers need to be accelerated

- Indian Railways
- Indian defence department
Why should the change be accelerated?

- 48% of the Indian households are still without drainage connection (Census 2011)
- New toilets in the rural and rapidly urbanising areas
- Contract based procurement through private operators
- 1000 sanitation workers die in India every year.
Thank you
References and readings

References and readings contd.

• No Swachh Bharat without Annihilation of Caste - [http://www.epw.in/margin-speak/no-swachh-bharat-without-annihilation-caste.html](http://www.epw.in/margin-speak/no-swachh-bharat-without-annihilation-caste.html)
• Dying for a living - [http://infochangeindia.org/livelihoods/sidelines/dying-for-a-living.html](http://infochangeindia.org/livelihoods/sidelines/dying-for-a-living.html)
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