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SCHOOL OF PUBLIC HEALTH

# Geographic Information Systems: Finding the Spatial Parameters of Public Health

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mcgetric@ualberta.ca

# Presentation Overview

- *What's Public Health?*
- *Public Health Geographic Information Systems (GIS)*
- *Future Issues in Brief*
- *Topic in Focus:  
Community Based Participatory Research  
(CBPR)*

<http://www.esri.com/news/arcnews/winter0607/articles/winter0607gifs/p6p2-lg.jpg>



# What's Public Health?



[http://www.sph.tulane.edu/publichealth/bsph/images/public-health-hands\\_1.jpg](http://www.sph.tulane.edu/publichealth/bsph/images/public-health-hands_1.jpg)

What's Public Health?

Public Health GIS

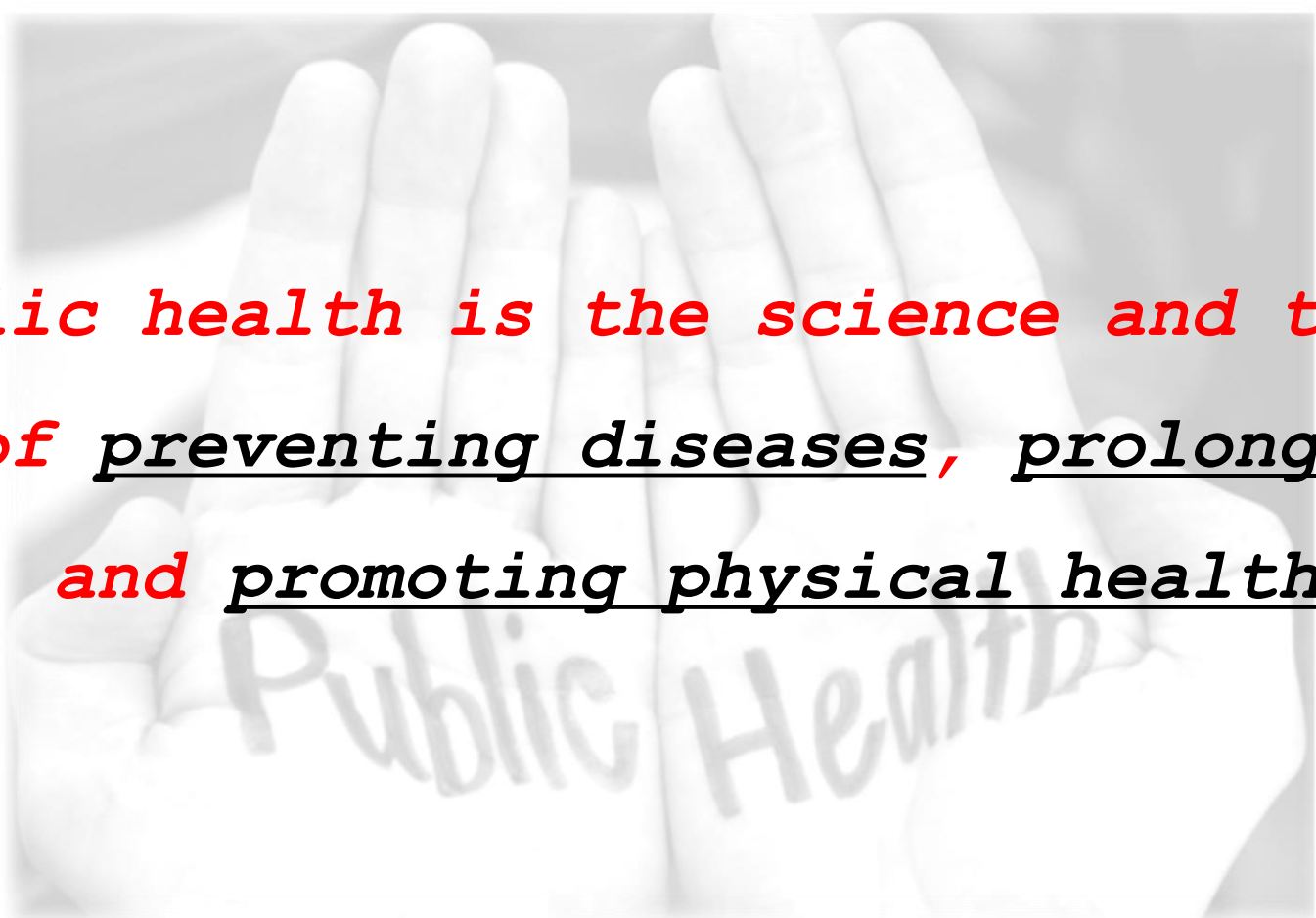
Future Issues

Topic in Focus



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# What's Public Health?



*"Public health is the science and the art of preventing diseases, prolonging life, and promoting physical health ..."*

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What's Public Health?

Public Health GIS

Future Issues

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# What's Public Health?

*"through organized community efforts and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health ..."*

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What's Public Health?

Public Health GIS

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# What's Public Health?

"... **the** sanitation of the environment, **the** control of community infections, **the** education of the individual **in** **principles of personal hygiene**, **the** organization of medical and nursing service **for the** early diagnosis **and** preventive treatment **of diseases.**"

[http://www.sph.tulane.edu/publichealth/bsph/images/public-health-hands\\_1.jpg](http://www.sph.tulane.edu/publichealth/bsph/images/public-health-hands_1.jpg)

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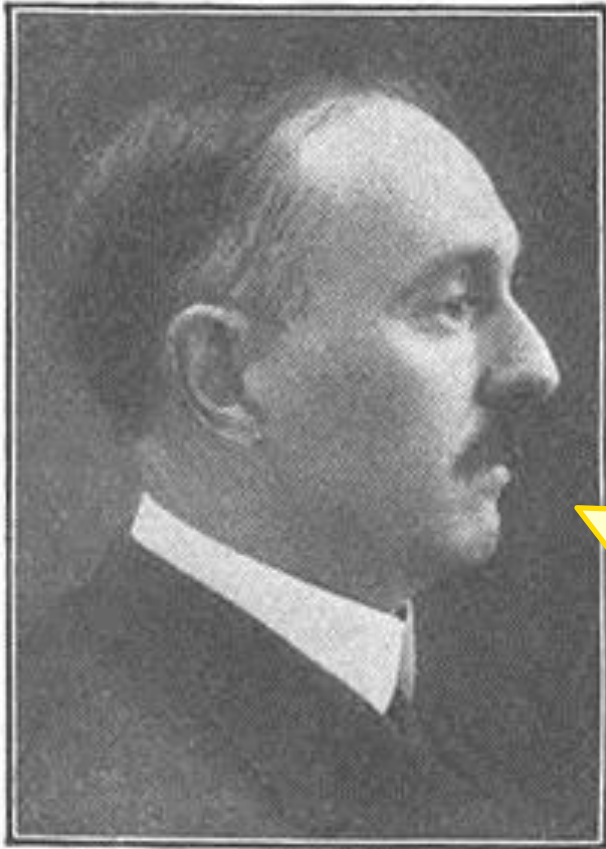
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# What's Public Health?



Charles-Edward Amory Winslow,  
1920: "The untilled fields of  
public health" in *Science* 51(1306)

*Public health is the science and the art of preventing diseases, prolonging life, and promoting physical health through organized community efforts and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health ... the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing service for the early diagnosis and preventive treatment of diseases."*

[http://upload.wikimedia.org/wikipedia/commons/thumb/f/f6/Charles-Edward\\_A.\\_Winslow.jpg/220px-Charles-Edward\\_A.\\_Winslow.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/f/f6/Charles-Edward_A._Winslow.jpg/220px-Charles-Edward_A._Winslow.jpg)

What's Public  
Health?

Public Health  
GIS

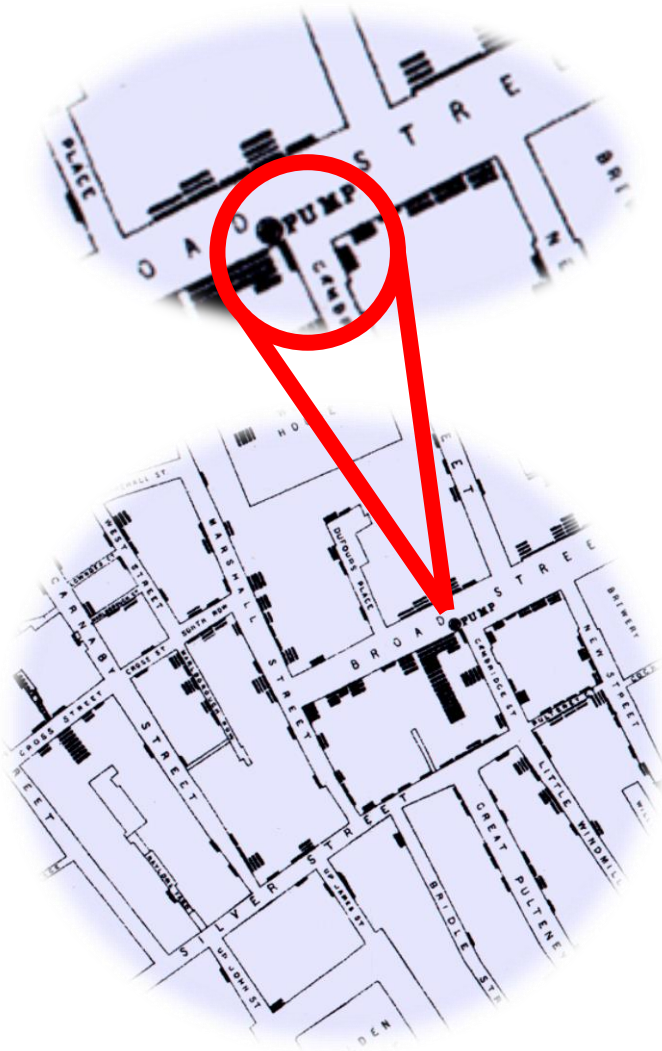
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# Public Health GIS



*Dr. John Snow:  
Father of Epidemiology  
Cholera Outbreak  
Soho London, 1854*

*Investigated the epidemic  
with spatial epidemiology:*

- 1) Ecological scale*
- 2) Case/control reasoning*
- 3) Statistical analysis*

[http://jcsites.juniata.edu/faculty/rhodes/ida/images/snowmap1e\\_1854.gif](http://jcsites.juniata.edu/faculty/rhodes/ida/images/snowmap1e_1854.gif)

What's Public  
Health?

Public Health  
GIS

Future Issues

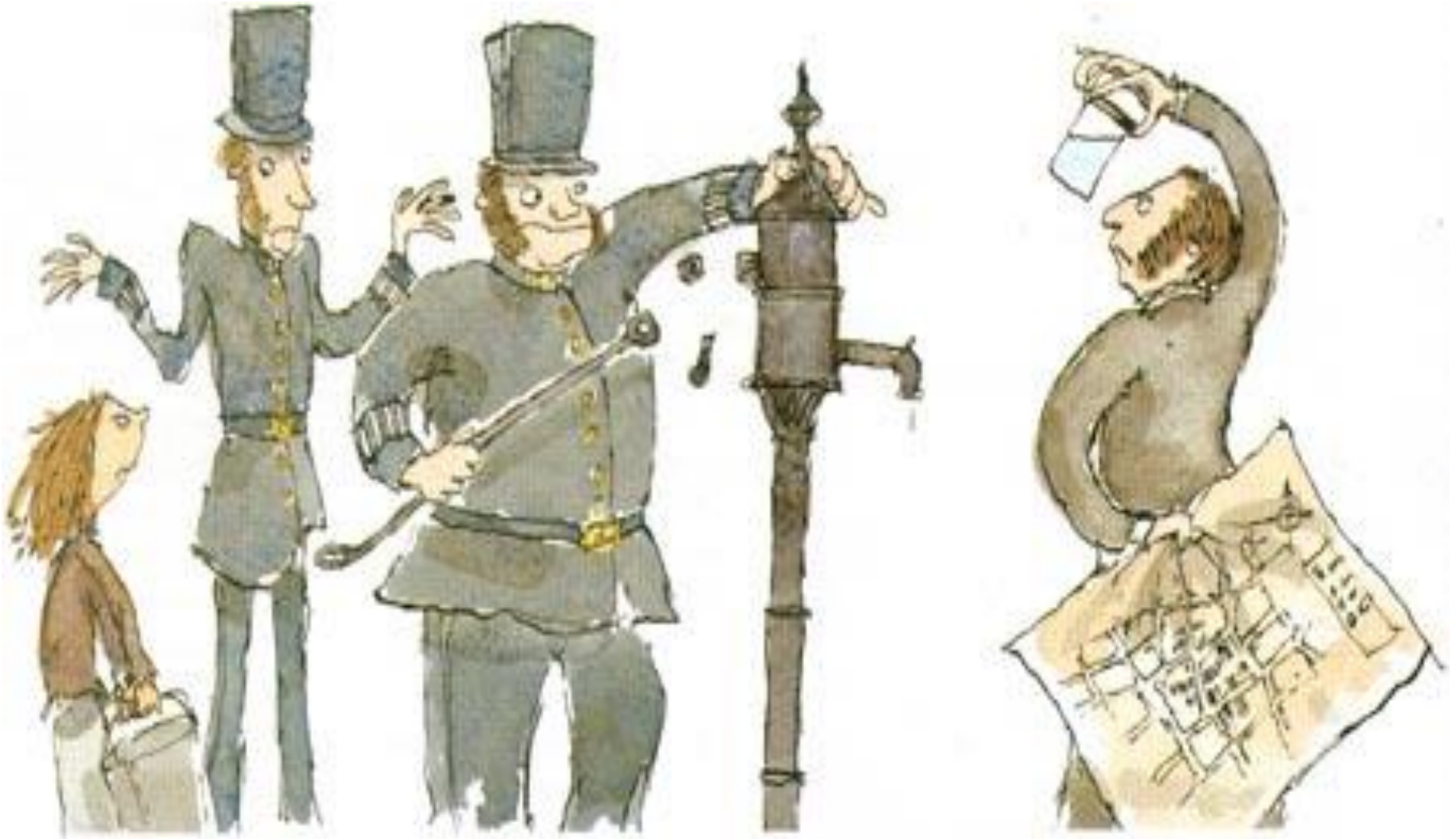
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# Public Health GIS



<http://www.ph.ucla.edu/epi/snow/graphics/cricketfig6.jpg>

What's Public Health?

Public Health GIS

Future Issues

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# Public Health GIS

- *Research*
- *Disease surveillance*
- *Risk analysis*
- *Health care planning and policy*
- *Demographics*
- *Public outreach communication*



<http://www.esri.com/news/arcnews/winter0607/articles/winter0607gifs/p6p2-lg.jpg>

What's Public Health?

Public Health GIS

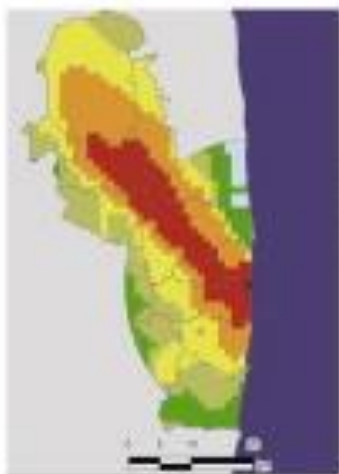
Future Issues

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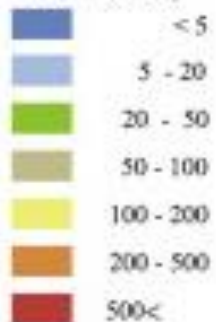
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# Public Health GIS: Research

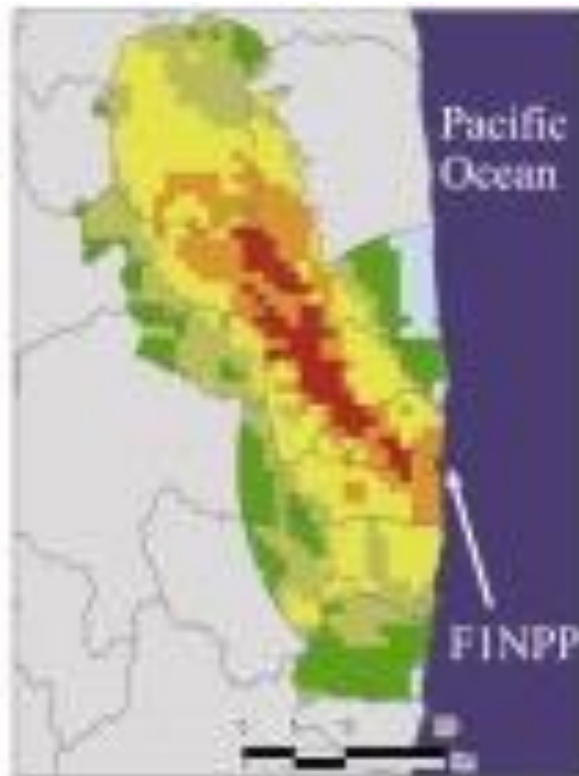


Without Decontamination  
EeCC = 0.6

CDE<sub>30</sub> (mSv)  
(30-year cumulative  
external dose)



EeCC: External Exposure  
Conversion Coefficient



Result 1: EeCC = 0.6



Result 2: EeCC = 0.2

Yasutaka, T., Iwasaki, Y., Hashimoto, S. ... Nakanishi, J. (2013).  
A GIS-based evaluation of the effect of decontamination on  
effective doses due to long-term external exposures in  
Fukushima. *Chemosphere*. 93(6), 1222-1229.

What's Public  
Health?

Public Health  
GIS

Future Issues

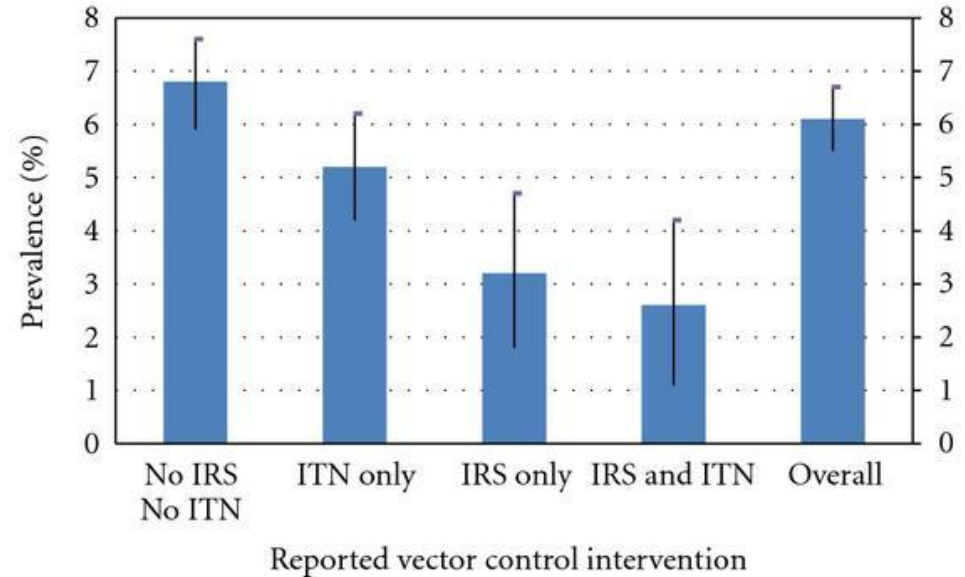
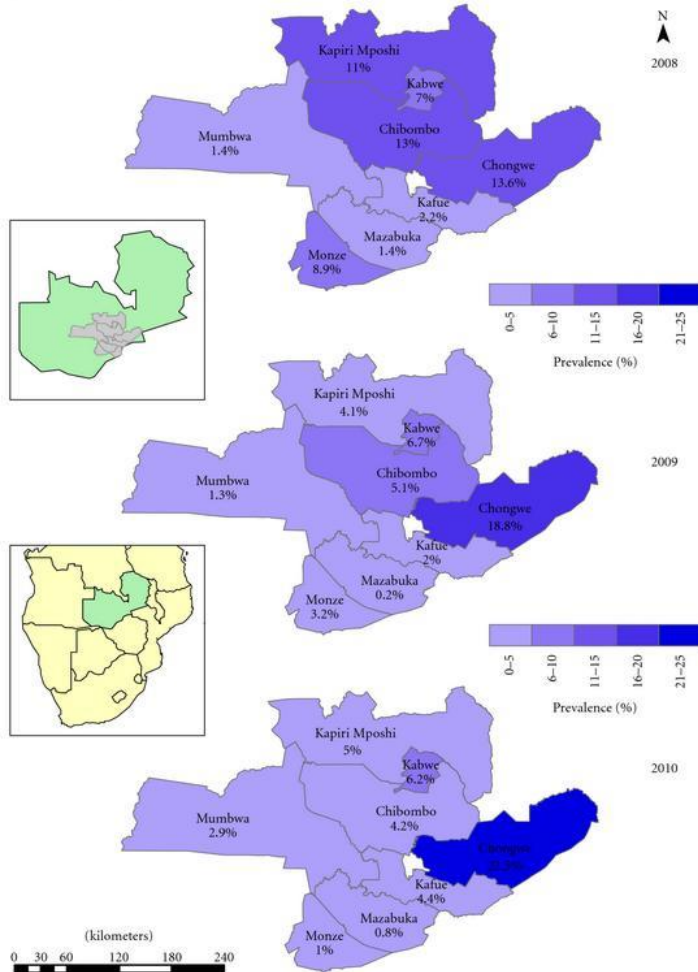
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# Public Health GIS: Disease Surveillance

Zambia  
Prevalence of infection with *Plasmodium falciparum* in children 1 to 14 years of age by district, observed during household surveys in 2008, 2009, and 2010



Chanda, E., Munyongwe Mukonka, V., Mthembu, D. ... Shinondo, C. J. (2012). Using a Geographical Information-System-Based Decision Support to Enhance Malaria Vector Control in Zambia. *Journal of Tropical Medicine*. 2012, Article ID 363520.

What's Public Health?

Public Health GIS

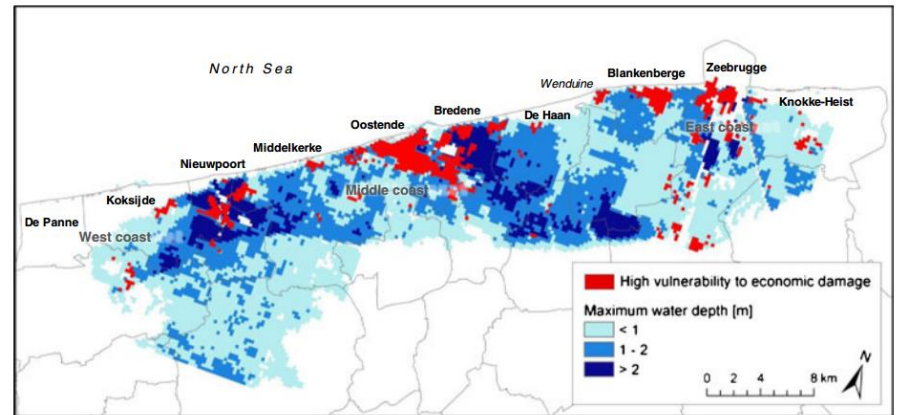
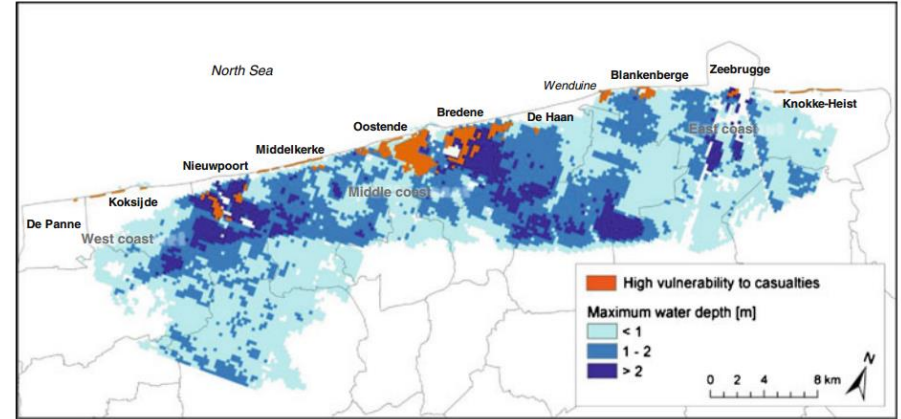
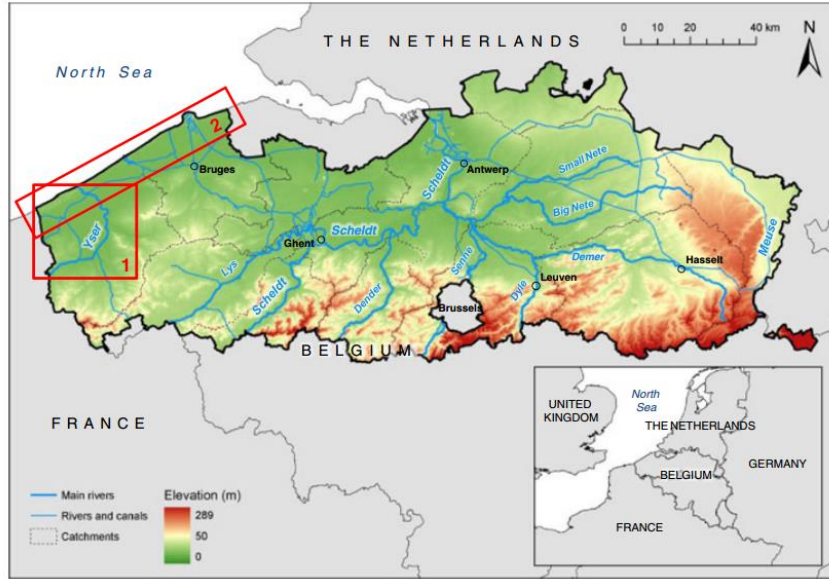
Future Issues

Topic in Focus



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# Public Health GIS: Risk Analysis



Kellens, W., Vanneuville, W. Verfaillie, E. ... De Maeyer, P. (2013). Flood Risk Management in Flanders: Past Developments and Future Challenges. *Water Resources Management*. 27, 3585-3606.

What's Public Health?

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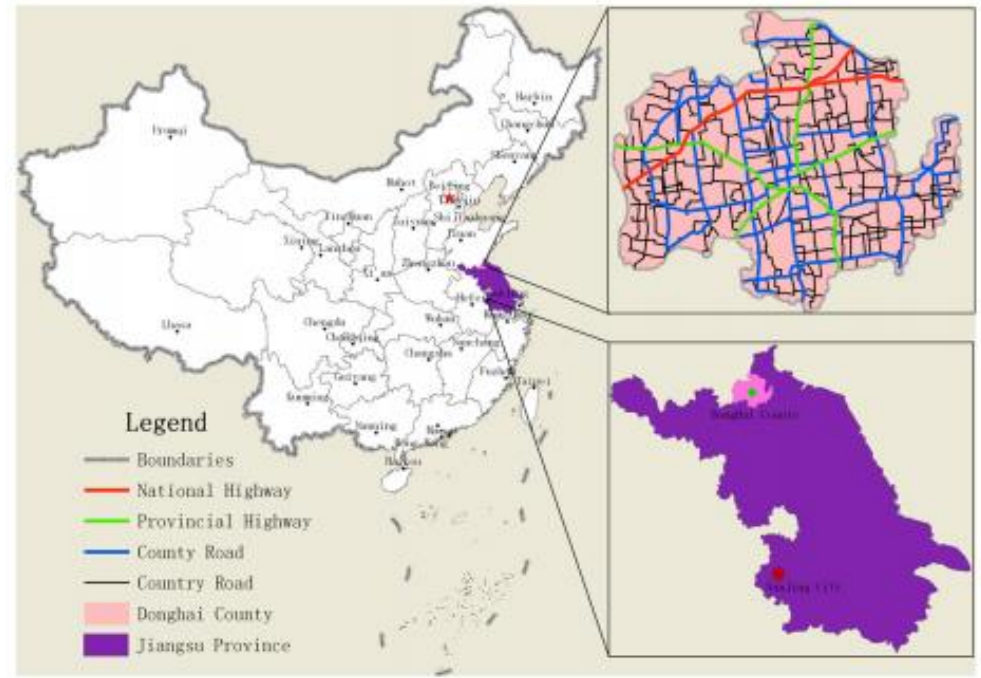
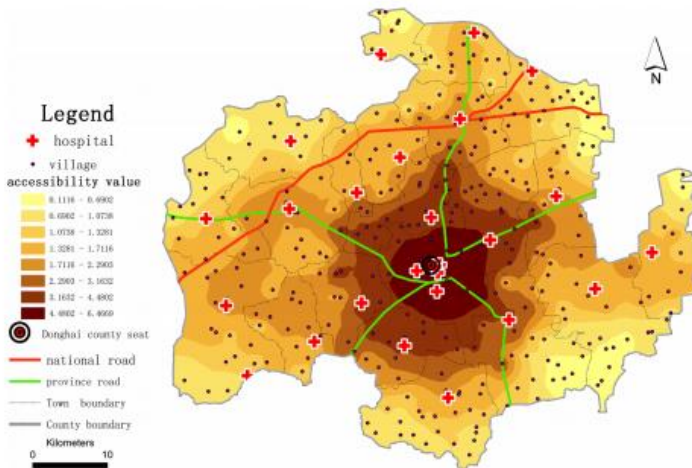
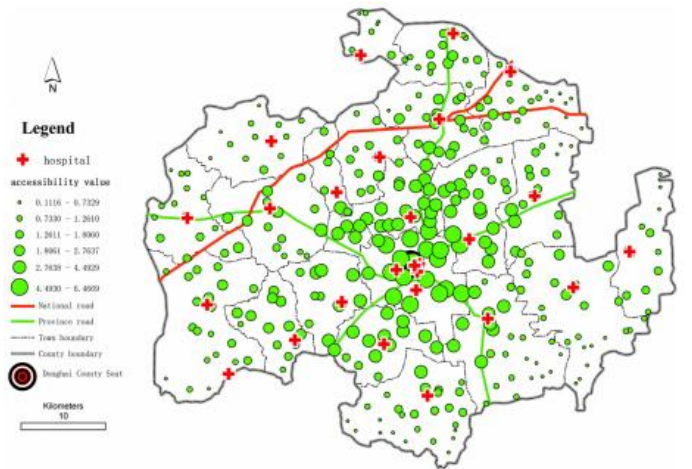
Future Issues

Topic in Focus



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# Public Health GIS: Health care planning and policy



Hu, R., Dong, S., Zhao, Y ... Li, Z. (2013).  
Assessing Potential Spatial Accessibility  
of Health Service in Rural China: A Case  
Study of Donghai County. *Journal for  
Equity in Health*. 12, 35.

What's Public Health?

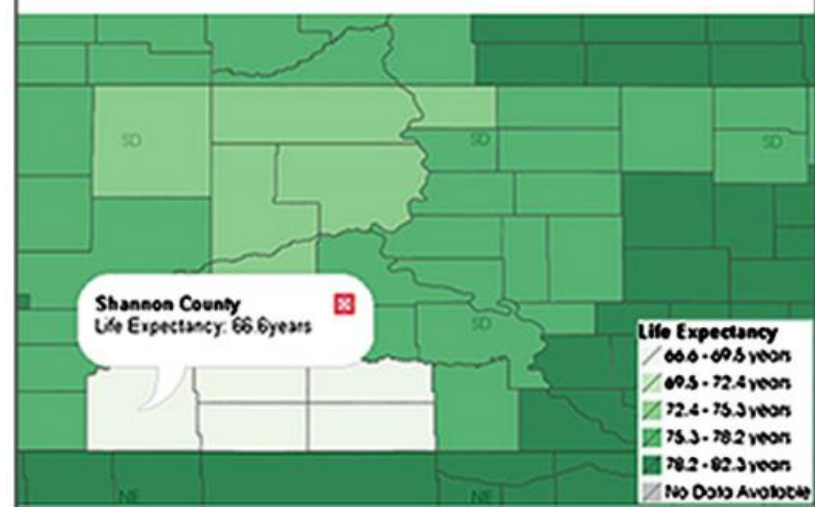
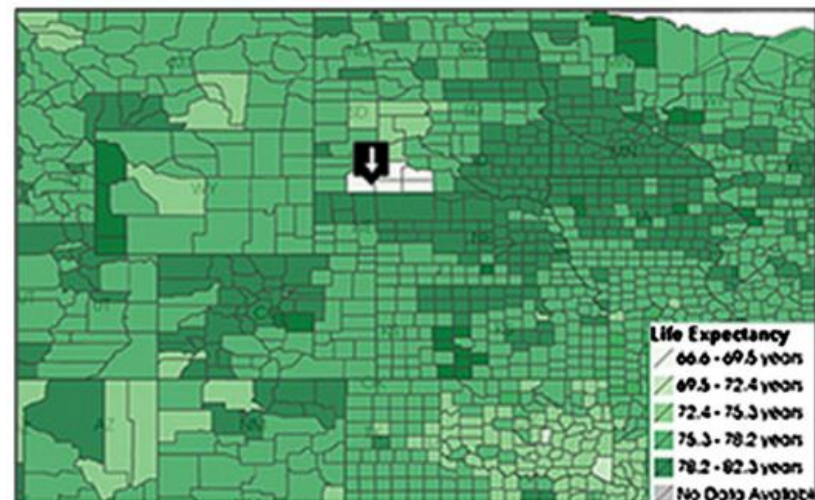
Public Health GIS

Future Issues

Topic in Focus

# Public Health GIS: Demographics

County Name	State	Life Expectancy min=66.6 years average=76.4 years max=81.3 years	Infant Mortality min=0.0 deaths average=7.3 deaths max=23.7 deaths	Percent Uninsured min=3.6 % average=13.4 % max=35.7 %	Smoking Rate min=3.6 % average=23.4 % max=46.2 %
Bennett County	SD	66.6 years	3.3 deaths	24.1 %	28.8 %
Jackson County	SD	66.6 years	18.4 deaths	27.2 %	20.2 %
Shannon County	SD	66.6 years	15.7 deaths	29.3 %	42.4 %
Todd County	SD	66.6 years	14.9 deaths	30.9 %	39.9 %
Baltimore city	MD	69.6 years	11.1 deaths	17.1 %	27.9 %
Marlboro County	SC	69.6 years	10.6 deaths	19.2 %	35.7 %
Petersburg city	VA	69.6 years	12.6 deaths	18.1 %	26.0 %
Phillips County	AR	69.8 years	10.4 deaths	26.0 %	20.9 %



Sopan, A., Song-le Noh, A., Karol, S., ... Shneiderman, B. (2012). Community Health Map: A geospatial and multivariate data visualization tool for public health datasets. *Government Information Quarterly*. 29(2), 223-234.

What's Public Health?

Public Health GIS

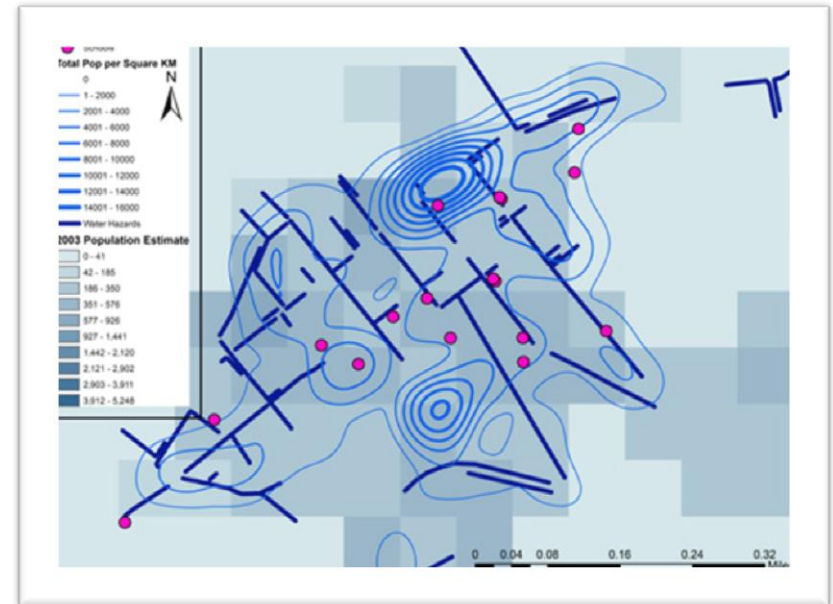
Future Issues

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# Public Health GIS: Public outreach communication



Curtis, A., Blackburn, J. K., Widmer, J. M., Morris Jr, J. G. (2013). A ubiquitous method for street scale spatial data collection and analysis in challenging urban environments: Mapping health risks using spatial video in Haiti. *International Journal of Health Geographics*. 12, Article number 21.

What's Public Health?

Public Health GIS

Future Issues

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# Future Issues in Brief

- *Patient privacy and confidentiality*
- *Representing human spatial scale*
- *Availability of spatially referenced health outcome data*
- *Comparability of spatial epidemiological analyses*
- *Differences in spatial resolution between data sets*
- *Intensive computational requirement of bio-statistical analyses*

<http://www.esri.com/news/arcnews/winter0607/articles/winter0607gifs/p6p2-lg.jpg>

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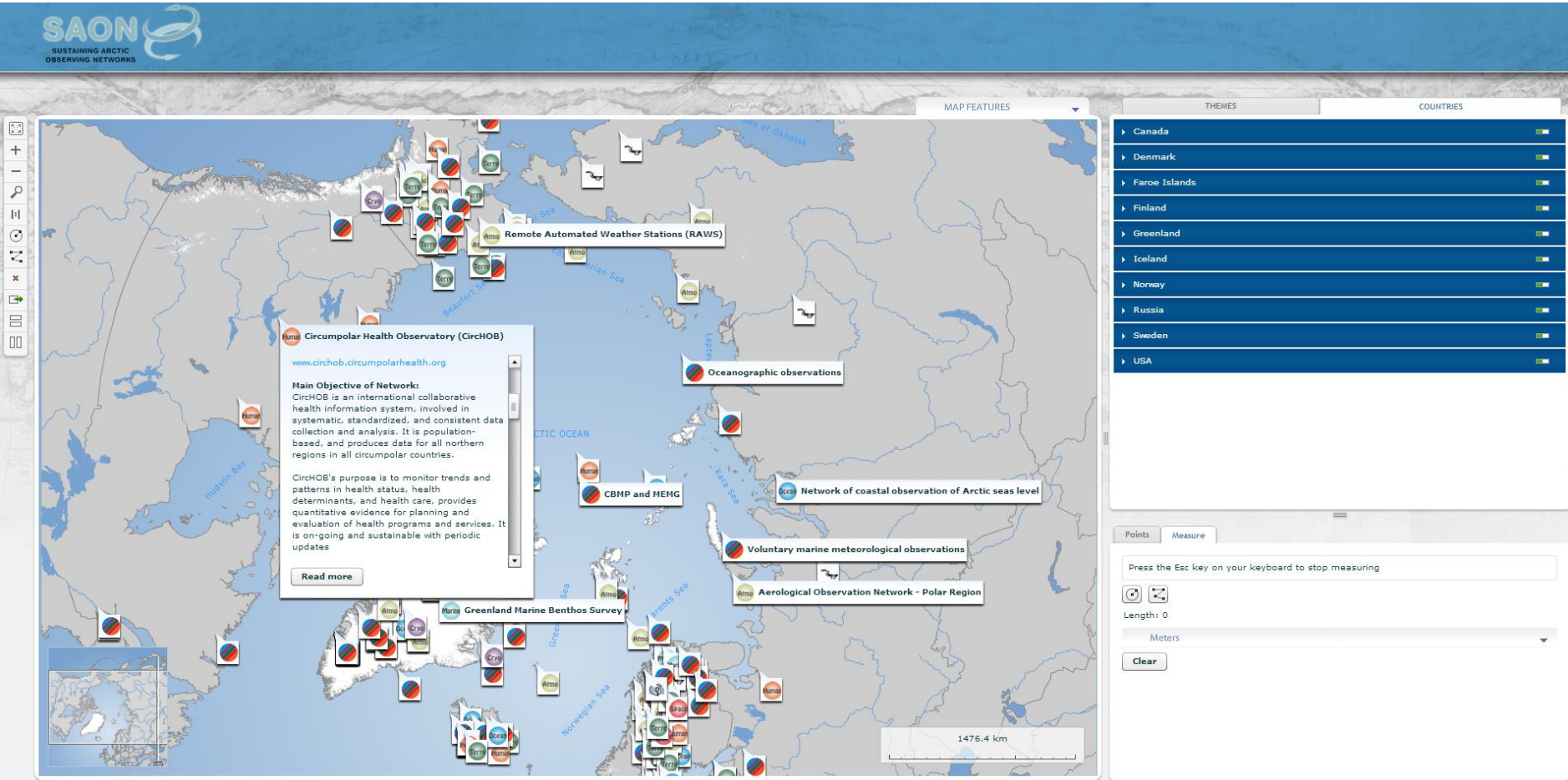
Topic in Focus



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# Topic in Focus: Community Based Participatory Research

## Sustaining Arctic Observing Networks (SAON)



<http://portal.inter-map.com/saon/#mapID=26&groupID=441&z=1.0&up=0.0&left=0.0>

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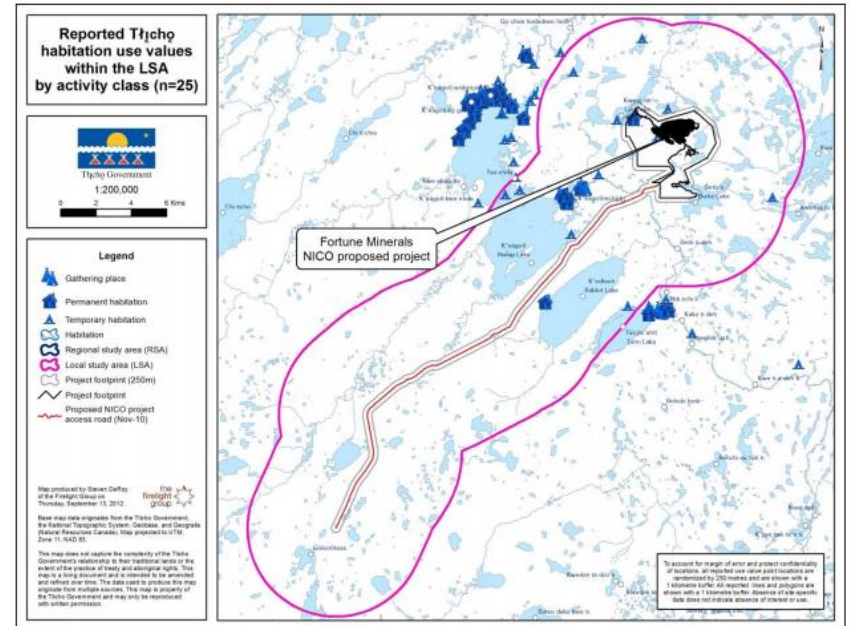
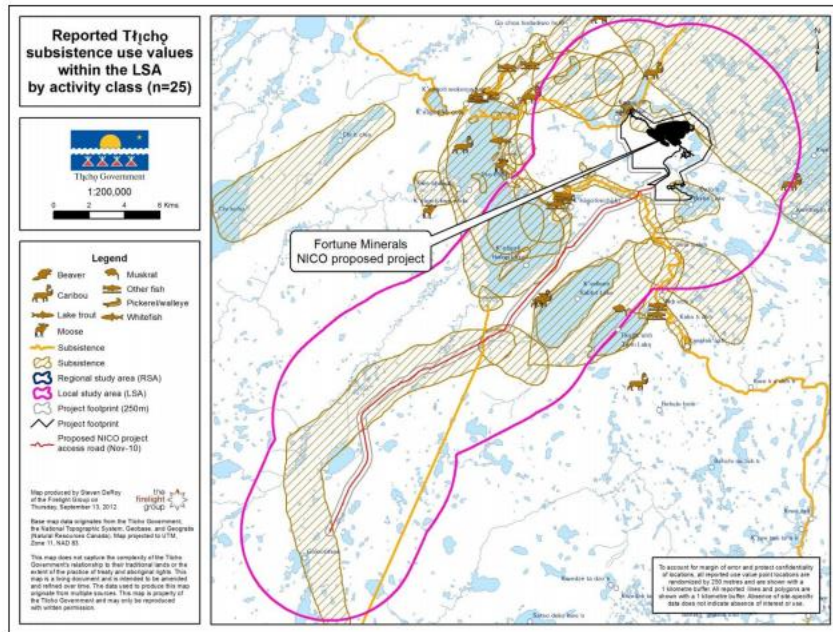


<http://www.fosjm.org/images/the-life-and-culture-of-the-yupik-people-of-alaska.jpg>; <http://2.bp.blogspot.com/-oeRpln-tHlg/TJ9pVgIdtI/AAAAAAAAMGk/30vg5ByDjNA/s1600/Alaska+Oil+Pipeline.JPG>;  
[http://www.nunatsiaqonline.ca/stories/article/65674indigenous\\_statement\\_calls\\_for\\_ban\\_on\\_all\\_arctic\\_oil\\_development/](http://www.nunatsiaqonline.ca/stories/article/65674indigenous_statement_calls_for_ban_on_all_arctic_oil_development/); <http://www.grida.no/publications/et/pt/page/2580.aspx>;  
[http://s.wsj.net/public/resources/images/OB-WB566\\_arctic\\_E\\_20130121154402.jpg](http://s.wsj.net/public/resources/images/OB-WB566_arctic_E_20130121154402.jpg); <http://media.economist.com/images/20090718/CIR904.gif>; <http://barentsobserver.com/en/arctic/crackdown-rip-on-opus-international-season-15-11>



# Topic in Focus: Community Based Participatory Research

## ○ Relational autonomy as a social determinant of health



[http://www.reviewboard.ca/upload/project\\_document/EA0809-004\\_Traditional\\_Knowledge\\_and\\_Use\\_Study\\_Tlı̨cẖo\\_Government.PDF](http://www.reviewboard.ca/upload/project_document/EA0809-004_Traditional_Knowledge_and_Use_Study_Tlı̨cẖo_Government.PDF)

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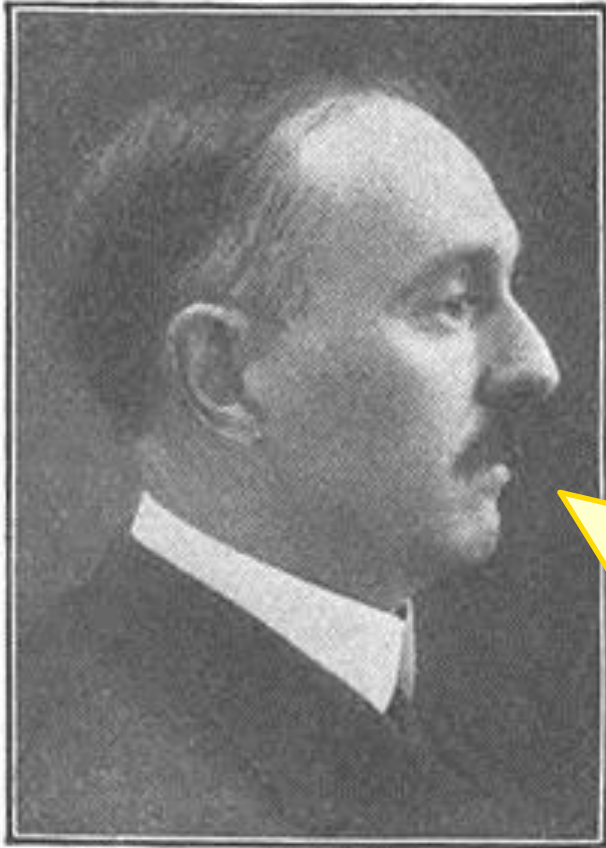
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