Program Project IV: The Biology of Chronic Disease Emergence
Overview

- Add Health Program Project IV: The Biology of Chronic Disease Emergence
  - context for project inception
  - motivation for its development
  - knowledge gaps
  - introduction to the study intent on filling them
  - aims
  - cohort surveillance initiative
  - preliminary findings
  - summary
Context

- As of 2013, cardiovascular disease (CVD) mortality in the U.S. had been slowly declining.
U.S. Age-Standardized CVD Death Rates, 2000-2013

Source: CDC, NCHS.
Context

• However, at that time in the U.S., CVD events were still
  – occurring every 34-40 seconds
  – accounting for ~ 610-660k new cases / year
  – costing us ~ $317 billion / year
• So the national burden of CVD remained quite high…
CVD Prevalence by Age & Sex, 2009-2012

From NHANES. Source: NCHS & NHLBI.
Major Causes of Death by Sex, 2013

Source: NCHS & NHLBI.
Top Two Causes of Death by Age, 2013

Source: NCHS.
Motivation

• Although ~ 70% of CVD can be averted or delayed via prevention, screening & intervention
  – CVD risk reduction in U.S. adults is challenging
    • 69% overweight/obese
    • 33% hypertensive
    • 17% currently smoking
    • 13% hypercholesterolemic
    • 12% diabetic
  – temporal evolution of CVD burden was :: anticipated
Motivation

• Although young adults can be mischaracterized as unburdened by CVD & other chronic diseases
  – the challenge of CVD risk reduction isn’t peculiar to older U.S. adults
  – Add Health Wave IV illustrated this…
Anthropometric Risk Factors

Body Mass Index (kg/m²)

Waist Circumference (cm)

Add Health Wave IV (2008)
NHANES (2007-2008)
Cardiovascular Risk Factors

Metabolic Risk Factors

Density of Glucose (mg/dl) for Add Health Wave IV (2008) and NHANES (2007-2008)


Motivation

• These & other factors ↑ risk of subclinical atherosclerosis or hemorrhage of the arteries supplying e.g.
  – brain
  – heart
  – abdomen
  – kidneys
  – lower extremities

• The risk often culminates in later life as overt CVD with obvious implications for public health
  – carotid artery disease, TIA, stroke
  – CHD, MI, HF
  – AAA, dissection, ischemic bowel
  – renal artery stenosis, CKD, ESRD
  – PAD, critical limb ischemia
Motivation

- Generally, to study emergence of CVD & other chronic diseases in U.S. adults at risk
- Specifically, to study emergence of CVD & other chronic diseases in the Add Health cohort through Wave V, despite its current focus on younger adults
Knowledge Gaps

- CVD & other chronic disease risk factors had not been thoroughly examined in a contemporary or nationally representative study capable of documenting changes in & manifestations of those risks from adolescence through 4th decade of life, after which virtually no one has ideal CV health
- Their examination awaited greater availability, diversity & generalizability of longitudinal data capable of supporting epidemiologic inferences about chronic disease risk to the larger population of young adults
Introduction

- Enter
  Add Health Program Project IV: The Biology of Chronic Disease Emergence
- [http://www.cpc.unc.edu/projects/addhealth](http://www.cpc.unc.edu/projects/addhealth)
Aims

• (1) Design protocols for collecting bio data / specimens
• (2) Monitor & control field / lab operations so as to ensure high quality bio data & specimens
• (3) Estimate prevalence / incidence of societally burdensome chronic diseases & disparities in their distributions
• (4) Serve as the bio data resource to the program & the entire scientific community
• (5) Implement a scalable surveillance system for chronic disease events
Aims

• (1) Design protocols for collecting bio data / specimens
• (2) Monitor & control field / lab operations so as to ensure high quality bio data & specimens
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• (4) Serve as the bio data resource to the program & the entire scientific community
• (5) Implement a scalable surveillance system for chronic disease events
Surveillance

• Implement a scalable surveillance system for chronic disease events
  – ascertainment
  – review
  – adjudication
  – classification
• Begin w/ participant deaths due to e.g.
  – accidents
  – CVD
  – cancer
• Thereby position the study for
  – ongoing surveillance of mortality
  – potential expansion to morbidity
Surveillance

• How do you do that?
  – assemble experienced team
CSI: Add Health

Surveillance Team

Add Health
The National Longitudinal Study of Adolescent to Adult Health
CSI: Add Health

Surveillance Team

Carol Murphy
Elyssa Trani
Eric Whitsel
Laura Loehr
Bob Hummer
Surveillance

- How do you do that?
  - assemble experienced team
  - develop standardized protocol
Surveillance Protocol
Surveillance

• How do you do that?
  – assemble experienced team
  – develop standardized protocol
    • NDI matching
    • CPC scoring
    • MOC investigation
    • MD review, classification & adjudication
Surveillance

• NDI matching
  Determine if Add Health & NDI agree re ≥ 1 of:
    – SSN
    – month & ±1 year of birth, 1\textsuperscript{st} & last name
    – month & ± 1 year of birth, 1\textsuperscript{st} & mid initial, last name
    – month & day of birth, 1\textsuperscript{st} & last name
    – month & day of birth, 1\textsuperscript{st} & mid initials, last name
Surveillance

• CPC scoring*
  Assign points based on match of:
  – 1\textsuperscript{st} name or initial (0;1)  – SSN (0-9)
  – middle initial (0;1)  – birth day (0;2)
  – last name (0;2)  – birth month (0;2)
  – sex (0;1)  – birth year (0;2)
  – state of residence (0;1)

Sum & group scores, as follows:

<table>
<thead>
<tr>
<th>Total</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-11</td>
<td>non-match</td>
</tr>
<tr>
<td>12-19</td>
<td>potential match, investigate</td>
</tr>
<tr>
<td>20-21</td>
<td>match</td>
</tr>
</tbody>
</table>

*Based on Atherosclerosis Risk in Communities (ARIC) algorithm.
Surveillance

• MOC investigation
  Assemble, abstract & enter into DES
    – cohort history (automatic)
    – obituary
    – death certificate
    – health provider Q
    – ME/coroner report
    – next-of-kin interview
    – hospital records

• MD review, classification & adjudication
Preliminary Findings

<table>
<thead>
<tr>
<th>Case Status</th>
<th>Wave 3</th>
<th>Wave 4</th>
<th>Wave 5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deceased or Unlocatable</td>
<td>96</td>
<td>131</td>
<td>43</td>
<td>270</td>
</tr>
<tr>
<td>Matched (1:1)</td>
<td>80 (83%)</td>
<td>115 (88%)</td>
<td>40 (93%)</td>
<td>235 (87%)</td>
</tr>
</tbody>
</table>
Preliminary Findings (n=235)
Preliminary Findings (n=235)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n (%) or mean (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>160 (68%)</td>
</tr>
<tr>
<td>Age</td>
<td>24.3 (14-37)</td>
</tr>
</tbody>
</table>
Preliminary Findings (n=235)

- Per NDI, underlying cause of death
  - external (73%)
  - cancer (6%)
  - cardiovascular (5%)
  - respiratory (5%)
  - infectious / parasitic (2%)
  - endocrine / nutritional / metabolic (2%)
  - digestive (1%)
  - other (7%)
Preliminary Findings
Summary

- **Add Health Program Project IV: The Biology of Chronic Disease Emergence**
- Scalable surveillance system for chronic disease events
- Our hope is that the data it generates will help
  - support your research
  - generate actionable, timely knowledge for public health professionals at the local, state, regional & national levels
  - assess the latest DHHS & AHA prevention efforts
    - by 2016, to thwart 1 million MIs & strokes
    - by 2020, to ↑ CV health of the US population to ↓ CVD deaths by 20%