Supplementary Appendix

This appendix has been provided by the authors to give readers additional information about their work.

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THE UNIVERSITY of LIVERPOOL

IMPACT, A VALIDATED, COMPREHENSIVE CORONARY HEART DISEASE MODEL

SUPPLEMENTARY APPENDIX for the US MODEL

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SUPPLEMENTARY APPENDIX FOR THE IMPACT MODEL

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Table 1. THE USA IMPACT MODEL: INTRODUCTION and DETAILED METHODOLOGY

The tables included in this supplementary appendix document provide details about the methods that were used in creating the US IMPACT model. This model examines the effects of changes in treatments and risk factors trends on changes in mortality from coronary heart disease (CHD) among US adults aged 25-84 years. Earlier versions of the IMPACT mortality model have been previously applied to data from Europe, New Zealand and China.[1-5] This cell-based mortality model, developed in Microsoft Excel, has been described in detail online and elsewhere.[1, 6-8]

Changes in mortality rates from CHD, USA 1980-2000

Data sources used in examining the changes in mortality rates from 1980 to 2000 among US adults aged 25-84 years are shown in Table 2. Mortality rates from CHD were calculated using the underlying cause of death: International Classification of Diseases (ICD)-9 codes 410-414, 429.2 and ICD-10 codes I20-I25. Both unadjusted and age-adjusted mortality rates were calculated. Age-standardization was done using the direct method based on the US projected 2000 population.

Expected and *observed* number of deaths from CHD

The data sources needed to estimate the expected and observed number of deaths from CHD for 2000 are shown in Table 2. The expected number of deaths from CHD in 2000 was calculated by multiplying the age-specific mortality rates from CHD in 1980 by the population counts for 2000 in that age-stratum. Summing over all age strata then yielded the *expected* numbers of deaths from CHD. The difference between the number of *expected* and *observed* number of deaths from CHD represents the mortality fall, the total number of *deaths prevented or postponed* (**DPPs**) from the combined changes in treatment patterns and risk factor prevalence.

Treatments

The treatment arm of the Model includes the following populations of patients:

- those hospitalized with an acute myocardial infarction (AMI),
- patients admitted to the hospital with unstable angina,
- community-dwelling patients who have survived an AMI,
- patients who have undergone revascularisation procedure (coronary artery bypass grafting (CABG), or a percutaneous transluminal coronary angioplasty (PTCA), with or without stent.
- community-dwelling patients with angina pectoris (no revascularisation)
- patients admitted to hospital with heart failure,
- community-dwelling patients with heart failure (no hospital admission).
- Hypertensive individuals eligible for hypotensive therapy
- Hypercholesterolaemic subjects eligible for cholesterol lowering therapy

The main data sources used to estimate the numbers of these groups are shown in Table 2. For each of the groups, we estimated the number of DPPs that were attributable to various treatments. A listing of the treatments that were considered in the model and the data sources used to estimate the percentages of patients receiving treatments are shown in Tables 3 and 4.

The general approach to calculating the number of DPPs from an intervention among a particular patient group was first to stratify by age and sex, then to multiply the estimated number of patients in the year 2000 by the proportion of these patients receiving a particular treatment, by the 1-year case-fatality rate, and by the relative reduction in the case-fatality rate due to the administered treatment. Sources for estimates of efficacy (relative risk reductions) are shown in Table 3. Sources for treatment uptakes are shown in Table 4.

Age-specific case-fatality rates for each patient group are presented in Table 5.

We assumed that compliance (concordance), the proportion of treated patients actually taking therapeutically effective levels of medication, was 100% among hospital patients, 70% among symptomatic community patients, and 50% among asymptomatic community patients.[6, 8-10]

All these assumptions were tested in subsequent sensitivity analyses.

EXAMPLE 1: estimation of DPPs from a specific treatment

For example, in the United States in 2000, about 102,280 men aged 55-64 were hospitalized with AMI in 2000 of whom approximately 84% were given aspirin.[11] Aspirin use reduces case-fatality rate by approximately 15%.[12] The underlying 1-year case-fatality rate in these men was approximately 5.4%.[13] The DPPs for at least a year were therefore calculated as

Patient numbers x treatment uptake x relative mortality reduction x one-year case fatality

= 102,280 x 84% x 15% X 5.4% = 696 deaths prevented or postponed.

This calculation was then repeated

a) for men and women in each age group, and

b) incorporating a Mant and Hicks adjustment for multiple medications

c) using maximum and minimum values for each parameter in each group, to generate a sensitivity analysis (see below).

Risk factors

The second part of the IMPACT model involves estimating the number of coronary heart disease DPPs related to changes in cardiovascular risk factor levels in the population. The US IMPACT model includes smoking, total cholesterol, systolic blood pressure, body mass index, diabetes, and physical activity. Data sources used to calculate the trends in the prevalence (or mean values) of the specific risk factors are shown in Table 2.

Two approaches to calculating DPPs from changes in risk factors were used. In the **regression approach**—used for systolic blood pressure, total cholesterol, and body mass index--the number of deaths from CHD occurring in 1980 (the base year) were multiplied by the absolute change in risk factor prevalence, and by a regression coefficient quantifying the change in CHD mortality that would result from the change in risk factor level. Natural logarithms were used, as is conventional, in order to best describe the log-linear relationship between changes in risk factor levels and mortality.

EXAMPLE 2: estimation of DPPs from risk factor change using regression method:

Mortality fall due to reduction in systolic blood pressure in women aged 55-64

For example, in 1980, there were 26,352 CHD deaths among 12,629,000 women aged 55-64 years. Mean systolic blood pressure in this group then decreased by 3.09 mmHg (from 136.00 in 1980 to 132.91 mmHg in 2000). The largest meta-analysis reports an estimated age- and sex-specific reduction in mortality of 50 percent for every 20 mmHg reduction in systolic blood pressure, generating a logarithmic coefficient of –0.035. [14]

The number of deaths prevented or postponed as a result of this change was then estimated as:

= (1-(EXP(coefficient*change))*deaths in 1980

= (1-EXP(-0.035*3.09))* 26,352 = 2701

This calculation was then repeated

a) for men and women in each age group, and

b) using maximum and minimum values in each group, to generate a sensitivity analysis.

Data sources for the number of CHD deaths are shown in Table 2, sources for the population means of risk factors are shown in Table 2, and sources for the coefficients used in these analyses are listed in Table 6.

EXAMPLE 3: estimation of DPPs from risk factor change using PARF method

The **population-attributable risk factor (PARF) approach** was used for smoking, diabetes, and physical activity. PARF was calculated conventionally as

$$\mathbf{(P \times (RR-1)) / (1+P \times (RR-1))}$$

where P is the prevalence of the risk factor and RR is the relative risk for CHD mortality associated with that risk factor. DPPs were then estimated as the CHD deaths in 1980 (the base year) multiplied by the difference in the PARF for 1980 and 2000.

For example, the prevalence of diabetes among men aged 65-74 years was 14.5% in 1980 and 20.7% in 2000. Assuming a Relative Risk of 1.93,[15] the PARF was 0.119 in 1980 and 0.161 in 2000. The number of deaths attributable to the increase in diabetes prevalence from 1980 to 2000 was therefore

the CHD deaths in 1980, (123055) * (0.161 - 0.119) = 5168 DPPs

This calculation was then repeated

a) for men and women in each age group,

b) for physical inactivity and smoking

c) using maximum and minimum values in each group, to generate a sensitivity analysis

Data sources for the prevalence of risk factors and for the number of CHD deaths are shown in Table 2. Sources for the relative risks used in these PARF analyses are listed in Table 7. All come from the InterHeart study,[15] the largest international study to provide *independent* RR values, adjusted for other major risk factors.

The rationale for choosing the regression or PARF approaches for specific risk factors in the US IMPACT Model is detailed in Table 8.

OTHER METHODOLOGICAL CONSIDERATIONS

Several methodological issues will be discussed below. These include adjusting the relative reduction in case-fatality rate for patients receiving multiple treatments, establishing rules for avoiding double-counting individual patients who may fall into more than a single disease category (patient group), treatment overlaps, and sensitivity analyses.

POLYPHARMACY ISSUES

Individual CHD patients may take a number of different medications. However, data from randomized clinical trials on efficacy of treatment combinations are sparse. Mant and Hicks suggested a method to estimate case-fatality reduction by polypharmacy.[16] This approach was subsequently endorsed by Yusuf[17] and Law and Wald.[18]

EXAMPLE 4: estimation of reduced benefit if patient taking multiple medications (Mant and Hicks approach)

If we take the example **of secondary prevention following acute myocardial infarction,** good evidence (Table 3) suggests that, for each intervention, the relative reduction in case fatality is approximately: aspirin 15%, beta-blockers 23%, ACE inhibitors 20%, statins 22% and rehabilitation 26%. The Mant and Hicks approach suggests that in individual patients receiving all these interventions, case-fatality reduction is very unlikely to be simply additive, i.e. not **106%** (15% + 23%+ 20% + 22% + 26%). Instead, having considered the 15% case fatality reduction achieved by aspirin, the next medication, in this case a beta-blocker, can only reduce the **residual** case fatality (1-15%). Likewise, the subsequent addition of an ACE inhibitor can then only decrease the **remaining** case fatality, which will be 1 - [(1- 0.15) X (1-0.23)].

The Mant and Hicks approach therefore suggests that a **cumulative relative benefit** can be estimated as follows:

Relative Benefit = 1 - [(1-relative reduction in case-fatality rate for treatment A) X (1-relative reduction in case-fatality rate for treatment B) X ...X (1- relative reduction in case-fatality rate for treatment N).

In considering appropriate treatments for AMI survivors, applying relative risk reductions (RRR) for aspirin, beta-blockers ACE inhibitors statins and rehabilitation then gives:

Relative Benefit = 1 - [(1 –aspirin RRR) X (1 - beta-blockers RRR) X (1 - ACE inhibitors RRR) X (1- statins RRR) X (1- rehabilitation RRR)]

= 1 - [(1- 0.15) X (1-0.23) X (1-0.20) X (1- 0.22) X (1- 0.26)]

= 1 - [(0.85) X (0.77) X (0.80) X (0.78) X (0.74)]

= **0.70 i.e. a 70% lower case fatality**

This represents a **34%** relative reduction (0.70/1.06) on the simple additive value of **106%.**

Potential overlaps between patient groups: avoiding double counting

There are potential overlaps between CHD patient groups (Table 9).

For example, approximately half the patients having CABG surgery have a previous AMI,[6] approximately 25% of AMI survivors develop heart failure within 12 months[19], and over 50% of CHD patients have a history of hypertension.[20] All these assumptions were tested in subsequent sensitivity analyses.

SENSITIVITY ANALYSES

Because of uncertainties surrounding many of the values, a multi-way sensitivity analysis was performed using the analysis of extremes method.[21] For each model parameter, a lower and upper value was assigned using either 95% confidence intervals where available (for instance therapeutic effectiveness quantified as a relative risk reduction in the relevant meta-analyses), or otherwise plus or minus 20%.

An analysis of extremes was therefore performed whereby the maximum and minimum feasible values were fed in to the model. By multiplying through, the resulting product then generated maximum and minimum estimates for deaths prevented or postponed (Table below).

EXAMPLE: sensitivity analysis for AMI patients given aspirin

An example of calculating lower and upper-bound estimates for DPPs for treatment with aspirin among men aged 55-64 years who were hospitalized with an AMI is presented here. 95% confidence intervals from the meta-analysis were used for relative mortality reduction; lower and upper bound estimates for the other parameters were calculated as minus or plus 20% [except for treatment uptake that was capped at 99%]. Multiplying all the lower-bound estimates yielded the minimum [lower bound] estimate and multiplying the upper-bound estimates yielded the maximum [upper bound] estimate.

	Patient numbers	**Treatment Uptake**	**Relative Mortality Reduction***	**One year case fatality**	**Deaths prevented or postponed**
	A	**B**	**C**	**D**	**(A x B x C x D)**
Best Estimate	102,280	0.84	15%	5.4%	696
Minimum estimate	81,824	0.67	11%*	4.3%	259
Maximum estimate	122,736	0.99	19%*	6.5%	1501

* 95% CI from the Antithrombotic Trialists' Collaboration meta-analysis[12], see Table 3.

This approach may be described as a "robust" approach for two reasons.
a) maximum and minimum values for each variable were deliberately forced to provide a wider range rather than a narrower one, e.g. relative mortality reduction ±20% rather than say, ±10%.
b) the resulting product, for instance the minimum estimate, was generated by assuming that the lowest feasible values all occurred <u>at the same time,</u> a most unlikely situation.

Table 2. **Main Data Sources for the Parameters Used in the USA IMPACT Model**

	1980	2000
Population statistics (number)	U.S. Census Bureau	U.S. Census Bureau
Deaths by age and sex (number)	National Vital Statistics System	National Vital Statistics System
CHD Mortality (rates)	National Vital Statistics System (ICD-9 codes 410-414, 429.2)	National Vital Statistics System (ICD-10 codes I20-I25)
NUMBER OF PATIENTS ADMITTED YEARLY		
Myocardial infarction: ICD9: 410, 411	NHDS	NHDS, MEPS
Angina pectoris: ICD9: 413	NHDS	NHDS
Heart failure: ICD9: 425.4, 425.5, 425.9, 428.0, 428.1 and 428.9	NHDS	NHDS, MEPS
Number of patients treated with		
CABG: ICD-9 36.1	NHDS	NHDS
PTCA: ICD9 36.01-36.05	NHDS	NHDS
Cardiopulmonary resuscitation in the community		
Numbers	Seattle and Olmsted county surveys	Seattle and Olmsted county surveys
Uptake	Seattle and Olmsted county surveys	Seattle and Olmsted county surveys
	NHDS	NHDS
Acute myocardial infarction		
Hospital Resuscitation	Seattle and Olmsted county surveys	Seattle and Olmsted county surveys Literature review
	NHDS	NHDS
Thrombolysis	NRMI, NHDS	NRMI, NHDS
Primary angioplasty	NRMI, NHDS	NRMI, NHDS
Aspirin	NRMI	NRMI
Beta blockers	Assume zero	NRMI
ACE inhibitors	Assume zero	NRMI
Primary CABG surgery	Assume zero	NRMI
Primary PTCA (angioplasty)	Assume zero	NRMI
Angina pectoris: unstable		
Prevalence	Extrapolated	CRUSADE
Platelet IIB/IIIA Inhibitors	Assume zero	Literature review
Aspirin alone	Assume zero	Literature review
Aspirin & Heparin	Assume zero	Literature review
Primary CABG surgery	Assume zero	NRMI
Primary PTCA (angioplasty)	Assume zero	NRMI

Secondary prevention following AMI		
Aspirin	Assume zero	NHANES 1999-2000, BRFSS 2000
Beta blockers	Assume zero	NHANES 1999-2000
ACE inhibitors	Assume zero	NHANES 1999-2000
Statins	Assume zero	NHANES 1999-2000
Warfarin	Assume zero	NHANES 1999-2000
Rehabilitation	Assume zero	NHANES 1999-2000
Secondary prevention following CABG or PTCA		
Aspirin	Assume zero	NHANES 1999-2000
Beta blockers	Assume zero	NHANES 1999-2000
ACE inhibitors	Assume zero	NHANES 1999-2000
Statins	Assume zero	NHANES 1999-2000
Warfarin	Assume zero	NHANES 1999-2000
Rehabilitation	Assume zero	NHANES 1999-2000
Congestive Heart Failure		
ACE inhibitors	Assume zero	NHANES 1999-2000
Beta blockers	Assume zero	NHANES 1999-2000
Spironolactone	Assume zero	NHANES 1999-2000
Aspirin	Assume zero	NHANES 1999-2000
Statins	Assume zero	NHANES 1999-2000
Treatment for chronic angina		
CABG surgery	NHDS	NHDS
PTCA (angioplasty)	Assume zero	NHDS
Community angina pectoris: total		
Prevalence	NHANES II (1976-80)	NHANES 1999-2000
Aspirin	Assume zero	NHANES 1999-2000
Statins	Assume zero	NHANES 1999-2000
Community Chronic heart failure		
Prevalence	NHANES II (1976-80)	NHANES 1999-2000
ACE inhibitors	Assume zero	NHANES 1999-2000
Beta blockers	Assume zero	NHANES 1999-2000
Spironolactone	Assume zero	NHANES 1999-2000
Aspirin	Assume zero	NHANES 1999-2000
Statins	Assume zero	NHANES 1999-2000
Hypertension		
Prevalence	NHANES II (1976-80)	NHANES 1999-2000
Treated (%)	NHANES II (1976-80)	NHANES 1999-2000

Statins etc for primary prevention		
Hypercholesterolemia (%)	NHANES II (1976-80)	NHANES 1999-2000
Treated (%)	Assume zero	NHANES 1999-2000
POPULATION RISK FACTOR PREVALENCE		
Current smoking	NHANES II (1976-80),	NHANES 1999-2000,
Systolic blood pressure	NHANES II (1976-80)	NHANES 1999-2000
Cholesterol	NHANES II (1976-80)	NHANES 1999-2000
Physical activity	BRFSS 1985 (extrapolated to 1980)	BRFSS 2000
Obesity (BMI)	NHANES II (1976-80)	NHANES 1999-2000
Diabetes	NHANES II (1976-80)	NHANES 1999-2000

Key
ACE denotes angiotensin-converting enzyme, AMI acute myocardial infarction, BRFSS Behavioral Risk Factor Surveillance System, CABG coronary artery bypass graft surgery, ICD International Classification of Diseases, MEPS Medical Expenditure Panel Survey, NHANES National Health and Nutrition Examination Survey, NHDS, National Hospital Discharge Survey, NHIS, National Health Interview Survey, NRMI, National Registry of Myocardial Infarction, and PTCA percutaneous transluminal coronary angioplasty.

Table 3. Clinical efficacy of interventions: relative risk reductions obtained from meta-analyses, and randomised controlled trials*

TREATMENTS	Relative Risk Reduction (95% CI)	Comments	Source paper: First author (year), notes
Acute myocardial infarction			
Thrombolysis	31% (95% CI: 14, 45)	<55 yrs: OR=0.692; RRR=30.8 (95% CI: 14-45) 55-64 yrs: OR=0.736; RRR=26.4 (95% CI: 17-40) 65-74 yrs: OR=0.752; RRR=24.8 (95% CI: 15-37) >75 yrs: OR=0.844; RRR=15.6 (95% CI: 4-30)	Estess(2002)[22], [updated FTT]
Aspirin	15% (95% CI: 11, 19)	OR=0.85 (95% CI: 0.81, 0.89). RRR 15% (95% CI: 11,19) page 75:outcome is vascular and nonvascular deaths	Antithrombotic Trialists' Collaboration (2002)[12]
Primary angioplasty STEMI	32% (95% CI: 5, 50)	OR 0.68 (95% CI: 0.50, 0.95). RRR 32% (95% CI: 5,50) outcome compares primary angioplasty to thrombolytics, not specific to STEMI, in results on page 3.	Cucherat (2003).[23]
Primary PTCA Non-STEMI	32% (95% CI: 5, 51)	OR 0.65 (95% CI: 0.49, 0.95). RRR 32% (95% CI: 5,51) for cardiovascular death on page 917. [RRR for cardiovascular death or MI was 26 (95% CI: 3,44) and was 24 (95% CI: 0,42) for any death]	RITA 3 (Fox 2005)[24]
Primary CABG surgery	39% (95% CI: 23, 52)	OR 0.61 (95% CI: 0.48, 0.77). RRR 39% (95% CI: 23,52) on page 565, 0-5 yr mortality	Yusuf (1994)[25]

Beta blockers	4% (95% CI: -8, 15)	OR 0.96 (95% CI: 0.85, 1.08), RR 4% (95% CI: -8,15) on page 1732.	Freemantle (1999)[26]
ACE inhibitors	7% (95% CI: 2, 11)	OR 0.93, (0.89, 0.98), RR 7% (2,11) for 30 day mortality in MI.	ACE Inhibitor Myocardial Infarction Collaborative Group 1998.[27]
Cardio-pulmonary resuscitation (CPR)			
Community CPR USA	5% (95% CI: 4, 15.3)	Nichol study reports overall median survival to discharge at 7.4% in this multi-country/site review, page 520 The Model focuses on 30/7 survival. Discharge survival will therefore provide an over-estimate, which we have explicitly addressed by assuming 5% at 30/7. Rea looks at odds of bystander dispatcher assisted CPR and bystander CPR without dispatch assistance and compares to No bystander CPR. 7265 out-of-hospital arrests attended. OR 0.59 - 0.69 for these two groups which would give RRRs of 41% and 31%. [Consider as crude equivalent of CPR to no CPR comparison]. 15.3% survival to discharge in King-county, WA; consider as maximum value. Use Nichol (1999)[28] 5% as USA average. Graham et al 1999 meta anlysis of papers 1973 - 1996 report 6.4% at discharge. Assume better in 2000, thus 6.4% at 30/7 OPALS RCT reports only 5.2%.	Nichol (1999)[28] Rea (2001)[29]
Hospital CPR USA	33% (95% CI: 10, 36)	AMI accounted for 35% of adult total cases. Adult survival to discharge 36% post VF or VT (majority of post AMI cases, only 10.6% post Asystole, Adult survival to discharge 18% overall, but this reflected ALL Medical arrests in hospital. (varied from 10-36%	Nadkarni (2006)[30] NHDS discharge codes (2000) Tunstall-Pedoe(1992)[31]

		depending on type of initial rhythm) (tables 4 &5 page 55) Review of 36,000 adults with cardiac arrests in the 253 US/Canadian Hospitals National Registry of CPR. Nadkarni, JAMA, 2006:295 (1) 50-57) Older article from Tunstall-Pedoe on page 1350 shows survival at 24 hrs to be 32%, discharge to home at 21%, and 1 year survival to be 15% overall. (16% and 8% in general wards, 31% and 16% in coronary care unit (page 1349), etc. Assume in USA 2000 is better. Corroboration: Model assumes that approximately 2% AMI admissions have primary VF (Olmsted County study). This is consistent with NHDS discharge code of CPR in 0.74% (2000), suggesting approximately 1/3 survive.	
Secondary Prevention in CHD Patients			
Aspirin	15% (95% CI: 11, 19)	OR 0.85 (95% CI: 0.49, 0.95), RR 15% (95% CI: 11, 19) outcome is vascular and nonvascular deaths on page 75. This data seems to be appropriate to this outcome in CHD patients	Antithrombotic Trialists' Collaboration (2002)[12]
Beta blockers	23% (95% CI: 15, 31)	OR 0.77 (95% CI: 0.85, 0.69), 23% (95% CI: 15,31) on page 1734. Odds of death in long term trials.	Freemantle (1999)[26]
ACE inhibitors	20% (95% CI: 13, 26)	OR 0.80 (95% CI: 0.74, 0.87), 20% (95% CI: 13,26) on page 1577, death up to 4 years [endpoint of study looking at those with heart failure or LV dysfunction.]	Flather (2000)[32]

Statins	22% (95% CI: 10, 26)	OR=0.78 (95% CI: 0.74—0.84). RRR=22% (95% CI: 10, 26) RR=0.77 (95% CI: 0.68—0.87). RRR=23% (95% CI: 13,30) in those with other CHD	Cholesterol Treatment Trialists' Collaborators (2005)[33]
		OR=0.77 (95% CI: 0.71-0.83). RRR=23% (95% CI: 17, 29) Wilt (2004) Section CHD mortality, page 1430.	Wilt (2004)[34]
Warfarin	22% (95% CI: 13, 31)	OR=0.78 (95% CI: 0.67-0.90), RRR=22% (95% CI: 10, 33) Meta-analysis looking at oral anticoagulant therapy in coronary artery disease (31 trials about 18,000 patients) by intensity of INR control: High intensity (INR>2.8) warfarin vs. control for outcome of death had OR of 0.78(95% CI: 0.69-0.87) corresponding to a RRR of 22% (95% CI: 13, 31); Moderate intensity warfarin (INR 2-3.0) vs. control had OR of 0.82 (95% CI: 0.23-2.33) not significant but corresponding RRR of 18% (95% CI: -133, 77)	Anand and Yusuf (1999)[35] Lau (1992)[36]. Table 1, page 253 (anticoagulants).
Rehabilitation	26% (95% CI: 10, 39)	OR= 0.74 (95% CI: 0.61-0.90), RRR = 26% (95% CI: 10, 39) in Fig 1, page 685 Taylor reference.	Taylor (2004)[37]

Chronic Angina			
CABG surgery years 0-5	39% (95% CI: 23, 52)	OR= 0.61 (95% CI: 0.48-0.77), RR 39% (95% CI: 23,52) on page 565, 5 yr mortality	Yusuf (1994)[25]
CABG surgery years 6-10	32% (95% CI: 2, 30)	OR= 0.83 (95% CI: 0.70-0.98), RR 17 (95% CI: 2,30) on page 565, 10 yr mortality OR= 0.68 (95% CI: 0.56-0.83), RR 32 (95% CI: 17,44) on page 565, 7 yr mortality CABG compared to medical treatment	Yusuf (1994)[25]
Angioplasty in chronic angina, with stents	13% (95% CI: 0, 16)	OR=0.87 (95% CI: 0.52-1.45), RRR=13% (95% CI: -45, 48)	BASKET RCT (Lancet 2005 366, 921)[38]: Comparison of drug eluting stents vs. bare metal stents Folland (1997)[39] Table 3, all deaths, 60 months follow up.
		Maximum benefit, assume equivalent to CABG surgery for two vessel disease CABG, OR 0.84, (RR 16% 2, 30) 5 year survival 88% in controls. Minimum assumption: NIL benefit	Yusuf (1994)[25] Pocock (1995)[40]: No difference between PTCA and CABG as initial revasc procedure. Ditto Bucher (2000)[41]

Aspirin	15% (95% CI: 11, 19)	OR= 0.85 (95% CI: 0.81-0.89), RR 15% (95% CI: 11,19) outcome is vascular and nonvascular deaths on page 75.	Antithrombotic Trialists' Collaboration (2002)[12]
Statins	**22%** (95% CI: 10-26)	RR=0.78 (95% CI: 0.74—0.84). RRR=22% (95% CI: 10, 26) RR=0.77 (95% CI: 0.68—0.87). RRR=23% (95% CI: 13,30) in those with other CHD	Cholesterol Treatment Trialists' Collaborators (2005)[33]
Unstable Angina			
Aspirin alone	15% (95% CI: 11, 19)	OR= 0.85 (95% CI: 0.81-0.89), RR 15% (95% CI: 11,19) outcome is vascular and nonvascular deaths on page 75. Assume appropriate for unstable angina patients	Antithrombotic Trialists' Collaboration (2002)[12]
Aspirin & Heparin	33% (95% CI: -2,56)	OR 0.67 (95% CI: 0.48,1.02) RR 33% (95% CI: -2, 56) in table 2. The study outcome is composite MI death and non fatal MI, compares those on ASA+Hep to ASA only	Oler (1996)[42] . .
Platelet glycoprotein IIB/IIIA inhibitors	9% (95% CI: 2,16)	RR 0.91 (95% CI: 0.84, 0.98) RR 9% (95% CI: 2,16) study looked at acute coronary syndrome without persistent ST elevation	Boersma (2002)[43]
Primary PTCA Non-STEMI	32% (95% CI: 5-51)	OR 0.68 (95% CI: 0.49, 0.95). RRR 32% (95% CI: 5, 51) for	RITA 3 (Fox 2005)[24] Cardiovascular deaths, table 3
Primary CABG surgery	**43%** (95% CI: 19,60)	OR 0.57 (95% CI: 0.40, 0.81). RR 43% (95% CI: 19,60) reduction in mortality at 5 years in those with class III/IV angina, table 4, page 566.	Yusuf (1994)[25]

Heart failure in patients requiring hospitalisation			
ACE inhibitors	20% (95% CI: 13,26)	OR 0.80 (95% CI: 0.74, 0.87). RR 20% (95% CI: 13,26) on page 1577, [death up to 4 years was study endpoint for those with heart failure or LV dysfunction].	Flather (2000)[32]
Beta blockers	35% (95% CI: 26,43)	OR 0.65 (95% CI: 0.57, 0.74). RR 35% (95% CI: 26,43) : all cause mortality	Shibata (2001)[44]
Spironolactone	30% (95% CI: 18, 41)	OR 0.70 (95% CI: 0.59, 0.82). RR 30% (95% CI: 18,41) in those that had at least one cardiac related hospitalization. [31% (95% CI: 18-42) in entire study population of those with CHF, page 711]	Pitt (1999)[45]
Aspirin	15% (95% CI: 11,19)	OR= 0.85 (95% CI: 0.81, 0.89), RR 15% (95% CI: 11,19) outcome is vascular and nonvascular deaths on page 75.	Antithrombotic Trialists' Collaboration (2002)[12]
Statins	22% (95% CI: 10-26%)	OR=0.78 (95% CI: 0.74, 0.84). RRR=22% (95% CI: 10-26), post AMI OR=0.77 (95% CI: 0.68, 0.87). RRR=23% (95% CI: 13,30) in those with other CHD	Cholesterol Treatment Trialists' Collaborators (2005)[33]

Heart failure in the community			
ACE inhibitors	20% (95% CI: 13,26)	OR 0.80 (95% CI: 0.74, 0.87). RR 20% (95% CI: 13,26) on page 1577, death up to 4 years [in those with heart failure or LV dysfunction].	Flather (2000)[32]
Beta blockers	35% (95% CI: 26,43)	OR 0.65 (95% CI: 0.57, 0.74). RR 35 (95% CI: 26,43). Section 3.3 page 353	Shibata (2001)[44]
Spironolactone	31% (95% CI: 18, 42)	OR 0.69 (95% CI: 0.58, 0.82). RR 31% (95% CI: 18-42) in entire study population consisting of those with CHF, page 711 [30 (95% CI: 18, 41) in those with a cardiac related hospitalization].	Pitt (1999)[45]
Aspirin	15% (95% CI: 11, 19)	OR= 0.85 (0.81, 0.89), RR 15% (11,19) outcome is vascular and nonvascular deaths on page 75. Assume appropriate for patients with CHF due to CHD	Antithrombotic Trialists' Collaboration (2002)[46]
Statins	22% (95% CI: 10-26%)	OR=0.78 (95% CI: 0.74, 0.84). RRR=22% (95% CI: 10-26) OR=0.77 (95% CI: 0.68, 0.87). RRR=23% (95% CI: 13,30) in those with other CHD	Cholesterol Treatment Trialists' Collaborators (2005)[33]

Hypertension treatment			
	13% (95% CI: 6,19)	OR 0.87 (95% CI: 0.81, 0.94). RRR 13% (95% CI: 6, 19) in those with high blood pressure without disease at entry. [RRR 29% (95% CI: 17, 37) those with average blood pressure and CHD, treated with ACEI]	Law (2003)[47]
Therapies for primary prevention of raised cholesterol			
Statins	35% (95% CI: 11, 52)	OR 0.65 (95% CI: 0.48, 0.89). 35% (95% CI: 11,52) for CHD mortality (only trials using statins), figure 3 on page 4	Pignone (2000)[48]
Gemfibrozil	7% (95% CI: -8, 19)	OR 0.93 (95% CI: 0.81, 1.08); RRR 7% (95% CI: -8, 19)	Studer (2005)[49]
Niacin	5% (95% CI: -10, 18)	OR 0.95 (95% CI: 0.82, 1.10); RRR 5% (95% CI: -10, 0.18)	Studer (2005)[49]

***** Relative Risk Reduction calculated as 1- Odds Ratio

Table 4. Data sources for treatment uptake levels in USA 2000: Medical and surgical treatments included in the model

TREATMENTS	**Treatment Uptake in 2000** ***(as reported in source#)***	**Source (year)**
ACUTE MYOCARDIAL INFARCTION		
Thrombolysis	20.8%	Rogers (2000): National Registry of Myocardial Infarction 1999[11]
Aspirin	84%	
Primary angioplasty	7.3%	
Primary CABG	9%	
Intravenous beta blockers	19%	
ACE inhibitors	23%	
Cardio-pulmonary resuscitation		
In the Community	45% *	Rea (2001)[29] Culley (1991)[50]
In Hospital	2% **	Bunch (2003)[51] NHDS discharge code CPR (2000)
SECONDARY PREVENTION IN CHD PATIENTS		
Aspirin	39%	NHANES 1999-2000, Foody (2003)[52]
Beta blockers	34%	NHANES 1999-2000
ACE inhibitors	26%	NHANES 1999-2000
Statins	35%	NHANES 1999-2000
Warfarin	9%	NHANES 1999-2000
Rehabilitation	27%	(CDC 2003): BRFSS 2001[53]
CHRONIC ANGINA		
CABG surgery	100%	NHDS 2000
Angioplasty	100%	NHDS 2000
Aspirin in community	51%	NHANES 1999-2000
Statins in community	50%	NHANES 1999-2000
UNSTABLE ANGINA		
Aspirin & Heparin	60%	Shahi (2001)[54] (Maximum 86% from CRUSADE 2003)
Aspirin alone	20%	Shahi (2001)[54]
Platelet glycoprotein IIB/IIIA inhibitors	25%	Peterson (2003)[55]
CABG surgery for UA	20%	NHDS 2000
Angioplasty for UA	30%	NHDS 2000

HEART FAILURE INCLUDING A HOSPITAL ADMISSION		
ACE inhibitors	43%	NHANES 1999-2000
Beta blockers	27%	
Spironolactone	5.5%	
Aspirin	24%	
Statins	22.5%	
HEART FAILURE IN THE COMMUNITY		
ACE inhibitors	47%	NHANES 1999-2000
Beta blockers	30%	
Spironolactone	7%	
Aspirin	29%	
Statins	29%	
HYPERTENSION TREATMENTS	58%	NHANES 1999-2000
HYPERLIPIDAEMIA - 1' PREVENTION		
Statins	16%	NHANES 1999-2000
Gemfibrozil	2%	
Niacin	2%	

Uptake percentages as reported in source papers. Values may differ from those in Table 1 of manuscript, which report weighted averages for ALL age groups 25-84 years included in the Model.
* Exemplar King County claims to reach 50% out-of-hospital arrests. Assume US average lower, 45%.
AHA statistics suggest 335,000 out-of-hospital CHD deaths. Rea (2001)[29] King County, suggests 1.89 per 1000 HMO adults, 1986-1994, 4% per year decline to 2000, suggests approximately 204,530 out-of-hospital cardiac arrests. Culley (1991)[50] suggested that 3754 arrests treated by emergency medical service in 4 years in King County with a population of 1.75 million; suggests approximately 1073 per million per year locally. Hence, suggests a USA maximum total of about 300,320 out-of-hospital cardiac arrests.

** Assume approximately 2% of AMI admissions have primary ventricular fibrillation (Olmsted county);[51] 2% is consistent with NHDS discharge code for cardiopulmonary resuscitation in 0.74% (2000), i.e. given that approximately 1/3 survive.

Table 5. **Age-specific case fatality rates for each patient group**

GROUP	AMI	Post AMI	Unstable Angina	CABG surgery	Angioplasty	Heart Failure *Hospital*	Heart Failure *Community*	Hypertension	Hypercholesteraemia
Interval	**30 day**	**One year***	**One year***	**One year***	**One year***	**One year**	**One year**	**One year**	**One year**
Mean	0.084	0.051	0.069	0.020	0.016	0.246	0.081	0.010	0.006
MEN									
25-34	*0.011*	0.008	0.016	0.003	0.003	0.034	0.011	0.000	0.000
35-44	*0.012*	0.009	0.024	0.005	0.005	0.068	0.022	0.001	0.001
45-54	*0.023*	0.017	0.034	0.007	0.007	0.096	0.032	0.002	0.002
55-64	*0.054*	0.034	0.056	0.012	0.012	0.140	0.045	0.006	0.006
65-74	*0.101*	*0.073*	0.070	0.023	0.025	0.283	0.093	0.014	0.014
75-84	*0.164*	*0.122*	0.091	0.042	0.042	0.337	0.111	0.035	0.035
85+	*0.279*	*0.189*	0.118	0.075	0.074	0.418	0.138	0.094	0.094
WOMEN									
25-34	*0.011*	*0.004*	*0.016*	*0.003*	*0.003*	0.034	0.011	0.000	0.000
35-44	*0.013*	*0.006*	*0.024*	*0.005*	*0.005*	0.068	0.022	0.001	0.001
45-54	*0.026*	*0.010*	*0.034*	*0.007*	*0.007*	0.096	0.032	0.001	0.001
55-64	*0.061*	*0.019*	*0.056*	*0.012*	*0.012*	0.140	0.045	0.002	0.002
65-74	*0.114*	*0.084*	*0.070*	*0.023*	*0.027*	0.222	0.081	0.007	0.007
75-84	*0.167*	*0.116*	*0.091*	*0.042*	*0.039*	0.289	0.094	0.021	0.021
85+	*0.267*	*0.177*	*0.118*	*0.075*	*0.061*	0.368	0.121	0.079	0.079
SOURCE	**Medicare**	**Medicare**	**Van Domberg[13]**	**Medicare**	**Medicare**	**Medicare**	**Medicare**	**NHANES &**	**Vital Statistics**

*excluding heart failure patients (already considered within heart failure groups)

Table 6. Specific Beta Coefficients For Major Risk Factors: Data sources, values and comments.

Estimated β coefficients from multiple regression analyses for the relationship between absolute changes in population mean risk factors and % changes in coronary heart disease mortality for men and women, stratified by age.

	Age groups (years)				
SYSTOLIC BLOOD PRESSURE	25-44	45-54	55-64	65-74	75-84
Men (hazard ratio per 20 mmHg)	**0.49**	**0.49**	**0.52**	**0.58**	**0.65**
Men (log hazard ratio per 1 mmHg)	**-0.036**	**-0.035**	**-0.032**	**-0.027**	**-0.021**
Min	-0.029	-0.028	-0.026	-0.022	-0.017
Max	-0.043	-0.042	-0.039	-0.032	-0.025
Women (hazard ratio per 20 mmHg)	**0.40**	**0.40**	**0.49**	**0.52**	**0.59**
Women (log hazard ratio per 1 mmHg)	**-0.046**	**-0.046**	**-0.035**	**-0.032**	**-0.026**
Min	-0.037	-0.037	-0.028	-0.026	-0.021
Max	-0.055	-0.055	-0.042	-0.039	-0.031

Source: Prospective studies collaborative meta-analysis, Lancet 2002 [60]
*UNITS: % mortality change per 20 mmHg change in Systolic BP
Strengths: massive dataset, includes US data, adjusted for regression dilution bias, consistent with randomized clinical trials, results stratified by sex and age, with 95% CIs
Limitations: some publication bias still possible.

CHOLESTEROL

	Age groups (years)					
	25-44	45-54	55-64	65-74	75-84	85+
Men & Women (Mortality reduction per 1 mmol/l)	**0.900**	**0.650**	**0.450**	**0.333**	**0.317**	**0.250**
Log coefficient	**-1.2942**	**-0.8238**	**-0.5245**	**-0.3719**	**-0.3512**	**-0.2709**
Lower 95% CI	-1.035	-0.659	-0.420	-0.298	-0.281	-0.217
Upper 95% CI	-1.553	-0.989	-0.629	-0.446	-0.421	-0.325

Source: Law & Wald meta-analysis[56]
*UNITS: % mortality change per 1 mmol/l (38.6 mg/dl) change in total cholesterol
Strengths: includes US data, adjusted for regression dilution bias, includes randomized clinical trials, RCT values consistent with observational data, results stratified by sex and age, with 95% CIs
Limitations: some publication bias still possible.

BODY MASS INDEX (BMI)

	Age groups (years)				
	<44	45-59	60-69	70-79	80+
Risk reduction per 1 kg/m^2: James Asia Pacific data	0.1100	0.0900	0.0500	0.0400	0.0300
Asia Pacific age gradient therefore:	1.22	**1.00**	0.56	0.44	0.33
Bogers relative risks, CHD deaths per 5 kg/m^2		**1.16**			
Age specific relative risks per 1 kg/m^2, applying age gradients from James et al	1.04	**1.03**	1.02	1.01	1.01
Men & Women, log coefficients*	**0.0363**	**0.0297**	**0.0165**	**0.0132**	**0.0099**
Minimum values	0.0255	0.0209	0.0116	0.0093	0.0070
Maximum values *(from James et al)*	0.0466	0.0381	0.0212	0.0169	0.0127

Source: Bogers et al.,[57] James et al. 2004[58]
*UNITS: % mortality change per 1 kg/m^2 change in BMI
Strengths: Large number of studies included. Adjusted for blood pressure, total cholesterol, and physical activity. 95% CIs also provided.
Limitations: Observational data; age gradient applied from James study.

Table 7. Relative Risks Used in the United States IMPACT Model for Smoking, Diabetes and Physical Inactivity for Coronary Heart Disease Mortality. (Best, Minimum and Maximum Estimates from the InterHeart Study)
(and see Introduction for a worked example)

Yusuf InterHEART Study. Lancet 2004.[15] ***Odds ratios for relative effect of risk factors*** *(99% Confidence Intervals, NOT 95%)*

	Both sexes		**Men**		**Women**	
	Young	**Old**	**≤55 years**	**>55 years**	**≤65 years**	**> 65 years**
Lifestyle factors						
Smoking	***3·33 (2·86-3·87)***	***2·44 (2·10-2·84)***	**3·33 (2·80-3·95)**	**2·52 (2·15-2·96)**	***4·49 (3·11-6·47)***	***2·14 (1·35-3·39)***
Fruit and vegetables	*0·69 (0·58-0·81)*	*0·72 (0·61-0·85)*	0·72 (0·59-0.88)	0·77 (0·64-0·93)	*0·62 (0·44-0·87)*	*0·55 (0·38-0·80)*
Exercise	***0·95 (0·79-1·14)***	***0·79 (0·66-0·94)***	**1·02 (0·83-1·25)***	**0·79 (0·66-0·96)**	***0·74 (0·49-1·10)***	***0·75 (0·46-1·22)***
Alcohol	*1·00 (0·85-1·17)*	*0·85 (0·73-1·00)*	1·03 (0·87-1·23)	0·86 (0·73-1.01)	*0·74 (0·41-1·31)*	*0·83 (0·49-1·42)*
Hypertension	*2·24 (1·93-2·60)*	*1·72 (1·52-1·95)*	1·99 (1·66-2·39)	1·72 (1·49-1·98)	*2·94 (2·25-3·85)*	*1·82 (1·39-2·38)*
Diabetes	***2·96 (2·40-3·64)***	***2·05 (1·71-2·45)***	**2·66 (2·04-3·46)**	**1·93 (1·58-2·37)**	***3·53 (2·49-5·01)***	***2·59 (1·78-3·78)***
Abdominal obesity	*1·79 (1·52-2·09)*	*1·50 (1·29-1·74)*	1·83 (1·52-2·20)	1·54 (1·30-1·83)	*1·58 (1·14-2·20)*	*1·22 (0·88-1·70)*
Psychosocial	*2·87 (2·19-3·77)*	*2·43 (1·86-3·18)*	2·62 (1·91-3·60)	2·45 (1·82-3·29)	*3·92 (2·26-6·79)*	*2·31 (1·22-4·39)*
High ApoB/ApoA1 ratio	*4·35 (3·49-5·42)*	*2·50* (2·05-3·05)*	4·16 (3·19-5·42)	2·51 (2·00-3·15)	*4·83 (3·19-7·32)*	*2·48 (1·60-3·83)*

Smoking, adverse lipid profile, hypertension, and diabetes had a greater relative effect on risk of acute myocardial infarction in younger than older individuals
*The INTERHEART study quoted a value of only 1.02 for exercise in men aged <55 years. This was clearly an outlier. We have therefore assumed a value of 0.77 in line with men and women in the other age groups, and consistent with most other studies.[59]

Table 8: **US IMPACT Model Risk Factor Methodology: Rationale for choice of regression or PARF approaches for specific risk factors**

Modelling TREATMENT effects appears reasonably precise, because each treatment has a meta-analysis with a fairly well quantified efficacy value, plus 95% confidence intervals.
Quantifying the mortality reduction attributable to the change in a specific RISK FACTOR remains a less precise science. This table explains the rationale for choosing the best approach for each risk factor: regression based on absolute change in the risk factor*, regression based on relative change in the risk factor*, or population attributable risk fraction (PARF).
We also specify the best data source for each.

*Absolute and Relative beta regression approaches are illustrated earlier in the Supplementary Appendix.
An ABSOLUTE beta regression coefficient quantifies the CHD mortality reduction for each UNIT change in risk factor, e.g. mmHg change for BP, or mg/dl change for cholesterol
A RELATIVE beta regression coefficient quantifies the CHD mortality reduction for each % relative change in risk factor, e.g. a 12 mmHg fall in SBP, from 120 mmHg to 108 mmHg, would represent a **10%** relative decrease (12/120).

Risk Factor	**Source**	**Strengths**	**Limitations**	**Comments and recommend-ation**	**DPP value in US Model** (contribution to total CHD mortality fall)
BLOOD PRESSURE					
1. Systolic BP: regression using absolute beta approach	PSC 2002[14]	Large meta-analyses include US data. Age and sex stratified. SBP preferable to DBP, because stronger relationship with CHD deaths	Observational data-assume complete reversibly of risk	CURRENT APPROACH Supersedes relative approach.	68,880 (20%)
2. Diastolic BP. Regression using absolute beta	Law 2003[60]	Appeared adequate in England and Whales model log linear.	SBP superior to DBP as a risk factor for CHD. Generated a gross over-estimate when applied to US population.	Superseded	310,880 (91%)
3. PARF	Midspan	Original approach in Scottish IMPACT Model	Sensitive to reference value and category cut-offs. Estimated DPPs always appeared very low.	Obsolete	-

CHOLESTEROL					
1. Regression using absolute Beta	Law et al, meta-analysis[61]	Large meta-analysis, split by age and sex; cohort and RCT results very consistent; supported by more recent reviews	Published in 1994	CURRENT APPROACH	82,830 (24%)
2.Regression using relative Beta*	Vartiainen 1994[62]	Appeared satisfactory in earlier IMPACT Models; similar to log-linear approach.	Not log-linear	Superseded	101,915 (30%)
3. PARF using quintiles	Midspan	Used in 1996	Sensitive to reference value and category cut-offs	Obsolete since 1997	-
BMI					
1.Regression using absolute Beta	Bogers et al 2006[57]	Large meta-analysis with US data, Broadly consistent with Asian and PSC analyses; age-splits taken from James et al. Adjusted for major confounders: smoking, cholesterol, blood pressure, and physical activity	An "upstream" CHD risk factor. CHD risk partly or wholly mediated through "downstream factors: BP, cholesterol and impaired glucose tolerance. DPP values consistent with earlier US studies.	CURRENT APPROACH Potential confounding addressed by using this adjusted value	-25,905 (-7.6%)
2.Regression using relative Beta	Never required				
3. PARF using OBESITY quintiles	Inter Heart[63]	Large, global study including US data	Sensitive to reference value and category cut-offs. Under-estimation likely.	An arbitrary approach to a continuous variable. Superseded	-39,840 (-12%)

SMOKING					
1. PARF	Inter Heart[15]	Log linear. InterHeart large, global study including US data. RRs consistent with other studies. Appropriate for a dichotomous variable.	Regression approach might provide useful alternative approach?	CURRENT APPROACH	39,925 (12%)
2. Regression using absolute beta	Vartiainen 1994[62]	Used in earlier IMPACT Models. Result consistent with PARF approach.	Not dichotomous. Not log-linear	Superseded	47,380 (14%)

DIABETES					
1. PARF approach	Inter Heart[15]	Large, global study including US data. RRs consistent with other studies. Appropriate method for dichotomous variable.	Case control study, albeit huge.	CURRENT APPROACH	-33,465 (-10%)
2. Regression approach	-	-	Appropriate Betas not identified, and methodologically dubious	Not attempted	-

PHYSICAL ACTIVITY					
1. PARF approach	Inter Heart[15]	Large, global study including US data. RRs consistent with other studies. Appropriate method for dichotomous variable.	Alternative PARF methods possible. Important to use independent RR values. (Aim to examine activity sub-categories in future studies)	CURRENT APPROACH	17,445 (5%)
2. Regression approach	-	-	Appropriate Betas do not exist, and methodologically dubious	Not attempted	-

Table 9. Main Assumptions and Overlap Adjustments Used in the USA IMPACT Model

Treatment category	***ASSUMPTIONS AND OVERLAP ADJUSTMENTS***	**Justification**
Post-AMI patients	Assume 25% already counted as HF patients	Unal (2004)[3]
	Therefore assume residual case fatality halved, having transferred these HF patients to the HF group	Unal (2004)[3]
Post-CABG patients	Assume 2/3 had MI, already counted as Post AMI	Unal (2004)[3]
Post-PTCA survivors	Assume 50% had prior AMI, already counted as Post AMI	Unal (2004)[3]
	Assume 25% also had CABG, thus already counted as Post CABG	NHDS
	Assume 25% had prior PTCA, i.e. repeats, already counted	NHDS
Chronic angina treatment: PTCA patients progressing to CABG surgery	Assume that 20% of PTCA go to CABG	NHDS
Efficacy of PTCA in angina	Assumed equivalent to CABG surgery for two vessel disease (maximum estimate), or equal to medical therapy (minimum estimate)	Sculpher (1994)[64] Folland (1997)[39] Yusuf (1994)[25]
Angina in the community	Start with the total patient numbers with angina in the community, based on NHANES prevalence Then deduct patients counted elsewhere: -Patients already treated for unstable angina in hospital, -50% of those receiving CABG for angina -50% of those receiving secondary prevention post AMI/post CABG/Post Angioplasty,	Capewell (2000)[2]
Heart failure in the community	Based on NHANES prevalence Assume 50% of heart failure is due to CHD Deduct patients treated for severe heart failure in the hospital (already counted)	NHANES 1999-2000
Hypertension treatment: overlaps with other CHD patient groups	Total hypertensive patient numbers in community calculated, then deduct: -50% of post AMI patients -50% of community angina patients -50% of community heart failure patients	NHANES 1999-2000
Fall in population blood pressure	Estimate the number of DPPs by hypertension treatment -Then subtract this from the total DPPs attributed to the secular fall in population BP	Capewell (1999)[65] Capewell (2000)[6]

AMI denotes acute myocardial infarction, CABG coronary artery bypass graft surgery, CHD coronary heart disease, DPPs deaths prevented or postponed, HF heart failure, NHANES National Health and Nutrition Examination Survey, and PTCA percutaneous transluminal coronary angioplasty.

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