Conducting Environmental Health Research in Remote Regions of Northern Ontario: Challenges and Adaptive Strategies

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Background

- Canadians who live in rural, remote, northern and Aboriginal communities face significantly greater health challenges than those living in urban centres
- Our group has previously conducted environmental health studies in partnership with First Nation (FN) communities on the western shores of James Bay
- Conducting research studies in remote regions posed several challenges

Objectives

- To address significant challenges that exist in conducting environmental health research in remote areas, such as the James Bay region in Northern Ontario
- To identify potential solutions or adaptive strategies to mitigate the impact of these challenges on research studies

Challenges & Adaptive Strategies

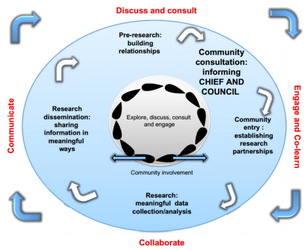
1. Partnership with First Nation Communities:

A. Challenge: Helicopter research approach
- Developing projects without community input
- Collecting data without full informed consent
- Not sharing or using findings to improve the community

Adaptive Strategy: Community-based participatory research approach
- Emphasis on developing genuine partnerships between communities and external researchers[1]
- Work together to identify real concerns to the community
- Community members are participants and collaborators
- Three essential elements of a partnership are respect, equity and empowerment[2]
- Communities should benefit directly from research findings
- This approach increases relevance of findings for community members

B. Challenge: Fear and distrust of outsiders

Adaptive Strategy: To overcome distrust it is essential to consult with the community, obtain consent from community leaders, and build rapport through honest discussion with participants throughout the study[3,4]
- The following framework was developed for building research partnerships with First Nations communities[1]:



- Collaborating with community allows to have a combination of "insiders" and "outsiders" on the research team[5]
  - An "insider" may have a strong understanding of local issues and often has the trust of participants
  - An "outsider" may offer more objectivity and allow participants to share important personal information

Challenges & Adaptive Strategies

C. Challenge: Educational limitations in remote areas

Adaptive Strategy: Participatory approach to research involves tribal members as stakeholders in the science
- Provide educational and training opportunities (e.g. study methodology)
- Provide hands-on experience by involving members in project planning, study design, collecting samples and/or data, presenting results to the community

D. Challenge: Maintaining privacy, confidentiality, and anonymity of study participants
- Challenging when conducting research with small communities[3]
- Desire for privacy may preclude community members from participating or revealing important personal information

Adaptive Strategy: Inform participants that any sensitive or personal information is private and confidential and should not be repeated outside of the study[3]. Additionally:
- Ensure all investigators undergo training in human research ethics
- Study protocol must be reviewed by a Research Ethics Board
- Provide copy of protocol to First Nations leaders to obtain their input on study design to ensure that it is aligned with community values, practices, and beliefs

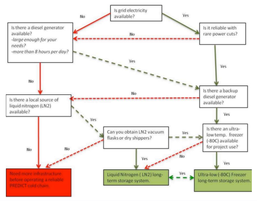
2. Study & Laboratory Logistics:

A. Challenge: Ensuring all equipment and supplies are delivered and data are retrieved
- Difficult to access certain remote locations due to distance and lack of roads & highways

Adaptive Strategy:
- Plan to deliver equipment during most optimal time (e. g. in the winter, using the seasonal winter "ice" roads)
- Work with local airlines for cargo delivery to improve access to supplies
- Use equipment that can withstand jarring movements in suboptimal weather conditions
- Bring ~1.5x of the necessary equipment in case of breakdown

B. Challenge: Keeping samples or materials within a certain temperature range during all stages of the study (i.e. cold chain system)
- Challenging due to lack of reliable power source, refrigerators and freezers, and a liquid nitrogen (LN2) source in remote areas

Adaptive Strategy:
- Plan and develop a cold chain system:
  - Assess the constraints → Identify the required materials & resources to implement and maintain it → Identify local suppliers
  - Can use the following decision tree for cold chain planning[6]:
  - Use alternative methods if not enough infrastructure available:



Challenges & Adaptive Strategies

- ❑ Portable dry ice maker (only for short-term storage)
- ❑ Dry shipper LN2 container (storage up to several weeks)
- ❑ Commercial cold-chain services (e.g. Cryoport)
- ❑ Desiccate or fluid-preserve samples (store at ambient temperature)

- Hand-carry samples, as commercial shipping from remote areas is unreliable

3. Energy Supply:

Challenge: Lack of electricity in remote, off-grid regions
- Challenging as electricity is essential for powering:
  - ❖ Research laptop computers for data collection and storage
  - ❖ Portable refrigerators/freezers, if applicable
  - ❖ Satellite or "bush" phones

Adaptive Strategy: Use portable and standalone systems that may be used as a source of power
1. Photovoltaic (PV) systems can provide DC or AC by the use of PV panels in the presence of sun[7]
- Two cost-effective (~$1,500) mobile PV systems:
  a) Solar generator cart on wheels – can power small appliances
  b) Solar suitcase – provides power to laptop computers, medical devices, and mobile communication devices
2. Portable power generators may also be used as a secondary or emergency source of energy (~$1,000)

4. Climate Change:

Challenge:
- Northern Ontario has experienced flooding due to intense rainfalls, rapid snowmelt, and ice jamming in the spring[8]
- Challenging as this may affect the research group and study

Adaptive Strategy:
- Must plan well and consider climate variability and how it may affect current or future field operations
- Emergency preparedness
  - ❖ Have satellite phones
  - ❖ In case of an early thaw, as roads become unavailable, arrange with a local air transportation company for rescue

References

1. Bharadwaj L. A framework for building research partnerships with first nations communities. Environ Health Insights. 2014;8:15-25.
2. Sistili B, Metatawabin M, Iannucci G, Tsuji LJS. An Aboriginal Perspective on the Remediation of Mid-Canada Radar Line Sites in the Subarctic: A Partnership Evaluation. 2009. 2009;59(2):13.
3. Casale M, Lane T, Sello L, Kuo C, Cluver L. Conducting health survey research in a deep rural South African community: challenges and adaptive strategies. Health Res Policy Syst. 2013;11:14.
4. Robinson A, Burley M, McGrail MR, Drysdale M, Jones R, Rickard CM. The conducting and reporting of rural health research: rurality and rural population issues. Rural Remote Health. 2005;5(4):427.
5. McGrail MR, Jones R, Robinson A, Rickard CM, Burley M, Drysdale M. The planning of rural health research: rurality and rural population issues. Rural Remote Health. 2005;5(4):426.
6. PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Implementing Cold Chain for Safe Sample Transport and Storage.
7. Salahuddin Q, Farhan Q. Green Technology for Disaster Relief and Remote Areas. 2014/06/15; Indianapolis, Indiana: ASEE Conferences.
8. OCCIAR. Workshop Report: Impacts of Climate Change on Northern Ontario Communities Focusing on Municipal Infrastructure and Tourism 2009.