

Use of the integrative model for
environmental health for focusing
community engagement with local
conditions and people's responses to
these conditions

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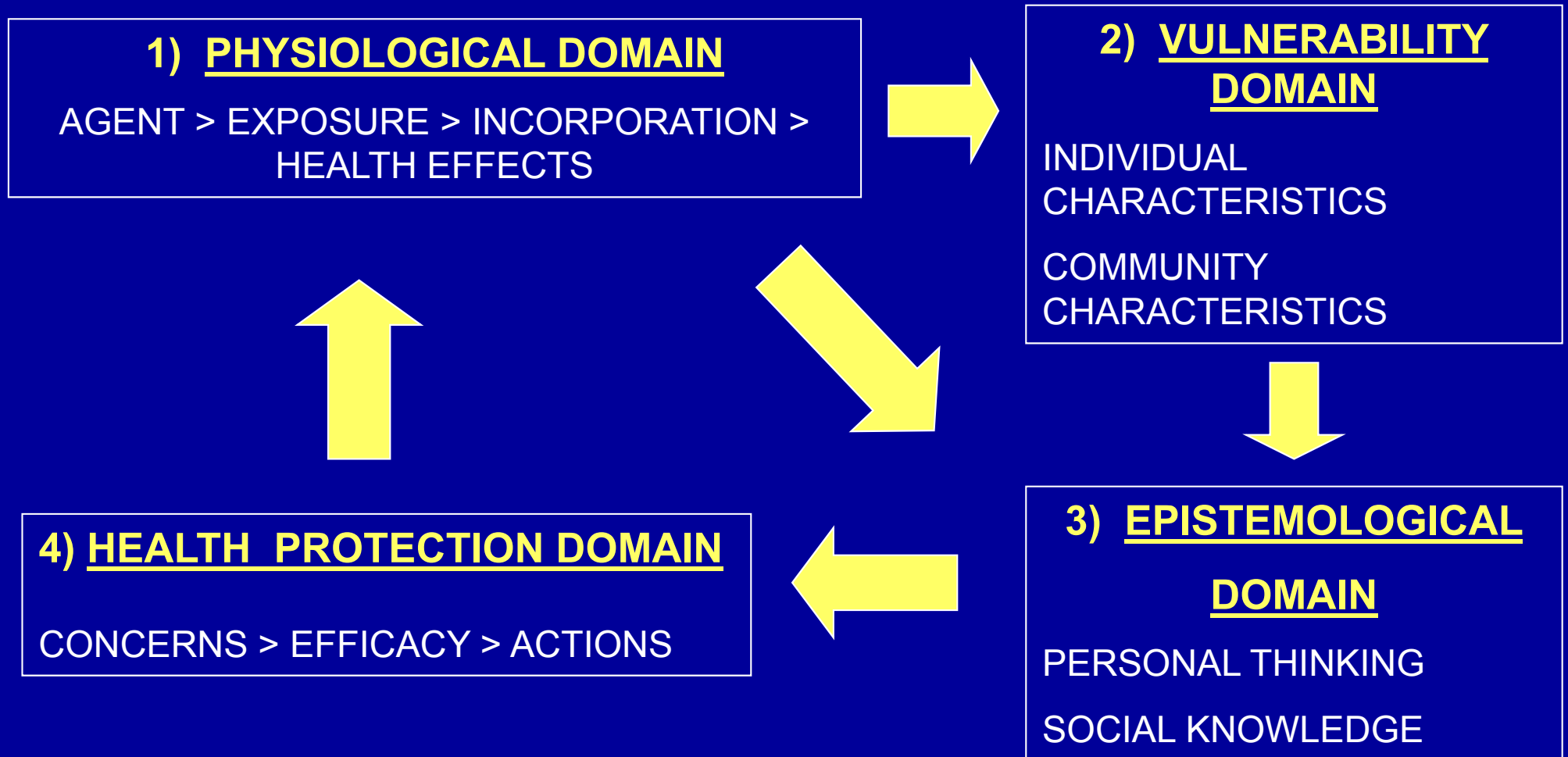
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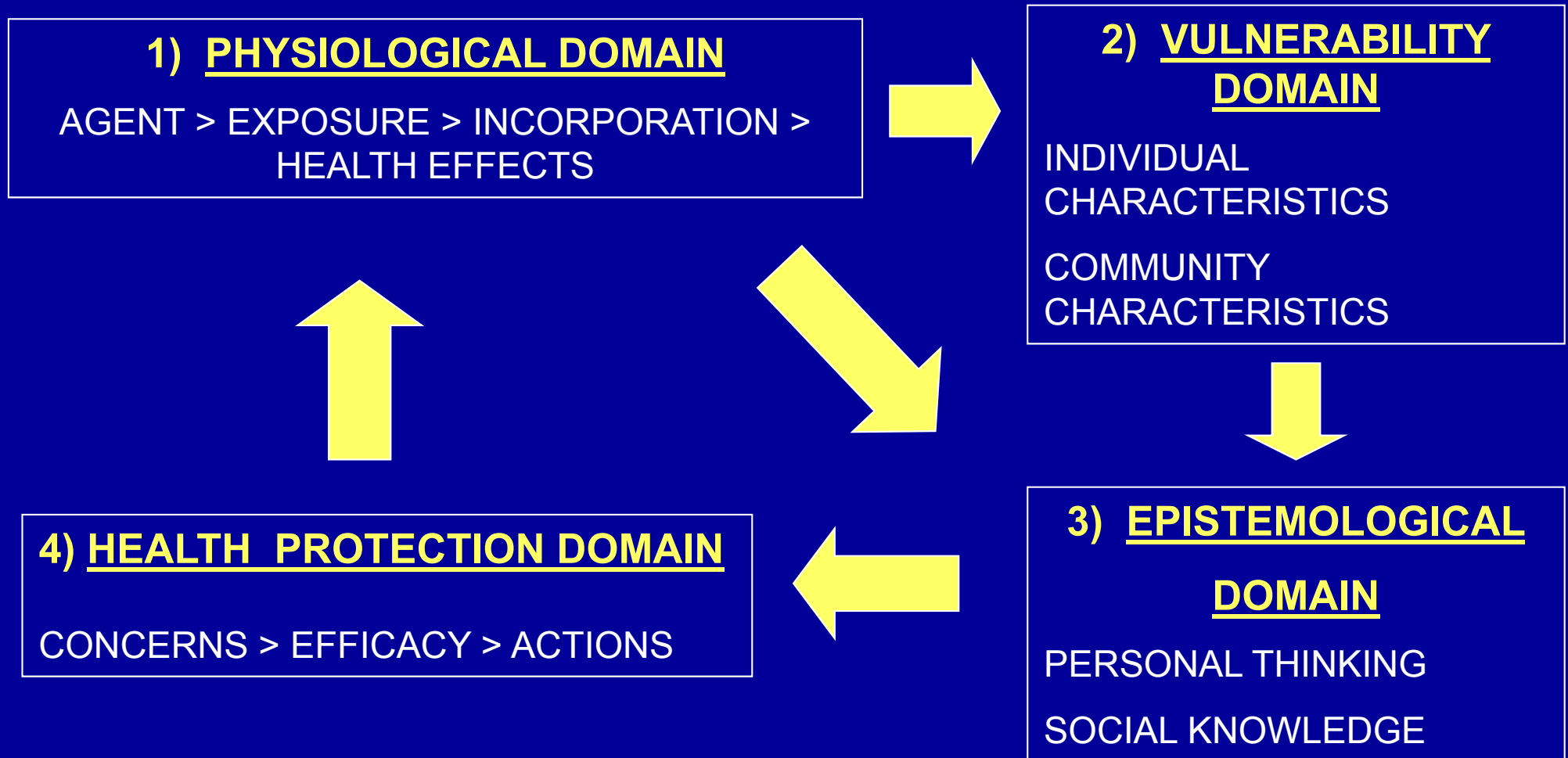


Model for Environmental Health Research

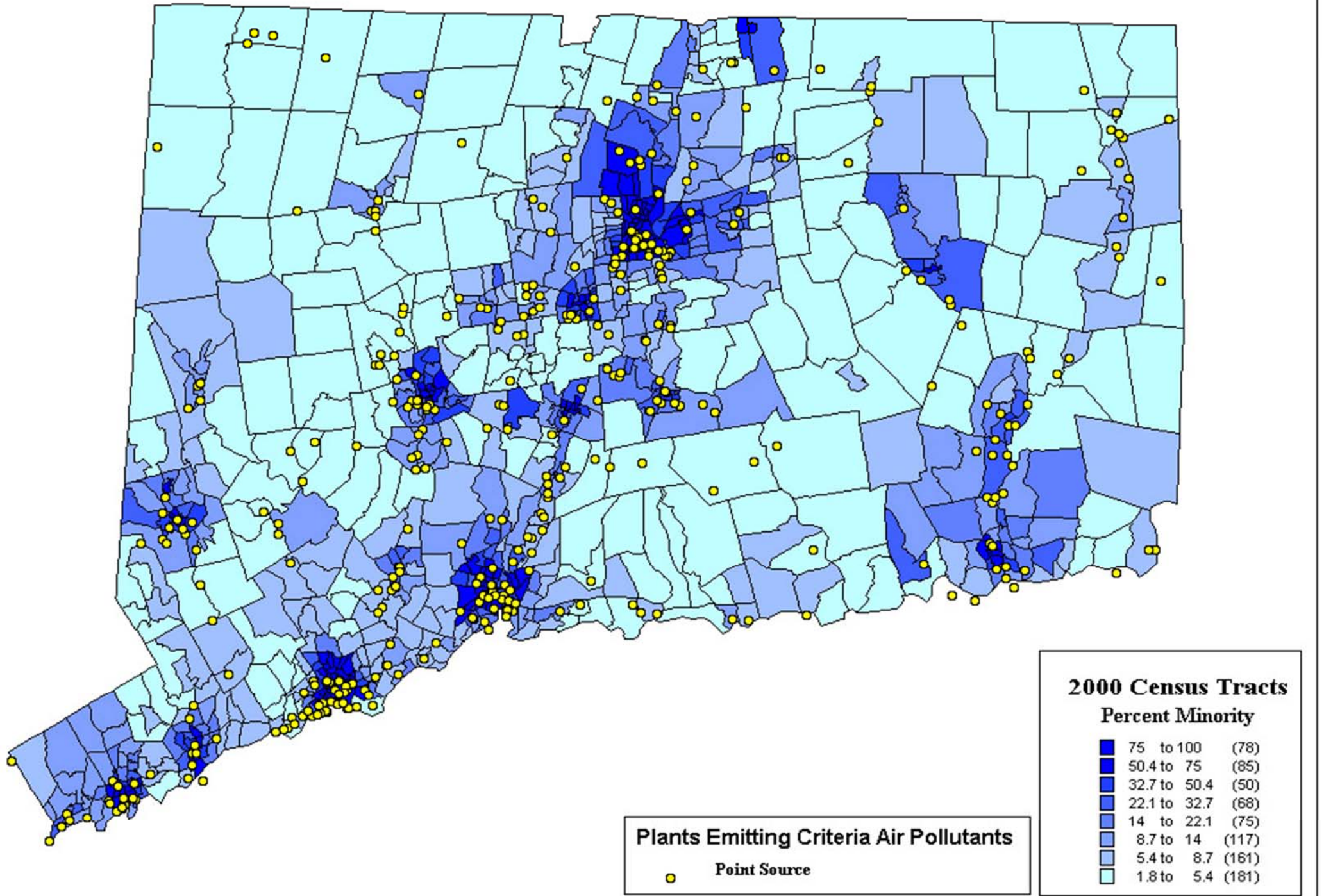




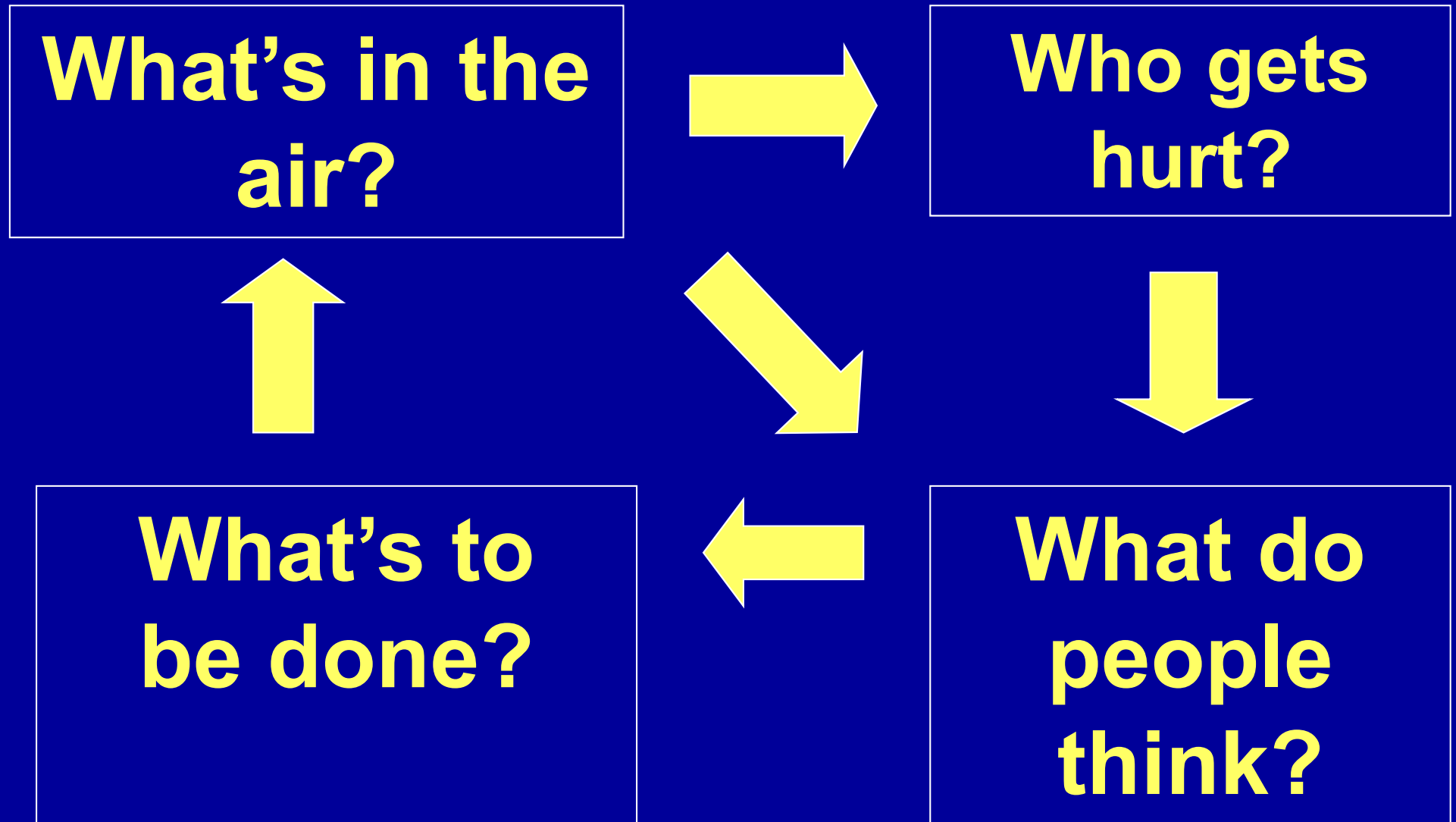
Model for Environmental Health Research



2000 Census Tracts Percent Minority & Plants Emitting Criteria Air Pollutants



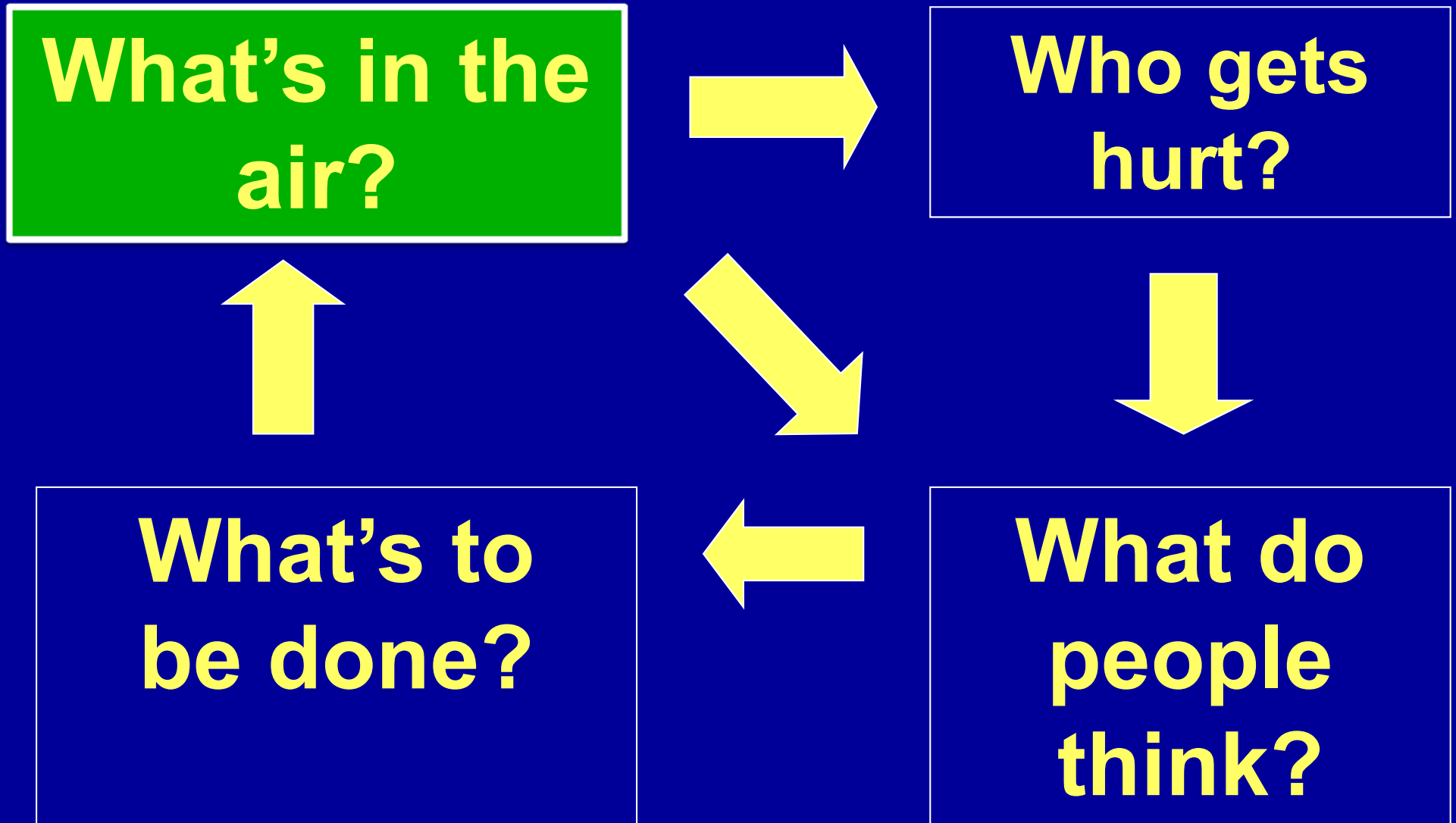
The Air and Us



DATA COLLECTION

DOMAIN		INFORMATION	
General	Study-specific	Type	Source
Physiological Domain	What's in the air?	Particles in the air.	Air particulate meter
Vulnerability Domain	Who gets hurt?	Who the people are? (race, ethnicity, gender, age) Person in household with breathing difficulties	Survey
Epistemological Domain	What do people think?	Beliefs and experiences people have about air pollution.	Survey
Health protection domain	What's to be done?	What people do to protect themselves from air pollution Discussion re group response (New Haven Environmental Justice Network)	Survey Meeting notes

The Air and Us



Particulate matter measurement

- Lighthouse Handheld Particle Counter Model 3016
- Number of particles within a liter of air (drawn in 21 seconds)
- 6 particle sizes ($.3\mu\text{m}$, $.5\mu\text{m}$, $1.0\mu\text{m}$, $2.5\mu\text{m}$, $5.0\mu\text{m}$, $10.0\mu\text{m}$)
- 12 locations
- 9 readings for each location for each particle size
 - (3 replications on each of 3 days)
- Analysis based on medians

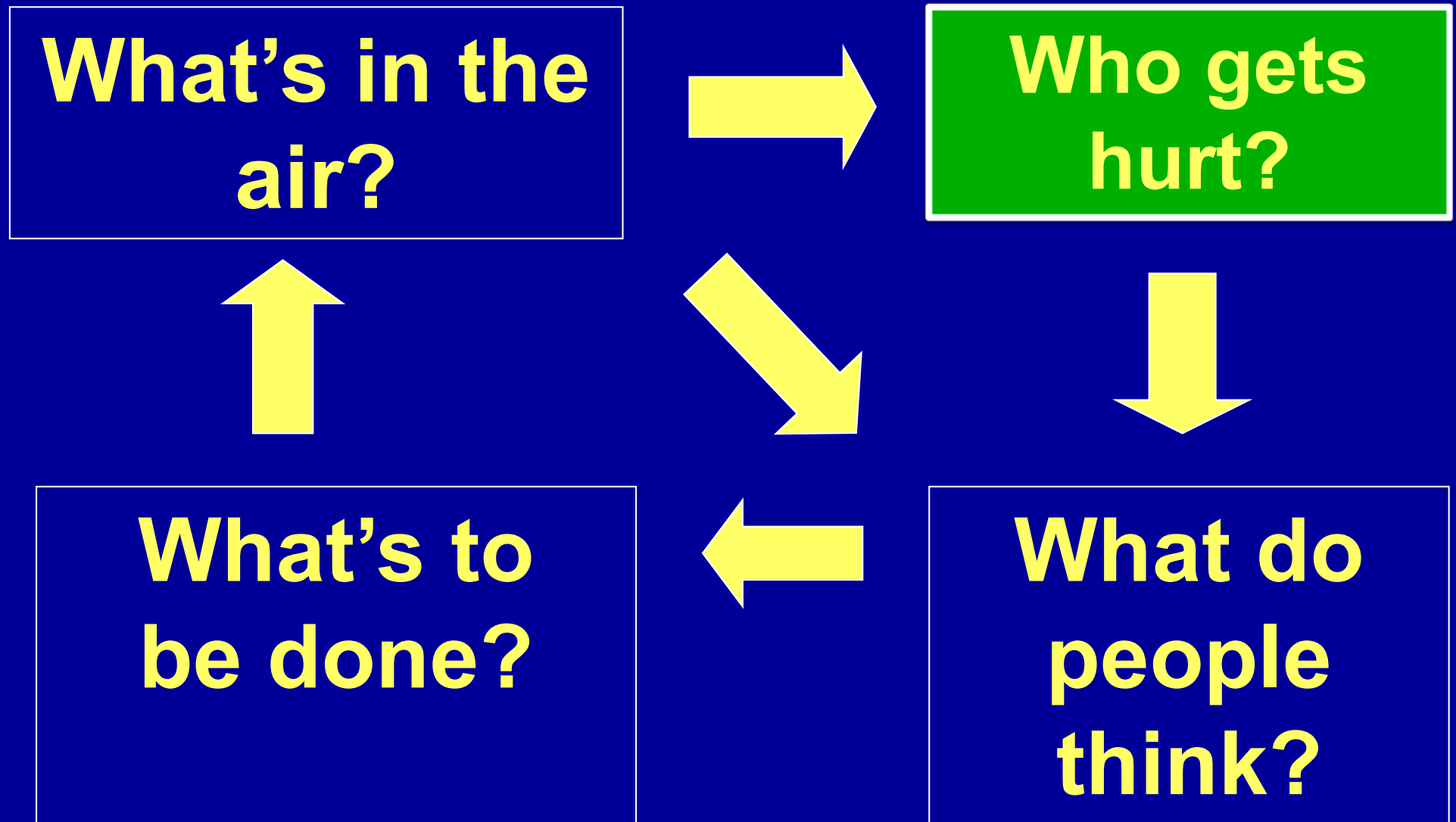
Median number of particles in a liter of air.

Location	Smallest Particles (.3-.5 μ m)
East	
Farnum Court	30151
Wooster Square	20227
Central	
Dwight School	19588
St. Raphael's Hospital	18610
West	
Westville	16568

Survey

- Door-to-door survey in three areas of city
 - Five neighborhoods
- One page questionnaire
- N=222
- Gender: females - 113 (50.9%)
- males - 108 (48.6%)
- Hispanic: 32 (14.4%)
- Black or African-American: 64 (28.8%)
- Age: Mean is 43.8 and range is 18-82

The Air and Us

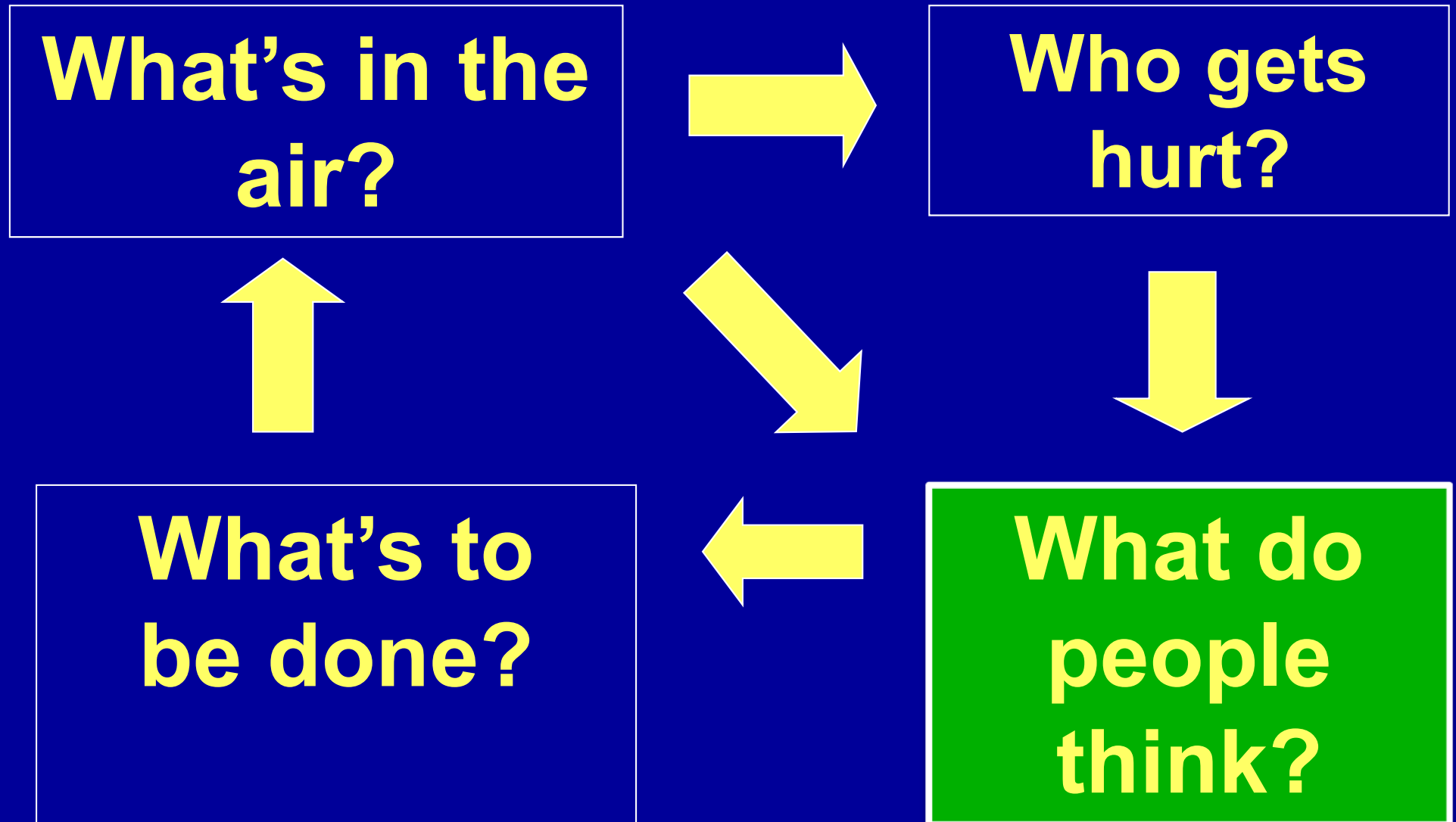


Does anyone at home in your family suffer from breathing difficulties such as asthma?

	Yes (%)
Farnum Court	68.9
Wooster Square	31.4
Dwight	30.8
St. Raphael's	57.6
Westville	24.2
Total	40.7

$X^2=29.012$, $df=4$, $p<.000$

The Air and Us



Does the neighborhood where you live have dirtier or cleaner air than the City of New Haven as a whole?

	Dirtier %	Same n (%)	Cleaner n (%)
Farnum Court	71.1	6.7	22.2
Wooster Square	43.8	22.9	33.3
Dwight	48.0	12.0	40.0
St. Raphael's	41.2	5.9	52.9
Westville	4.8	12.7	82.5

$X^2=62.726$, $df=8$, $p<.000$

Key questions and number of particles by neighborhood

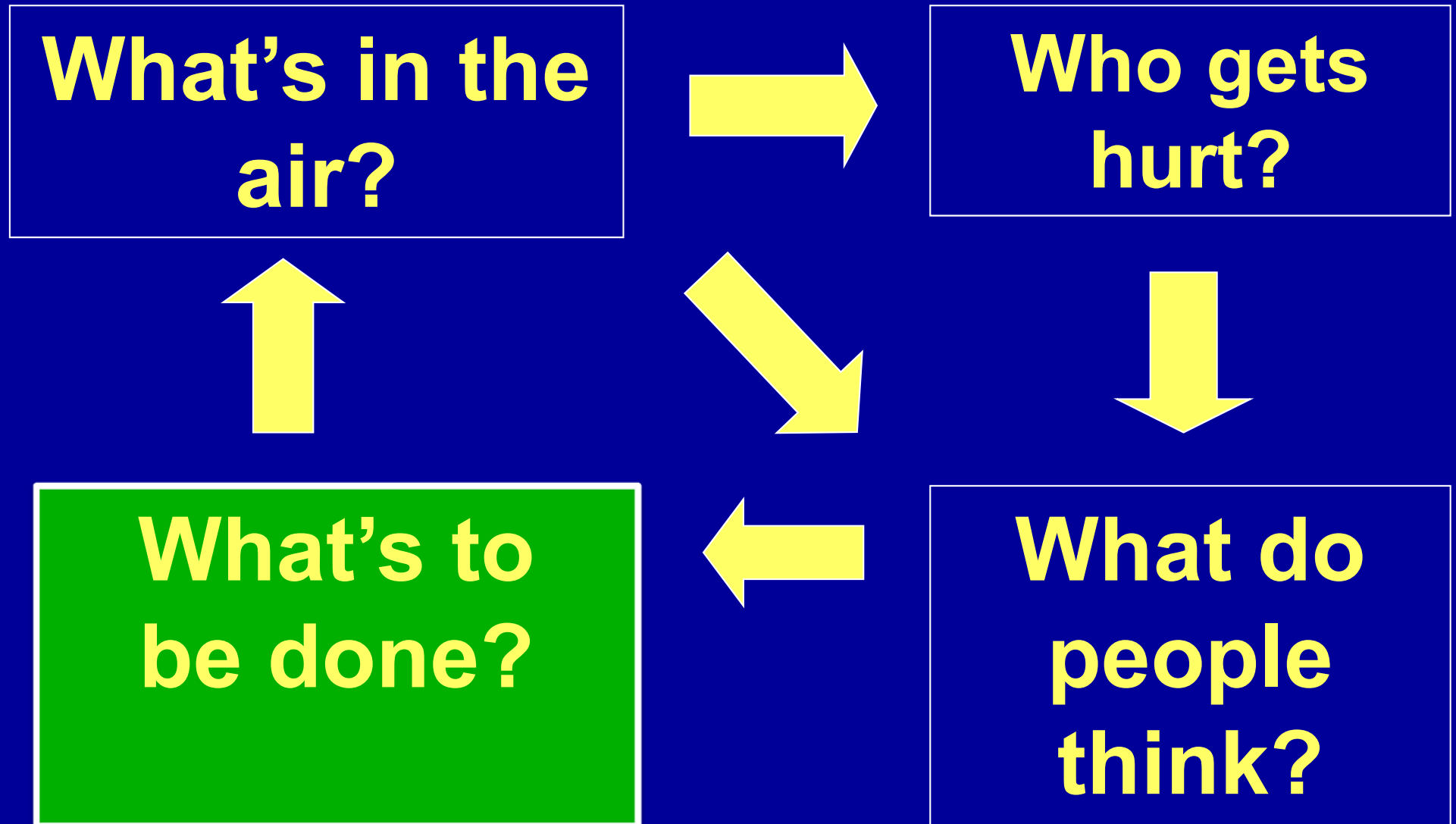
	Survey Data					Particles in liter of air ¹
	Sample characteristics			Neighborhood air dirtier ²	Breathing difficulties ³	
	n	Hispanic %	Black %			
East						
Farnum Court	45	35.6	66.7	71.1	68.9	30151
Wooster Square	51	2.2	5.9	43.8	31.4	20227
Central						
Dwight	26	11.5	19.2	48.0	30.8	19588
St. Raphael's Hospital	34	29.4	61.8	41.2	57.6	18610
West						
Westville	66	3.0	7.6	4.8	24.2	16568

¹Air data is taken from monitoring locations most central to residences included in survey. Numbers represent numbers of particles in liter of air and are medians based on 9 readings per location (3 replications X 3 days = 9 readings).

²Does the neighborhood where you live have dirtier or cleaner air than the city as a whole?

³Does anyone in your home suffer from breathing difficulties such as asthma?

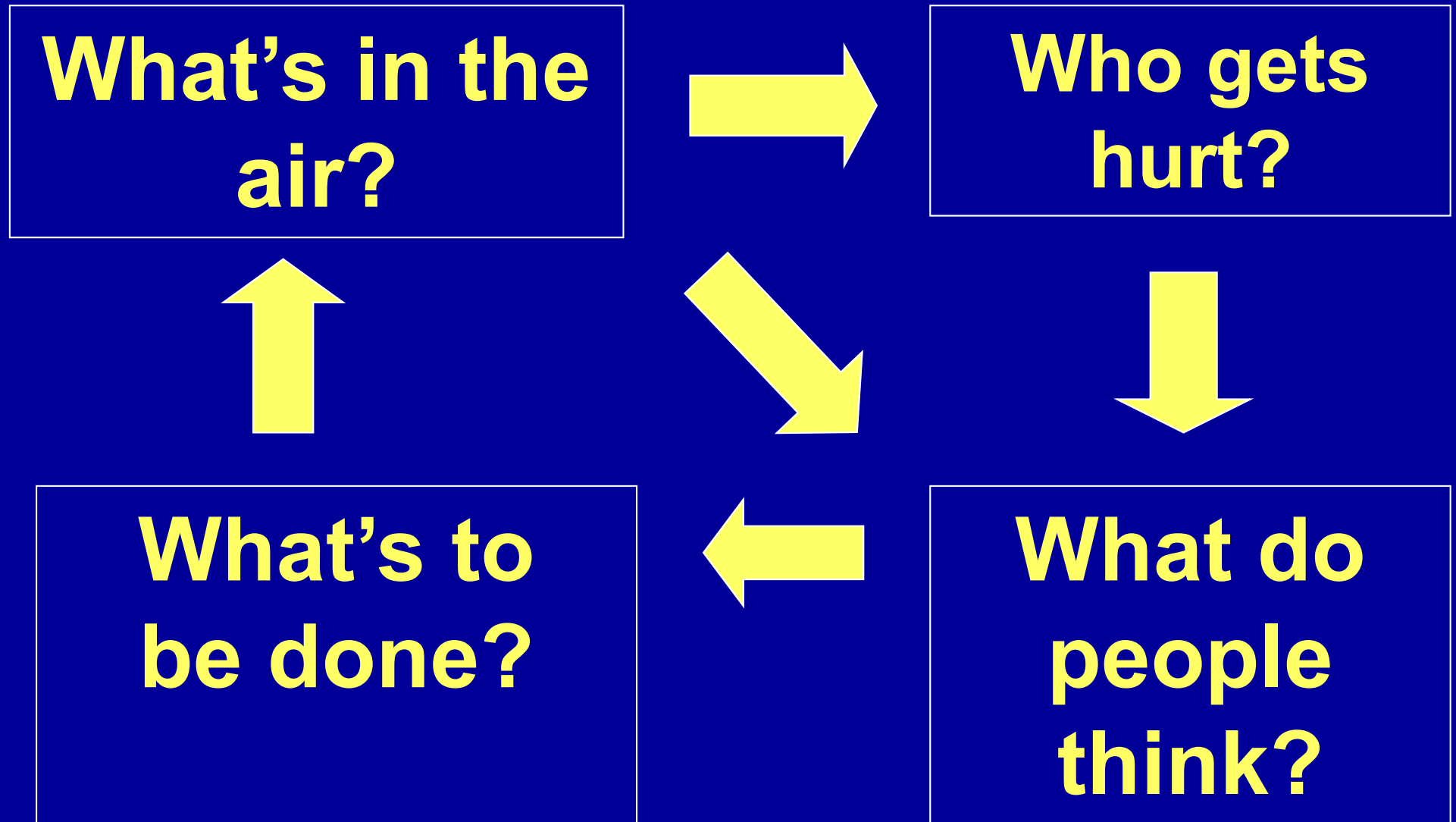
The Air and Us



Strategies for “bad air days”

	Stay inside %
Farnum Court	70.5
Wooster Square	27.5
Dwight	26.9
St. Raphael's	65.6
Westville	28.8
Total	42.0
Chi-square (p)	33.542 (<.000)

The Air and Us



New Haven Environmental Justice Network

- Community partner
- Voted project among strategic priorities
 - 2006
 - 2007
- March, 2006 – Discussion of method
 - Recommendation re locations, questions
- November, 2007 – Presentation of results
 - Animated discussion, including suggestions of more locations
 - Request to publicize results more widely
- December, 2007
 - Results briefly described at community event
 - Lengthy interview with local reporter

New Haven Advocate

Thursday, January 10, 2008

The Air That You Breathe

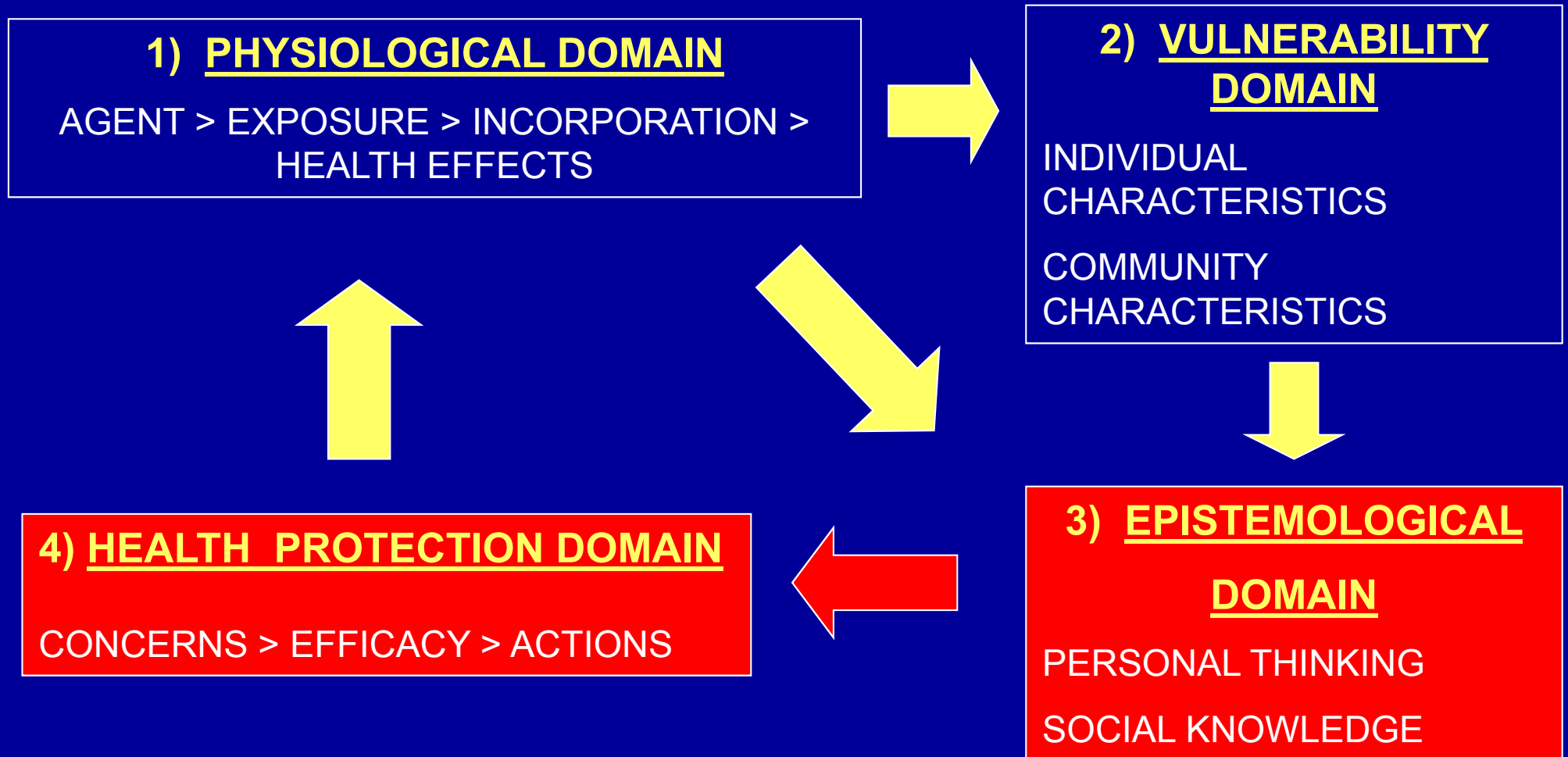
A new air quality study reveals the crap New Haven's breathing. And it ain't pretty.

By Evan Brown

"I'm trying to save your life," says Ed Grant, eyes fixed and stony-faced. He is deadly serious.New Haven's air is dangerous, and it's making people sick.

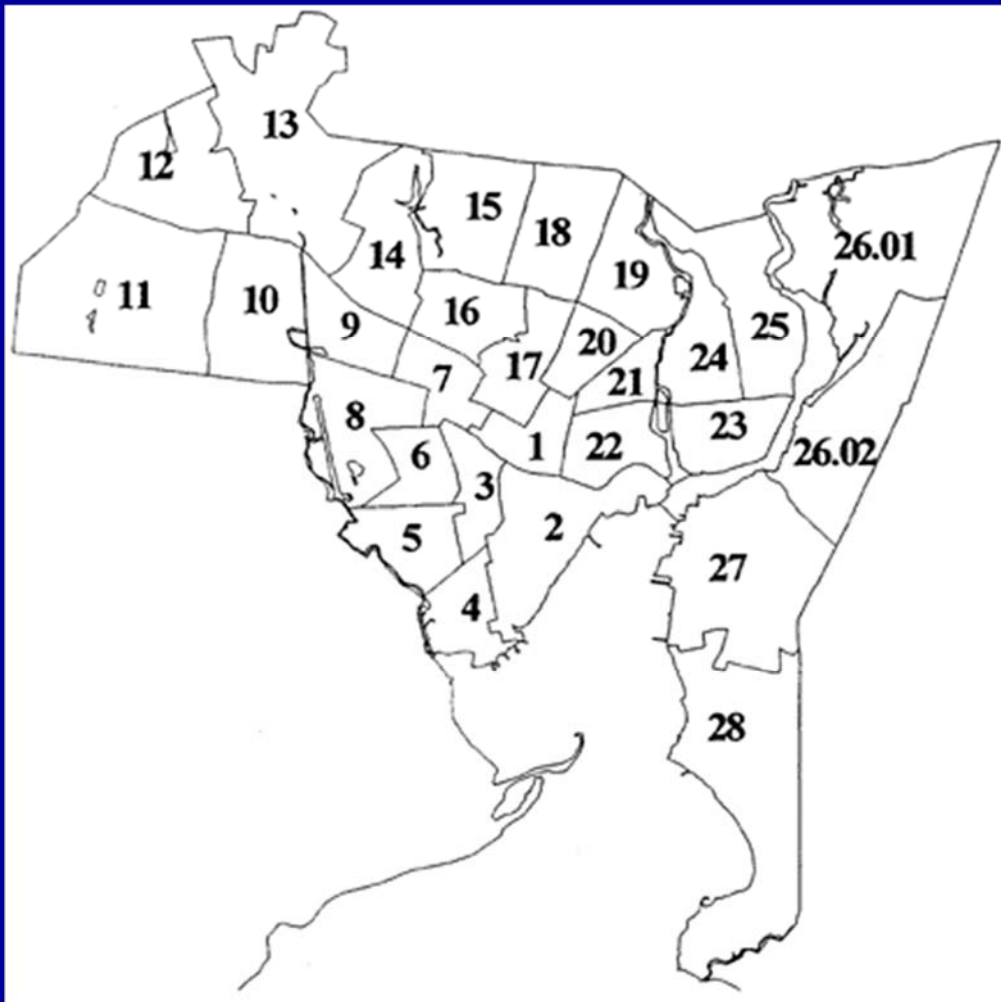


Model for Environmental Health Research



Setting

East part of New Haven (11 census tracts)



- 19-20** East Rock
- 21** Upper Wooster Square
- 22** Wooster Square
- 23-25** Fairhaven
- 26.01** Quinnipiac Meadows
- 26.02** Fairhaven Heights
- 27** East Shore Annex
- 28** Morris Cove

Setting

Environmental Insults:

- Power plants (2)
- Sludge incinerator
- Intersection of I-91 and I-95
- Oil terminal
- Proposed trash and sludge transfer stations (2)
- Contaminated rivers (2) -- mercury, PCBs, etc
- Lead paint
- Other

Three Phases

- Phase 1- Qualitative interviews
 - To develop content of instrument
- Phase 2 – Expert review of items
 - To establish content validity
 - To improve instrument
- Phase 3 – Instrument validation
 - To determine psychometric properties
 - To describe environmental health engagement among people in an urban community.

Qualitative Interviews

- Specific Aims

- How do people describe their engagement with environmental health – in their own words?
- To develop content for new instrument

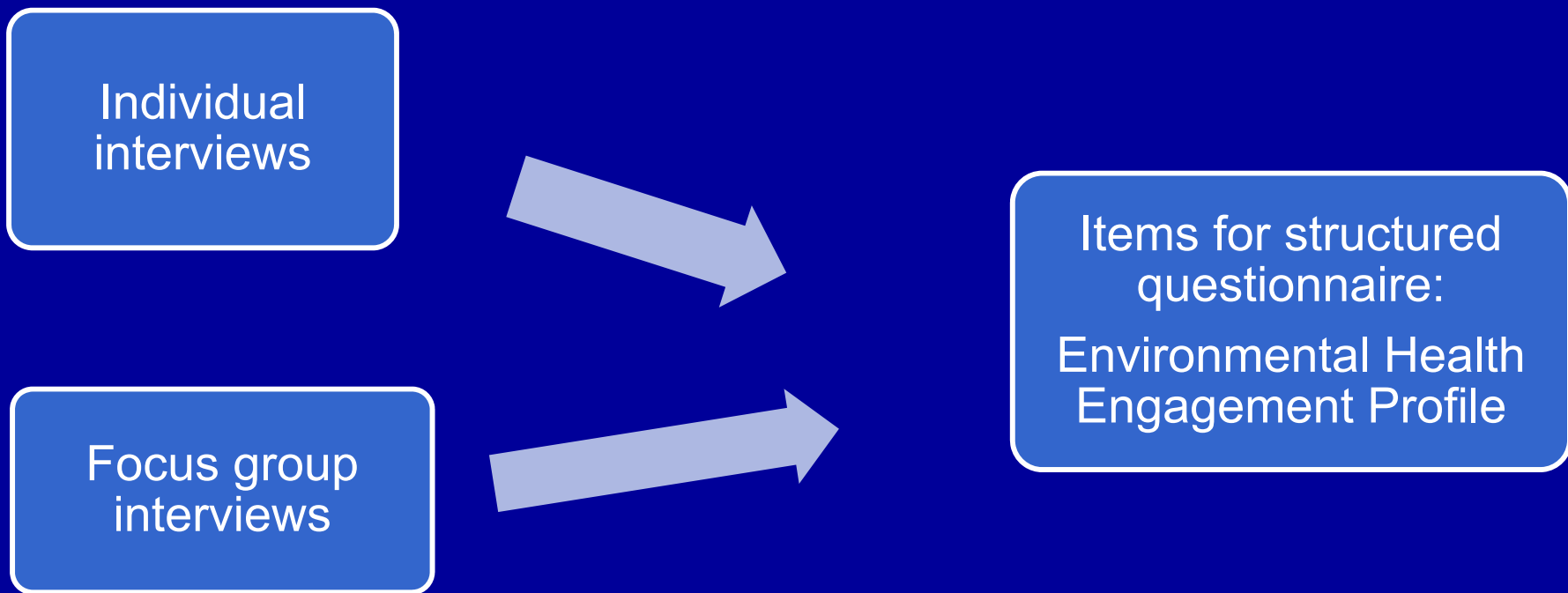
- Methods

- Qualitative descriptive design
- Individual (18) or group (23) interview
- 41 urban residents
- Analogous questions across formats
- Interviews audiotaped
- Professionally transcribed
- Qualitative coding – NVivo software

Example questions

- Sometimes when a person gets sick, something toxic in the environment caused the sickness. Have you ever been suspicious that this happened to you, or to someone you know well?
- When people think that something in the environment is unhealthy, they might do things to protect themselves or their families. Could you tell me about anything you do of this sort?

From qualitative interviews to structured questionnaire



Survey with structured questionnaire

- Specific Aims
 - Test psychometric properties
 - To describe patterns of environmental health engagement in an urban community
- Sample
 - Age:
 - Mean: 46 (SD - 17.2)
 - Range: 18-84
 - Gender:
 - Female 61%
 - Male 39%
 - Ethnicity / race
 - Hispanic 13%
 - Black 18%
 - American Indian 1.2%
 - Non-Hispanic, white 64.4%
- Methods
- Telephone Survey
 - By census tract, by street
 - Interviewers : 16 student research assistants
- Participation
 - Interviews initiated: 450
 - Completed: 433
 - Interrupted: 17

Results: Internal structure

Subscales	Meaning
Pollution Sensitivity Scale	Extent to which people see pollution in their immediate environment.
Pollution-Causes-Illness Scale	Extent to which people attribute negative health effects to polluted conditions.
Pollution Acceptance Scale	Extent to which people accept pollution as unavoidable.
Community Environmental Action	Extent to which people collaborate with others to reduce environmental health threats in their community.
Personal Environmental Action Scale	Extent to which people take precautions to protect themselves from environmental health hazards.

Pollution Sensitivity Scale

Item	Factor Loading	Mean	SD
Asbestos in buildings	.78	2.8	3.1
Toxic places like abandoned factories or dumps	.78	3.0	3.2
Improper disposal of garbage or hazardous waste	.73	4.2	3.5
Chemicals in rugs, furniture and car upholstery	.73	3.5	3.0
Pesticides--insect sprays, lawn chemicals etc.	.73	3.7	3.0
Mold in buildings	.70	3.6	3.2
Radiation from nuclear power plants	.69	1.3	2.4
Contaminated drinking water	.68	2.6	3.1
Pesticides, hormones, antibiotics in our food	.68	4.4	3.4
Polluted rivers, harbors, lakes or ocean	.65	5.4	3.3
Air pollution from factories and power plants	.62	3.3	3.1
Lead from peeling paint	.62	2.6	3.1
Animal waste--pet droppings, farm animal manure	.59	3.1	3.0
Air pollution from trucks, buses, and cars	.53	5.8	2.8

Definition: Extent to which people see pollution in their immediate environment.

Cronbach's $\alpha = .91$

Pollution Causes Illness Scale

Item	Factor Loading	Mean	SD
When people get sick, it is often because of pollution in the environment	.76	4.5	3.0
The mental development of children is harmed by toxins in the environment	.68	6.2	3.3
Many people in my community have health problems because of pollution	.67	4.9	3.5
The air in my neighborhood smells or looks polluted	.66	3.8	3.3
Most cancer is caused by pollution in the environment	.66	5.0	3.0
The drinking water in my community causes health problems	.64	2.6	3.0
People who work with chemicals often get sick from it	.61	7.2	2.8
Asthma is often made worse by pollution in the air	.58	8.4	2.5
I spend time worrying about pollution being bad for my health	.54	4.0	3.6
Some schools in my community are contaminated and unhealthy	.51	4.7	3.5
The environment where I work might hurt my health	.46	3.7	3.7
People should worry about toxic things in their homes	.44	8.2	2.5

Definition: Extent to which people attribute negative health effects to polluted conditions.

Cronbach's $\alpha = .84$

Pollution Acceptance Scale

Item	Factor Loading	Mean	SD
Pollution is just a necessary part of modern life, so we can't do much about it	.74	2.4	3.2
I don't consider environmental problems nearly as important as other problems in my family or neighborhood	.66	3.9	3.3
I am too busy to do anything about how the environment affects health	.62	2.9	3.1
People don't need to worry about toxic things, because our bodies can overcome the toxins	.58	1.9	3.0
People often exaggerate the amount of sickness caused by pollution.	.56	3.8	3.1

Definition: Extent to which people accept pollution as unavoidable.

Cronbach's $\alpha = .67$

Community Environmental Action Scale

Item	Factor Loading	Mean	SD
I join with others in trying to keep polluting businesses out of our community	.83	2.7	3.6
I attend meetings about environmental health problems in my community	.79	1.9	3.2
When something is polluting our community, my neighbors and I get it stopped	.77	3.9	3.7
I tell others about how the environment can affect health	.62	4.8	3.8

Definition: Extent to which people collaborate with others to reduce environmental health threats in their community.

Cronbach's $\alpha = .79$

Personal Environmental Action Scale

Item	Factor Loading	Mean	SD
I stay away from a place if I think the air will be especially dirty there	.67	6.4	3.6
To keep out bad air, I close my windows	.59	4.9	3.9
I drink water that is bottled or filtered – not just from the faucet	.57	6.6	3.7
I avoid being around people who are smoking	.52	6.4	4.0
I avoid using insect sprays and pesticides because they could make people sick	.44	6.7	3.5
I limit how much fish I eat because fish might contain toxic chemicals	.31	4.4	3.8
I talk to my doctor or nurse about how to reduce the effects of pollution on my health	.30	2.7	3.5
I pick up trash that I see in the street or around my neighborhood	.18	6.8	3.5
I do what is necessary to make sure my home is free of toxins, like lead and radon	.18	7.8	3.1

Definition: Extent to which people take precautions to protect themselves from environmental health hazards.

Cronbach's $\alpha = 0.63$

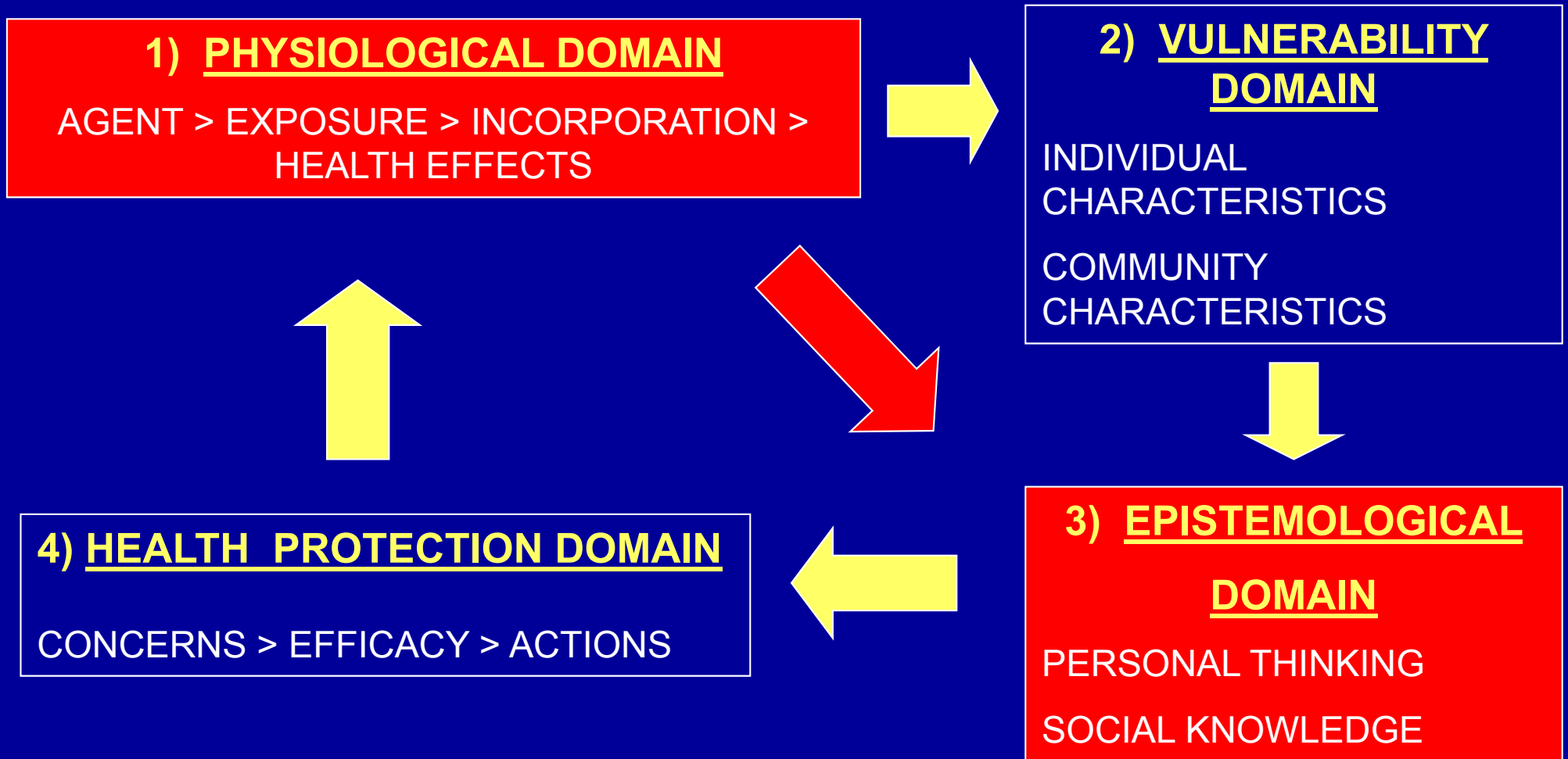
Scale scores by location

Census Tract	N	Pollution Sensitivity Scale	Pollution causes illness scale	Pollution Acceptance Scale	Community Environmental Action	Personal Environmental Action
19 East Rock	39	3.3	5.1	2.0	3.1	5.8
20 East Rock	40	3.2	4.9	2.6	2.5	5.4
21 Upper Wooster Square	38	3.5	5.9	2.5	4.7	6.8
22 Wooster Square	39	3.6	4.8	2.6	3.0	5.4
23 Fair Haven	35	3.9	5.4	2.5	3.2	5.7
24 Fair Haven	38	4.8	5.8	3.6	3.7	5.7
25 Fair Haven	43	4.0	5.6	3.1	3.6	6.2
26.01 Quinnipiac Meadows	44	3.2	5.0	3.7	2.8	5.6
26.02 Fair Haven Heights	36	3.3	5.2	3.1	3.4	5.5
27 East Shore Annex	39	3.4	5.6	3.5	3.5	6.5
28 Morris Cove	42	2.9	4.7	3.2	2.8	5.5
Total	433	3.5	5.3	3.0	3.3	5.8

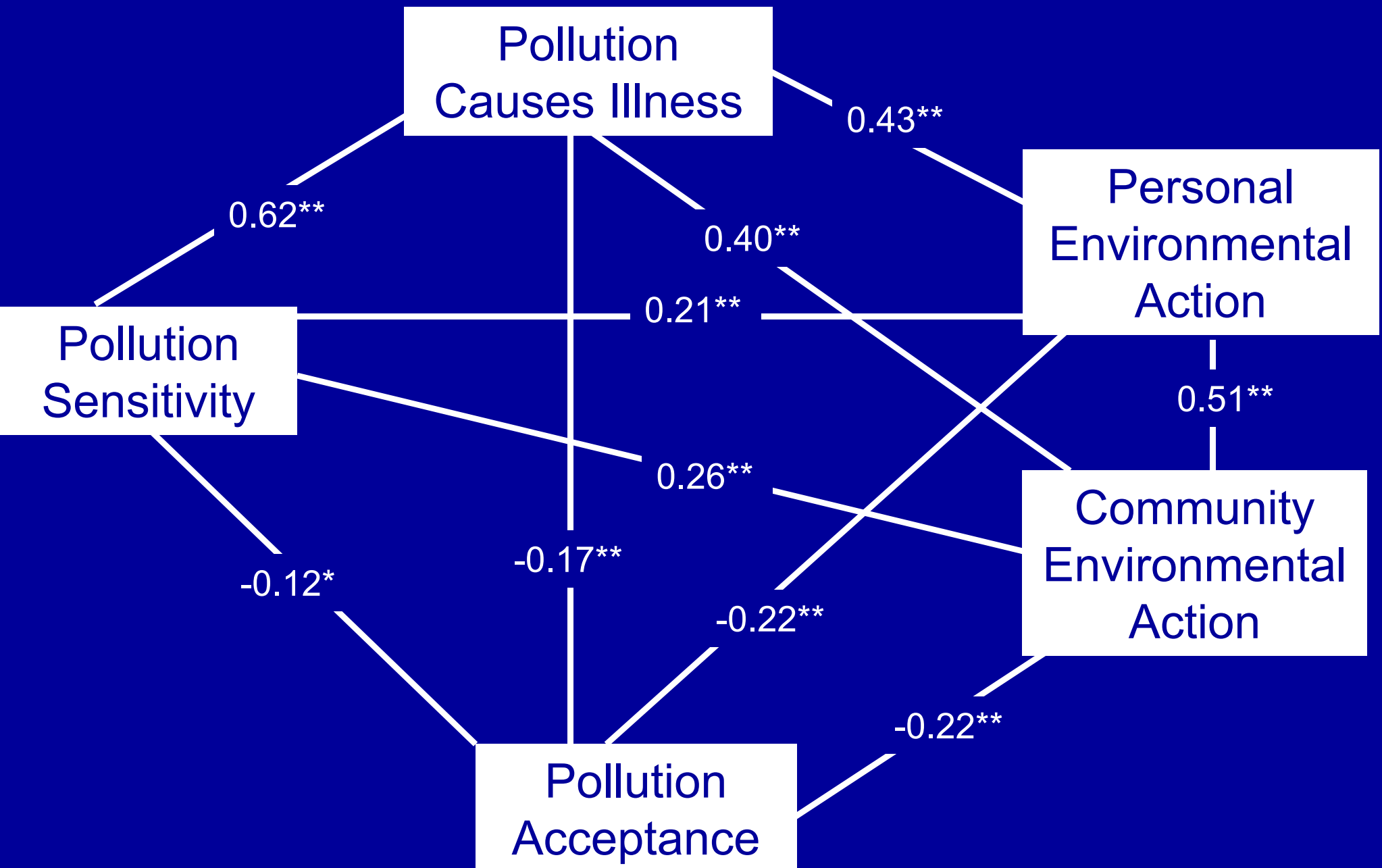
Pollution type by location

Census Track	Air pollution from trucks, buses and cars	Air pollution from factories and power plants	Lead from peeling pant	Contaminated drinking water	Improper disposal of garbage or hazardous waste	Toxic places like abandoned factories or dumps	Radiation from nuclear power plants
19 East Rock	4.7	2.7	3.3	2.6	3.3	1.6	.8
20 East Rock	4.9	2.4	2.5	2.7	4.7	2.0	.5
21 Upper Wooster Square	7.2	3.9	3.5	3.1	4.0	3.1	1.2
22 Wooster Square	5.7	3.5	2.7	2.2	3.5	2.9	1.5
23 Fair Haven	6.5	4.7	3.0	3.4	4.9	4.1	1.3
24 Fair Haven	7.2	4.8	4.2	4.6	5.8	4.1	2.9
25 Fair Haven	6.3	3.7	3.2	2.4	4.9	4.6	1.6
26.01 Quinnipiac Meadows	5.3	2.9	1.5	2.0	4.1	2.9	1.1
26.02 Fair Haven Heights	6.0	3.9	1.9	1.9	4.6	3.2	.9
27 East Shore Annex	6.2	4.6	1.5	2.1	3.8	3.3	1.4
28 Morris Cove	4.3	3.0	1.6	2.1	2.9	1.6	1.2
Total	5.8	3.6	2.6	2.6	4.2	3.0	1.3

Model for Environmental Health Research

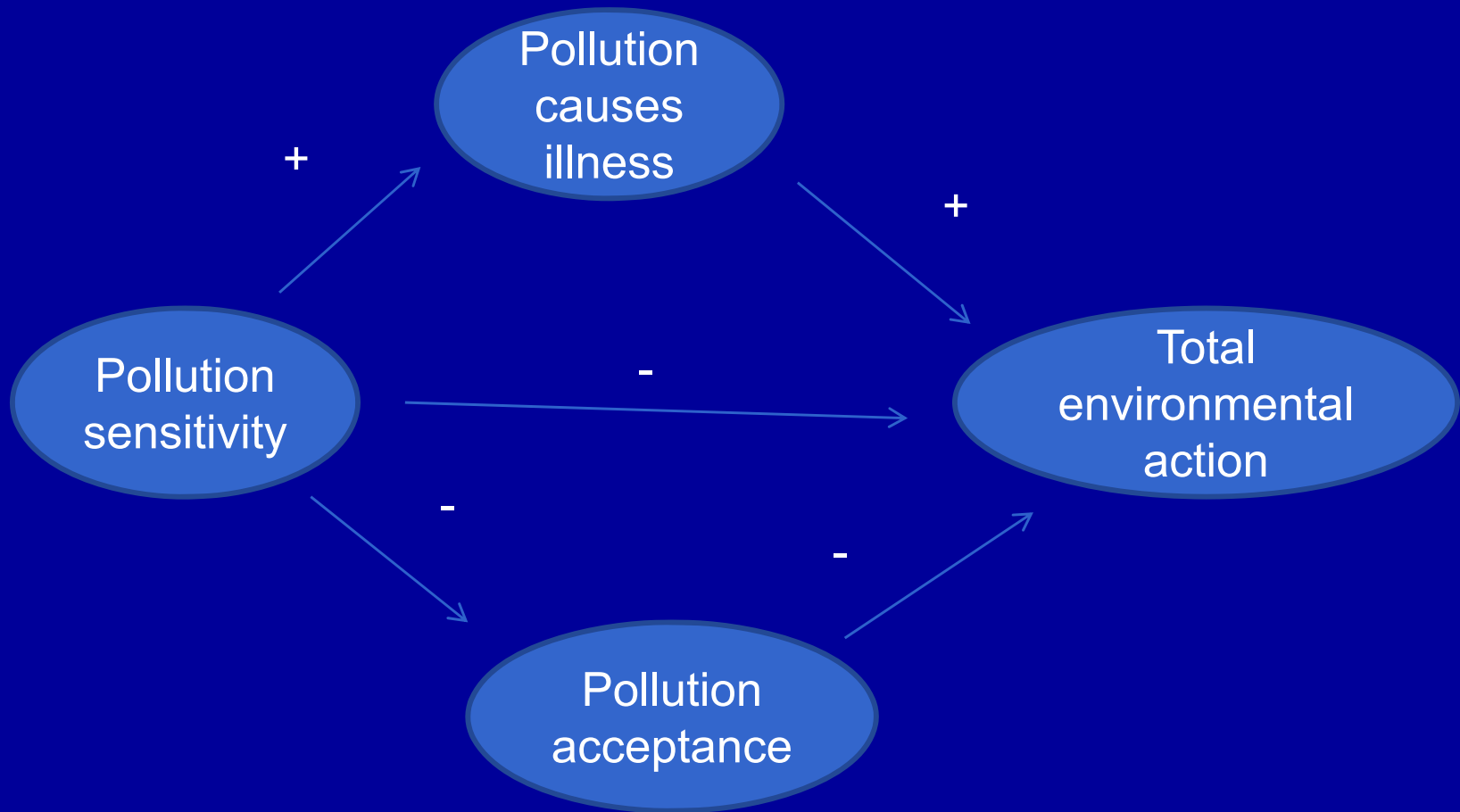


Correlations Between Scales

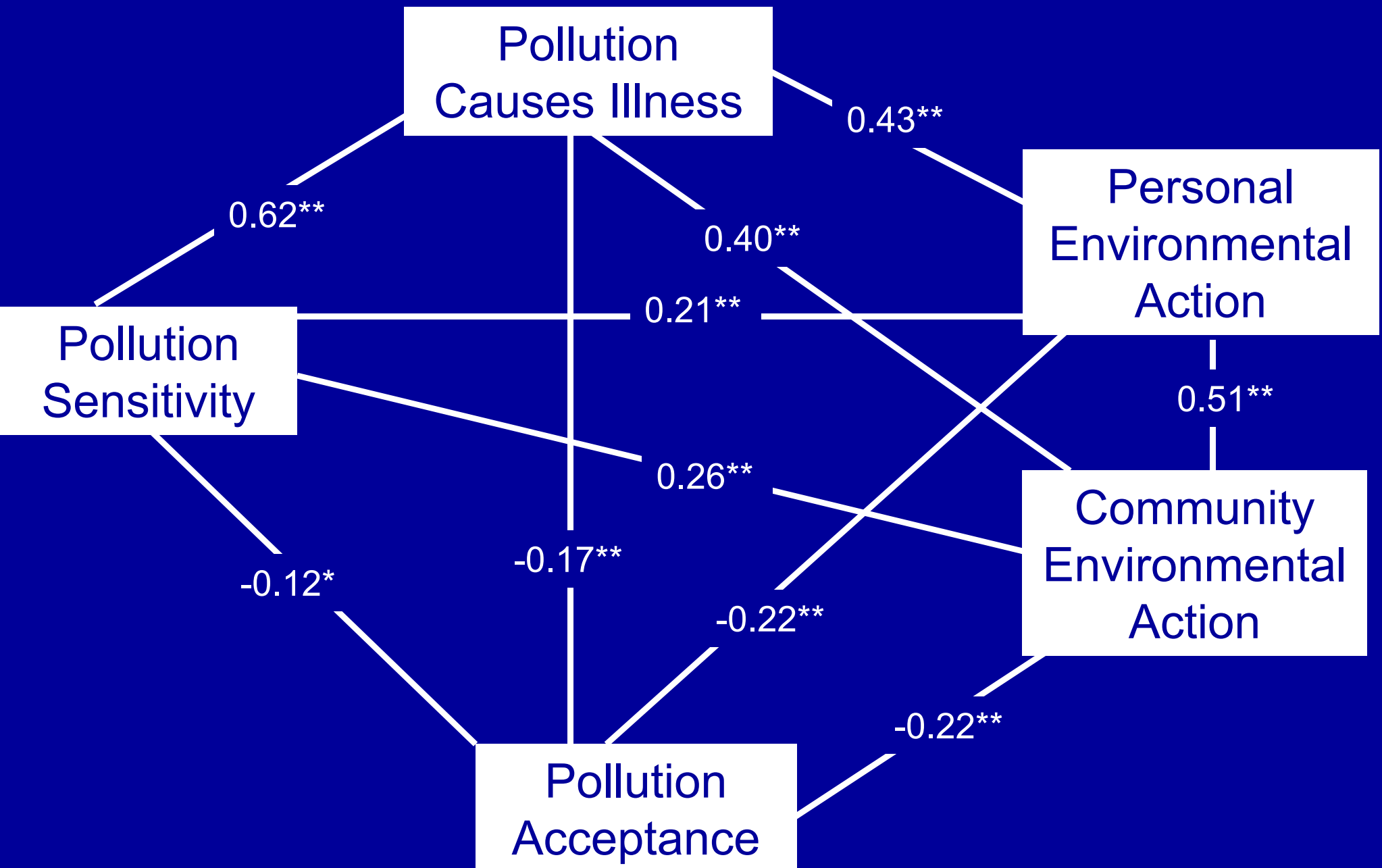


* $p < 0.05$ (2-tailed), ** $p < 0.001$ (2-tailed)

Results from structural equation model

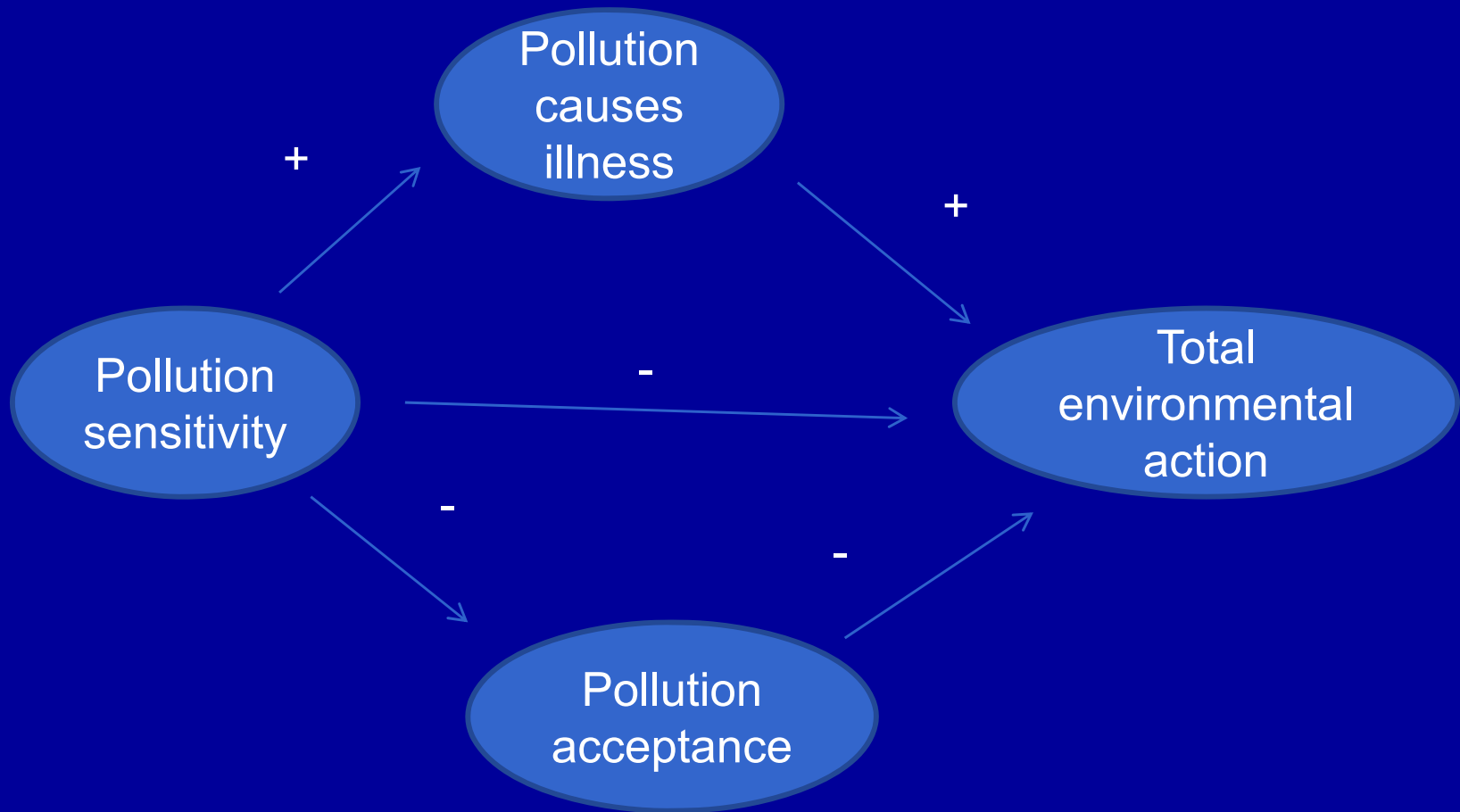


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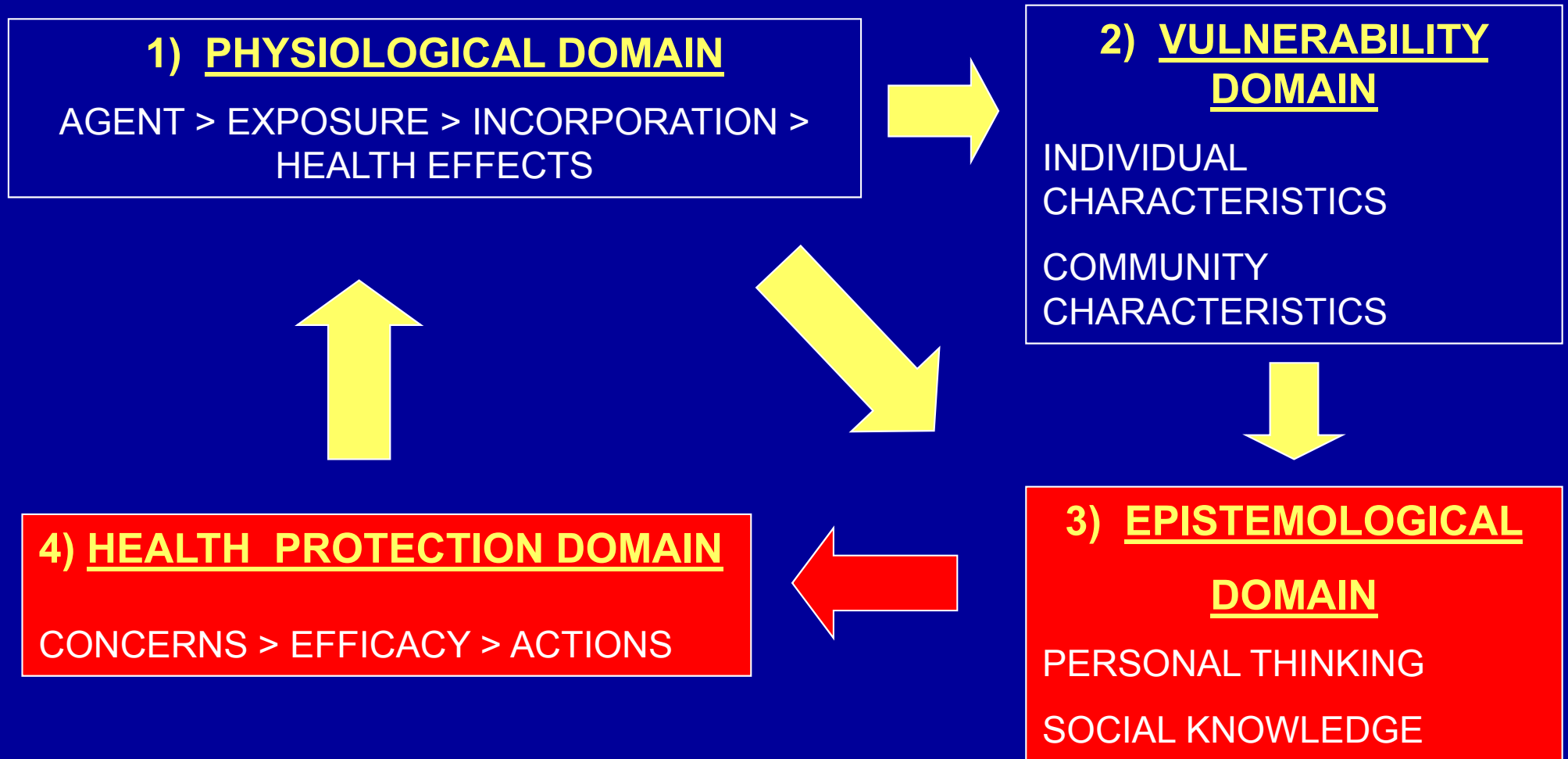


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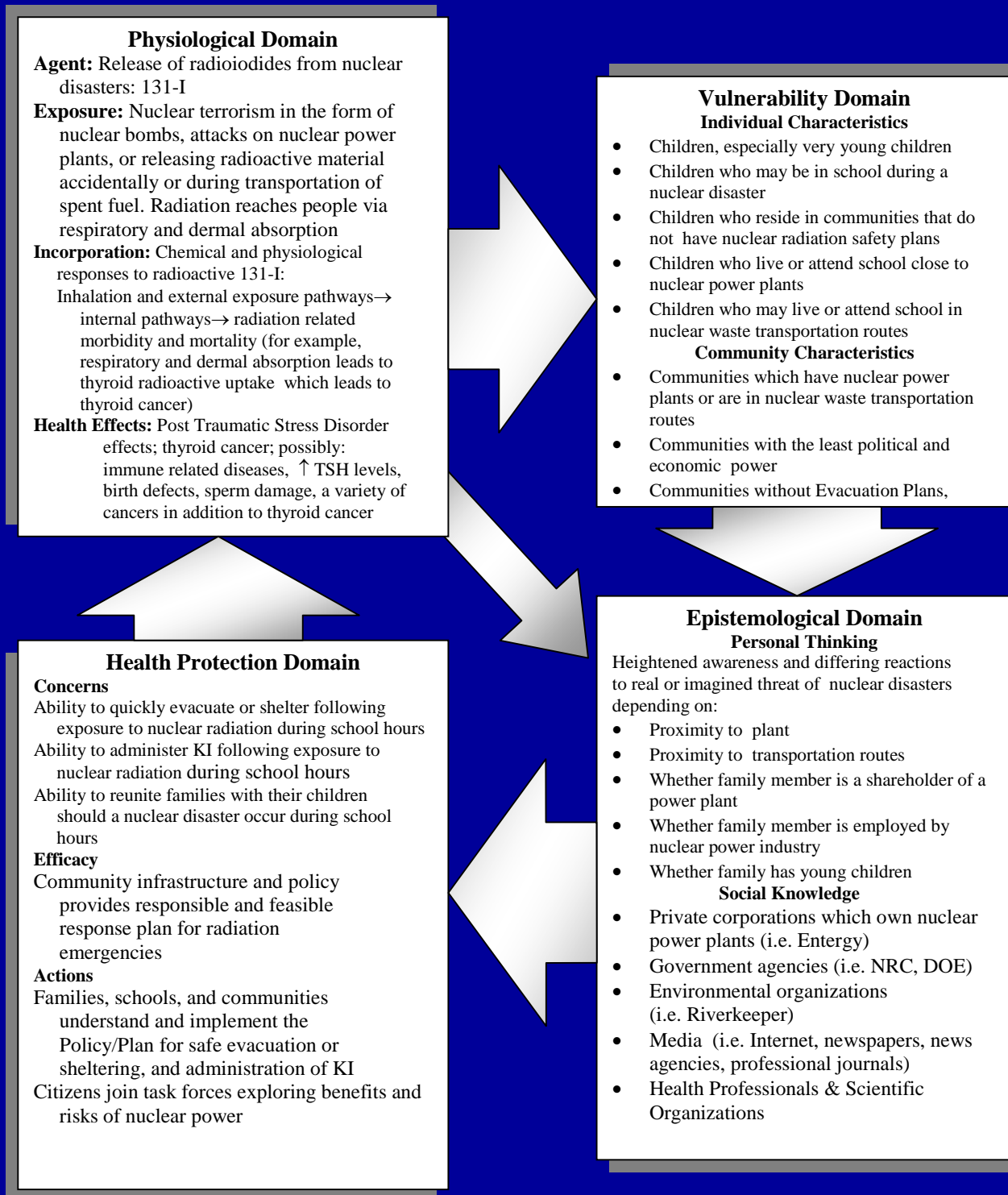
Results from structural equation model



Model for Environmental Health Research



Model For Environmental Health Regarding Radiation Exposure During Nuclear Disasters



Conclusions

- We have found the integrative model to be useful for looking comprehensively at environmental health issues.
- Yet the model needs some revisions which we will undertake.
- We will welcome opportunities to collaborate with others who would like to explore use of the model.