Watershed condition and children’s health: Global relationships & policy opportunities

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What we need to know

Policy / Decision → Ecosystem Change → Ecological Effect → Health Risk Factors → Health Outcome

Mediating Factors

Forest policy → Deforestation → Microhabitats → Vector populations → Malaria

BED NETS
Watersheds & waterborne disease

How does watershed disturbance affect downstream diarrheal disease among children?
Big data approach

- 100K’s of households in >90 countries
- 100’s of variables
- Compile for first time
The data

- Health outcomes (stunting, diarrhea, …)
- Social factors (wealth, education, …)
- Sanitation factors (water source, toilet type, …)
- Natural features (climate, land use, …)
- Watershed condition (human activity, forest cover …)

800K kids
49 countries
e.g., Mozambique
Variables modeled

Policy / Decision → Ecosystem Change → Ecological Effect → Health Risk Factors → Health Outcome

Upstream:
- Human activity
- Tree cover

Mediating Factors

Health Outcome

Diarrhea

Age
Wealth
Education
Improved water
Improved toilet
What impacts childhood diarrhea?

Herrera, et al. in review, Nature Communications
Comparing potential interventions

 Change in diarrhea (%)

Wealth
Education
Improved sanitation
Improved water
Tree change 10%
Tree change 20%
Tree change 30%

RURAL

% change in probability of DD

Herrera, et al. in review, Nature Communications
Where are children vulnerable?

Rasolofoson, et al. in prep
Sustainable Development Goals

1. No Poverty
2. Zero Hunger
3. Good Health and Well-Being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice and Strong Institutions
17. Partnerships for the Goals

Fisher, et al. in prep
Take homes

• Watershed condition affects children’s health
  – Even after controlling for mediating factors

• Signal strongest for most vulnerable kids
  – Rural (& poor) households depend more directly on nature

• Nature investments can be public health investments
  – WWF, USAID, UN
Collaborators
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HEAL
UNEP-WCMC

Support
Luc Hoffmann Institute at WWF
MAVA Foundation
NSF – SESYNC
Moore Foundation
Rockefeller Foundation
Forest effects: multiple outcomes

Diarrhea

Reduction in disease (prob.)

-1
-0.5
0
0.5
1

Poorest
Richest

Marginal effect

95% CI

Fisher, et al. in prep
Effects of change unequal

Improved engineered infrastructure & access to markets

(a) Mediating influences

(b) Degradation of ecological systems

(c) Improved engineered infrastructure & access to markets leads to improved health status

Degraded natural systems without access to improvements or markets lead to less healthy populations

Myers, et al. 2013. *PNAS*
Waterworld: human footprint
Impact of X on water at a point

Impact measure = % of water affected by:
- Livestock
- Protected areas
- Etc...

Data: precip, landcover, water routing