Epidemiology of Risk Factors for Coronary Artery Disease and Heart Failure

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Epidemiology of Risk Factors for CAD

- 1930-50 reports - patients with CAD with ↑ cholesterol, bp, male
- To measure causal relationships, longitudinal studies in healthy individuals needed
  - 1948, Division of Chronic Disease of US Public Health Service set up a such study in Framingham MA
  - 1950, 5000 adults free of CV disease aged 30-59 years enrolled
  - 1957-90% of subjects had been followed for 4 years
    - 1/20 had CAD, rate 2X in men, men with HT, obesity or a ↑ serum cholesterol had 2-6X ↑ new CV events, smoking ns
  - 1959-6 year follow up, smoking added as predictor
- Subsequent studies – Albany NY, Tecumseh MI, Chicago and San Francisco
- 1978, pooled analysis in 8422 men, 72011 person years, established the main risk factors as: hypertension, ↑ chol. DM. smoking, age and male sex

Major Risk Factors

- Age
- Male sex
- Smoking*
- Hypertension*
- Hypercholesterolaemia*
- Diabetes*
- Family history

Minor Risk Factors

- Obesity*
- Alcohol excess*
- Sedentary lifestyle*
- Type “A” personality
- Poverty/social deprivation

Risk factors multiplicative, not simply additive
Risk Factor Refinements with time...

- **Cholesterol**
  - Risk ↑ in proportion to circulating level of total cholesterol, especially LDL
  - HDL is cardio-protective
  - Newer work suggests Apo B superior
  - Most lipid risk is of moderate severity (mixed hyperlipidaemia, not FH (homo or heterozygous))

- **Obesity**
  - Waist/hip ratio superior to BMI

- **Hypertension**
  - SBP, DBP, Pulse pressure
Type II DM and CAD: UKPDS23

Multiple Risk Factors for Atherothrombosis

Generalized Disorders
- Age
- Obesity

Genetic Traits
- Gender
- PLA2

Inflammation
- Elevated CRP
- CD40 Ligand, IL-6
- Prothrombotic factors (F I and II)
- Fibrinogen

Lifestyle
- Smoking
- Diet
- Lack of exercise

Systemic Conditions
- Hypertension
- Hyperlipidemia
- Diabetes
- Hypercoagulable states
- Homocysteinemia

Local Factors
- Blood flow patterns
- Shear stress
- Vessel diameter
- Arterial wall structure
- % arterial stenosis

Atherothrombotic Manifestations
(MI, stroke, vascular death)

MI, myocardial infarction.
“Metabolic Syndrome” and CAD; Interheart

- **MS (WHO) \[\uparrow\] MI**
  - OR 2.69, PAR=14.5%
- **MS (IDF) \[\uparrow\] MI**
  - OR 2.2, PAR=16.8%
- **DM-OR 2.72**
- **HT-OR 2.6**

Case control: 26,903

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Mente et al JACC 2010:55;2390

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<table>
<thead>
<tr>
<th>Criteria</th>
<th>WHO Definition</th>
<th>IDF Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Diabetes mellitus</td>
<td>History of diabetes or HbA1c ≥6.5%</td>
<td>History of diabetes or HbA1c ≥6.5%</td>
</tr>
<tr>
<td>2. Hypertension</td>
<td>History of treated/untreated hypertension</td>
<td>History of treated/untreated hypertension</td>
</tr>
<tr>
<td>3. Abdominal obesity</td>
<td>Males WHR ≥0.90; females WHR ≥0.85</td>
<td>Europeans, sub-Saharan Africans, and Eastern Mediterranean and Arabics: Males WC ≥94 cm; Females WC ≥80 cm; South Asians, Chinese, and South and Central Americans: Males WC ≥90 cm; Females WC ≥80 cm; Japanese: Males WC ≥90 cm; Females WC ≥80 cm</td>
</tr>
<tr>
<td>4. Abnormal lipid profile</td>
<td>Males HDL-C &lt;0.90 mmol/l or taking fibrate/niacin; Females HDL-C &lt;1.03 mmol/l or taking fibrate/niacin</td>
<td>Males HDL-C &lt;1.03 mmol/l or taking fibrate/niacin; Females HDL-C &lt;1.29 mmol/l or taking fibrate/niacin</td>
</tr>
<tr>
<td>Total Metabolic syndrome</td>
<td>Diabetes mellitus + 2 or 3 other factors</td>
<td>Abdominal obesity + 2 or 3 other factors</td>
</tr>
</tbody>
</table>
CRP and CHD

Anand S et al EHJ 2010

<table>
<thead>
<tr>
<th>Features to prove causality</th>
<th>LDL Cholesterol and CHD</th>
<th>C-reactive protein and CHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistency of observational data</td>
<td>Yes; summary relative risk per 1</td>
<td>Yes; summary relative risk per 1</td>
</tr>
<tr>
<td></td>
<td>$SD = 1.38$ (95% CI: 1.09 – 1.73)</td>
<td>$SD = 1.23$ (95% CI: 1.07 – 1.42)</td>
</tr>
<tr>
<td>Temporality</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Dose response</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mechanistic data consistent with observational</td>
<td>Yes; consistent across multiple model systems</td>
<td>No</td>
</tr>
<tr>
<td>Genetic data supporting causality</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Experimental Evidence: including RCTs</td>
<td>Yes, multiple RCTs</td>
<td>Unclear</td>
</tr>
</tbody>
</table>
INTERHEART

- 29,000 subjects, 262 sites, 52 countries (urban sites)
  - 80% of CHF occurs in developing countries
- Case control
  - 15,152 1st MI patients and 14820 healthy controls
  - Europe 25%
  - China 25%
  - S Asia 20%
  - Middle East 13%
  - S America 12%
  - Africa 5%
  - 90% of the global risk of MI is predicted by 9 traditional risk factors
  - Regardless of ethnicity, region or gender

Yusuf et al Lancet 2004;364;937
## INTER-HEART: Risk of acute MI associated with risk factors in the overall population

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Odds ratio adjusted for age, sex, and smoking (99% CI)</th>
<th>Odds ratio adjusted for all (99% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ApoB/ApoA-1 (5th quintile cf with 1st)</td>
<td>3.87 (3.39-4.42)</td>
<td>3.25 (2.81-3.76)</td>
</tr>
<tr>
<td>Current smoking</td>
<td>2.95 (2.72-3.20)</td>
<td>2.87 (2.58-3.19)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.08 (2.77-3.42)</td>
<td>2.37 (2.07-2.71)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>2.48 (2.30-2.68)</td>
<td>1.91 (1.74-2.10)</td>
</tr>
<tr>
<td>Abdominal obesity</td>
<td>2.22 (2.03-2.42)</td>
<td>1.62 (1.45-1.80)</td>
</tr>
<tr>
<td>Psychosocial</td>
<td>2.51 (2.15-2.93)</td>
<td>2.67 (2.21-3.22)</td>
</tr>
<tr>
<td>Vegetable and fruits daily</td>
<td>0.70 (0.64-0.77)</td>
<td>0.70 (0.62-0.79)</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.72 (0.65-0.79)</td>
<td>0.86 (0.76-0.97)</td>
</tr>
<tr>
<td>Alcohol intake</td>
<td>0.79 (0.73-0.86)</td>
<td>0.91 (0.82-1.02)</td>
</tr>
<tr>
<td>All combined</td>
<td>129.2 (90.2-185.0)</td>
<td>129.2 (90.2-185.0)</td>
</tr>
</tbody>
</table>

3 SNPs associated with Apo B—significantly associated with MI

*Yusuf et al Lancet 2004:364;937*
### INTER-HEART: Population-attributable risk of acute MI in the overall population

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>PAR adjusted for age, sex, and smoking (99% CI)</th>
<th>PAR adjusted for all (99% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ApoB/ApoA-1 (5th quintile cf 1st)</td>
<td>54.1 (49.6-58.6)</td>
<td>49.2 (43.8-54.5)</td>
</tr>
<tr>
<td>Current smoking</td>
<td>36.4 (33.9-39.0)</td>
<td>35.7 (32.5-39.1)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>12.3 (11.2-13.5)</td>
<td>9.9 (8.5-11.5)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>23.4 (21.7-25.1)</td>
<td>17.9 (15.7-20.4)</td>
</tr>
<tr>
<td>Abdominal obesity</td>
<td>33.7 (30.2-37.4)</td>
<td>20.1 (15.3-26.0)</td>
</tr>
<tr>
<td>Psychosocial</td>
<td>28.8 (22.6-35.8)</td>
<td>32.5 (25.1-40.8)</td>
</tr>
<tr>
<td>Vegetable and fruits daily</td>
<td>12.9 (10.0-16.6)</td>
<td>13.7 (9.9-18.6)</td>
</tr>
<tr>
<td>Exercise</td>
<td>25.5 (20.1-31.8)</td>
<td>12.2 (5.5-25.1)</td>
</tr>
<tr>
<td>Alcohol intake</td>
<td>13.9 (9.3-20.2)</td>
<td>6.7 (2.0-20.2)</td>
</tr>
<tr>
<td>All combined</td>
<td>90.4 (88.1-92.4)</td>
<td>90.4 (88.1-92.4)</td>
</tr>
</tbody>
</table>

**PAR=population-attributable risk**

Yusuf et al. Lancet 2004:364;937
Trends in CHD Mortality 1990-2000, aged 35-74

Capewell S, O’Flaherty M Heart 2008;94:1105-1108
Hypertension: Population Trends: WHO MONICA

- 38 populations, 21 countries, 4 continents, 200 subjects, each 10 year age band 35-64
- Change from mid 80s-90s
- Mean decrease in SBP
  - men 2.2mmHg, 3.3mmHg in women
- Mean decrease in DBP
  - men 1.4mmHg and 2.2mmHg in women
- Antihypertensive medication for high readings ↑ from 0.5% to 11.4%
- No differential fall in high readings-other determinants of BP lowering at work

*Tunstall-Pedoe et al BMJ:2006*

- Risk factors worse: +17%
  - Obesity (increase): +7%
  - Diabetes (increase): +10%
- Risk factors better: -61%
  - Population BP fall: -20%
  - Smoking: -12%
  - Cholesterol (diet): -24%
  - Physical activity: -5%
- Treatments: -47%
  - AMI treatments: -10%
  - Secondary prevention: -11%
  - Heart failure: -9%
  - Angina: CABG and PCI: -5%
  - Hypertension therapies: -7%
  - Statins (primary prevention): -5%
  - Unexplained: -9%

341,745 fewer deaths in 2000
Trends in CAD Mortality and Changes in risk factors

- Recent - Population-based study, Ontario, CA, aged 25-84
- Compared 1994 with 2005
- Age adjusted mortality ↓ by 35%
  - 191 to 125 deaths /100 000 inhabitants, translating to an estimated 7585 fewer CHD deaths in 2005
  -↑ treatments -43% of the total mortality decrease, AMI (8%), chronic stable CAD (17%), and HF (10%)
  - Trends in RFs accounted for 48% of the reduction
  -↓ cholesterol (23%), SBP (20%).
  -↑ DM prevalence and BMI -↑CHD mortality of 6% and 2%

Wijeysundera et al JAMA. 2010;303(18):1841
Population Risk Factors and CAD

- Risk factor ↓ vs ↑ Rx
  - 50% CV deaths before hospital, many 1st manifestation
  - MONICA study, 27% reduction on CHD in 15 countries, 75% ↓ in incidence (i.e. risk factor modification) only 25% ↓ in case fatality (Tunstall-Pedoe, Lancet 1999 and 2000)
  - Risk factor lag times –CHD reduction are short

- Threats
  - Levelling off of CHD death rates in younger age groups
  - Ageing of the population-i.e. change in prevalence
Epidemiology of Heart Failure

**Prevalence**
- 0.8% (age 50-59)
- 9.1% (>80 yrs)

**Incidence**
- 0.2% (54 yrs)
- 0.4% (85 yrs)

**Aetiology**
- 75% preceding HT
- 39% CHD
  - 29% also HT

*The Natural History of Congestive Heart Failure; The Framingham Study. NEJM 1971 285; 3441*
Classical Epidemiology of Heart Failure

Goteborg-Sweden

- **prevalence**
  - 2.1% age 50
  - 13% age 67

- **incidence**
  - 0.15% (50)
  - 1% age (67)

Erikson et al Eur Heart J 1989 ; 10 : 647
Risk Factors for Heart Failure
“The men born in 1913”

Table 5: Relative risk (RR) and population etiological fraction (EF) for independent variables among men aged 50, 54 and 60 years in relation to CHF at the age of 67 years

<table>
<thead>
<tr>
<th>Variable</th>
<th>Age at baseline (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>P &lt;</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.01</td>
</tr>
<tr>
<td>Smoking</td>
<td>0.0001</td>
</tr>
<tr>
<td>Body weight</td>
<td>0.0001</td>
</tr>
<tr>
<td>Heart volume</td>
<td>0.01</td>
</tr>
<tr>
<td>ECG T-wave</td>
<td>0.02</td>
</tr>
<tr>
<td>HR variability</td>
<td>0.02</td>
</tr>
<tr>
<td>Peak flow</td>
<td>0.04</td>
</tr>
<tr>
<td>Fy-antigen</td>
<td>0.01</td>
</tr>
<tr>
<td>Stress</td>
<td>0.01</td>
</tr>
<tr>
<td>All variables</td>
<td>—</td>
</tr>
<tr>
<td>With Fy-ag</td>
<td>2.5(0.8–11.2)</td>
</tr>
<tr>
<td>No Fy-ag</td>
<td>4.1(2.2–15.5)</td>
</tr>
</tbody>
</table>

The P-value refers to the significance level of the variables versus CHF stage 1 or more in the multivariate analysis (— means data not available).

Erikson et al Eur Heart J 1989; 10: 647
Definition of Heart Failure

ESC Guidelines for the Diagnosis of CHF

Symptoms of heart failure (at rest or during exercise)

Objective evidence of cardiac dysfunction at rest

Response to treatment when the diagnosis is in doubt
Change in Aetiology of HF in Framingham Heart Study

McMurray, J. J et al. Heart 2000;83:596-602
Lifetime Risk of HF

Framingham Heart Study
- Free of HF at baseline
- 3,757 men and 4,472 women followed from 1971-1996, 583 develop HF
- Age 40 years lifetime risk for developing HF was
  - 21.2% men and 19.3% women
  - Lifetime risk X 2 if bp > 160/100 c.f < 140/90 mmHg
  - Without MI, lifetime risk 1/9 for men and 1/6 women

Lloyd-Jones D et al Circ 2002;106:3068
Prevalence of Systolic Dysfunction

North Glasgow MONICA  (McDonagh et al Lancet 1997)
- 2000, 25-74 yrs
- 2.9%, 1.5% CHF, 1.4% ASLVD (LVEF≤30%)
- 6.4% (men) and 4.9% in (women) >65 years

The Helsinki Ageing Study (Kupari et al J Intern Med 1997;241:387-94)
- 501,75-86 yrs
- Clinical HF 8.2% overall, 2.3% with systolic dysfunction
- 9% ASLVD

The Rotterdam Study (Mosterd et al EHJ 1999;20:447)
- 2267 men and women aged 55-95
- 3.7% fractional shortening ≤25% (5.5% men and 2.2% women)
- 2.2% asymptomatic LVD (59%)

Poole (Dorset UK) (Morgan et al BMJ 1999;318;368)
- 817 subjects 70-84 years
- 7.5% LVD (12.2% men and 2.9% women)
- 52% undiagnosed

Echoes (England) (Davies et al Lancet 2001)
- LVD: 1.8% (72), 50% asymptomatic
- Borderline LVD: 3.5% (139)
## North Glasgow MONICA Aetiology

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>SLVD</th>
<th>ASLVD</th>
<th>No LVD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IHD</td>
<td>95%</td>
<td>71%</td>
<td>17%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Angina</td>
<td>62%</td>
<td>43%</td>
<td>9%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MI</td>
<td>50%</td>
<td>14%</td>
<td>4%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ECG ischaemia</td>
<td>77%</td>
<td>50%</td>
<td>15%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypertension</td>
<td>68%</td>
<td>52%</td>
<td>24%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>HT alone</td>
<td>5%</td>
<td>14%</td>
<td>13%</td>
<td>ns</td>
</tr>
<tr>
<td>IHD alone</td>
<td>31%</td>
<td>33%</td>
<td>12%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>HT and IHD</td>
<td>64%</td>
<td>38%</td>
<td>9%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ECG abnormal</td>
<td>77%</td>
<td>60%</td>
<td>27%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Alcohol excess</td>
<td>0%</td>
<td>14%</td>
<td>4%</td>
<td>ns</td>
</tr>
<tr>
<td>Valve abnormality</td>
<td>25%</td>
<td>0%</td>
<td>5%</td>
<td>ns</td>
</tr>
</tbody>
</table>

*McDonagh T A et al Lancet 1997;350:829*
Aetiology

- **ECHOES**
  - **LVSD**
    - 53% myocardial ischaemia
    - 53% angina
    - 42% hypertension
  - **PLVEF**
    - 13% myocardial ischaemia
    - 33% angina
    - 37% hypertension

- **Helsinki Ageing Study**
  - 8.2% HF
    - IHD 54%
    - HT 54%


Aetiology of Heart Failure; Bromley Study

- Population of 290,000 South London
- All incident HF cases identified over 15 months
- HF incidence 0.9/1000/yr
- 99/135 under 75 years underwent angiography and MPS
- 25% - the aetiology was not CAD prior to angiography/MPS

Fox et al EHJ (2001) 22, 228–236
The CV Health Study

- Prospective, community-based, epidemiological, observational study of 5,888 participants ≥65 years old from 4 different locations of the U.S
- 5625 without CHF
- Incidence rate of 19.3/1,000 person-years (5.5 years of FU)

**Population Attributable Risk**

- CHD (13.1%)
- Systolic BP ≥140 mm Hg (12.8%)
- ↑ CRP (9.7%)
- Subnormal LV function (4.1%)
- Atrial fibrillation (2.2%)

Gottiener JS et al. JACC 2000:35;1628
Modern Epidemiology-US Health Ageing and Body Composition Study

- 2394 subjects free of HF, median FU of 7 yrs, mean age, 73.6; 47.9% men; 58.6% white
- 8.8%-HF (13.6/1000 per 1000 person yrs > males and blacks

Kalogeropoulos K et al Arch Intern Med. 2009;169(7):708-715
Trends in the Incidence of HF post MI
Framingham

- 676 aged 45-85 (mean age 67, 34% women)
- 30-day HF incidence post MI ↑ from 10% in 1970-79 to 23.1% in 1990-99 (P =0.003)
- 30-day mortality after MI ↓ from 12.2% (1970-79) to 4.1% (1990-99)
- Similar data at 5 years

Rochester Epidemiology Project 1979-2002, 962 incident HF cases and controls

Table 2: Change in Prevalence of Risk Factors Over Time Among Heart Failure Cases 1979-2002

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Year of Heart Failure Diagnosis (% Patients)</th>
<th>P Value (Trend)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary heart disease</td>
<td>25.0</td>
<td>30.3</td>
</tr>
<tr>
<td>Hypertension</td>
<td>58.4</td>
<td>65.5</td>
</tr>
<tr>
<td>Diabetes</td>
<td>13.0</td>
<td>20.9</td>
</tr>
<tr>
<td>Obesity</td>
<td>19.6</td>
<td>20.5</td>
</tr>
<tr>
<td>Ever smoker</td>
<td>45.6</td>
<td>51.5</td>
</tr>
</tbody>
</table>

Table 3: Time from Risk Factor to Development of Heart Failure Among Cases

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Overall (n = 962)</th>
<th>Women (n = 517)</th>
<th>Men (n = 445)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary heart disease</td>
<td>4.9 (0.4-10.8)</td>
<td>3.3 (0.2-8.2)</td>
<td>5.7 (0.9-12.3)*</td>
</tr>
<tr>
<td>Hypertension</td>
<td>15.1 (7.3-23.7)</td>
<td>16.0 (7.9-26.1)</td>
<td>13.4 (6.8-20.8)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>9.8 (5.0-18.6)</td>
<td>12.6 (5.7-20.0)</td>
<td>8.5 (4.1-16.0)</td>
</tr>
<tr>
<td>Obesity</td>
<td>16.1 (10.1-20.4)</td>
<td>16.2 (10.7-20.1)</td>
<td>16.0 (8.4-20.5)</td>
</tr>
</tbody>
</table>

Table 4: Association Between Heart Failure and Risk Factors from Case/Control Analysis

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value</th>
<th>Population Attributable Risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall</td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>3.05 (2.36-3.95)</td>
<td>&lt;.001</td>
<td>0.20 (0.16-0.24)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.16 (0.12-0.20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.23 (0.16-0.30)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.44 (1.18-1.76)</td>
<td>&lt;.001</td>
<td>0.20 (0.10-0.30)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.28 (0.14-0.42)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.13 (0.00-0.26)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.65 (1.98-3.54)</td>
<td>&lt;.001</td>
<td>0.12 (0.09-0.15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.10 (0.06-0.14)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>0.13 (0.08-0.18)</td>
</tr>
<tr>
<td>Obesity</td>
<td>2.00 (1.57-2.55)</td>
<td>&lt;.001</td>
<td>0.12 (0.08-0.16)</td>
</tr>
<tr>
<td></td>
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<td>0.12 (0.07-0.17)</td>
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<td></td>
<td>0.13 (0.07-0.19)</td>
</tr>
<tr>
<td>Ever smoker</td>
<td>1.37 (1.13-1.68)</td>
<td>.002</td>
<td>0.14 (0.06-0.22)</td>
</tr>
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<td></td>
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<td>0.08 (0.00-0.15)</td>
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<td>0.22 (0.07-0.37)</td>
</tr>
</tbody>
</table>
Heart Failure with Preserved Systolic Function ?
HFREF vs HFPEF in Framingham

- **HFREF (314-59%)**
- **HFNEF (220, 41%)**
- Pre onset of HF and at onset RFs
- MV predictors of HFPEF-SBP, AF, female sex
- Prior MI and LBBB reduced OR for HFPEF

Lee et al Circ 2009;119:3070
HFREF, HFPEF and Survival with CAD in Framingham

Lee et al Circ 2009;119:3070
Influence of Parental HF: Framingham Offspring Cohort

- 1039 subjects, parents no HF
- 458 with at least one parent with HF
- MV ORs compared to no parent with HF group
  - $1.35 (0.99-1.84)$ for ↑ LV Mass
  - $1.29 (0.96-1.27)$ for ↑ LVEDD
  - $2.37 (1.22-4.61)$ for LVDD
- 10 year age sex adjusted incidence of HF
  - 2.72% vs 1.62%
  - MV adjustment-HR 1.7 (1.11-2.60)

Lee et al NEJM 2006: 355:138
BNP as RF for HF
Framingham

- 3346 persons without HF
- FU-5.2 years
- Each ISD log BNP increment associated with
  - 27% ↑ risk of death (p=0.009)
  - 28% ↑ risk of 1st CV event (p=0.03)
  - 77% ↑ risk of HF (p<0.001)

Wang et al NEJM 2004: 350:655
Alcohol and Heart Failure: Physicians Health Study

- 21,601 free of HF, followed 1982-2005, 904 cases developed
- No evidence for association between moderate alcohol intake and HF without CAD

Djousse et al Circ 2007;115: 34-39
Socio-Economic Class and HF

- 28-year follow-up, 1004 men (14.3%) were discharged from hospital or died with HF.
- Compared to highest occupational class, men with intermediate non-manual occupations had a multiple-adjusted hazard ratio (HR) of 1.28, 95% confidence interval (CI) 0.98–1.67, lower officials and foremen had an HR of 1.57 (1.22–2.03), semiskilled and skilled workers 1.48 (1.15–1.89), and unskilled workers 1.72 (1.34–2.20).
- Low SES is an independent risk factor for long-term risk of HF in men.

Schaufelberger M et al. EHJ 2007;28:212-218
Risk Factors for CAD and HF

- Same...
- Mortality rate reduction on CHD, mainly attributable to reduction on RF levels
- Stable incidence of HF
  - Increasing prevalence
  - Better survival from MI
  - Ageing population
- Risk factor modification
  - Primary and secondary has huge potential to reduce the incidence of HF
The end.....