Transdisciplinary Approaches to Eliminating Health Disparities: The Emerging Role of Social Environmental Factors
Differences & Disparities Occur At Many Geographic Levels
## Life Expectancy at Birth in 17 Peer Countries, 2007*

<table>
<thead>
<tr>
<th>Country</th>
<th>Males LE</th>
<th>Rank</th>
<th>Country</th>
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<th>Country</th>
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<td>Japan</td>
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Age-Adjusted Death Rates for States & DC, U.S., 2011

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

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2015 RWJ County Health Rankings, Texas

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*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?
Contributors to Early Death in the US

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

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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

Health Disparities

Fundamental Causes
Patterns of Social Organization
Individual Characteristics
Biology

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

Change in Life Expectancy (Yrs)

Race/Gender

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

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

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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

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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

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But What Do We Mean by Environment?

Chemical exposures (altered diets, toxins)

Social exposures (availability of services, exposure to violence)

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

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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

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Race/Ethnic Differences in Breast Cancer Mortality

![Graph showing breast cancer death rates by race and ethnicity in the United States from 1975 to 2002.](https://example.com/graph.png)

**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: National Center for Health Statistics, CDC, as provided by the SEER Program, NCI
Multi-Level Example: Obesity & Breast Cancer

Rates of Obesity

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

Healthy People 2010 target (15%)

% BMI 30 or 30+

0 20 40 60

Mexican-American  Black, NH  White, NH

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

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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 obesity²,³,⁴ may help to explain their less favorable outcomes from breast cancer⁵


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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
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)

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Ludwig et al., October 20, 2011, NEJM
Recent Interest in Social Variables
Precision Medicine Initiative

- Announced by Obama on January 30\textsuperscript{th} 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

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## Recent IOM* Recommendations for Core Domains & Measures

<table>
<thead>
<tr>
<th>Domain/Measure</th>
<th># Questions</th>
<th>Frequency</th>
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</thead>
<tbody>
<tr>
<td>Alcohol use</td>
<td>3</td>
<td>Screen &amp; follow-up</td>
</tr>
<tr>
<td>Race &amp; ethnicity</td>
<td>2</td>
<td>At entry</td>
</tr>
<tr>
<td>Residential address</td>
<td>1</td>
<td>Verify every visit</td>
</tr>
<tr>
<td>Tobacco use &amp; exposure</td>
<td>2</td>
<td>Screen &amp; follow-up</td>
</tr>
<tr>
<td>Census tract-median income</td>
<td>1</td>
<td>Update on address change</td>
</tr>
<tr>
<td>Depression</td>
<td>2</td>
<td>Screen &amp; follow-up</td>
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<tr>
<td>Education</td>
<td>2</td>
<td>At entry</td>
</tr>
<tr>
<td>Financial resource strain</td>
<td>1</td>
<td>Screen &amp; follow-up</td>
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<tr>
<td>Intimate partner violence</td>
<td>4</td>
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<td>Physical activity</td>
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<td>Screen &amp; follow-up</td>
</tr>
<tr>
<td>Social connection/isolation</td>
<td>4</td>
<td>Screen &amp; follow-up</td>
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<tr>
<td>Stress</td>
<td>1</td>
<td>Screen &amp; follow-up</td>
</tr>
</tbody>
</table>

Frequently collected

Not frequently collected

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*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**: Full or partial use of a vehicle, or is aware of & willing to use public transportation

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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)
## Recorder of Information at Hospital

<table>
<thead>
<tr>
<th>Hospital A</th>
<th>Hospital B</th>
<th>Hospital C</th>
<th>Hospital D</th>
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<tbody>
<tr>
<td>Case Manager</td>
<td>Admissions</td>
<td>Admissions</td>
<td>Case Manager</td>
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<tr>
<td><strong>Certification Coordinator</strong></td>
<td>Case Manager</td>
<td>Case Manager</td>
<td>Dietician</td>
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<tr>
<td>Nurse</td>
<td>Nurse</td>
<td>Certification Coordinator</td>
<td>Nurse</td>
</tr>
<tr>
<td>Physician</td>
<td>Physician</td>
<td>Dietician</td>
<td>PT/OT</td>
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<tr>
<td>Registrar</td>
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<td>Nurse</td>
<td>Registration</td>
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<td><strong>Social Worker</strong></td>
<td><em>PT</em></td>
<td>Patient Accounts</td>
<td>Social Worker</td>
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<td></td>
<td>Registration</td>
<td>Physical Therapist</td>
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<td></td>
<td><strong>Social Worker</strong></td>
<td>Physician</td>
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<td><strong>Spiritual Care/Chaplin</strong></td>
<td>Registration</td>
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<td><strong>Therapy</strong></td>
<td>Social Worker</td>
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* A = Urban academic hospital; B = Community safety-net hospital; C = Suburban hospital; D = Rural hospital

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### Variability in Observed Collection

<table>
<thead>
<tr>
<th>Social variable (collected at least once)</th>
<th>Hospital</th>
<th>Total (N=17)</th>
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<tbody>
<tr>
<td>A = Urban, academic, teaching hospital; B = Community safety-net hospital; C = Community suburban hospital; D = Community rural hospital</td>
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<td></td>
</tr>
</tbody>
</table>

#### RACE: Five minimum categories for race: American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and White.

- **A (N=3)**
- **B (N=7)**
- **C (N=4)**
- **D (N=3)**
- Total (N=17): 12

#### EDUCATIONAL LEVEL: Highest level of education that an individual (patient) has completed.

- **A (N=3)**
- **B (N=7)**
- **C (N=4)**
- **D (N=3)**
- Total (N=17): 5

#### CONTINUITY OF INSURANCE: Gaps in personal health insurance coverage.

- **A (N=3)**
- **B (N=7)**
- **C (N=4)**
- **D (N=3)**
- Total (N=17): 11

#### INCARCERATION HISTORY: History of imprisonment.

- **A (N=3)**
- **B (N=7)**
- **C (N=4)**
- **D (N=3)**
- Total (N=17): 6

#### HOME SUPPORT: Perceived adequacy of tangible support from others in performing daily activities.

- **A (N=3)**
- **B (N=7)**
- **C (N=4)**
- **D (N=3)**
- Total (N=17): 13

#### LIVING SITUATION: Where an individual lives (e.g., house, apartment, etc.)

- **A (N=3)**
- **B (N=7)**
- **C (N=4)**
- **D (N=3)**
- Total (N=17): 16

**Harvey Ball Legend**

- 🌒 = None
- 🌒 = All

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Preliminary data, Nagasako et al.
### QUALITATIVE DATA: OBSERVER COMMENTS

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>Hospital A</th>
<th>Hospital B</th>
<th>Hospital C</th>
<th>Hospital D</th>
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<tr>
<td><strong>CONTINUITY OF INSURANCE: Gaps in personal health insurance coverage</strong></td>
<td>&quot;Auto-populated.&quot;&lt;br&gt;&quot;Collected on all patients if information is possible.&lt;br&gt;Insurance is asked for in Case Coordinator Initial Notes. Social Work Assessment but soon to be in Case Coordination.&quot;</td>
<td>&quot;Discussed in verbal assessment but never documented.&quot;&lt;br&gt;&quot;Documented in Social Work notes.&quot;&lt;br&gt;&quot;Pre-Certification does health insurance/benefits.&lt;br&gt;Documented in [EMR 4] &amp; Soon on [EMR 5]. Not stored specifically self pay.&quot;</td>
<td>&quot;Collected and distributes information relating to the health insurance.&quot;</td>
<td>&quot;Face sheet -&gt; Insurances. Indicates what coverage the person has.&quot;&lt;br&gt;&quot;One has to look for this information…previous charts to see history.&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;Insurance is collected. Chart review if necessary or can be looked into if patient brings it up.&quot;</td>
<td>&quot;Registration takes care of this. Case managers are informed if things change.&quot;</td>
<td>&quot;Sometimes Social Worker finds out about second or different insurance. [EMR 4] under authorizations.&quot;</td>
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</table>

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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

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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

US Scientists
- 92% scored US as Best in world/Above average

US Adults
- 54% scored US as Average

*AAAS=American Association for the Advancement of Science


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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!

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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
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 diabetes¹
• Spencer et al.’s RCT of a community health worker intervention to improve glycemic control among African Americans & Latinos²

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

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Continuum of Disciplinary Integration

Monodisciplinary
Researchers from a single discipline work together to address a common problem.

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.

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.

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.

Adapted from Hall et al., 2012

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Dynamic Model of Translational Research

Source: Gehlert, J Adolescent Health, 2013
Social Conditions and Policies
Norms, Racism, Sexism, Discrimination, Public Policies, Poverty

Institutions
Health Care System, Families, Churches, CBOs, Legal System, Media, Political System

Neighborhoods
Collective Efficacy, Access to Resources, Social Cohesion, Segregation, Neighborhood Stability

Social Relationships
Social Networks, Social Support, Social Influences, Social Engagement

Individual Risk Factors
Age, SES, Education, Obesity, Tobacco Use, Diet, Race

Biologic/Genetic Pathways
Allostatic Load, Metabolic Processes, Physiological Pathways, Genetic Mechanisms

Patterns of Social Organization
Fundamental Causes

Health Services Research
Sociology, Human Ecology
Behavioral Epidemiology, Health Psychology
Epigenetics, Cell Biology

Health Care System, Families, Churches, CBOs, Legal System, Media, Political System

Biologic/Genetic Pathways
Allostatic Load, Metabolic Processes, Physiological Pathways, Genetic Mechanisms

Disease Risk & Outcomes

Source: Warnecke et al., AJPH, 2008

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• 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

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• 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