

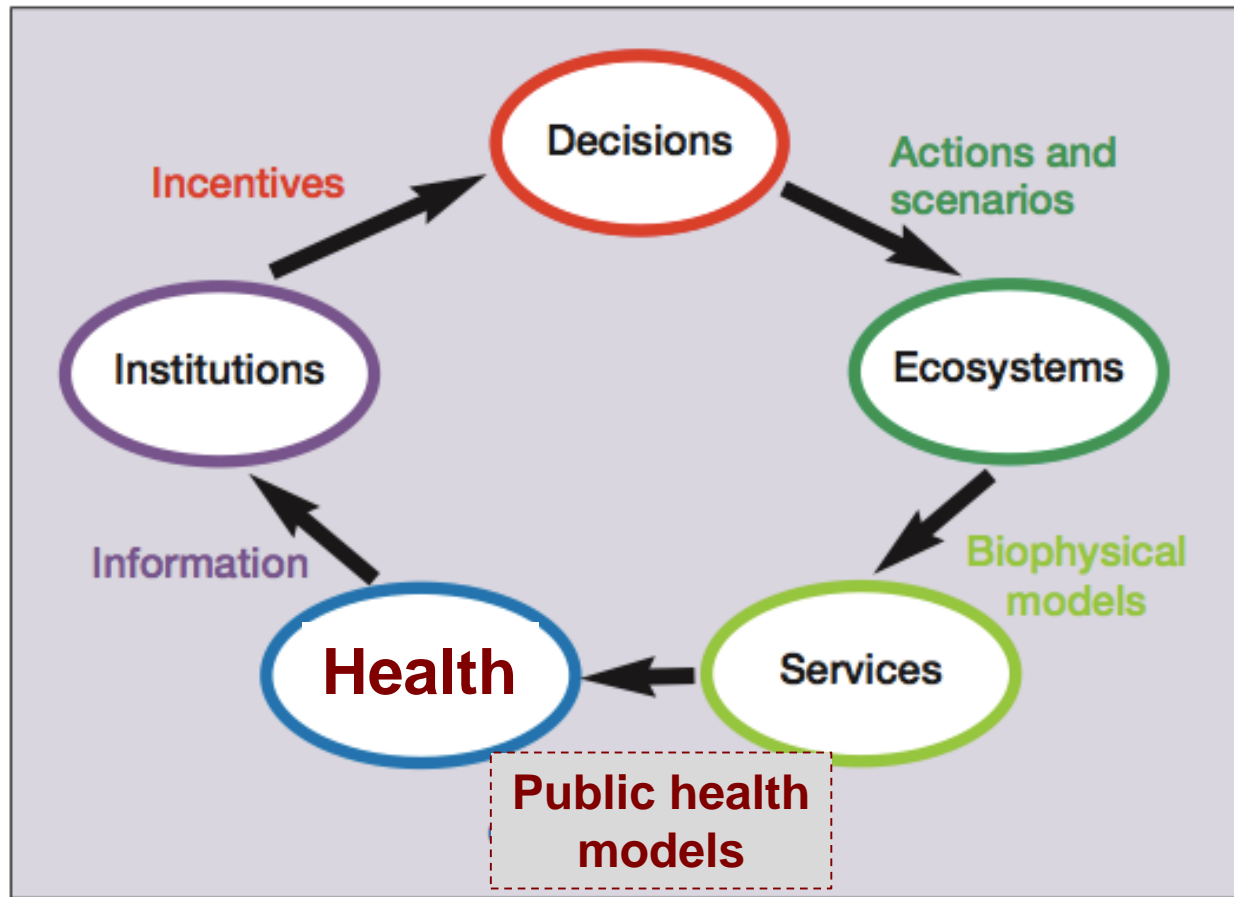
# Show me more than the money:

## Ecosystem Services and Human Health

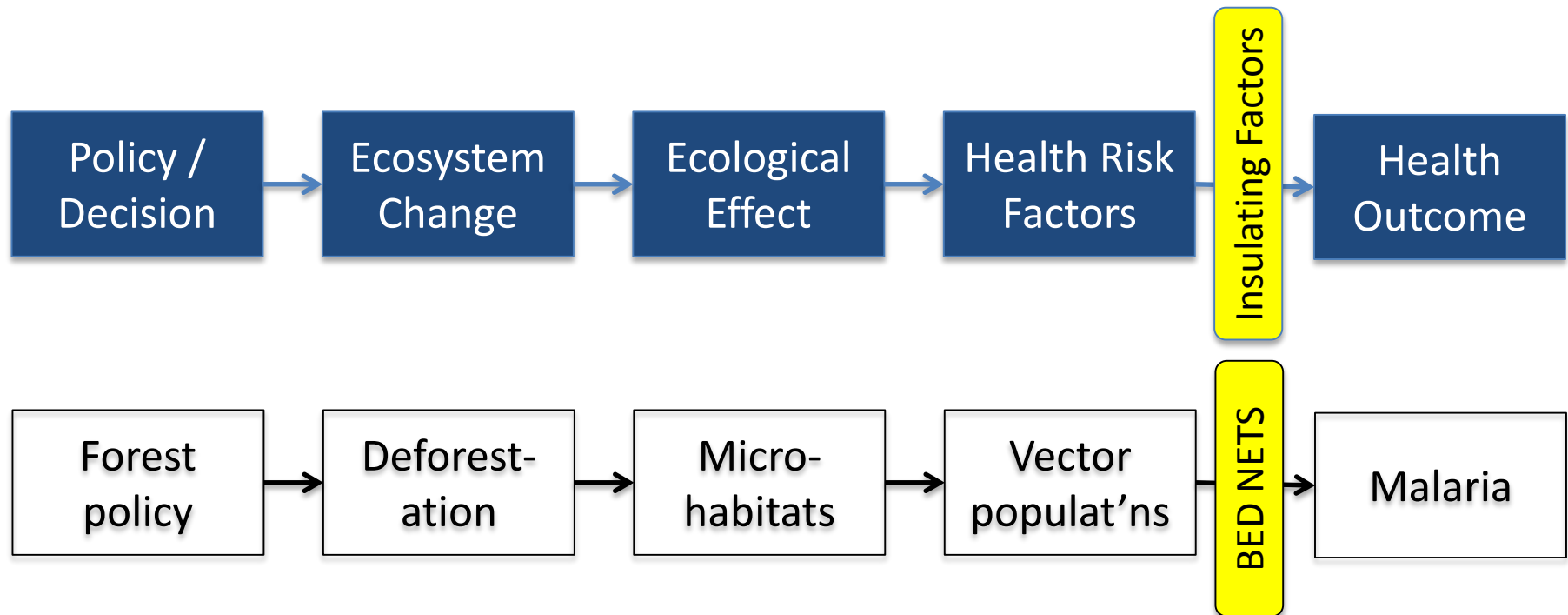


Taylor Ricketts  
Gund Institute, University of Vermont

# The overall idea



# What we need to know



- Fit production functions
- Get to concrete health outcomes
- Consider insulating factors

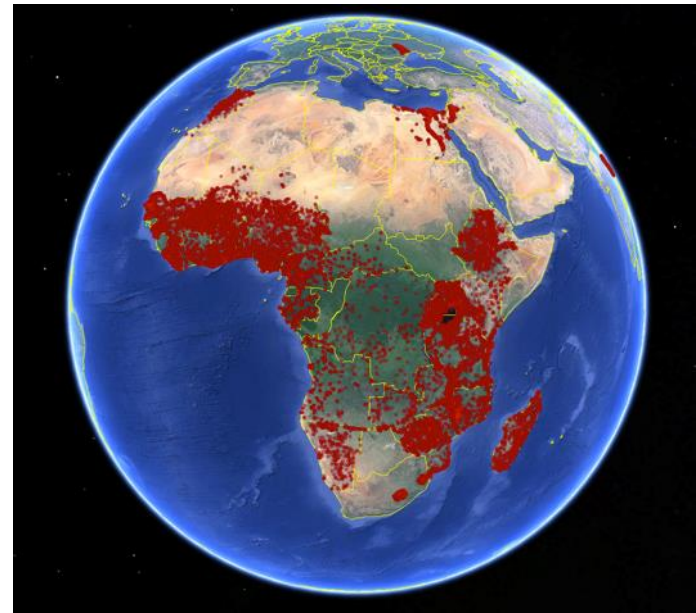
# Two examples

## 1. Pollinators and nutrition



Alicia Ellis, Sam Myers

## 2. Watersheds and waterborne disease



Alicia Ellis, Mark Mulligan,  
Brendan Fisher, et al.

# 1: Pollinators and nutrition

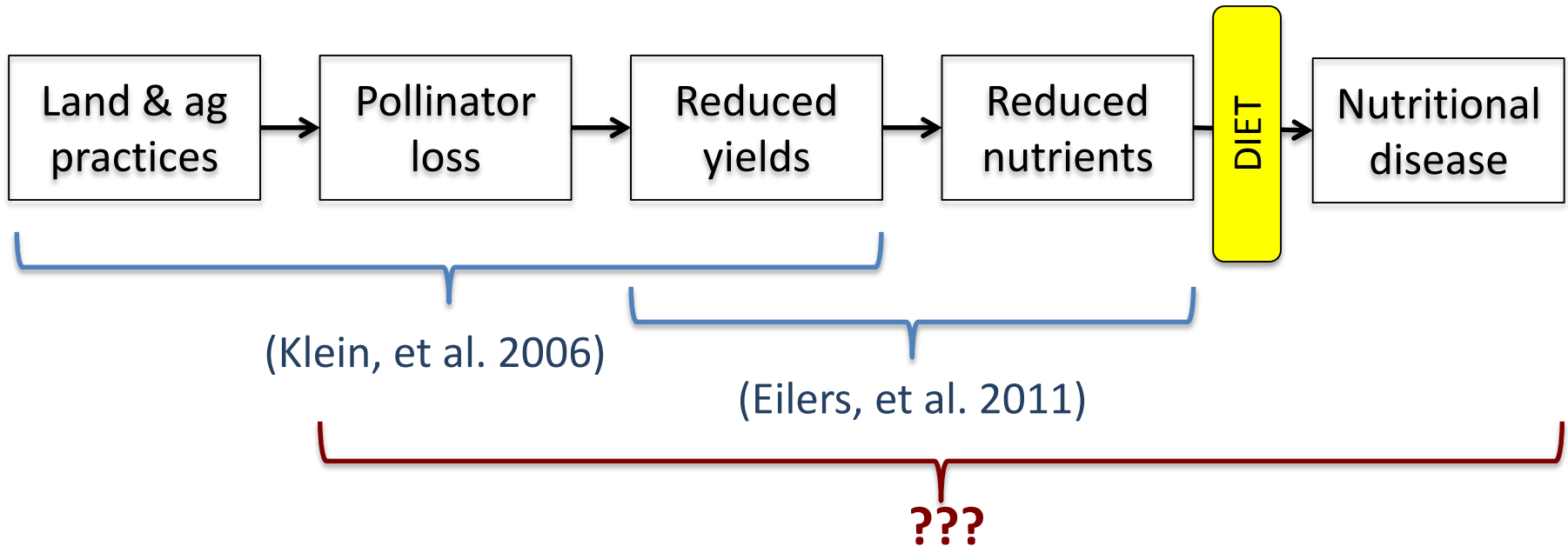
- 70% of crops
- Pollinators declining



## Question:

What effect would pollinator declines have on nutritional health?

# Pollinators and nutrition



## Science News

*... from universities, journals, and other research organizations*

## Pollinators Make Critical Contribution to Healthy Diets

# Diet data



Breeding Crops for Better Nutrition

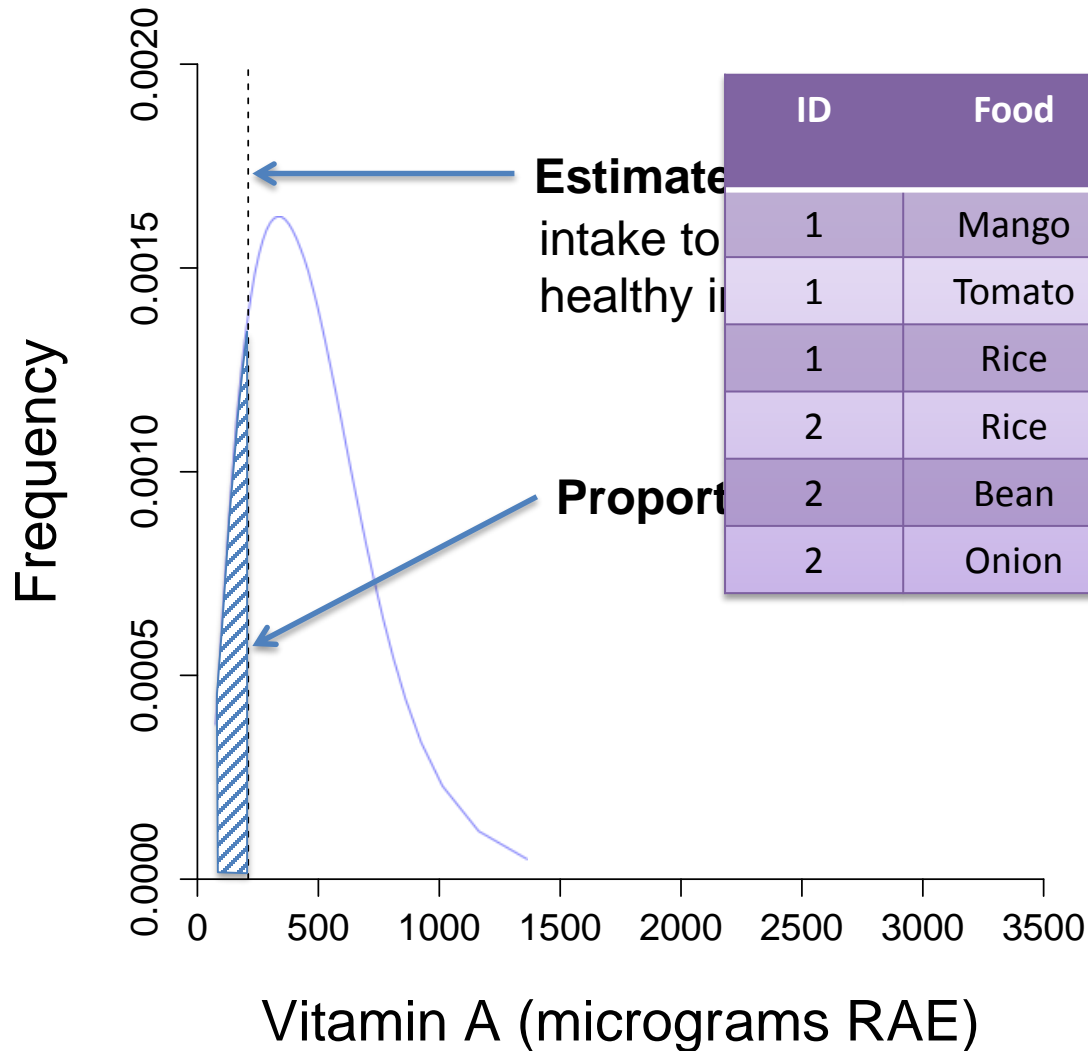


- 24-hour dietary recall
  - Bangladesh
  - Mozambique
  - Uganda
  - Zambia
- > 1 day of recall
- Food composition



# Risk of nutritional disease

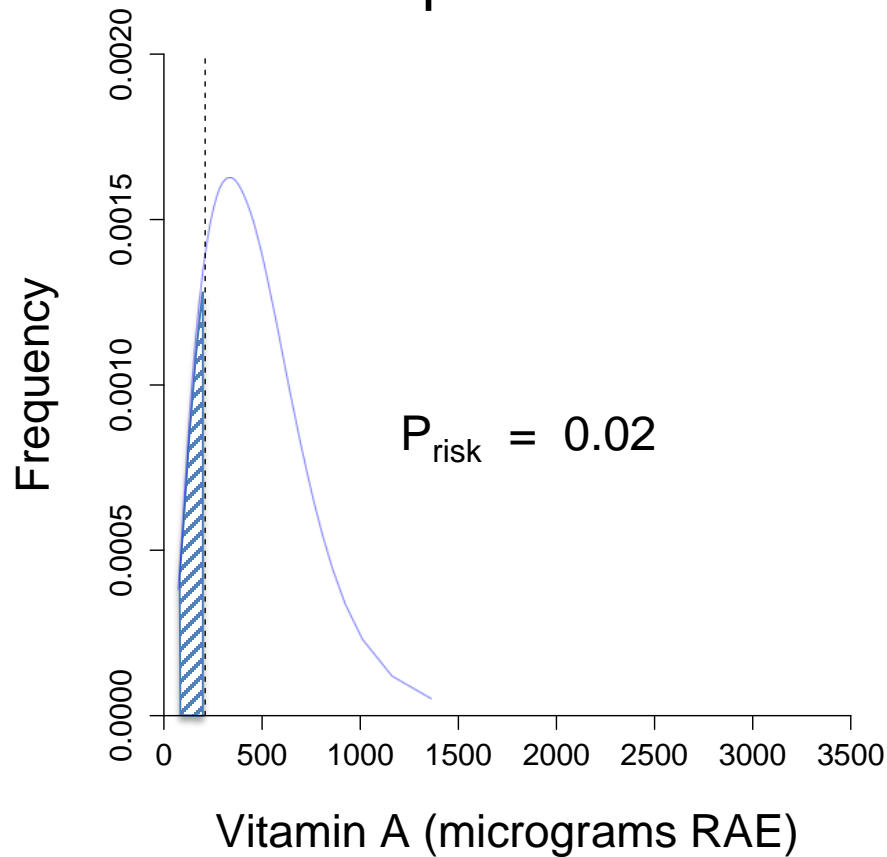
## Zambia – Vitamin A



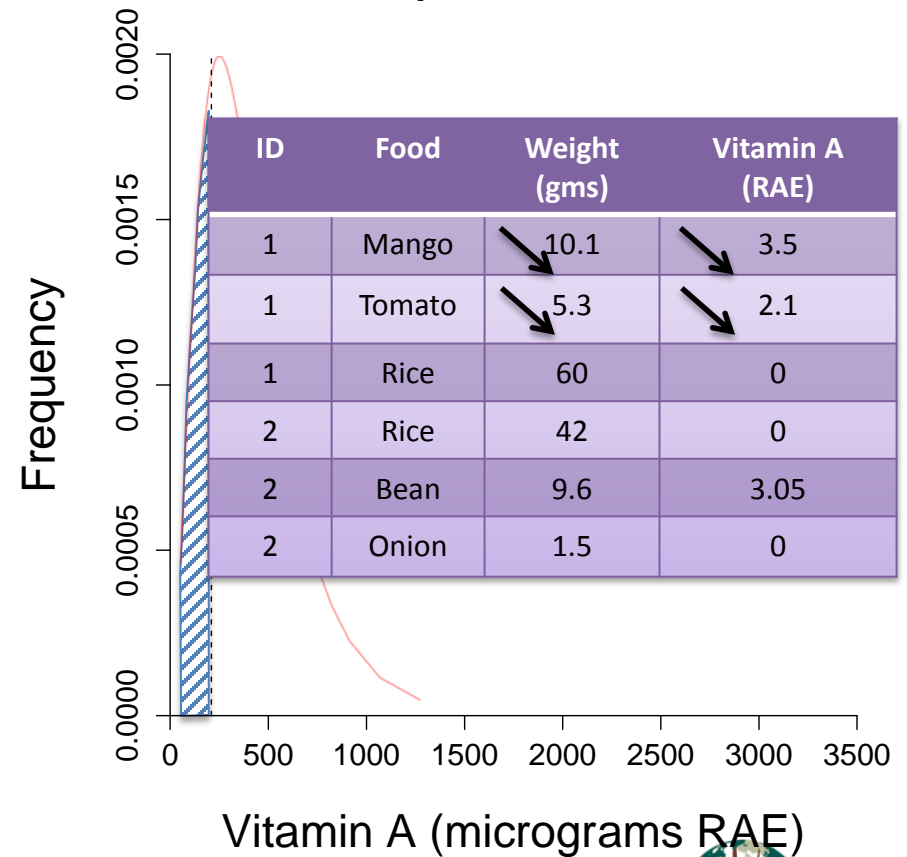
ID	Food	Weight (gms)	Vitamin A (RAE)
1	Mango	10.1	3.5
1	Tomato	5.3	2.1
1	Rice	60	0
2	Rice	42	0
2	Bean	9.6	3.05
2	Onion	1.5	0

# Change in risk

## Full pollination



## No pollination



# All countries, all nutrients

	<u>N</u>	<u>Vitamin A</u>	<u>Calcium</u>	<u>Folate</u>	<u>Iron</u>	<u>Zinc</u>
Bangladesh	500	0.020	0.001	0.013	0.03	0.028
Mozambique	186	<b>0.560 *</b>	0	<b>0.228</b>	0.05	0.016
Uganda	451#	<b>0.150 *</b>	0.019	0.041	0.03	0.009
Zambia	295	0.050	0.008	-0.002	0.01	0.001

(Ellis et al. in press. *PLoS ONE*)

# Take homes

- Big potential impacts
  - Vitamin A deficiency
  - Folate deficiency
- But not always the case
  - Sources of nutrients in diets
  - Overall nutrition level
- Need to consider actual diets

## 2. Watersheds & waterborne disease

### Question:

What effect does watershed disturbance have on downstream diarrheal disease among children?

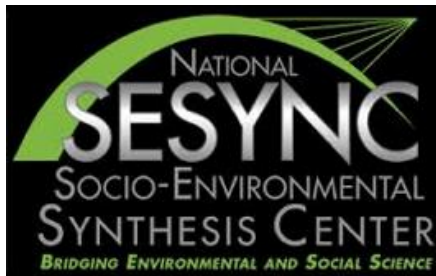


# Big data approach

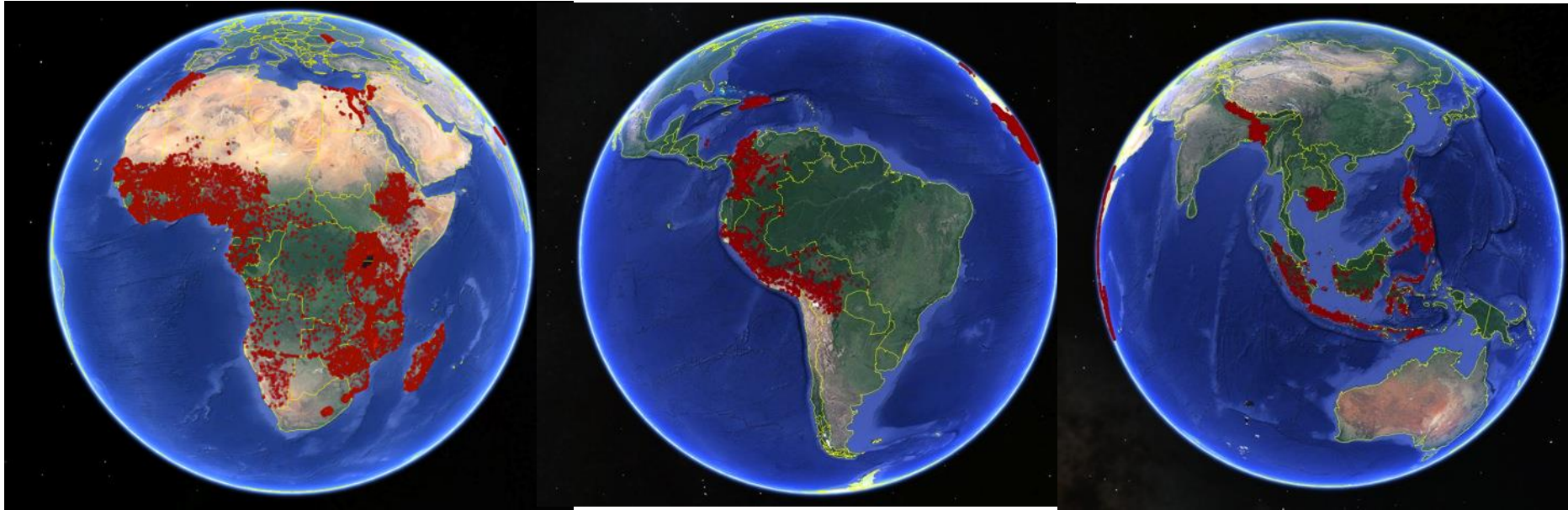


The  
**DHS** Program  
Demographic and Health Surveys

- ~500,000 households in >90 countries since 1984
- ~1000 Demographic, social, behavioral, health variables
- Compile for first time

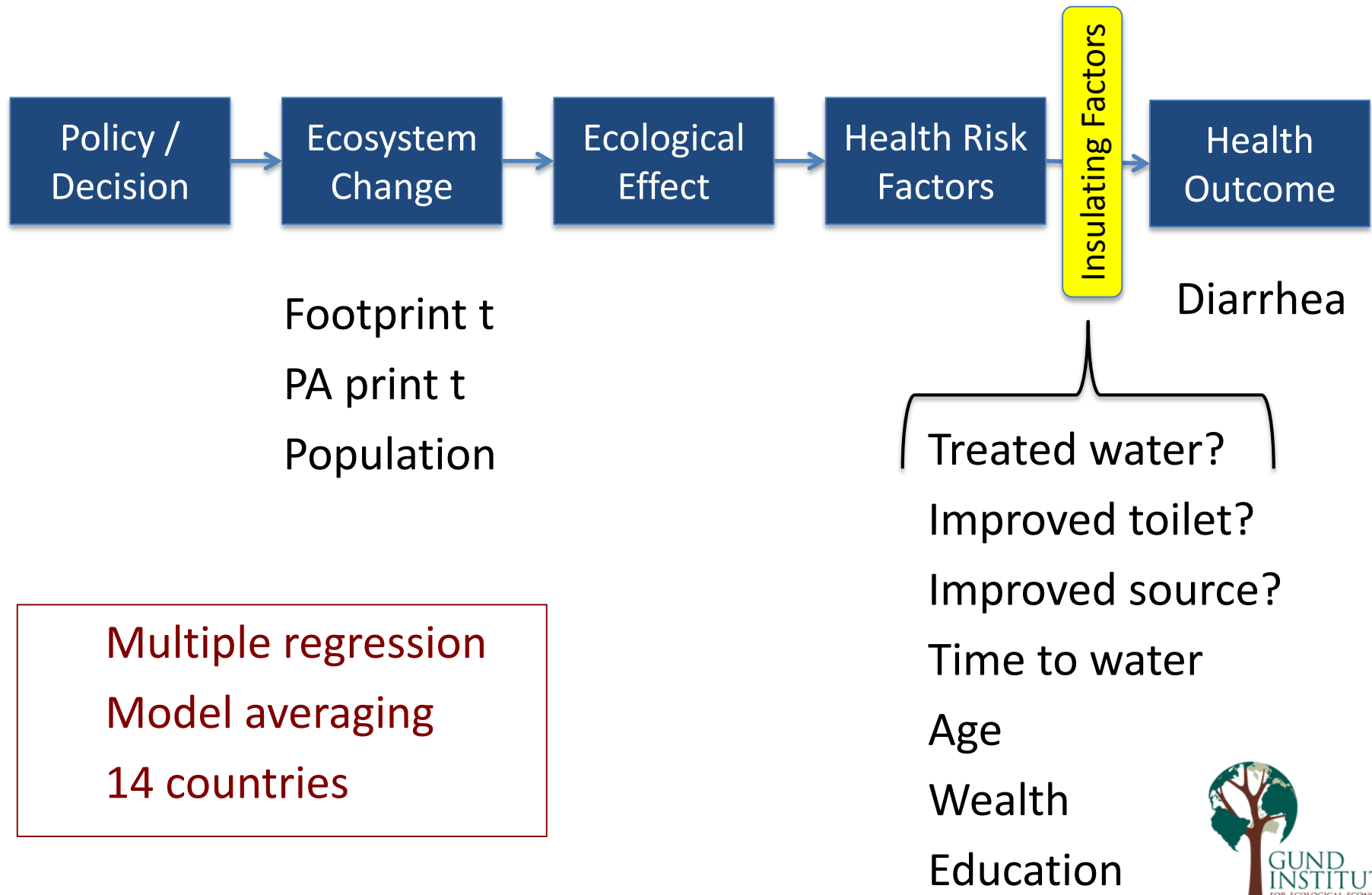


# The data

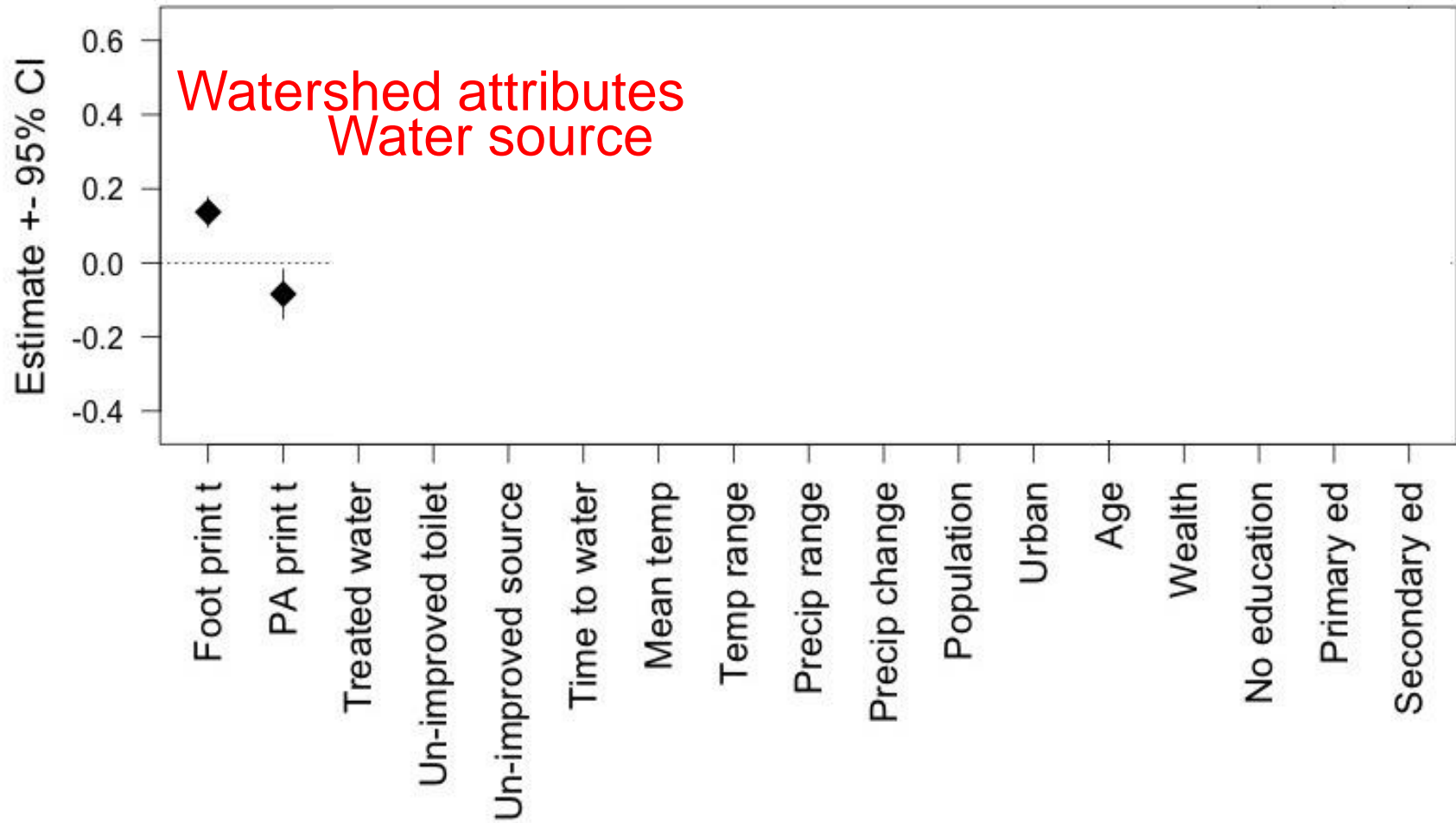


- Health outcomes (anemia, stunting, diarrhea, ...)
- Social factors (age, wealth, education, ...)
- Natural features (forest cover, climate, land use, ...)
- Sanitation factors (water source, toilet type, ...)
- Watershed condition (ag footprint, protected areas, ...)

# Initial models



# Strength of factors



# Take homes

- Watershed condition matters
  - So do many other things
- Syntheses complement case studies
  - Need to model carefully
- Database is a resource for many questions
  - SESYNC project and beyond

# HEAL

## HEAL

HEALTH & ECOSYSTEMS: ANALYSIS OF LINKAGES

GLOBAL CHALLENGES

GOALS

Search



A global collaboration among leading public health and environmental conservation institutions focused on understanding relationships between the state of ecosystems and public health outcomes.



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<http://www.wcs-heal.org>



# Thanks...

## Collaborators

Alicia Ellis  
Brendan Fisher  
Chris Golden  
Kiersten Johnson  
Mark Mulligan  
Sam Myers  
Robin Naidoo  
Steve Osofsky  
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Mary Shelley  
Tim Truer

Gund Institute, UVM  
Natural Capital Project  
HEAL

...

## Support

NSF – SESYNC  
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Rockefeller Foundation

...



# Countries

- Bangladesh
- Egypt
- Haiti
- Kenya
- Lesotho
- Mali
- Mozambique
- Namibia
- Peru
- Senegal
- Swaziland
- Uganda
- Zambia
- Zimbabwe