Transdisciplinary Approaches to Eliminating Health Disparities: The Emerging Role of Social Environmental Factors

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Differences & Disparities Occur At Many Geographic Levels

Life Expectancy at Birth in 17 *Peer* Countries, 2007*

	Males			Females	
Country	**LE**	**Rank**	**Country**	**LE**	**Rank**
Switzerland	79.33	1	Japan	85.98	1
Australia	79.27	2	France	84.43	2
Japan	79.20	3	Switzerland	84.09	3
Sweden	78.92	4	Italy	84.09	3
Italy	78.82	5	Spain	84.03	5
Canada	78.35	6	Australia	83.78	6
Norway	78.25	7	Canada	82.95	7
Netherlands	78.01	8	Sweden	82.95	7
Spain	77.62	9	Austria	82.86	9
UK	77.43	10	Finland	82.86	9
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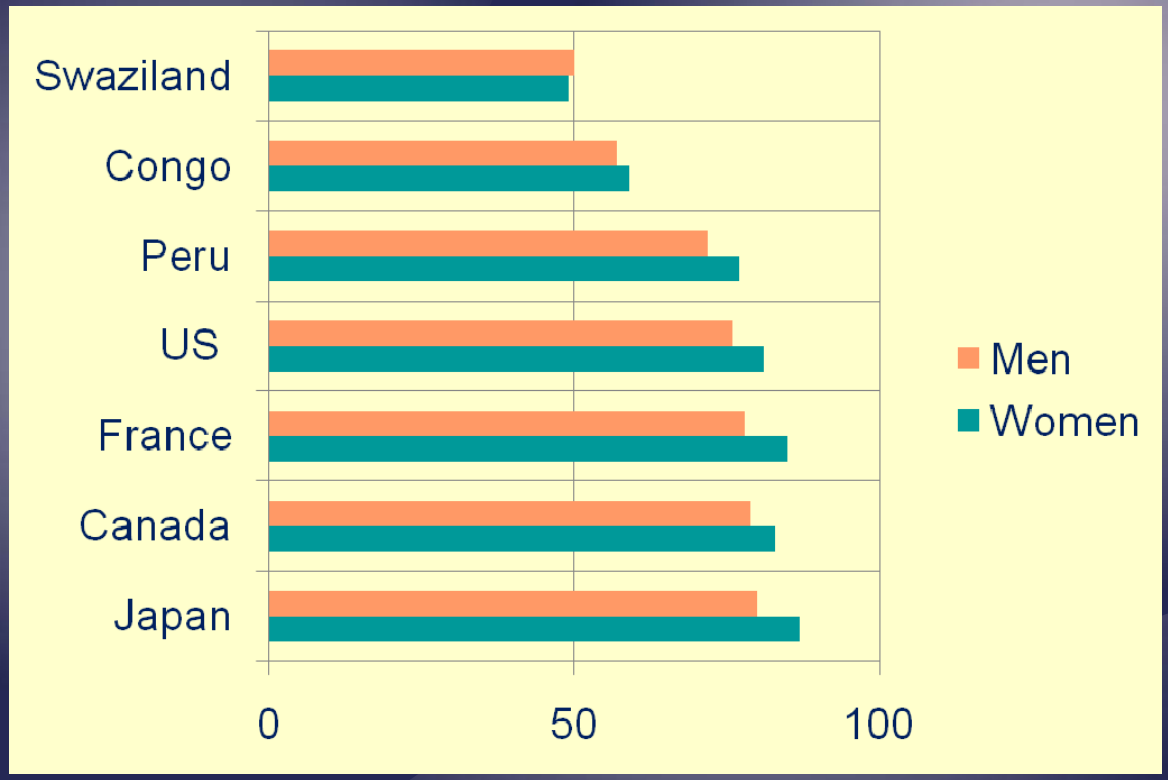
US	**75.64**	**17**	**US**	**80.78**	**16**

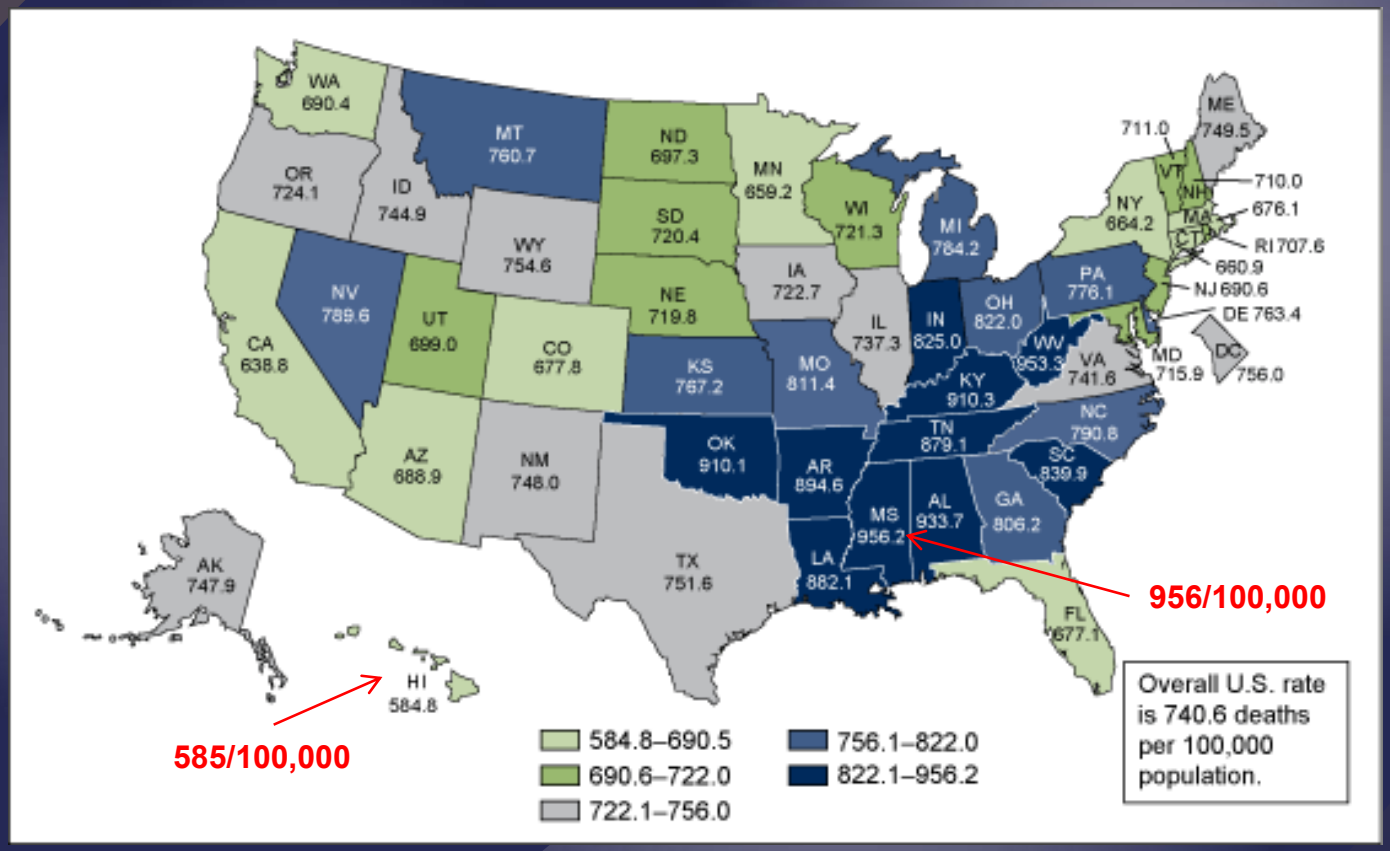
National Research Council & IOM, 2013, *US Health in International Perspective: Shorter Lives, Poorer Health

Life Expectancy at Birth in Peer & Non-Peer Countries, by Gender



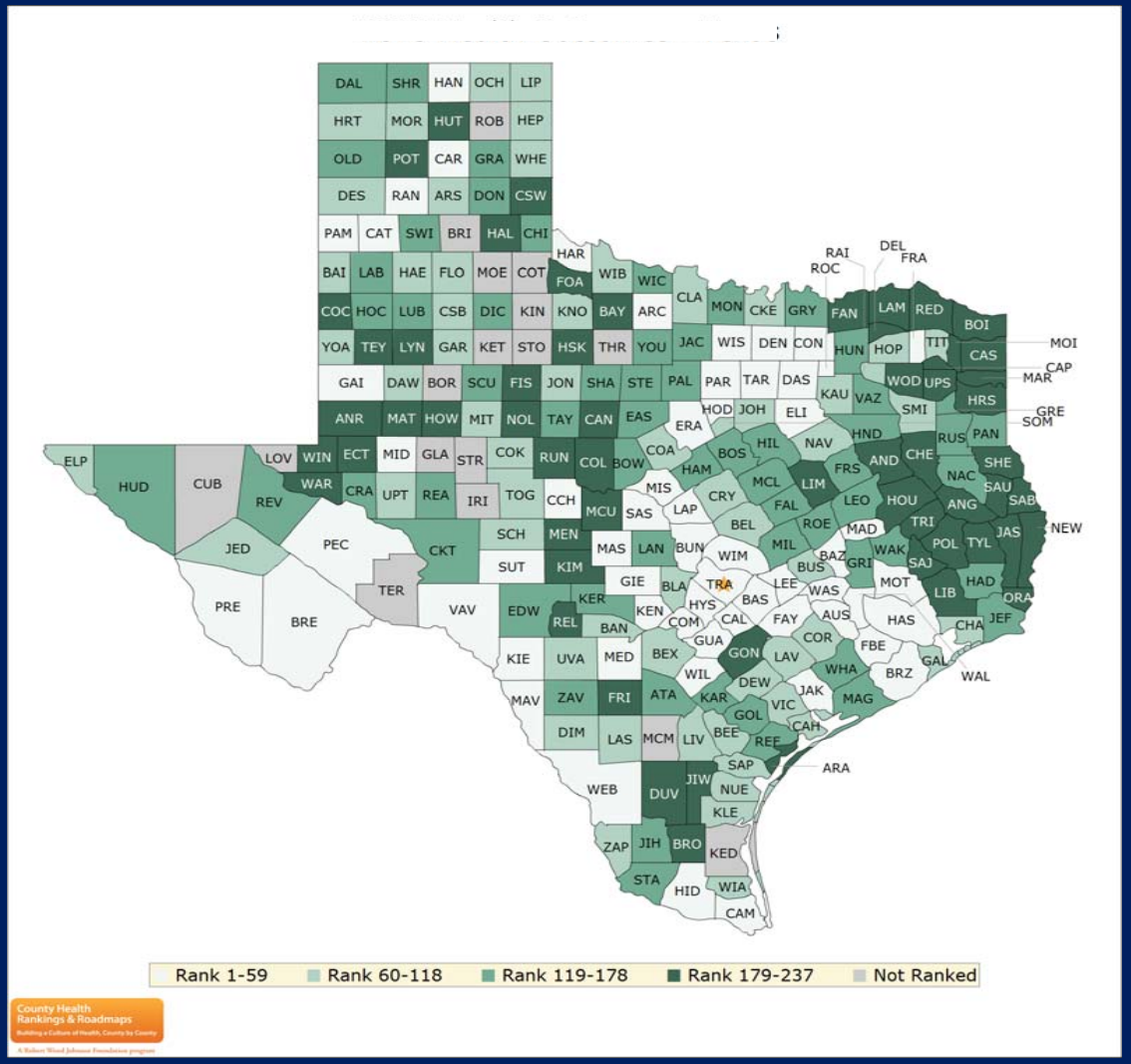
Source: United Nations Statistics Division, Social Indicators, 2012

Age-Adjusted Death Rates for States & DC, U.S., 2011



Source: CDC, National Center for Health Statistics Data Brief, Vol. 115, March, 2013

2015 RWJ County Health Rankings, Texas

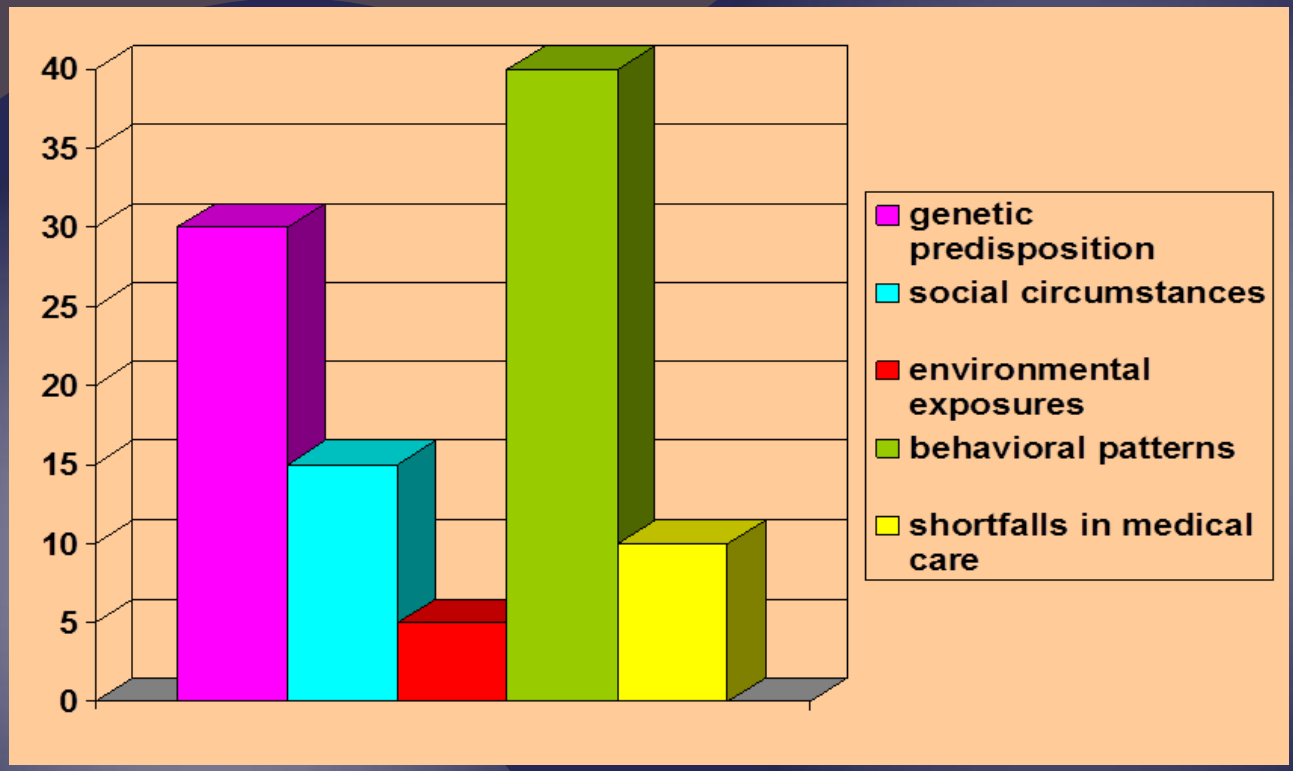


*RWJ = Robert Wood Johnson Foundation

Health Disparities

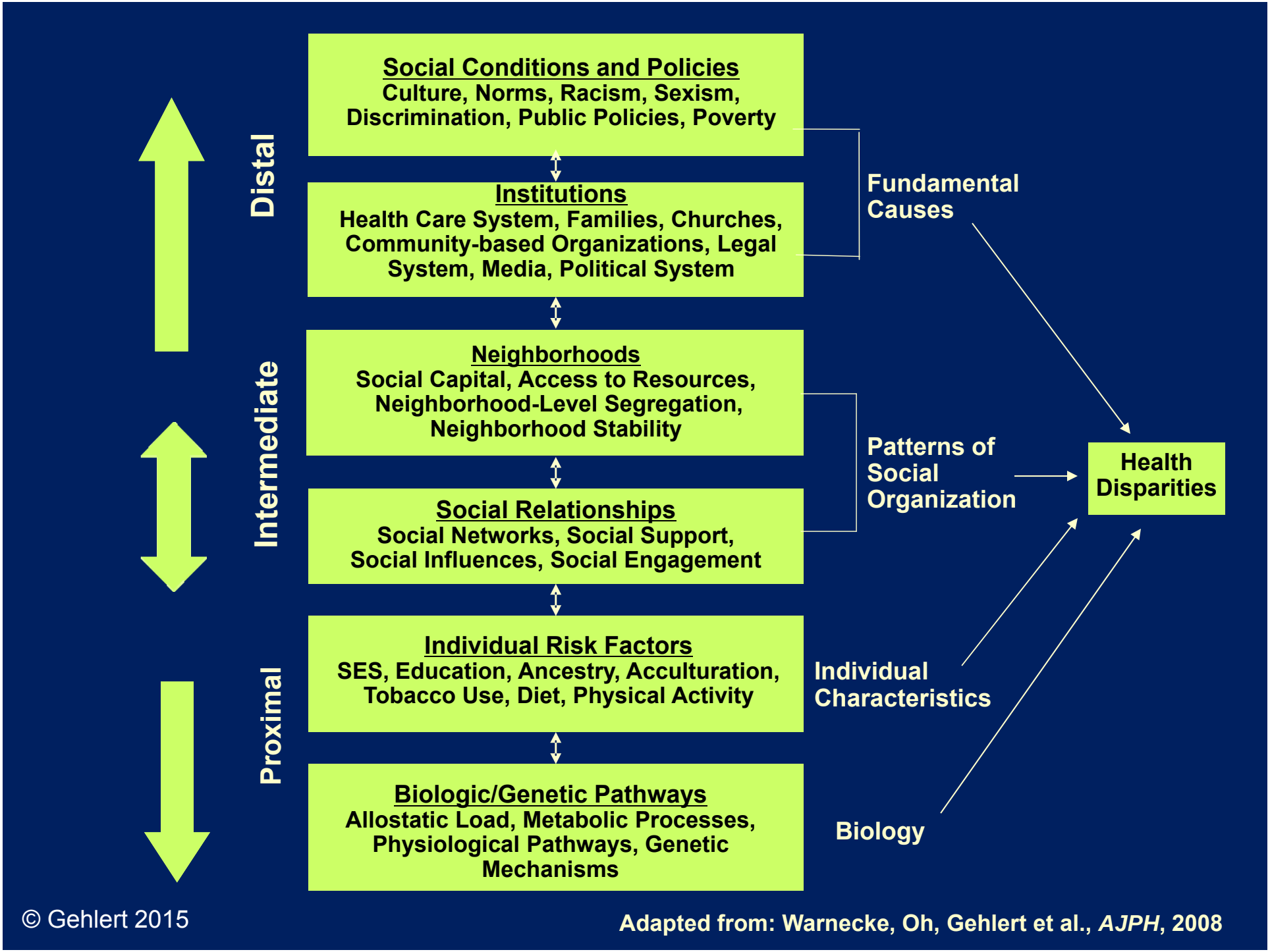
- Defined as differences in health that are not only unnecessary & avoidable but, in addition, are considered unfair & unjust
- Occur by race, ethnicity, gender, socioeconomic status, geography (rural versus urban), & other factors
- Reduced by health equity

What Do We Know About the Determinants of Health Disparities?



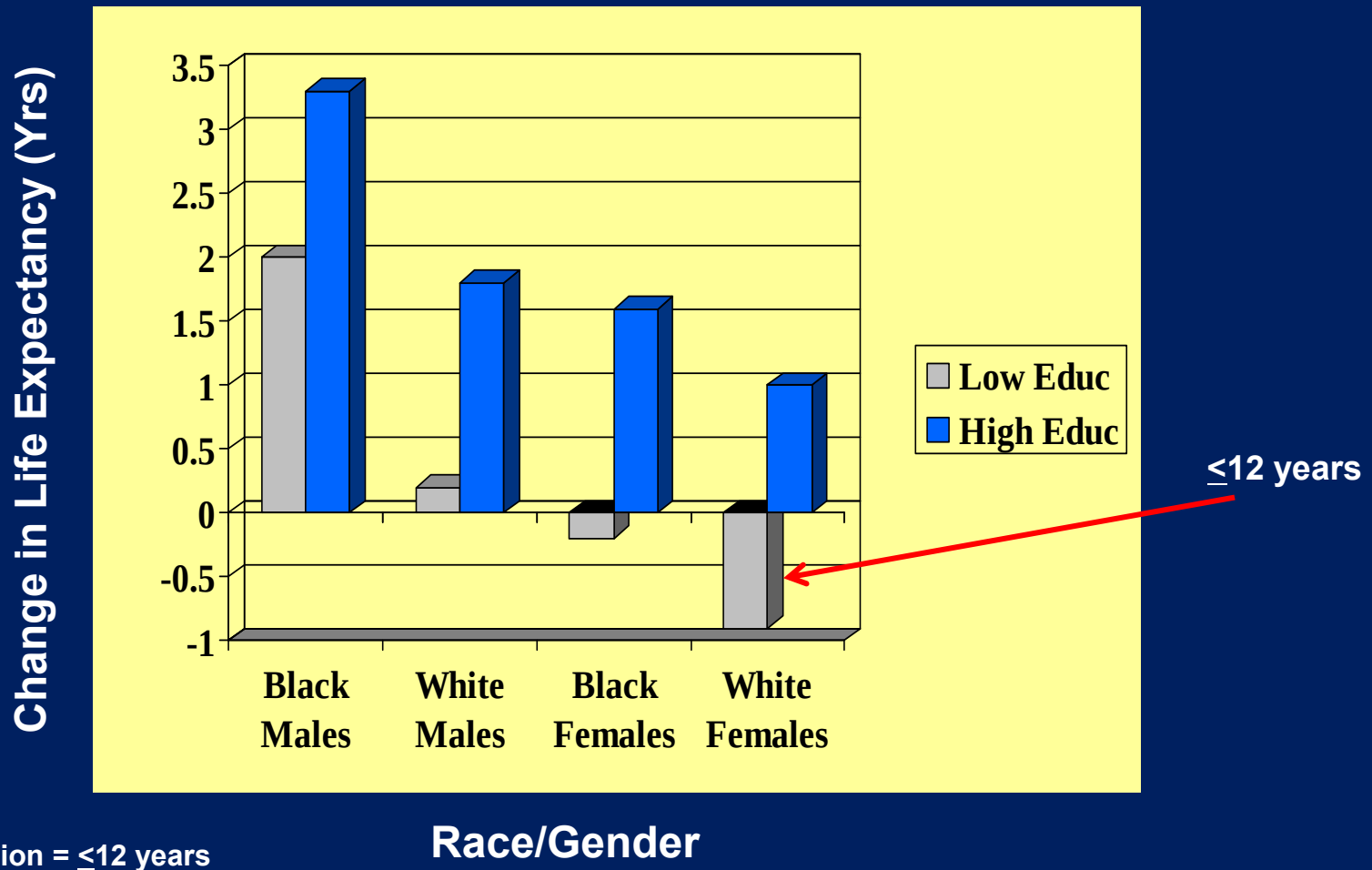
Source: McGinnis et al., *Health Affairs*, 2002

Contributors to Early Death in the US


Social Conditions and Policies
Culture, Norms, Racism, Sexism, Discrimination, Public Policies, Poverty
Institutions
Health Care System, Families, Churches, Community-based Organizations, Legal System, Media, Political System
Neighborhoods
Social Capital, Access to Resources, Neighborhood-Level Segregation, Neighborhood Stability
Social Relationships
Social Networks, Social Support, Social Influences, Social Engagement
Individual Risk Factors
SES, Education, Ancestry, Acculturation, Tobacco Use, Diet, Physical Activity
Biologic/Genetic Pathways
Allostatic Load, Metabolic Processes, Physiological Pathways, Genetic Mechanisms
Distal
Intermediate
Proximal
Fundamental Causes
Patterns of Social Organization
Individual Characteristics
Biology
Health Disparities
© Gehlert 2015
Adapted from: Warnecke, Oh, Gehlert et al., AJPH, 2008

Social Circumstances are the Least Studied Determinant, but Potentially the Most Significant

Change in Life Expectancy at Age 25 by Race, Gender, & Education: 1990-2000



Low education = ≤12 years
High education = 13 or more years
N = 147,039

Source: Meara et al., 2008, p. 354, *Health Affairs;* National Health Interview Survey

Models that Aren't Multi-Level Fail to Capture Complexity

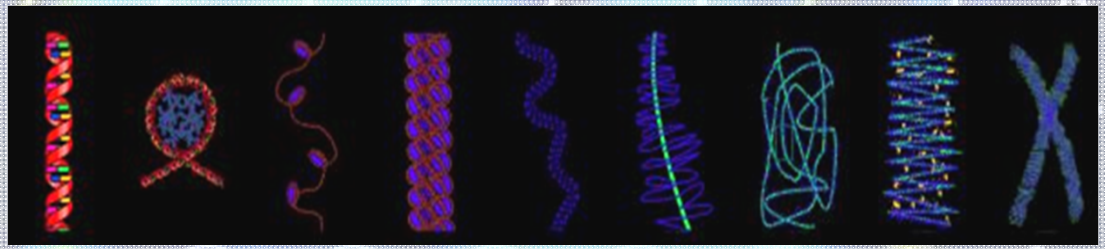
- Research has tended to focus on biological & individual-level factors
- Less on distal factors & intermediate social & physical contexts & relationships in which distal factors are experienced
- Most troubling is the lack of attention to interactions between levels

How Do Factors at Different Levels Interact? How Does the Environment "Get Under the Skin" to Affect Health?

The environment may shape the genome by modifying the epigenome

Epigenomics

Acquired changes in how genes are marked & programmed



Versus genomics, which has to do with inborn errors or variants of DNA sequence

But What Do We Mean by Environment?

Connected because persons exposed to poverty are more likely to be exposed to chemicals

Environmental Exposures & Disease

- **Generally occur at the neighborhood level**
- **Exposures cross-cut SES**
- **However, those of lower SES have less choice in terms of products, food, & housing & are more likely to be exposed to dumping of waste**

Resource Conservation & Recovery Act facilities tend to be close to neighborhoods with a higher percentage of minority residents, especially in nonmetropolitan areas*

*Davidson & Anderton, 2000, *Demography*

The Case of Breast Cancer:

Interactions Among Levels of Analysis & the Importance of Social Determinants

Race/Ethnic Differences in Breast Cancer Mortality

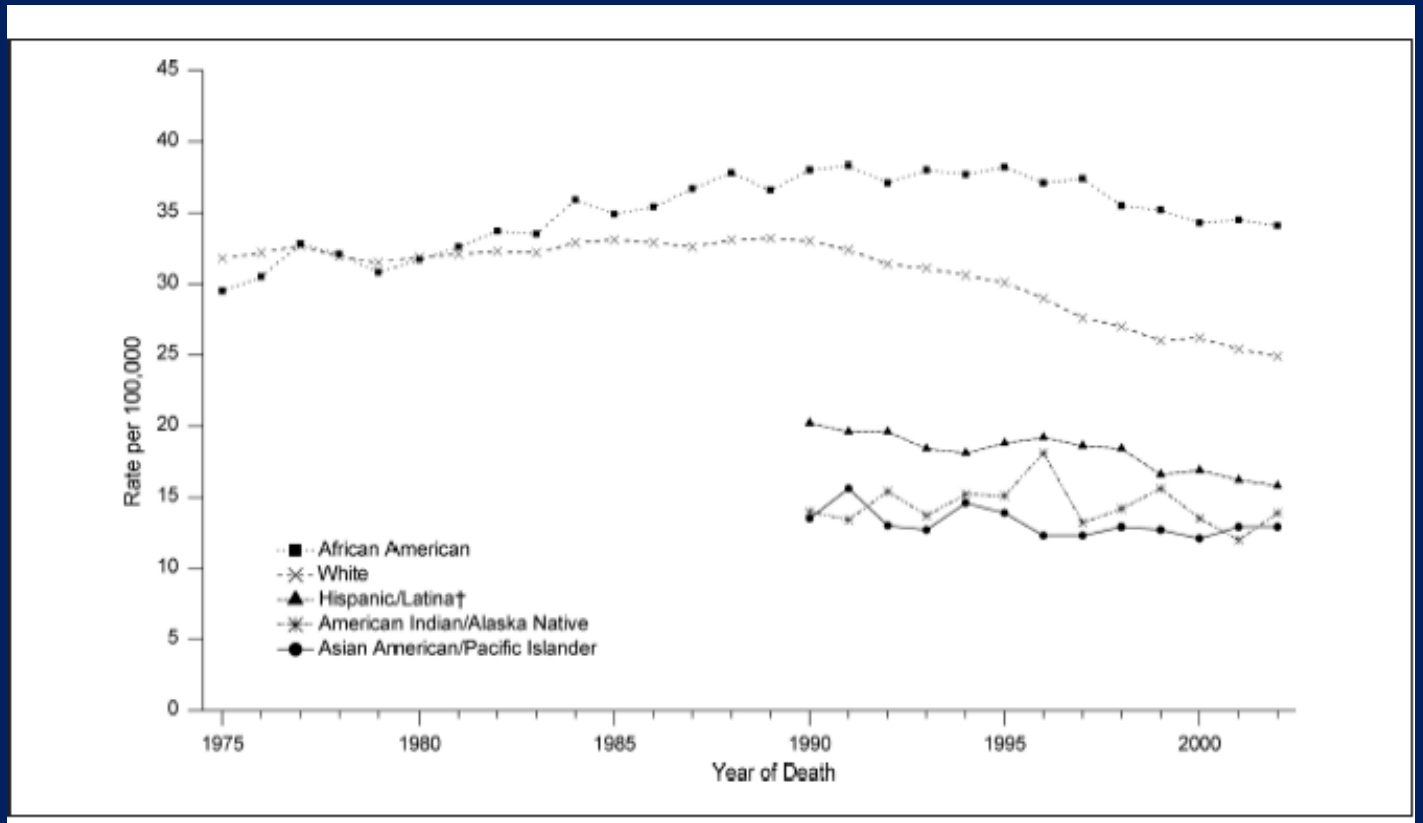
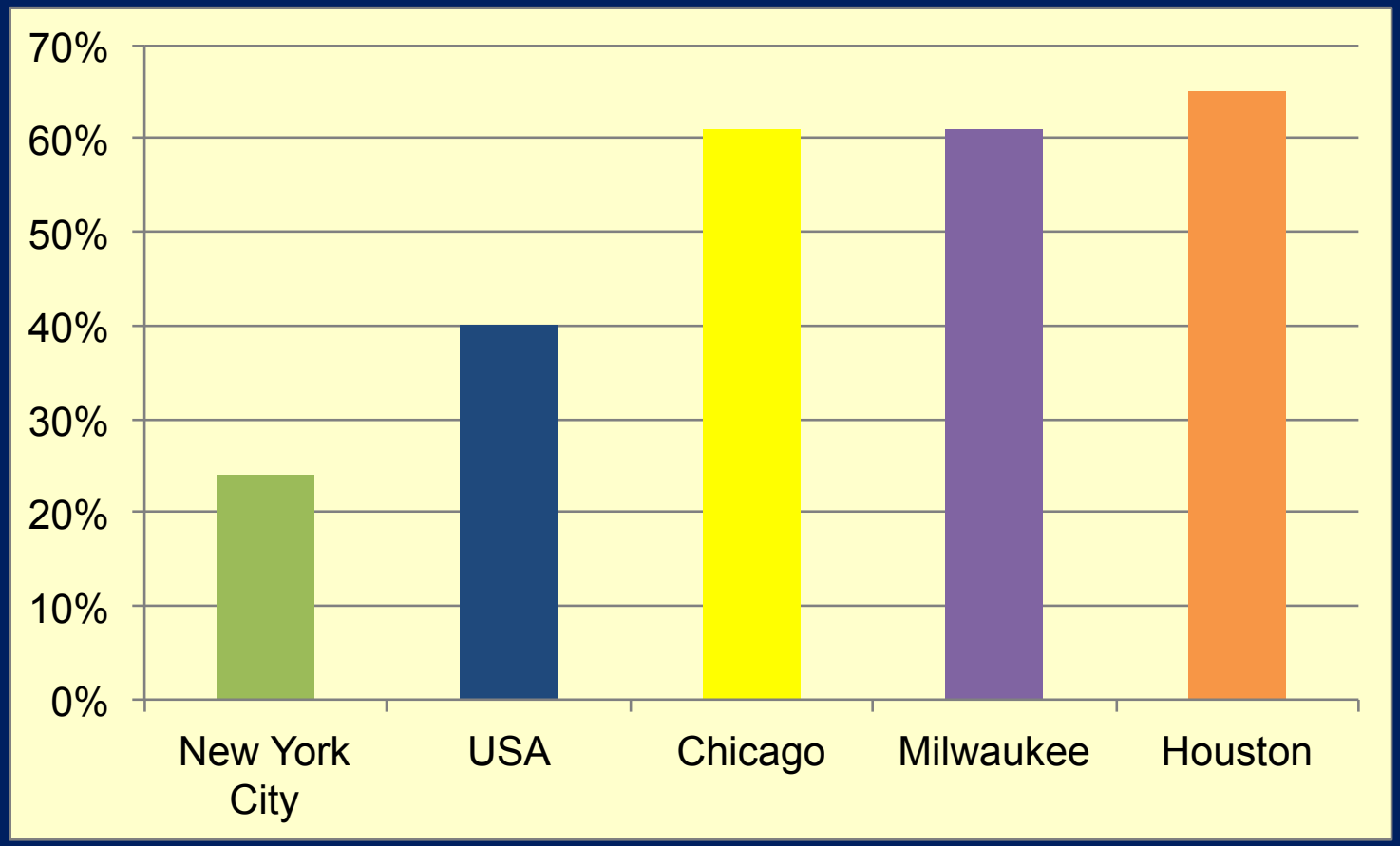


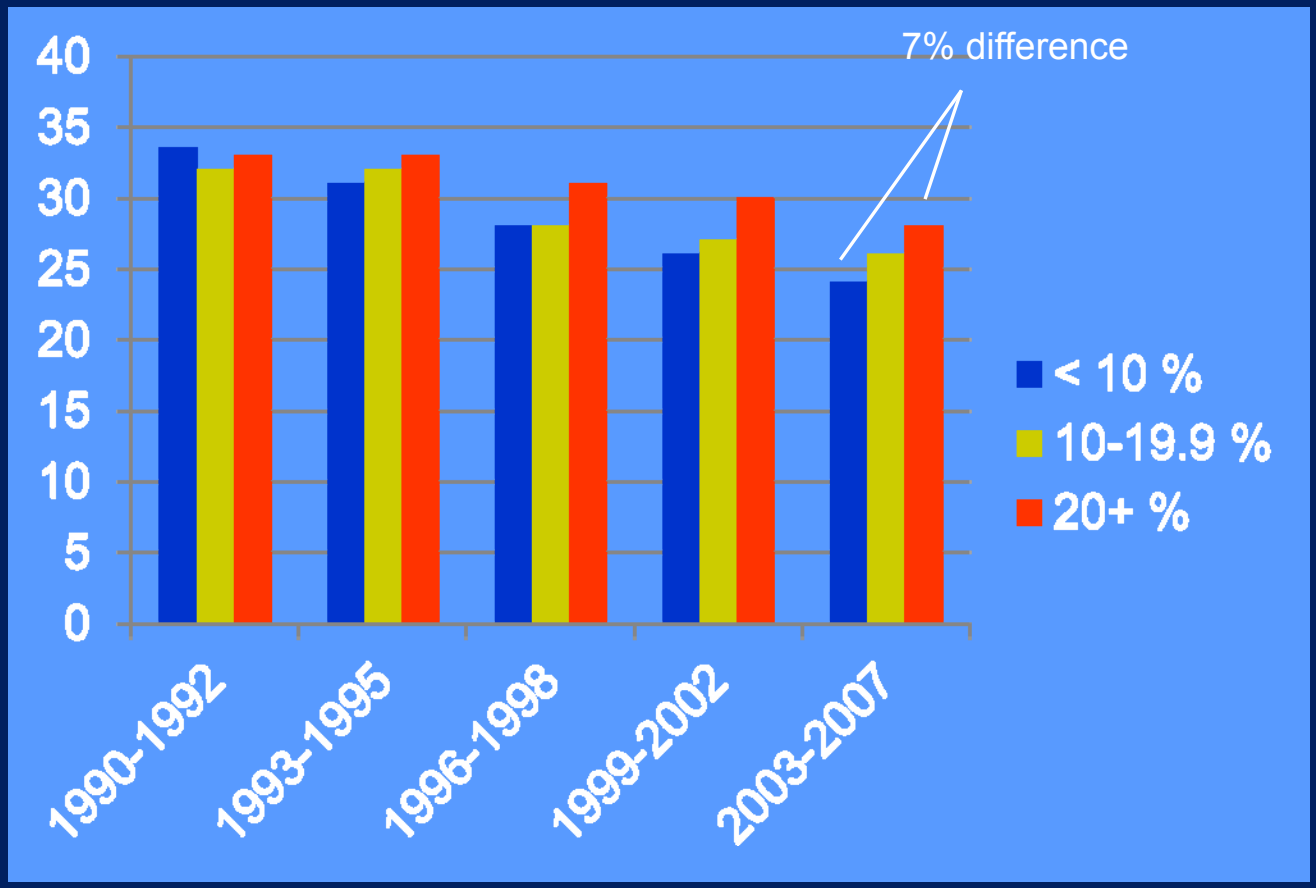
FIGURE 6 Female Breast Cancer Death Rates* by Race and Ethnicity, United States, 1975 to 2002.
*Rates are age-adjusted to the 2000 US Standard Population.
†Information is included for all states except Connecticut, Maine, Maryland, Minnesota, New Hampshire, New York, North Dakota, Oklahoma, and Vermont.
Source: National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

Black & White Breast Cancer Mortality Disparity, 3-Year Averages (2005-2007)



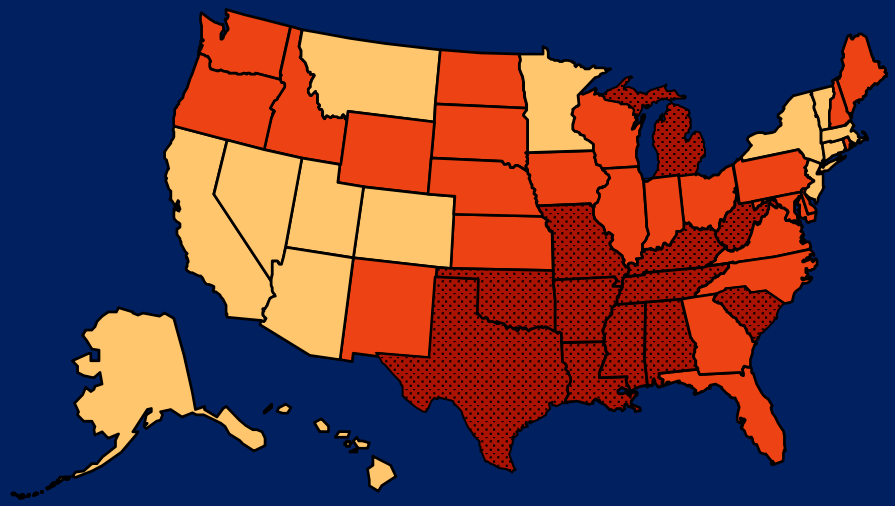
Source: Whitman, Orsi, & Hurlbert, 2012 , *Int J Cancer Epi, Detection, & Prev*

Trends in Breast Cancer Mortality by County-Level Poverty, 1975-2007



Source: National Center for Health Statistics, CDC, as provided by the SEER Program, NCI

Multi-Level Example: Obesity & Breast Cancer

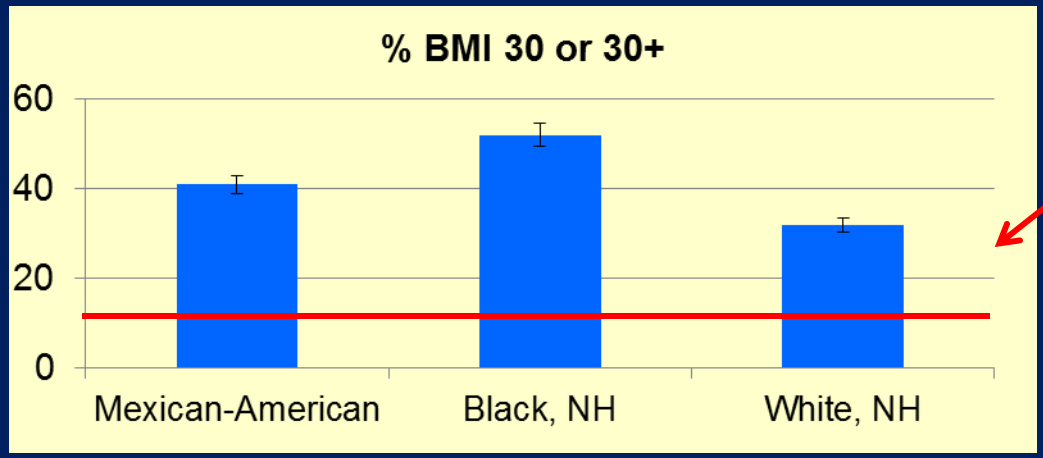


Rates of Obesity

Data not reported* | 15%–<20% | 20%–<25% | 25%–<30% | 30%–<35% | ≥35%

http://www.cdc.gov/obesity/data/prevalence-maps.html

Healthy People 2010 target (15%)



Prevalence of Obesity Among Women >20 years, NHANES, 2003-2006

Epigenetic Changes *In Utero*

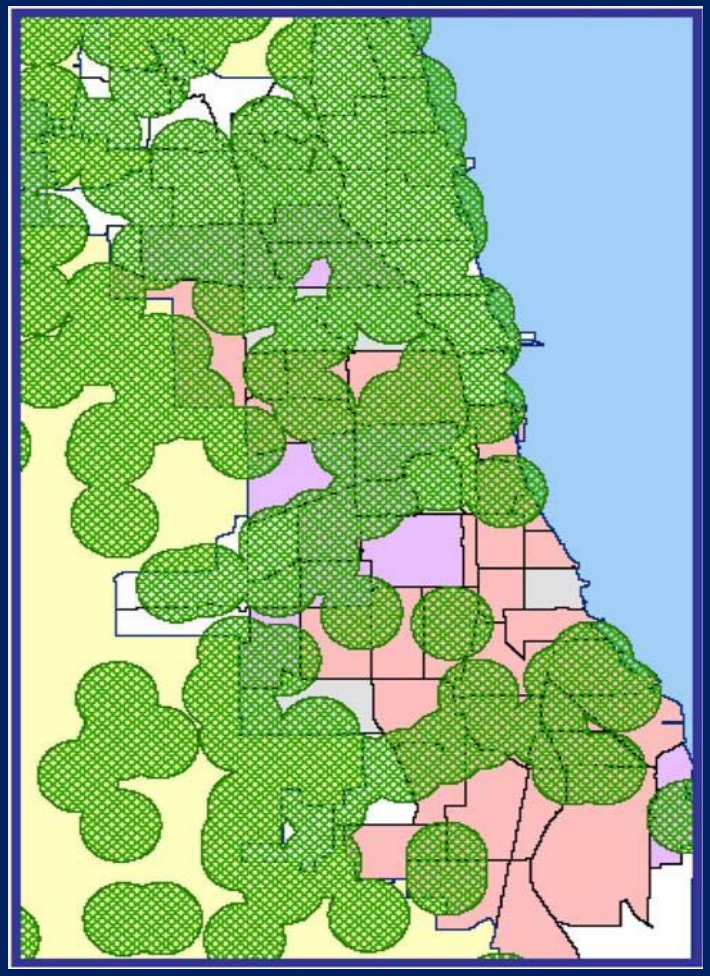
- High estrogenic fetal environments silence BRCA1 in daughters through methylation resulting in less BRCA1 to defend the cells from becoming cancerous.[1] They are more women who are obese entering pregnancy & to eat high fat diets while pregnant
- This predisposes daughters to breast cancer as adults
- That African-American women have higher rates of obesity[2,3,4] may help to explain their less favorable outcomes from breast cancer[5]

[1]Hilakivi-Clarke et al., *J Mammary Gland Biol Neoplasia*, 2013; [2]Flegal KM et al. JAMA, 2012;307:491-7; [3]Menashe I et al. JNCI, 2009;101:993-1001; [4]Bruce M et al. JNMA, 2007; 99:1152-8; [1]Morris G et al. JNMA, 2008;100:698-702

Social Factors Known to Influence Obesity

- Exposure to health information (e.g., diet, physical activity) that is understandable & culturally congruent
- Features of the neighborhood built environment (e.g., safe opportunities for physical activity; access to healthy foods)

Location of "Major Player" Grocery Stores in Chicago



Area that has at least one major grocer within a one-mile radius

50%+ African American

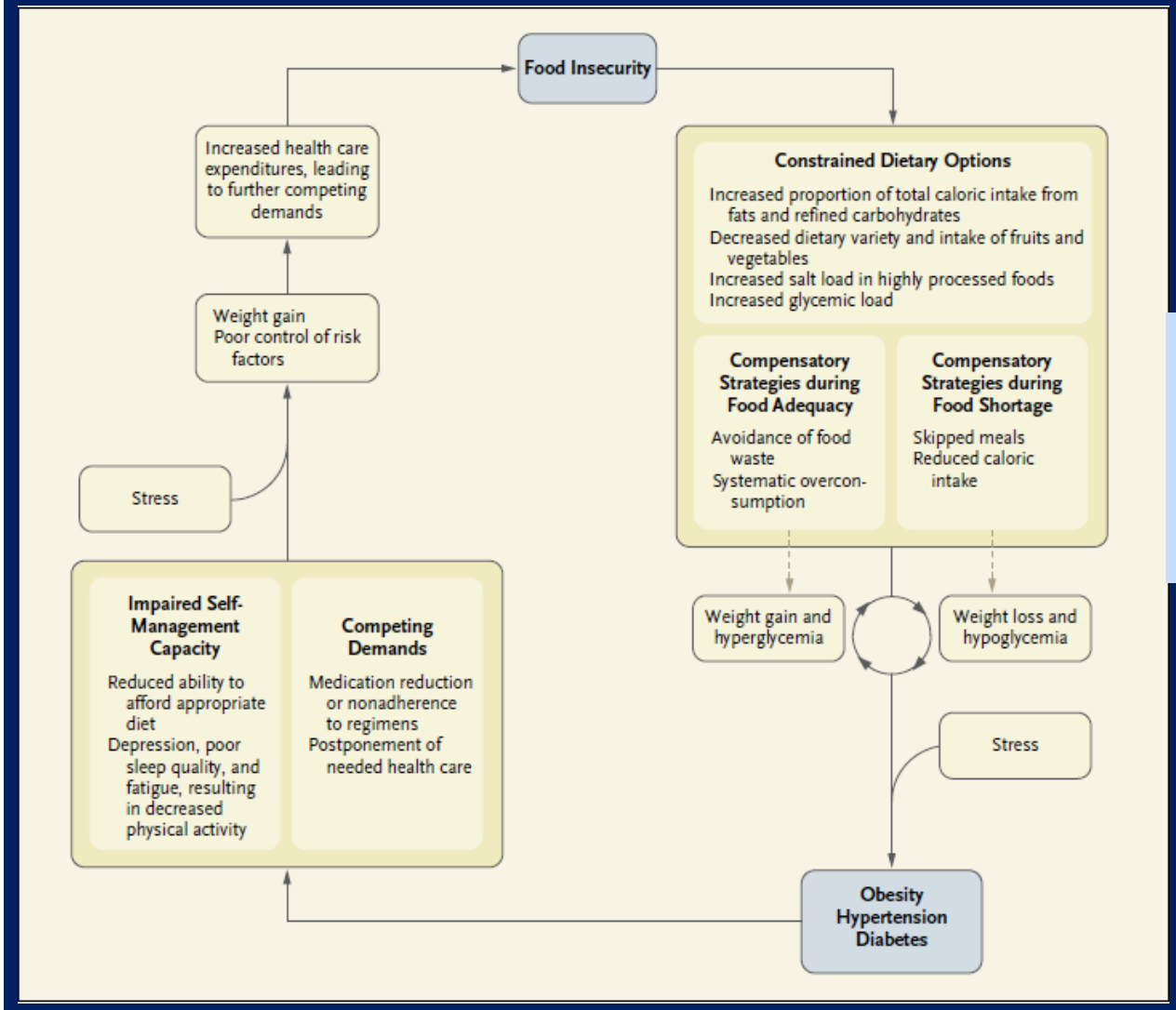
50%+ Hispanic

50%+ White

50%+ no single racial/ethnic group

Source: Metro Chicago Information Center, Oct., 2005

Cycle of Food Insecurity & Chronic Disease



Food insecurity may cause women to:

- **Skip meals**
- **Eat what is left on others' plates**
- **Save healthful food for children**
- **Eat less costly fast & junk food**

Source: Seligman & Schillinger, 2010, *NEJM*

Neighborhoods, Obesity, & Diabetes: Moving From Public Housing in Chicago

From 1994 to 1998, 4498 women & children were moved from public housing. 1788 were given low-poverty vouchers. Follow-up conducted from 2008 to 2010.

The prevalences of a BMI* of 35 or more, a BMI of 40 or more, and a glycated hemoglobin level of 6.5% or more were lower in the group receiving the low-poverty vouchers than in the control group

Absolute differences:
BMI ≥ 35 = 4.61 percentage points (95% confidence interval [CI], −8.54 to −0.69)
BMI ≥ 40 = 3.38 percentage points (95% CI, −6.39 to −0.36)
Glycated hemoglobin = 4.31 percentage points (95% CI, −7.82 to −0.80)

*BMI=Body mass index (relation of weight to height)

Ludwig et al., October 20, 2011, *NEJM*

Recent Interest in Social Variables

Precision Medicine Initiative

- **Announced by Obama on January 30th with request for $215 million in next fiscal year**
- **Collect genetic data on 1,000,000 Americans to understand genetic variations within diseases & develop treatments for them**
- **Data from medical records (information about diet, tobacco use, lifestyle, & environment, lab test results) & gene profiles**

Recent IOM* Recommendations for Core Domains & Measures

	Domain/Measure	# Questions	Frequency
Frequently collected	Alcohol use	3	Screen & follow-up
	Race & ethnicity	2	At entry
	Residential address	1	Verify every visit
	Tobacco use & exposure	2	Screen & follow-up
Not frequently collected	Census tract-median income	1	Update on address change
	Depression	2	Screen & follow-up
	Education	2	At entry
	Financial resource strain	1	Screen & follow-up
	Intimate partner violence	4	Screen & follow-up
	Physical activity	2	Screen & follow-up
	Social connection/isolation	4	Screen & follow-up
	Stress	1	Screen & follow-up

*IOM = Institute Medicine

Source: Institute of Medicine, November 13, 2014

Social Determinants of Health: Data Collection Within BJC Healthcare

KL2 project, Elna Nagasako, MD, PhD

Study Objective

Characterize the data on social factors being collected by personnel at 4 hospitals within the same 12-hospital BJC Healthcare system to inform current discussion on standardized collection of these factors

Methods

1. **Social factors identified**
   - **Input from information services, case coordination, & a hospital-based center for diversity & cultural competence**
2. **Literature reviewed to develop working definitions of factors**
3. **Hospitals selected for diversity (rural, urban academic, suburban, safety net)**
4. **Personnel selected for observation (case coordinators, case managers, registration personnel, social workers)**
5. **21 persons shadowed by during 17 observation periods**

Variables Collected by All Hospitals

- **AGE**: Age in years at admission
- **CARE COORDINATION**: Understand post-discharge care
- **CONTINUITY OF INSURANCE:** Gaps in personal health insurance coverage
- **CURRENT SYSTEM UTILIZATION**: Extent an individual uses the healthcare system over a given time
- **DISCHARGE AGAINST MEDICAL ADVICE**: Self-discharge against medical advice
- **ELECTRONIC COMMUNICATION:** Access to landline phone, wireless phone, or internet access
- **EMPLOYMENT STATUS:** Working, unemployed, self-employed, retired at admission
- **ENVIRONMENT:** Geographic location re measured air pollutants, access to healthy foods & recreational facilities
- **FUNCTIONAL STATUS:** Capable of bathing, eating, dressing, toileting, walking, & go up/down stairs unassisted
- **HEALTH LITERACY/LITERACY:** Ability to read, write & use numeracy to handle information, & make decisions
- **HOME SUPPORT:** Perceived adequacy of tangible support from others in performing ADLs
- **HOUSEHOLD COMPOSITION:** Other individuals living in household (family, spouse, friends, guardian)
- **HOUSING:** Household accessibility (e.g., stairs)
- **INCARCERATION HISTORY:** History of imprisonment
- **LANGUAGE:** Preferred spoken & written language
- **NUTRITION:** Type of food intake on a regular basis; quality of food eaten; accessibility of healthy food
- **OBESITY:** Body Mass Index ≥ 30
- **PHYSICAL ACTIVITY:** Degree to which a patient engages physical exertion in a given time period
- **LENGTH OF STAY:** Days patient in hospital or other healthcare facility
- **LIVING SITUATION:** Where an individual lives (e.g., house)
- **PRIMARY CARE PHYSICIAN:** Ability name the primary physician who provides care to a patient
- **PROXIMITY TO HEALTHCARE:** Geographical proximity (e.g., miles to nearest healthcare facility)
- **RACE:** American Indian/Alaska Native, Asian, Black/African American, Native Hawaiian/Other Pacific Islander, White
- **ETHNICITY**: Hispanic origin or non-Hispanic origin
- **READMISSION:** History of inpatient hospitalization both related & unrelated to current admission
- **RELIGION:** Subjective use of religion regardless affiliation
- **SELF-REPORTED HEALTH:** Patient's report, current physical, emotional, & mental health status
- **SMOKING/ALCOHOL/DRUG ABUSE:** Any habitual use of the tobacco plant leaf & its products; Alcohol use: drinking in moderation (1 drink or less per day for women & 2 drinks or less per day for men); Illicit drug use
- **TRANSPORTATION: F**ull or partial use of a vehicle, or is aware of & willing to use public transportation

Preliminary data, Nagasako et al.

Variables Collected at Some Hospitals

- **EDUCATIONAL LEVEL:** Highest level of education completed
- **INCOME:** Money patient earns in a given period of time
- **TRUST OF HEALTH SYSTEM:** An individual's willingness to seek care and resulting adherence to treatment recommendations
- **WHERE YOU SEE A DOCTOR:** Primary location that an individual goes when seeking medical care (e.g., clinic, ED)

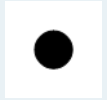
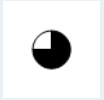
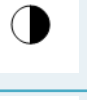
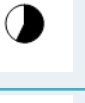
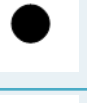
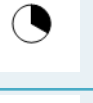
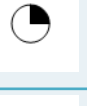
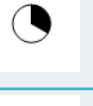
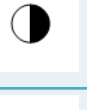
Preliminary data, Nagasako et al.

Recorder of Information at Hospital

Hospital A	Hospital B	Hospital C	Hospital D
Case Manager	*Admissions*	*Admissions*	Case Manager
Certification Coordinator	Case Manager	Case Manager	*Dietician*
Nurse	Nurse	*Certification Coordinator*	Nurse
Physician	Physician	*Dietician*	*PT/OT*
Registrar	*Precertification*	Nurse	*Registration*
Social Worker	*PT*	*Patient Accounts*	Social Worker
	Registration	*Physical Therapist*	
	Social Worker	Physician	
	Spiritual Care/Chaplin	*Registration*	
	Therapy	Social Worker	

A = Urban academic hospital; B = Community safety-net hospital; C = Suburban hospital; D = Rural hospital

Variability in Observed Collection

Social variable (collected at least once)	Hospital				Total (N=17)
	A (N=3)	B (N=7)	C (N=4)	D (N=3)	
RACE: Five minimum categories for race: American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and White.					12
EDUCATIONAL LEVEL: Highest level of education that an individual(patient) has completed.					5
CONTINUNITY OF INSURANCE: Gaps in personal health insurance coverage.					11
INCARCERATION HISTORY: History of imprisonment.					6
HOME SUPPORT : Perceived adequacy of tangible support from others in performing daily activities.					13
LIVING SITUATION: Where an individual lives (e.g., house, apartment, etc.)					16
Harvey Ball Legend  *= None*  *= All*					

A = Urban, academic, teaching hospital; B = Community safety-net hospital; C = Community suburban hospital; D = Community rural hospital

Preliminary data, Nagasako et al.

QUALITATIVE DATA: OBSERVER COMMENTS

DOMAIN	Hospital A	Hospital B	Hospital C	Hospital D
CONTINUITY OF INSURANCE: Gaps in personal health insurance coverage	"Auto-populated." "Collected on all patients if information is possible. Insurance is asked for in Case Coordinator Initial Notes. Social Work Assessment but soon to be in Case Coordination." "Insurance is collected. Chart review if necessary or can be looked into if patient brings it up."	"Discussed in verbal assessment but never documented." "Documented in Social Work notes." "Pre-Certification does health insurance/benefits. Documented in [EMR 4] & Soon on [EMR 5]. Not stored specifically self pay." "Registration takes care of this. Case managers are informed if things change." "Sometimes Social Worker finds out about second or different insurance. [EMR 4] under authorizations."	"Collected and distributes information relating to the health insurance." "Gives info on if patient is insured or not." "Pt. accounts is called in to look at this. They are called by the [case manager] to confirm insurance---> notes are made regarding insurance. If changes are made it will be noted in [EMR 6]---->[Case manager] will be notified." "...Also contains info on Medicare life time days. Patient Accounts does process, finds gaps in coverage, would know dates of coverage [EMR 3] contains information on insurances patients carries."	"Face sheet -> Insurances. Indicates what coverage the person has." "One has to look for this information…previous charts to see history."

Preliminary data, Nagasako et al.

Implications for the Precision Medicine Initiative & Its Ability to Reduce Health Disparities

How Could the PMI Help Eliminate Health Disparities?

Preventing Disease & Reducing Death Rates for Everyone in the Population Requires:

- **Collecting & analyzing consistent, accurate, reliable & sufficiently detailed data that represent all segments of the population**
- **Developing risk assessments & interventions that are effective for everyone requires evidence on the distribution & impact of causes across subpopulations**

Potential Obstacles to the PMI's Ability to Decrease Disparities

Minority Participation in Clinical Research Trials

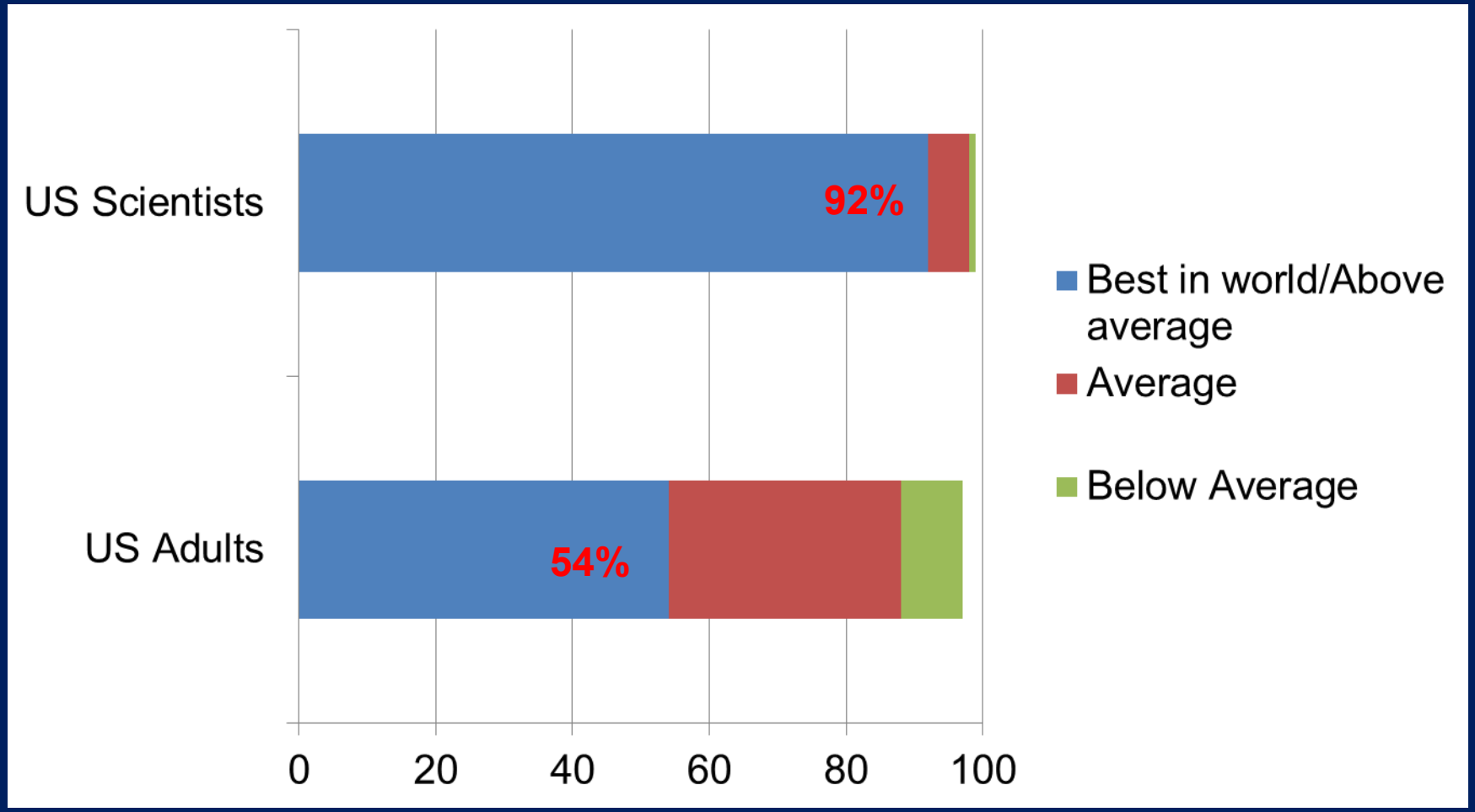
1993 **NIH[1] Revitalization Act established a mandate that funded research would be based on "valid analysis of whether the variables being studied in the trial affect….minority groups"**

2014 **A review[2] found that only 20% of randomized controlled studies reported in a major cancer journal reported analyzing results by race/ethnicity**

"Proportionately greater population increases in minorities, accompanied by their persistent & disproportionate cancer burden, reinforce the need for their greater representation in clinical trials"[2]

[1]NIH-National Institutes of Health [2]Chen et al., *Cancer*, April 1, 2014

Percent AAAS* Scientists Vs US Adults Rating US on Scientific Achievement



*AAAS=American Association for the Advancement of Science

Source: Pew Research Center. *Public & Scientists' Views on Science & Society*. At http://PI_ScienceandSociety_Report_012915.pdf

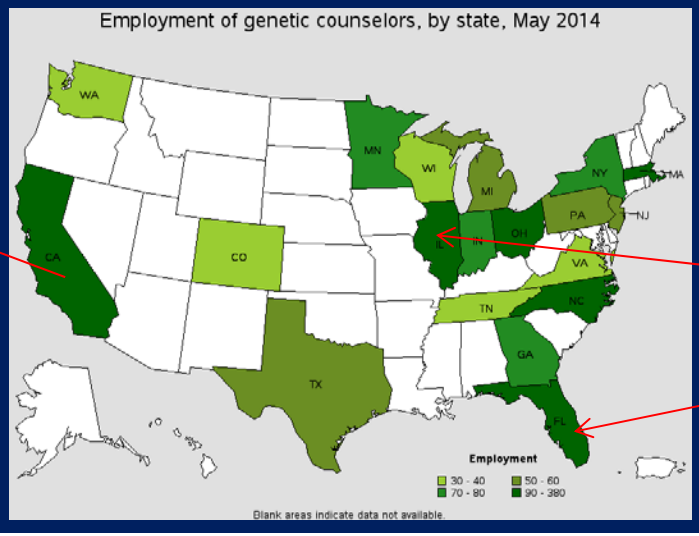
Recommendations for PMI

- **Make the effort to recruit a group that reflects the U.S. population in terms of race/ethnicity, socioeconomic status, & locale (rural/urban)**
- **Do not recruit entirely from clinic populations or rely entirely on the electronic health records for social data (you will miss those without consistent health care)**

If You Truly Want to Eliminate Health Disparities, Don't Take the Easy Route!

Recommendations for Precision Medicine

- Do not let the cost of genetic testing exclude some from the benefits of Precision Medicine (although the cost has gone down markedly, will Medicaid & other public insurance cover testing?)
- Systematize the collection of social variables (to capture the lives of minority groups)
- Make genetic counseling more widely available



380/38,800,000

100/12,800,000

90/19,890,000

Bureau of Labor Statistics, 2014

Capturing the Complexity of Health: The Transdisciplinary Environment

Where Does Social Work Fit?

Health Social Work Research

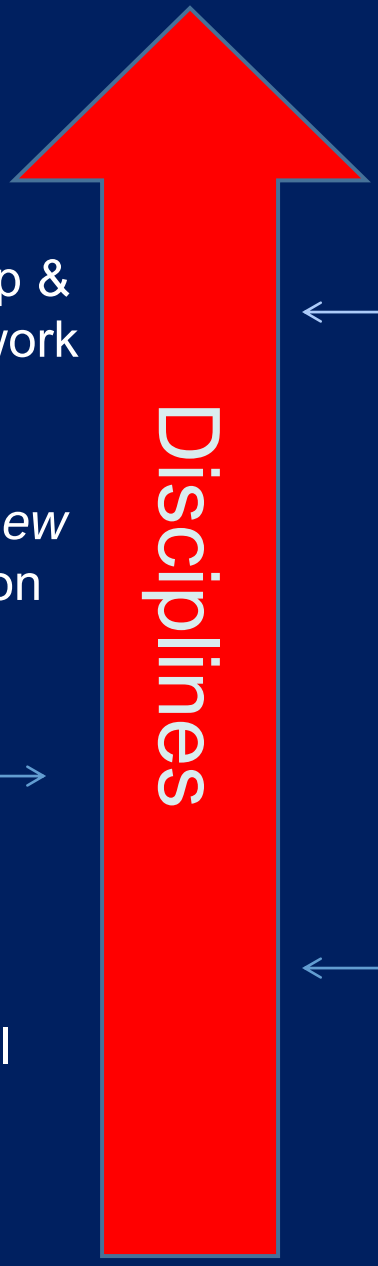
Health social work research provides evidence-based interventions for subpopulations

- **Ell et al.'s RCT of an intervention to address major depression among low-income Hispanics with diabetes[1]**
- **Spencer et al.'s RCT of a community health worker intervention to improve glycemic control among African Americans & Latinos[2]**

[1]Ell, Katon, Xie, Lee, Kapetanovic, Guterman, & Choi, 2010, *Diabetes Care*
[2]Spencer, Rosland, Kieffer, Sinco, Valerio, Palmisano et al., 2011, *Am J Pub Health*

Continuum of Disciplinary Integration

Adapted from Hall et al., 2012



Transdisciplinary

Researchers from *different disciplines work jointly* to develop & use a shared conceptual framework that synthesizes & extends discipline-specific theories, concepts, & methods to create *new approaches* to address a common problem

Interdisciplinary

Researchers from *different disciplines work jointly* to address a common problem. Some integration of perspectives occurs, but contributions remain anchored in their own disciplines

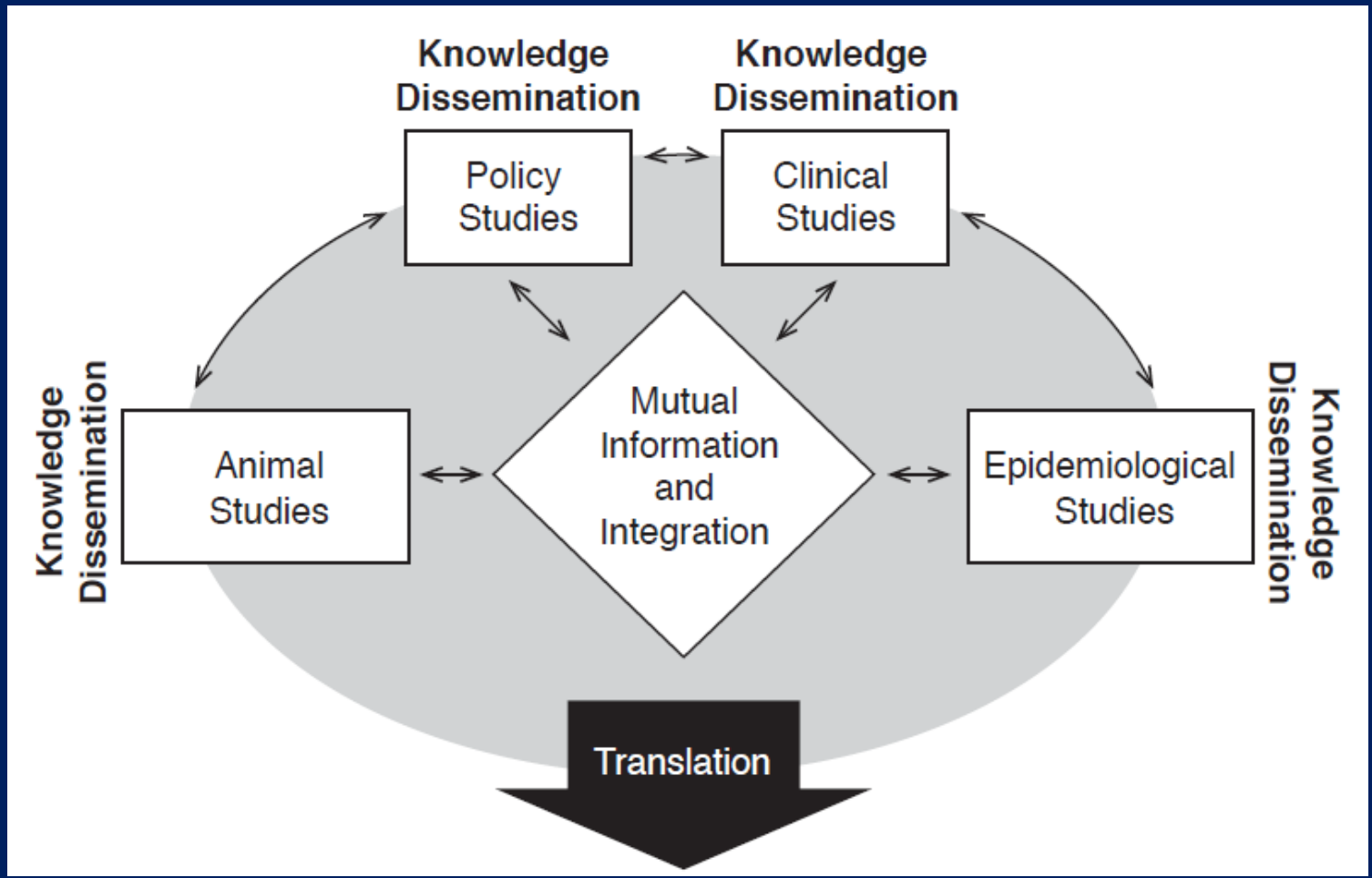
Multidisciplinary

Researchers from *different disciplines work sequentially,* each from their own discipline-specific perspective, with a goal of eventually combining results to address a common problem

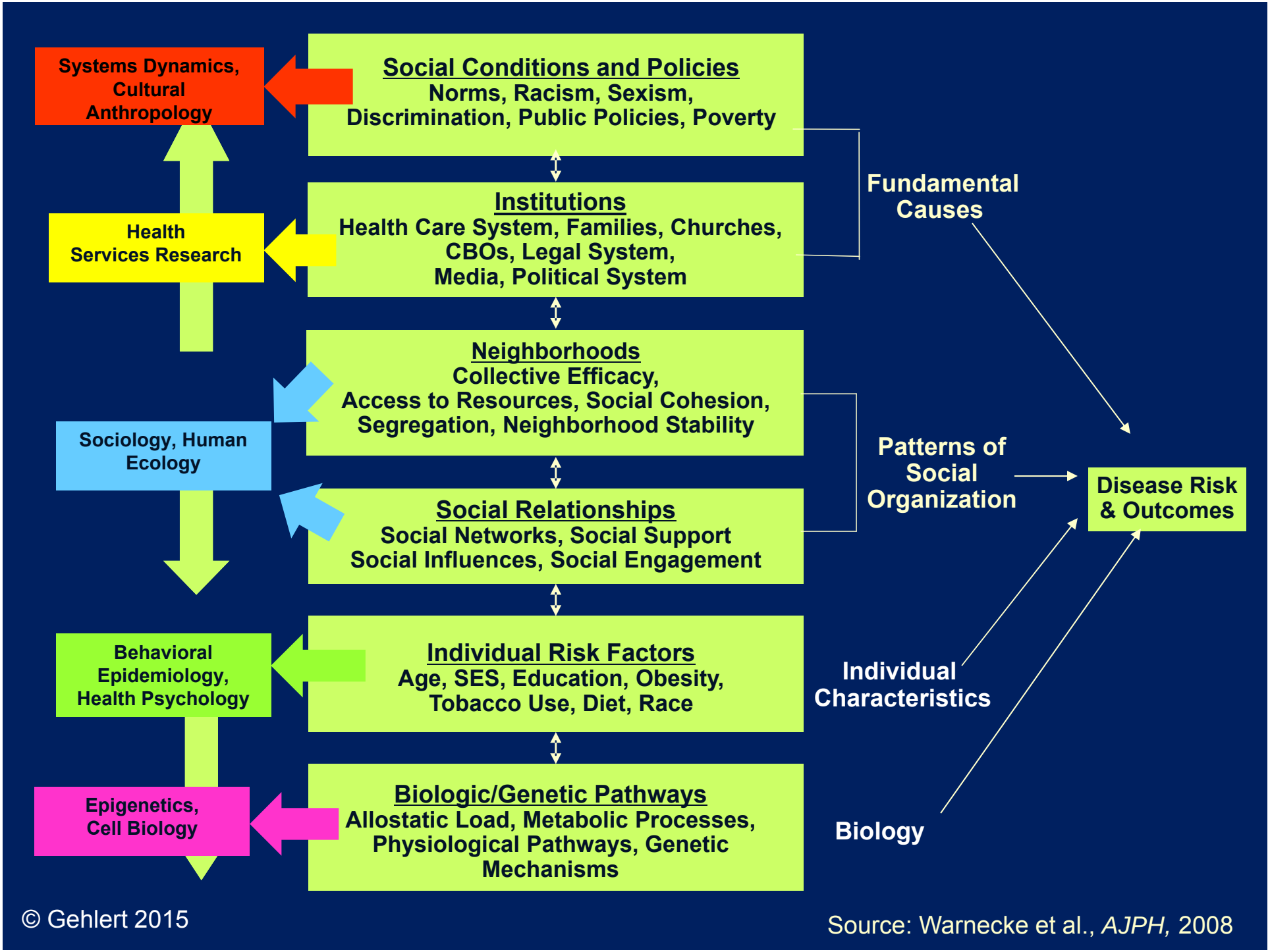
Monodisciplinary

Researchers from a *single discipline* work together to address a common problem

Dynamic Model of Translational Research

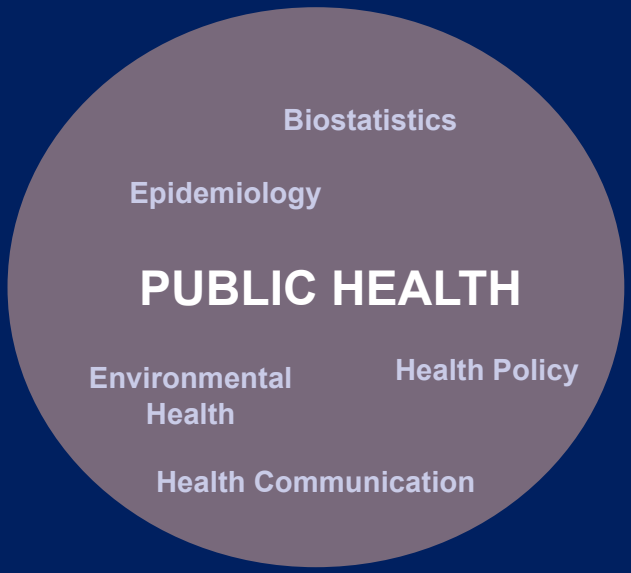


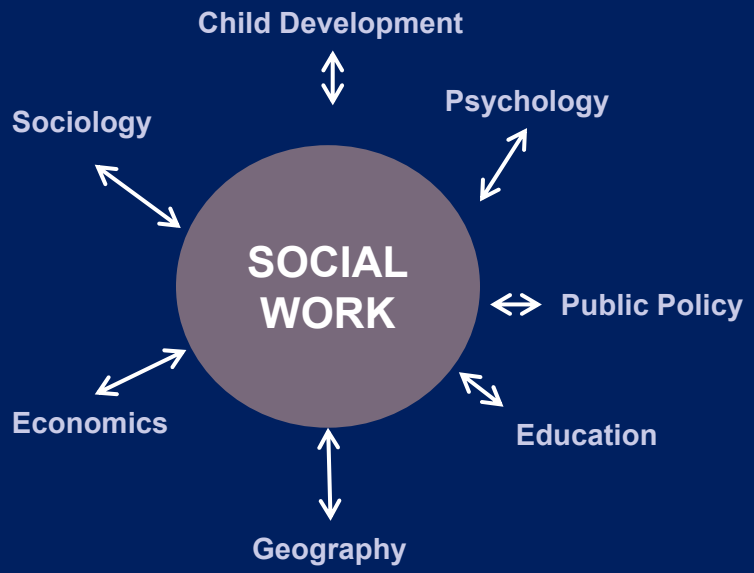
Source: Gehlert, *J Adolescent Health*, 2013



Source: Warnecke et al., *AJPH*, 2008

- Historically oriented to social determinants
- Able to engage communities (& understand why it is important)
- Able to draw theories from other disciplines/sciences to address complex human problems





Social Work May Be the Most Integrative Discipline

Source: Gehlert, in press, *Res Social Work Prac*

- Learn to communicate what we do & “market” social work research
- Frame social work from other perspectives & learn to speak the language of other disciplines (such as medicine & economics)
- Partner with other disciplines
- Develop cross-institutional collaborations (e.g., PBRNs*)

Challenge to Health Social Work: Establish the Contribution

*PBRN = Practice Based Research Network