



The Cardiovascular Health Study

Opportunities for answering more questions about aging

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Supported by National Heart, Lung, and Blood Institute

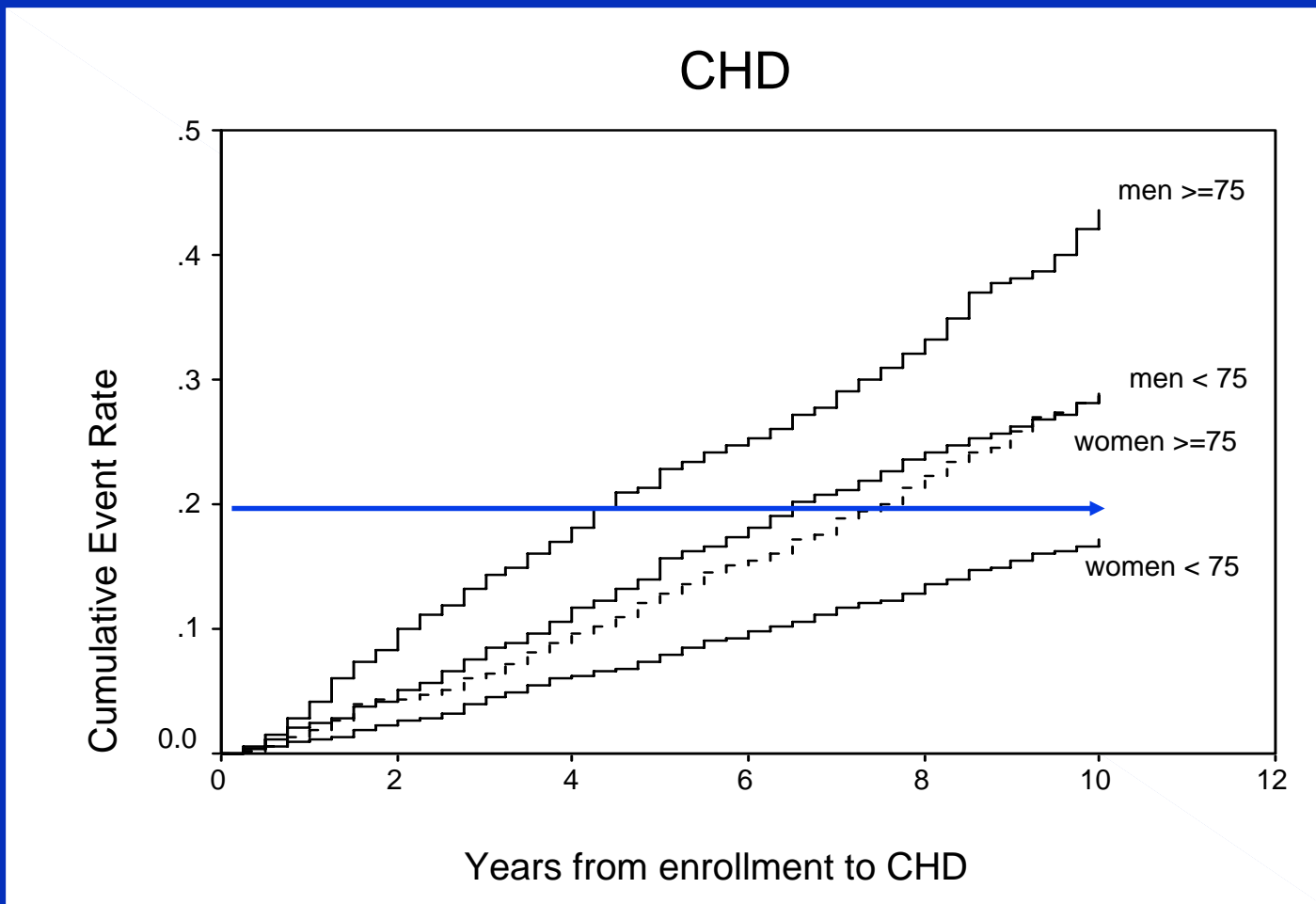
N01-HC-85079 through N01-HC-85086, N01-HC-35129, and N01-HC-15103



- The participants
 - 5888 men and women from 4 US communities
 - Annual examinations 1989-90 to 1998-99
 - Continued telephone contact (95% of survivors)
- The investigators
 - Representing many fields such as cardiology, neurology, geriatrics, general medicine as well as many institutions
 - Over 300 publications
 - Over 100 ancillary studies
 - Repository of stored specimens including DNA



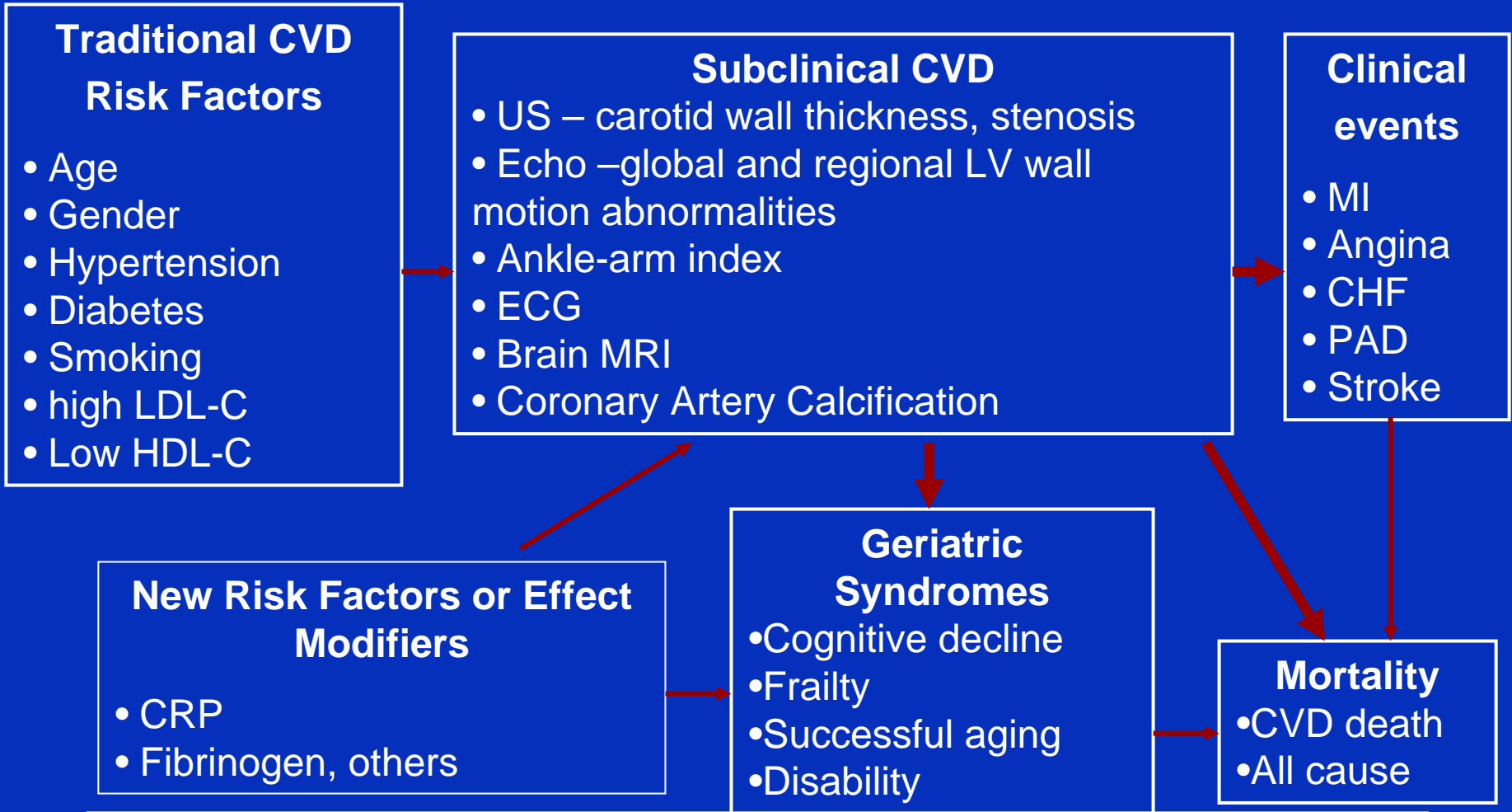
CHD rates in CHS by age group and gender



Arnold AM, Psaty BM, Kuller LH, Burke GL, Manolio TA, Fried LP, Robbins JA, Kronmal RA. J Am Geriatr Soc. 2005;53:211-218.



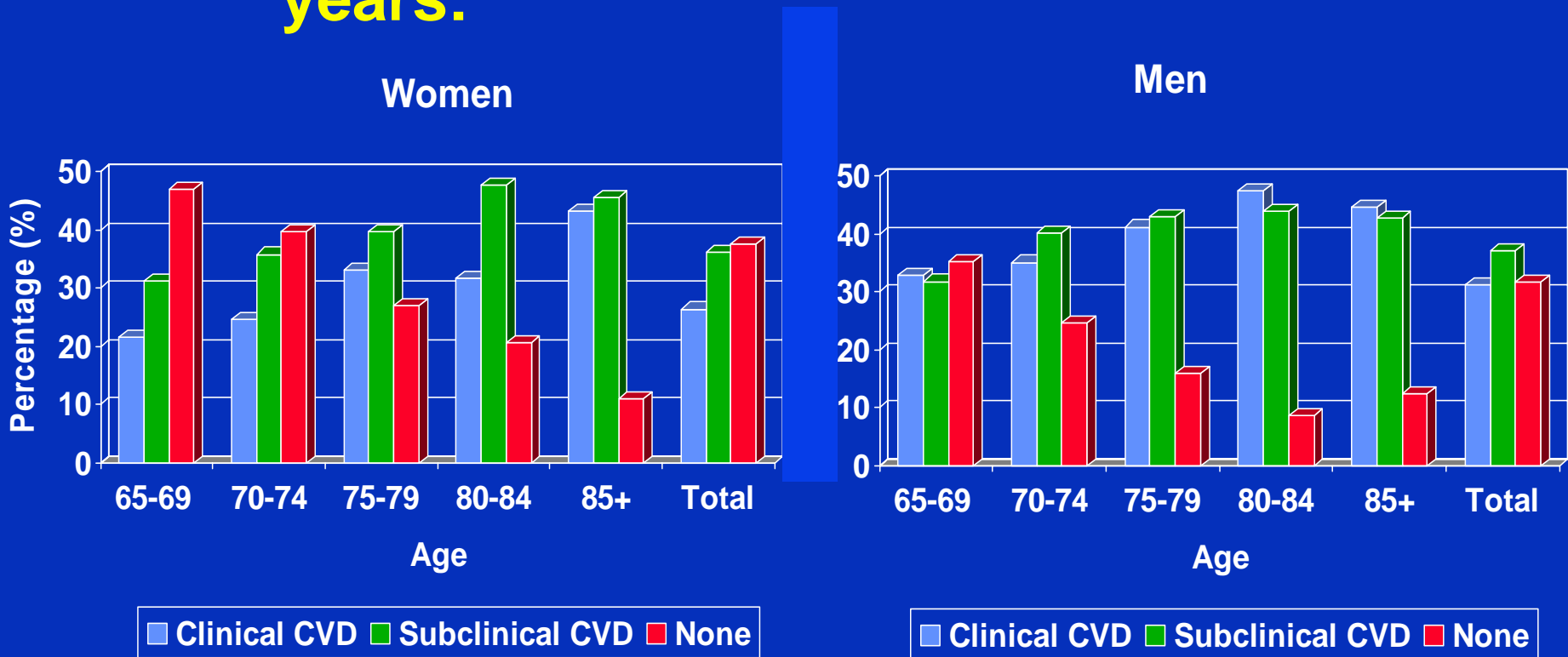
Framework for the study of subclinical cardiovascular disease





Prevalence of Clinical and Subclinical CVD by Age, and Gender

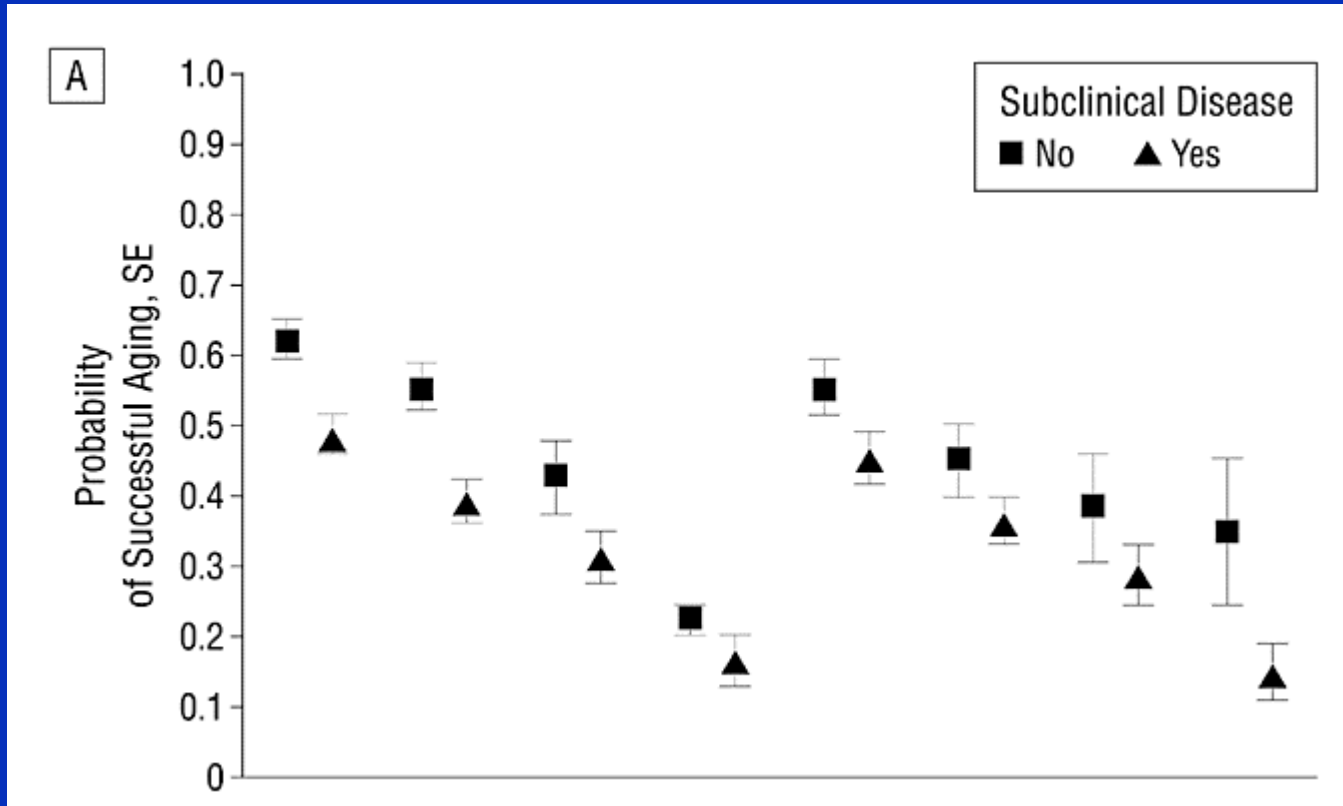
Cardiovascular Health Study, n=4,946; years:



Kuller LH, Borhani NO, Furberg CD, Gardin JM, Manolio TA, O'Leary DH, Psaty BM, Robbins JA. Prevalence of subclinical atherosclerosis and cardiovascular disease and association with risk factors in the Cardiovascular Health Study. Am J Epidemiol. 1994;139:1164-1179.



Probabilities of successful aging by subclinical CVD status in CHS



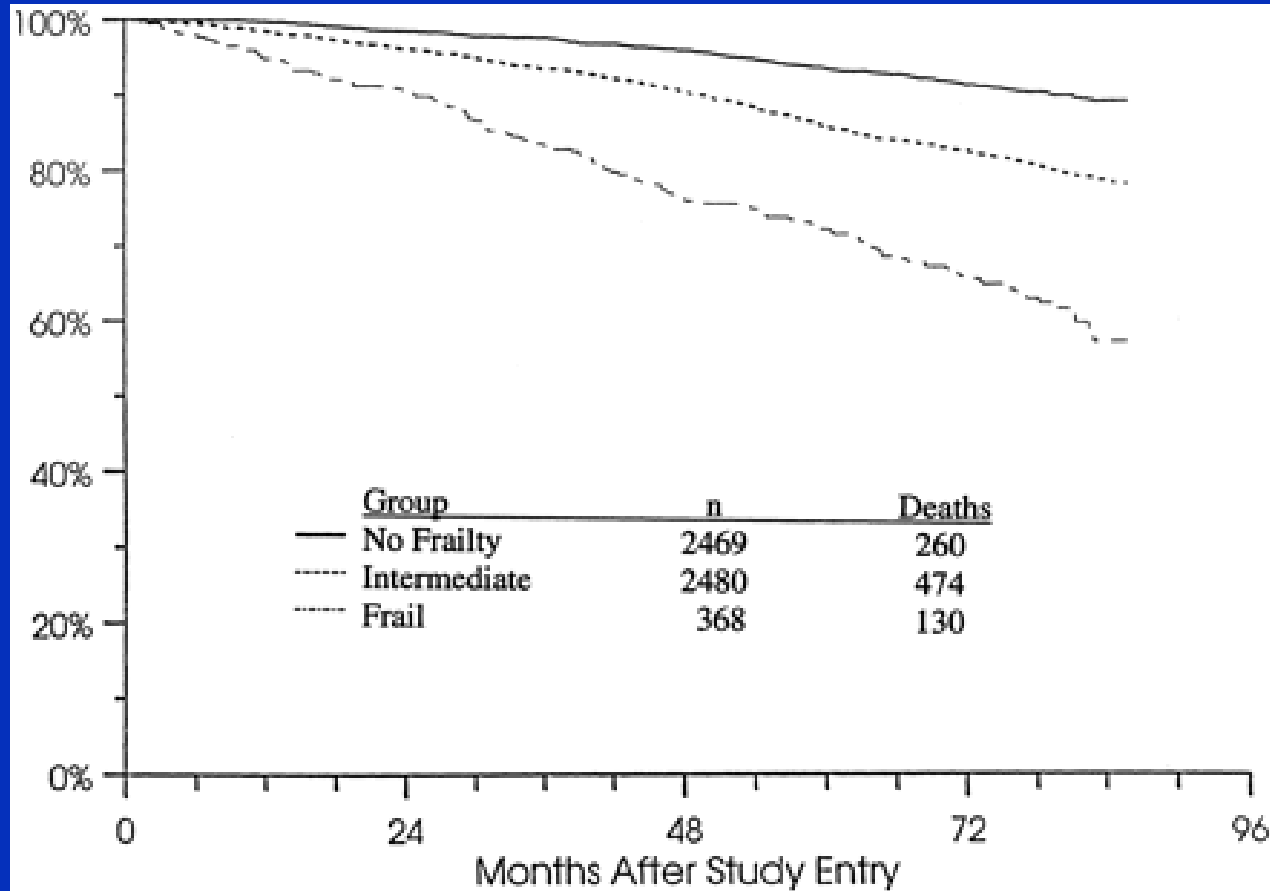
(A), no difficulty in activities of daily living (ADL)

Newman AB, Arnold AM, Naydeck BL, Fried LP, Burke GL, Enright P, Gottdiener J, Hirsch C, O'Leary D, Tracy R. Successful aging: effect of subclinical cardiovascular disease. Arch Intern Med. 2003;163:2315-2322 .



Frailty in CHS

Survival curve estimates (unadjusted) over 72 months of follow-up by frailty status at baseline



Frail (3 or more criteria present); Intermediate (1 or 2 criteria present); Not frail (0 criteria present). (Data are from both cohorts.)

Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, Seeman T, Tracy R, Kop WJ, Burke G, McBurnie MA. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci.* 2001;56A(3):M146-M156.



Semiannual contacts

- 5,888 participants aged 65+ enrolled in 2 cohorts: 5201 in 1989-90, and 687 in 1992-93
 - 1989-1999 annual clinic visits and 6 month phone calls
 - 1999-present: 6 month phone calls for hospitalizations or reported illness (CVD plus asthma, diabetes), medications, self-reported health, change in activities of daily living, marital status
 - 2005-2006: Follow-up exam for function: The CHS All Stars study funded by NIA
-



Clinic visit data

- SPSS data files for each Year or call
 - Year designation not intuitive (BL=Yr 2)
 - Second cohort added 3 years after BL =
Year 5 = 1992-93
 - 5th follow-up?
 - Year 7 = 1994-95 for original cohort
 - Year 10 = 1997-98 for new cohort
-

CHS Data, cont'd

- Variable names include 2 digit record number, eg
ACE06
BP07, BP37, HIBP29, BP57,
HIBP59
 - Follow up through May 30, 2004
(Year 16) is 89% complete
-



Data collected annually

- Medical & personal history
 - Medication use
 - ECG
 - Cognitive & physical function
 - Depression
 - Weight
-



Frequently Collected Data

- Timed walk
 - Blood pressure
 - Total cholesterol
 - Over the counter meds (Yr 6 on)
 - Benton Visual Retention (Yrs 6-9, 11)
-



Repeated measures

- Phlebotomy (HDL, LDL, insulin, glucose, CRP, creatinine)
 - Echocardiography (BL, Yr 7)
 - Carotid ultrasound (BL, Yr 5, Yr 11)
 - Ankle Arm Index (BL, Yr 5, Yr 11)
 - Cranial MRI (Yrs 5-6, 10-11)
 - Physical Activity (BL, Yr 5, Yr 9)
 - Pulmonary Function (BL, Yr 6, Yr 9)
 - Nutrition (BL, Yr 8)
-



Single measures

- Bioelectric impedance (BL)
 - Abdominal aortic ultrasound (Yr 5)
 - Sleep & asthma (Yr 6)
 - 6 minute walk, oximetry (Yr 9)
 - Urinary albumin (Yr 9)
 - Retinal photography (Yr 10)
 - Endothelial function (Yr 10)
 - Audiometry (Yr 11)
 - Vibration / Tuning Fork (Yr 11)
-



Available in subsets

- DXA scan (Yr 7 or 8)
 - Holter monitor (BL, Yr 7)
 - Dementia status
 - Thyroid function (BL)
 - Caregiver screening
 - Genetic markers / other blood lab data
(see Section 8 of manual)
-



Diabetes related data

- Self-report of diabetes annually
 - Insulin or OHGA use annually
 - Duration: BL for new cohort, Yr 11 for all
 - Fasting glucose (BL, Yr 5, Yr 9)
 - 2-hr glucose (BL, Yr 9)
 - Fasting insulin (BL, Yr 5)
 - 2-hr insulin (BL)
 - Components of metabolic syndrome (waist, triglycerides, HDL, BP, fasting glucose; BL, Yr 5)
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Diabetes, cont'd.

- Diabetes by ADA at baseline:
785 IFG
439 New diabetes
516 Known diabetes
 - Through Yr 11, 377 new cases identified by medication use
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Subclinical Disease

Composite Measure:

AAI ≤ 0.9

Major ECG abnormalities

Rose angina or claudication

Carotid stenosis $\geq 25\%$

Carotid wall thickness $> 80^{\text{th}}$ %ile

Abnormal wall motion or ejection fraction

CHS Events

- Main endpoints--MI, angina, CHF, stroke, TIA, PAD and total mortality--reviewed by committees
 - Diagnoses and procedure codes from all hospitalizations
 - Acute precipitant interviews for cardiac and cerebrovascular events
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Subclinical, cont'd

- MRI data: white matter grade, ventricle grade, infarcts
 - Abdominal aortic ultrasound
 - Carotid plaque characteristics
 - Endothelial function
 - Coronary calcium in a subset
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Cohort at Baseline

Age	72.8 yrs (65-100)
Male	2495 (42.4%)
Black race	924 (15.7%)
CVD	1826 (31.0%)
HS grad	4139 (70.3%)



Self-reported health

Excellent	790 (13.4%)
Very Good	1415 (24.0%)
Good	2175 (36.9%)
Fair	1256 (21.3%)
Poor	239 (4.1%)

CHS CVD / CHF

Number of events
through 6/30/02

Angina	1064
MI	696
CHF	1262
PAD	245
Stroke	789
TIA	212
Death	2658



CVD/CHF cont'd

- Other endpoints: atrial fibrillation by ECG and/or ICD-9 codes, deep vein thrombosis, sudden death
 - Hospital echocardiograms read to characterize heart failure as systolic or diastolic
 - Study echos recently re-read to measure left atrial size
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Aging and function

- Cognitive function annually (3MS, DSST)
 - ADL, IADL, walk ½ mile annually
 - Comorbidities: COPD, cancer
 - Performance based measures: timed walk, grip strength, chair stands, finger tapping, leg lift
 - Self-reported health, days in bed
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The logo for CHS Health Services features the letters 'CHS' in a bold, grey, sans-serif font. The 'C' and 'H' are connected at the top, and the 'S' is positioned to the right. A red heart shape is integrated behind the letters, with a red stethoscope-like line passing through the center of the 'H' and 'S'.

CHS Health Services

Self report

- nursing home stay
 - hospitalizations
 - home health care (Yrs 8-11)
 - usual medical care (Yrs 6,9)
 - insurance other than Medicare
 - reasons for not seeing doctor
 - flu / pneumonia shot annually
-



Health Services, cont'd

- CMS data through 1998
 - Group at Duke approved to get Medicare A & B data through 2002
 - Total costs/person available, but not by diagnosis
 - Significant amount of effort needed to retrieve cost data for specific project
-



Major ancillary studies

- **CHS Meds** – Psaty, PI, collected and coded annual medication use
 - **Sleep Heart Health Study** – Robbins, Newman, Punjabi, PI's, about 1250 men and women from three CHS field centers
 - **CHS Cognition Study** – Kuller, PI, determined dementia end-points in 3660 who had brain MRI
 - **CHS All Stars Study** – Newman, PI, trajectories to function
 - **CHS Events follow-up** – Psaty, PI, long term risk for CVD events
-



Mechanism to get involved

- Study the website and published papers (<http://www.chs-nhlbi.org>)
 - Secure CHS sponsor
 - Develop manuscript and/or ancillary study proposal
 - Submit for review and approval
 - Sign Data Distribution Agreement (DDA)
 - Alternative: request data from NHLBI public use site – Shorter follow-up, limited ancillary study data (<http://www.nhlbi.nih.gov/resources/deca/directry.htm>)
-



CHS Working Group Model

- Collaborating Investigators working with CHS investigators in topic areas
 - Supported by transition contract funds (NHLBI)
 - Active working groups:
 - Renal
 - Diabetes
 - Stroke
 - CHF
 - Health care utilization
 - Aging and geriatrics
-



Reading up:

American Journal of Geriatric Cardiology
March/April and May/June 2004

- Newman AB, Siscovick D. The Cardiovascular Health Study: risk factors, subclinical disease, and clinical cardiovascular disease in older adults.
 - Mathew ST, et al. Congestive heart failure in the elderly: the Cardiovascular Health Study.
 - Mukamal KJ, et al. Traditional and novel risk factors in older adults: cardiovascular risk assessment late in life.
 - Shlipak MG, et al. Chronic renal insufficiency and cardiovascular events in the elderly: findings from the Cardiovascular Health Study.
-



Reading up:

American Journal of Geriatric Cardiology
March/April and May/June 2004

- Weber MA, Wenger NK, Scheidt S. Insights from the Cardiovascular Health Study in older adults and from other original contributions.
 - Chaves PHM, et al. Subclinical cardiovascular disease in older adults: insights from the Cardiovascular Health Study.
 - Mozaffarian D, et al. Lifestyles of older adults: can we influence cardiovascular risk in older adults?
 - Rhoads CS, et al. Medications and cardiovascular health in older adults: room for improvement in prevention and treatment.
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CHS Home - Windows Internet Explorer

http://www.chs-nhlbi.org/default.htm

File Edit View Favorites Tools Help

Google G Go M 3 blocked Check AutoLink AutoFill Send to Settings

CHS Home

The Cardiovascular Health Study

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The Cardiovascular Health Study (CHS) is an NHLBI-funded observational study of risk factors for cardiovascular disease in adults 65 years or older. Starting in 1989, and continuing through 1999, participants underwent annual extensive clinical examinations. Measurements included traditional risk factors such as blood pressure and lipids as well as measures of subclinical disease, including echocardiography of the heart, carotid ultrasound, and cranial magnetic-resonance imaging (MRI). At six month intervals between clinic visits, and once clinic visits ended, participants were contacted by phone to ascertain hospitalizations and health status. The main outcomes are coronary heart disease (CHD), angina, heart failure (HF), stroke, transient ischemic attack (TIA), claudication, and mortality. Participants continue to be followed for these events. To date, more than 400 research papers from CHS have been published and more than 120 ancillary studies are ongoing or complete. [Read More](#)

[Principal Investigators and Study Sites](#)

Done

Internet

100%



Final Comments

- Wealth of data collected over 18 years
 - Lots of papers proposed and written, but plenty still to do
 - Analytic support still active at the Coordinating Center
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