Geographical Information Systems (GIS) in maternal health: A scoping review

Peter von Dadelszen²

On behalf of

Prestige Tatenda Makanga¹, Nadine Schuurman¹, Tabassum Firoz³

1: Department of Geography, Simon Fraser University, Canada
2: Cardiovascular Sciences Research Centre, St George's, University of London
3: Department of Medicine, University of British Columbia, Canada
Acknowledgements
GEOGRAPHICAL INFORMATION SYSTEMS (GIS) IN HEALTH

• Geographical Information Systems (GIS) are decision support systems involving the integration and analysis of location based data

• Their application to health is increasingly recognized, likely due to the ‘spatial turn’ in health
  • the increased use of geographical thought and mapping technologies within health sciences (Richardson, Volkow et al. 2013)
OBJECTIVES

• To investigate what is known about the application of GIS in maternal health research and practice

• To know how these applications compare between Low- and Middle-Income Countries (LMICs), and High-Income Countries (HICs)

• To identify of knowledge gaps and opportunities that exist in applying GIS to maternal health
SEARCH STRATEGY

• York methodology for scoping reviews (Arksey and O'Malley, 2005)
  • Identify the question(s),
  • Identify relevant literature
  • Select the literature
  • Charting the data
  • Collating, summarizing and reporting the results.

• Search for peer reviewed literature - Medline, Geobase and Web of Science
SUMMARY OF REVIEWED ARTICLES

• 65% (n = 26) of all reviews articles published post 2010
ACCESS TO MATERNAL HEALTH SERVICES

• Most common use of GIS in maternal health; based on distance and travel time to health facilities

• Absence of road data hinders modelling potential access in LMICs – creating these base data is a necessary prerequisite

• Modelling scenarios for planning design and geographic spread of care facilities

• Demographic data used similarly in LMICs and HICs to align potential spatial access to available transport options

• Identifying areas with an unmet obstetric need
RISK FOR MATERNAL ILL-HEALTH

- Spatial epidemiology (study of spatial variation in disease risk or incidence) is advancing the assessment of risk factors for maternal ill-health
  - e.g. pollution, natural disasters, socio-cultural variables

- Barriers for utilization of health services have also been modelled (e.g. having insurance and accessing maternal health services)

- Implicit use of GIS in modelling the effect of risks on maternal outcomes has been minimal

Association between having insurance and utilizing antenatal care services – Spatial variation in R² Values (Shoff 2012)
DESCRIPTIVE MAPPING OF MATERNAL OUTCOMES AND KEY INDICATORS

• Directly describing spatial variation in maternal outcomes, or diseases prevalence (e.g. HIV/AIDS) in pregnant women
  • The map was used for exploratory analysis leaving most of the judgment to the researcher or intended map user

• Hypothesis generation in maternal health research, prompting further investigation into the trends emerging from the map

• Mapping interventions that aim to improve maternal outcomes

US maternal mortality ratios
(Amnesty International)
KNOWLEDGE GAPS AND CHALLENGES – ACCESS TO CARE

• Scarcity of roads in LMICs limits modelling of access to care

• New spatio-temporal measures for access are needed. Static measures for access paint an inaccurate picture as access changes markedly during the wet season.

• CHWs are starting to extend the reach of basic care in LMICs, and access models need to account for this

• The impact of conflict and how this impedes access to care needs to be modelled
KNOWLEDGE GAPS AND CHALLENGES – RISK OF MATERNAL ILL-HEALTH

• Need for more implicit use of GIS to explore the place-specific influences on maternal outcomes
  • Improve performance of models
  • However, models are less generalizable
POLICY IMPLICATIONS

• Application of GIS in maternal health determined by policy priorities in global maternal health

• GIS is largely used to evaluate policy and potential exists to inform policy

• Much potential for geographic thought, not just maps, to inform policy and programs
CONCLUSION

• There has been an increase in the level of sophistication of GIS methods applied to maternal health

• Some of the current GIS methods are inadequate for LMICs and need further redesign – e.g. static access measures

• Building a spatial data infrastructure is an essential step to assist scaling up the use of GIS in maternal health

• More potential to further explore the role of GIS in contributing to new policy directions concerning maternal health
Thank you!