

## ***Chesapeake Bay Commission***

# **The Environment and Health – The Time is Now**

Co-directors

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**November 9, 2007**



## **From Marel Raub**

- “Highlight ways in which the Institute could be a resource for legislative / policy leaders.”
- “Focus on what clean water & a healthy environment mean locally for the community's sake, without a particular focus on the Bay.
  - A challenge in Bay restoration effort is that restoration of the Bay for the Bay's sake is not an issue for most residents as we live our daily lives.”
- “A description of the projects you are working on or are planning, and how the results can inform state and local decision-making.”

## Overview

- Overview of the Environmental Health Institute (EHI)
- What is “the environment?”
- How does the environment affect human health?
- Why is this a critical time for the environment and human health?
- Example projects of the EHI

## Overview of EHI

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## The Environmental Health Institute

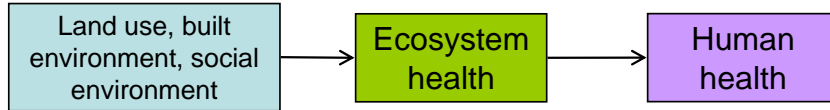
- A joint program of
  - JHU BSPH Department of Environmental Health Sciences and its NIEHS Center in Urban Environmental Health
  - The Geisinger Center for Health Research
- Co-directors
  - Brian Schwartz – Johns Hopkins Bloomberg School of Public Health
  - Walter 'Buzz' Stewart – Geisinger CHR
- Activities started in earnest February 2007

## Mission and Objectives

- **Mission**
  - To understand links between land use, ecosystem health, community health, and human health, and to translate knowledge into sustainable community-based solutions.
- **Core areas of activity**
  - Research
  - Education
    - Internships, joint advising, course offerings
  - Resource development
  - Community outreach and education
- **Regional partnerships**

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## Schematic Summary of the Purview of the Environmental Health Institute



**EXAMPLES**

- farmland use & locations
- riparian border projects
- suburban development & design
- street networks
- abandoned mines
- industrial development
- land use
- social environment

**EXAMPLES**

- river water measures
- biodiversity
- soil runoff, losses, depletion
- vegetation

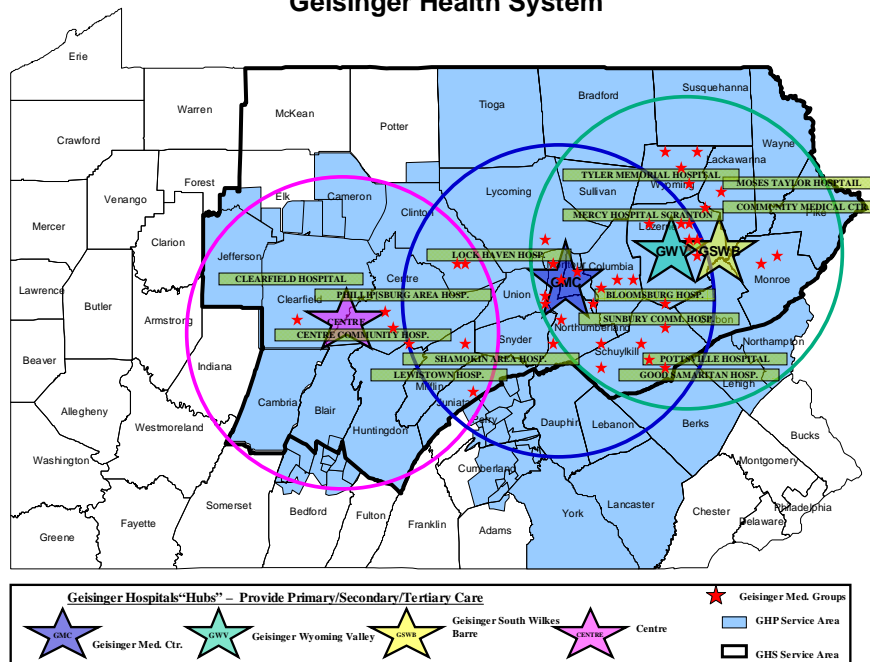
**EXAMPLES**

- INDIVIDUAL*
- cancer
  - cardiovascular
  - kidney disease
  - mental health
  - neurodegeneration
  - obesity
  - stress disorders

*COMMUNITY*

- summary measures for places

**Geisinger Health System**



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## Geisinger Health Care System

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- **3 hospitals – Danville, Scranton, Wilkes-Barre**
- **41 clinics in Pennsylvania**
- **Ideal patient population for research**
  - >2,000,000 patients seen in health system
  - 450,000 active primary care patients
- **Health plan assures excellent follow-up**

*Geisinger Health System Confidential*



## Geisinger Electronic Health Record

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- **In patient and outpatient captured**
- **Allows patient access through the web**
- **DNA and serum repository planned**

*Geisinger Health System Confidential*



# What is the Environment?

## The “Environment”

- The *Natural* Environment
- The *Built* (or anthropogenic) Environment
  - Encompasses all buildings, spaces, & products created and modified by people; transportation, land use, connectivity
  - Includes indoor and outdoor physical environment
- The *Social* Environment
  - Interactions among people in places
  - Measured as characteristics of places
  - Neighborhood “stress” as common focus

## The Built Environment

- In traditional EH approach, think about how what humans have created has resulted in hazardous exposures
- In newer approaches, think about how what humans have created influences health-related behaviors and “stress”



Near Houston Ship Channel as seen from  
top of San Jacinto Monument, 1988

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Is this the environmental health challenge of the future?



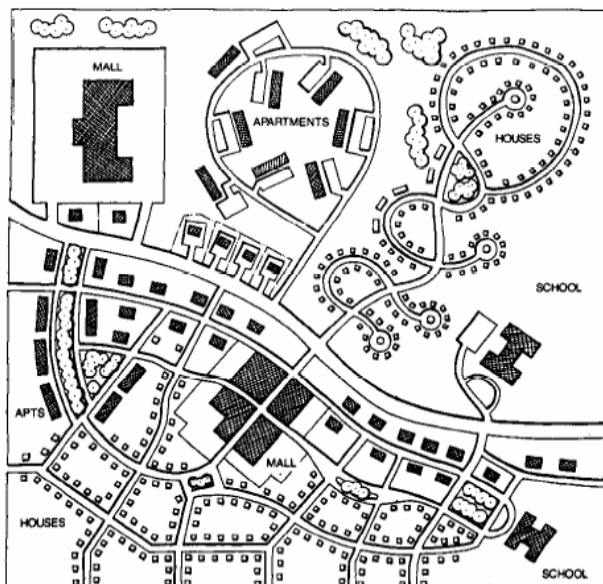
## What is Sprawl?

### *In general*

- Low density of land use (*DENSITY*)
- Single uses in given areas (*DIVERSITY*)
- Monotonous streetscapes (*DESIGN*)
- Non-connected street networks (*DESIGN*)
- Long distances between uses
- Sprawl is designed and produced to center not on humans but on automobiles, creating a high reliance

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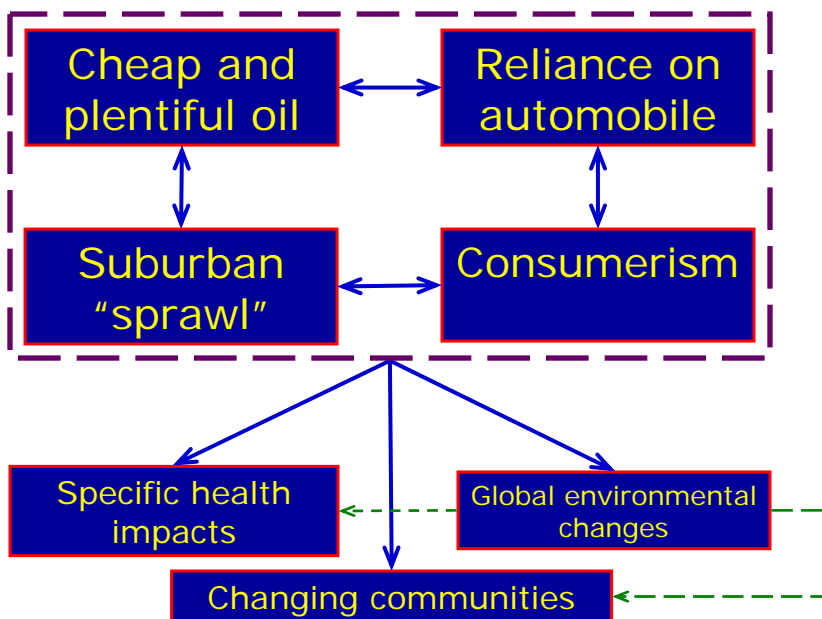
## SUBURBAN SPRAWL



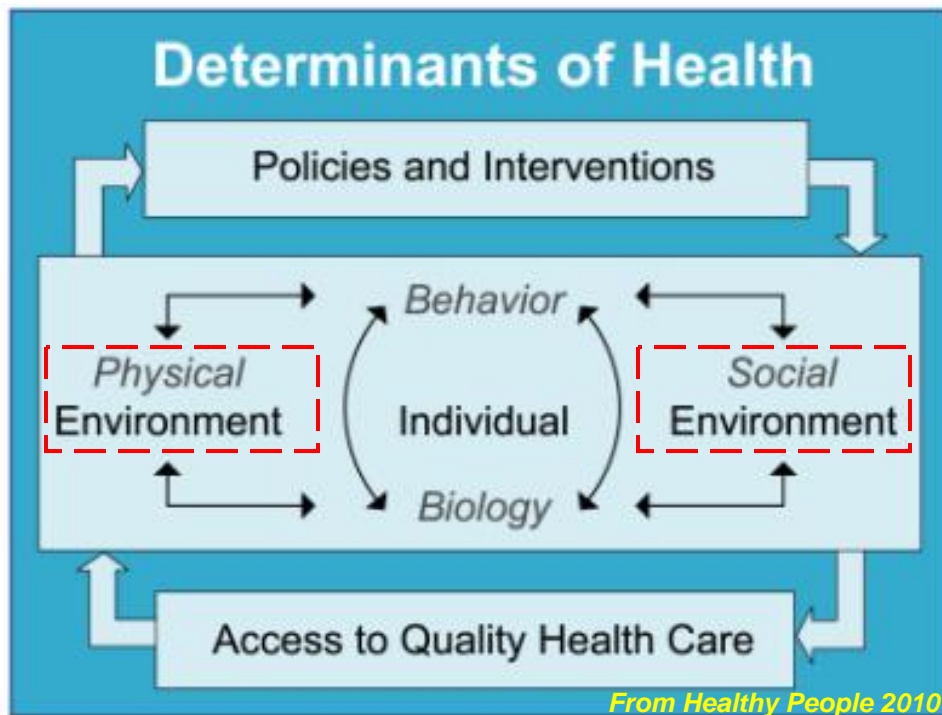
## TRADITIONAL NEIGHBORHOOD

Spielberg, ITE Journal, 1989. <http://www.ite.org/traffic/documents/JIA89A17.pdf>

## In the U.S., Inter-related Issues

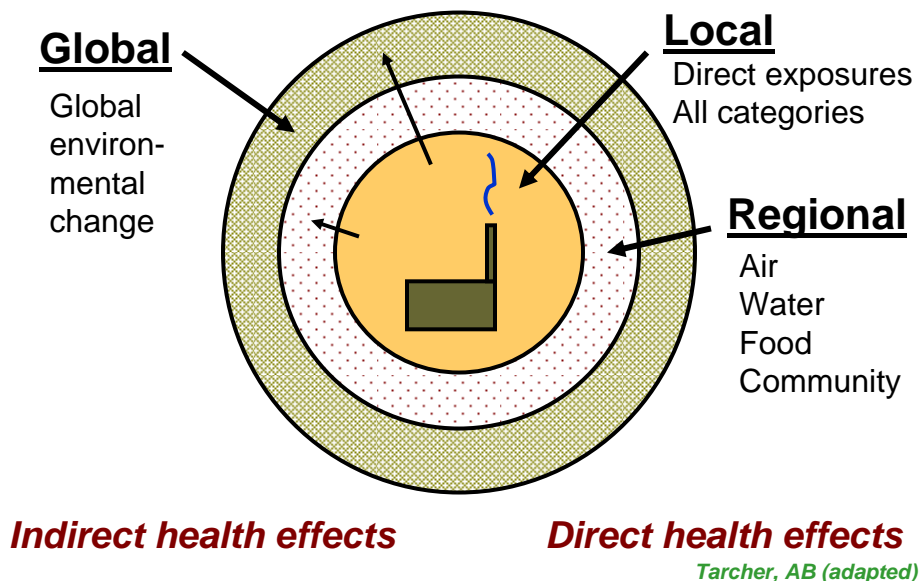


## How Does the Environment Influence Human Health?

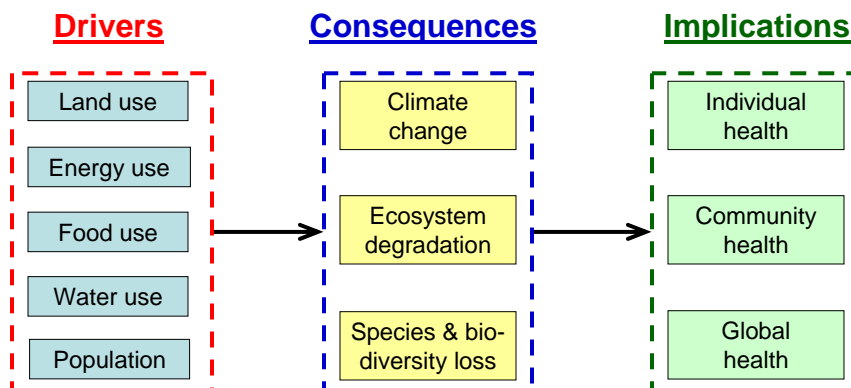


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## Environmental Impact on Health: A Schematic



## Schematic of the Environment & Human Health



# Why is this a Critical Time for the Environment and Human Health?

## Environmental Signals at Global Level

- Atmospheric CO<sub>2</sub>
- Temperature
- Sea levels
- Ecosystems
- Desertification
- Fisheries
- Coral reefs
- Water tables
- Biodiversity losses
- Soil quantity
- Soil quality
- Pasture lands
- Storm intensity
- Deforestation
- Rangelands
- Glaciers
- Polar ice caps
- Species losses
- Toxicants in air, water, soil

# After Peak Oil

**M. King Hubbert**  
**1903-1989**  
**Geophysicist**



He made a startling prediction in 1949 that the fossil fuel era would be of *very short duration*.

- In 1956 he predicted U.S. oil production would peak in 1970; he was scoffed at; he was correct.
- In 1968, he predicted world oil production would peak 200-2005.

Challenges	Responses	Outcomes
↓ Ecosystems		Conflict
Species losses		Refugees
Climate change	Geopolitics of scarcity	Social upheaval
Diminishing resources	Competition over resources	Population morbidity
Energy issues		Population mortality
Financial issues		
	(Workable solutions)	(Sustainability)

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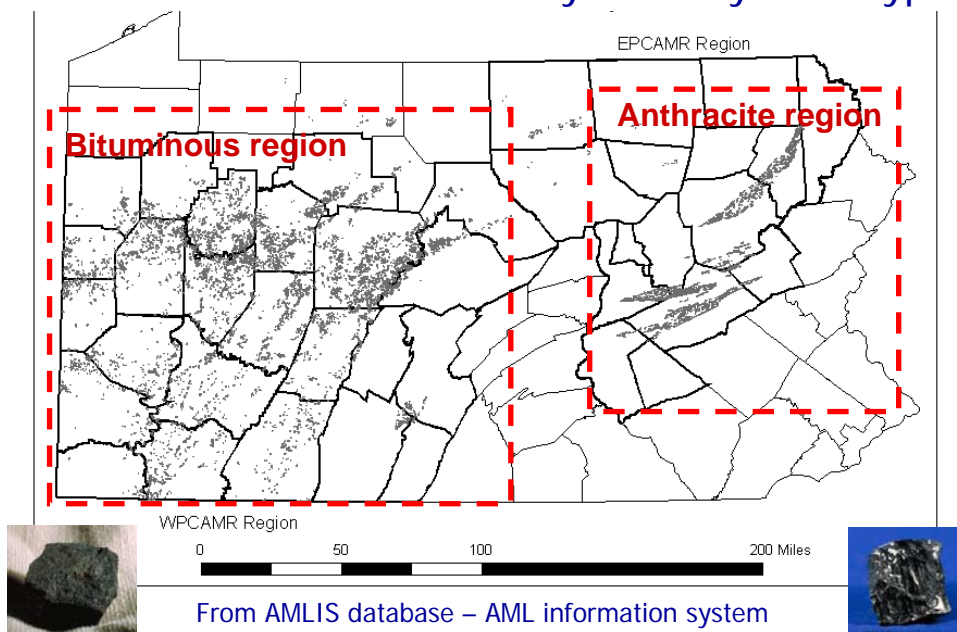


Examples of  
Research Projects

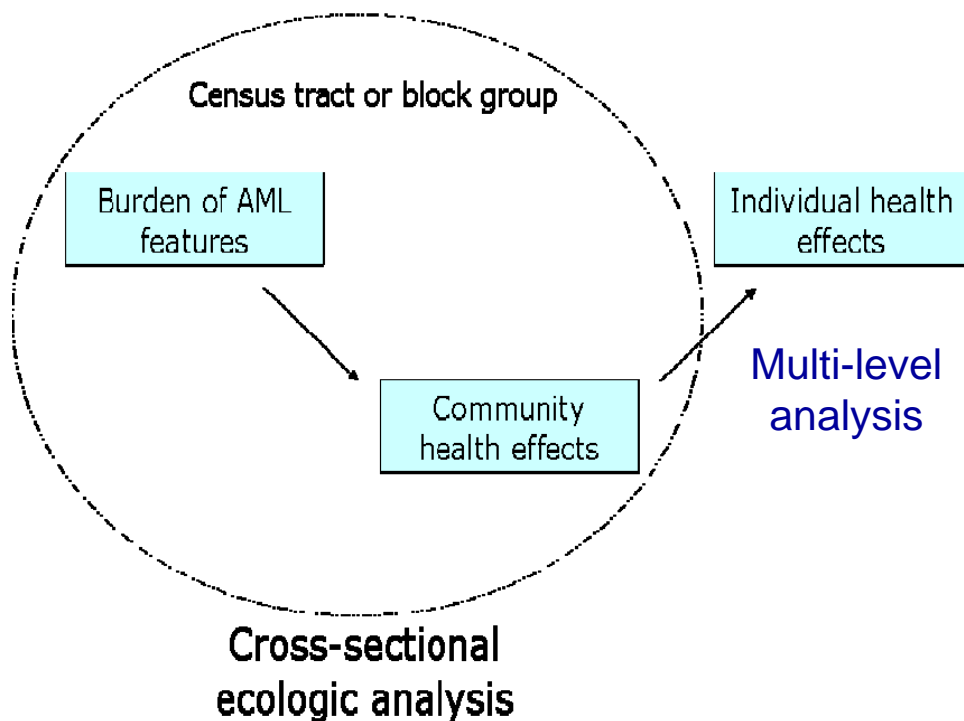
## Example: Abandoned Mine Lands

Working with Ann Liu, John  
Dawes, Mike Hewitt, Robert  
Hughes

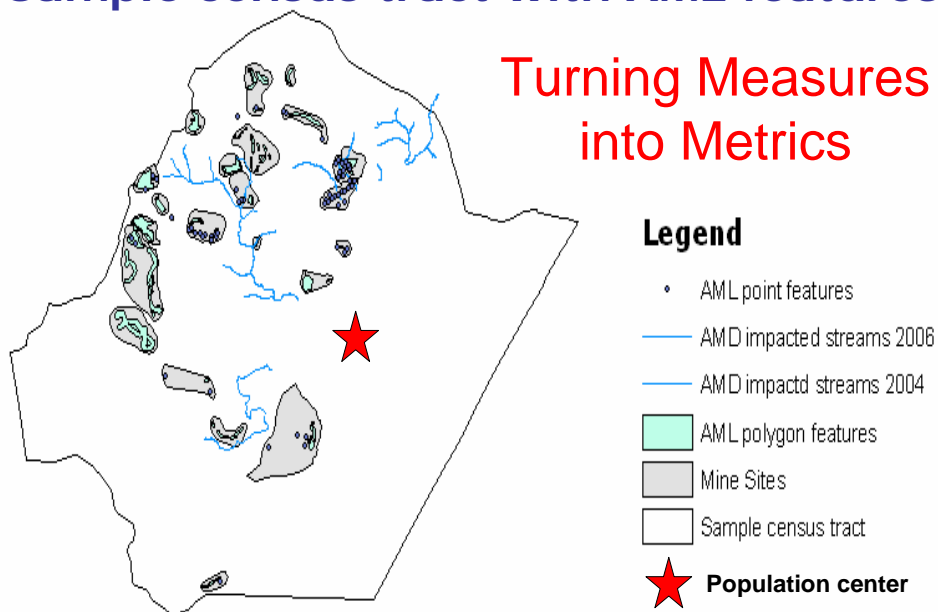
AML Problem Areas in Pennsylvania by Coal Type



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## Sample census tract with AML features



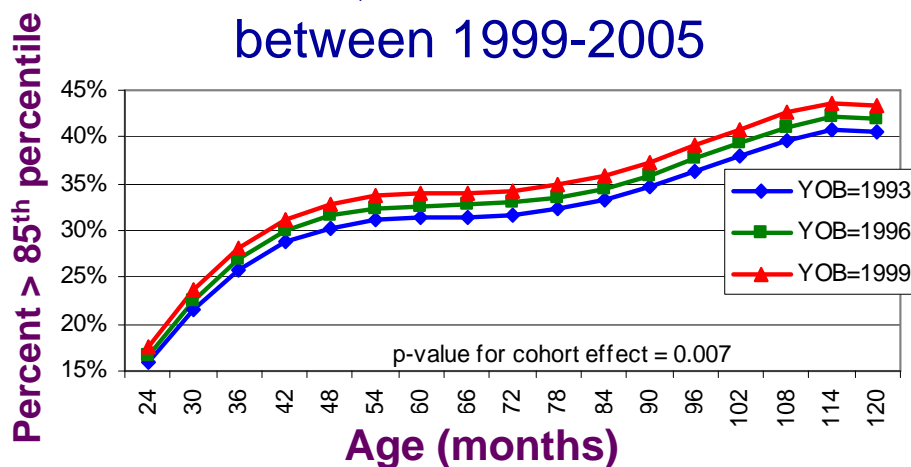
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<b>Four Dimensions for Assessing Burden of Abandoned Mines in Places</b>	
<b>Physical hazards</b>	1) # underground mine fires; 2) Area of each fire; 3) Distance of fire to population center; 4) # open shafts; 5) Height of open shafts; 6) Distance of shafts to population center; 7) Area of landslide regions; 8) Distance of regions to population center
<b>Aesthetic quality</b>	1) # of refuse piles; 2) Volume of each pile; 3) Distance of piles to population center; 4) Area of each abandoned structure; 5) Distance of structures to population center
<b>Toxic contamination</b>	1) # miles AMD impacted streams; 2) # AMD impacted streams; 3) Distance of streams to population center; 4) # discharge points; 5) pH discharge points; 6) Distance of discharge to population center
<b>Reclaimed features</b>	1) # of features reclaimed; 2) Distance of reclaimed features to population center

<b>Three Dimensions of Community Health</b>	
<b>Social disorganization</b>	1) % single parent families with kids; 2) % divorced or separated; 3) % out of labor force; 4) 1 - % home owner occupied; 5) 1 - % living in same household last 5 years
<b>Physical disorder</b>	1) % vacant housing; 2) % no indoor plumbing; 3) % no water; 4) % no kitchen
<b>Economic deprivation</b>	1) Townsend Index of Deprivation (% unemployment, % households overcrowded, % renter-occupied housing, % households without car); 2) % adults without HS diploma; 3) % families in poverty; 4) % households in poverty; 5) % on public assistance; 6) % working class

## Example: Obesity and the Built and Social Environments

Males, aged 2-9 years, born between  
1993-1999, with BMI measured  
between 1999-2005



... and compared to the nation, Geisinger clinic children  
have a higher prevalence of overweight & obesity

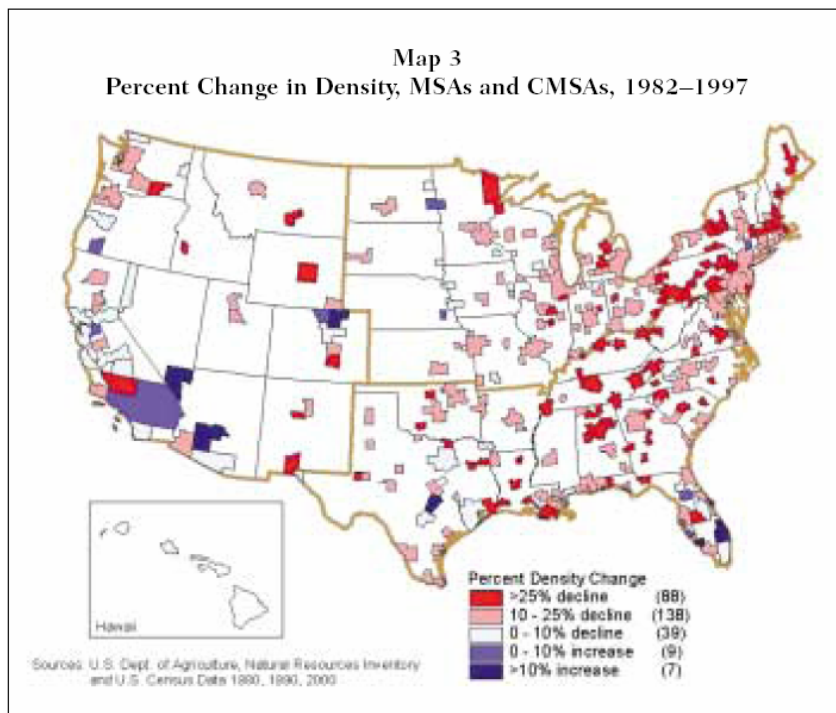
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In the GHS catchment area, land use has far  
outstripped population growth over the last  
two decades

**Table D.1.1.** Urban areas and towns in the GHS catchment area.

City	2000		1997		Change 1982-1997**	
	Population	% White	Density*	Population	Urban Land	Density
Scranton †	76,415	94%	2.43	4.1%	55.0%	-32.8%
Wilkes-Barre	43,123	93%	†	†		
State College	38,420	84%	2.83	15.2%	55.1%	-28.7%
Williamsport	30,706	84%	3.58	2.0%	53.2%	-33.5%
Johnstown	23,906	86%	2.44	-9.4%	53.0%	-40.8%
Hazleton	23,329	93%	†	†		
Altoona	10,345	96%	3.72	-4.5%	42.0%	-32.7%
Bradford	9,175	NA	NA			

\* People per urbanized acre; \*\* Data from Brookings Institution, 2001; † The Scranton-Wilkes-Barre-Hazleton MSA had a 2000 population of 624,776 (data for change are for MSA)



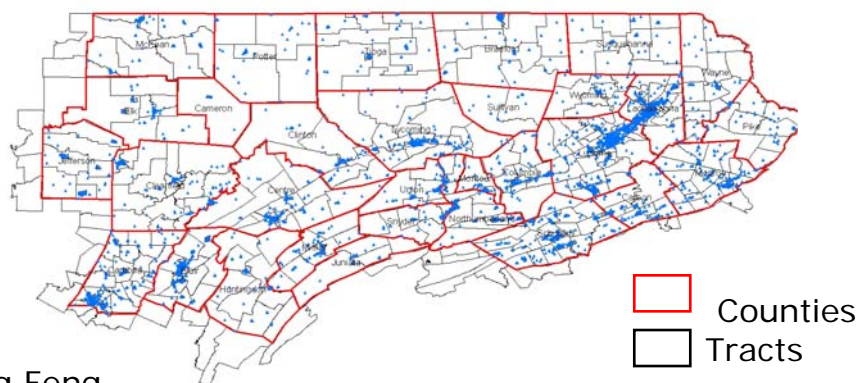
## Part I. Proposed Research

- Evaluate associations of density, diversity, design, accessibility, and clustering of local food environment, local physical activity environment, and land use ...

with ...

- ... body mass index and obesity in >100,000 children ages 2 to 18 years

### Food Sources and Retailers in Geisinger's 31 Counties



## The Local Food Environment

## Part II. Proposed Research

- 1,000 children aged 5-7 years in 50 census tracts in central, northern, and northeastern Pennsylvania (Geisinger Health System)
  - Range of settings rural to urban
  - Range of built & social environments
- Longitudinal design
  - Body composition and morphology
  - Insulin resistance, pubertal hormones
  - Novel methods for BE & SE assessment

### Example: Environmental Risk Factors in Patients with Chronic Kidney Disease

Slides adapted from Virginia Weaver

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## Proposed Study

- Application for funding to National Institutes of Health pending
- Longitudinal study of renal function decline
  - 700 patients
  - Two visits 24 months apart

## Using the EHR to Identify Eligible Patients

	MALES			FEMALES		
Variable	N	(%)		N	(%)	
# 50-70 year olds in EHR	28378	100%		34966	100%	
# with 1+ serum creatinine, "eligible"	18068	64%		21598	62%	
<b>OF ELIGIBLE</b>						
HTN (ICD codes or as dx in EHR)	9054	50%		10022	46%	
DM (ICD codes or as dx in EHR)	4106	23%		3849	18%	
eGFR = 30-60 ml/min/1.73 m <sup>2</sup>	1194	7%		2258	10%	
eGFR = 60-90 ml/min/1.73 m <sup>2</sup>	9194	51%		11869	55%	
eGFR > 90 ml/min/1.73 m <sup>2</sup>	7595	42%		7348	34%	
BMI# > 25 kg/m <sup>2</sup>	12454	88%		15494	80%	
BMI# > 30 kg/m <sup>2</sup>	7179	51%		9838	51%	
Current smoker	3756	22%		3309	16%	
	<b>Mean</b>	<b>Med</b>	<b>SD</b>	<b>Mean</b>	<b>Med</b>	<b>SD</b>
Age	59	59	6	59	59	6
Systolic BP, mm Hg	129	128	16	127	126	16
Diastolic BP, mm Hg	76	78	10	75	76	9
Serum creatinine, mg/dL	1.01	1.00	0.35	0.81	0.80	0.27
eGFR	86.3	83.3	21.9	82.0	79.3	20.3

Please feel free to contact us  
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