Health care costs related to cardiovascular disease and diabetes in CMDHB in 2008

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Jan 2010

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www.cmdhb.org.nz/About_CMDHB/Planning/Health-Status/Health-Status.htm

ISBN: 978-0-9582961-6-8

Abstract

Introduction and Aim

Cardiovascular disease (CVD) and diabetes are two of the leading causes of morbidity and mortality in New Zealand. This study aims to estimate the health care costs for people with CVD and/or diabetes in Counties Manukau District Health Board (CMDHB).

Methods

We estimated the health care costs for people (aged 15 years and over) in CMDHB with CVD or diabetes based on inpatient hospitalisation, pharmaceutical dispensing and laboratory test utilisation costs in the 2008 calendar year. Prevalence estimates and cost data were extracted from the routinely collected datasets sourced from New Zealand Health Information Service.

Results

People with CVD and/or diabetes accounted for 13% of the adult population in CMDHB. They contributed to 46% of the total inpatient hospitalisation costs in 2008 ($101 million). CMDHB spent a total of $151 million for people living with CVD and/or diabetes in inpatient hospitalisations, pharmaceuticals, and laboratory services over the 12 month period in 2008. An additional $24 million was spent on people who died with CVD and/or diabetes in 2008 in their last 12 months of life. On average, each person with CVD and/or diabetes is associated with $2,400 more health care costs compared to a person without CVD or diabetes in 2008.

Conclusion

Cardiovascular disease and diabetes accounted for a substantial proportion of health care expenditure in CMDHB in 2008. Investment in prevention programs has a great potential in reducing morbidity and mortality as well as saving health service costs in the future.

Introduction

Cardiovascular disease (CVD) and diabetes are two of the leading causes of morbidity and mortality in New Zealand. This study aims to estimate the health care cost for people with CVD and/or diabetes in Counties Manukau District Health Board (CMDHB).

Method

Study population

The study population is called the health contact population in CMDHB.

Inclusion criteria:

The study population included people who resided in the CMDHB area and had at least one contact with any of the following health services in 2008:

- Publicly funded inpatient or outpatient hospital events
- Pharmaceutical dispensing
- Community laboratory services
- Primary health organisation (PHO): either utilised PHO service or newly enrolled in 2008

Data were extracted from the following databases sourced from the New Zealand Health Information Service:

- National Minimum Dataset (Hospital Events) (NMDS)
- National Non-admitted Patient Collection (NNPAC)
- Pharmaceutical Collection
- Laboratory Claims Collection
- Primary Health Organisation Enrolment Collection
- General Medical Subsidy Data Mart

Ethnicity

Ethnicity was defined for the purposes of this study prioritised into 4 groups, viz:

- Maaori – any mention of Maaori
- Pacific - any mention of Pacific if no Maaori
- South Asian – any mention of Indian if no Pacific or Maaori
- Other – all others, including European, Chinese, etc

The rationale for this was that the first three mentioned are at higher risk for CVD and diabetes, the rest are at a relatively similar lower risk.

Cardiovascular disease prevalence

Within the study population, people with existing CVD were identified if they had

1. any hospital discharge or procedure related to cardiovascular disease since 2001 or
2. 2 or more pharmaceutical dispensing of specific anti-angina medications, namely glyceryl trinitrate, isosorbide dinitrate, isosorbide mononitrate, nicorandil, perhexiline in 2007 to 2008.

Prevalence ratios are age standardised using WHO population as a standard.

See Appendix 1 for more detailed methodology.

Diabetes prevalence

People with diabetes were identified as per previous work,[1] if they had:

1. an inpatient hospital discharge diagnosed with diabetes from 2003 to 2008; or
2. dispensed with a diabetes-specific medication between 2007 and 2008; or
3. received 4 or more HBa1c tests between 2007 and 2008; or
4. attended a diabetes-specific clinic in the last 2 years.

Cost estimates

The estimated health care cost for the health contact population was based on the cost weights recorded in NMDS, pharmaceutical and laboratory claim collections in 2008. The health care costs for people with CVD and/or diabetes is compared to people without CVD or diabetes.

Costs where appropriate were age standardised using the health contact population (15 years and over) as the population standard.

Cost in the last year of life

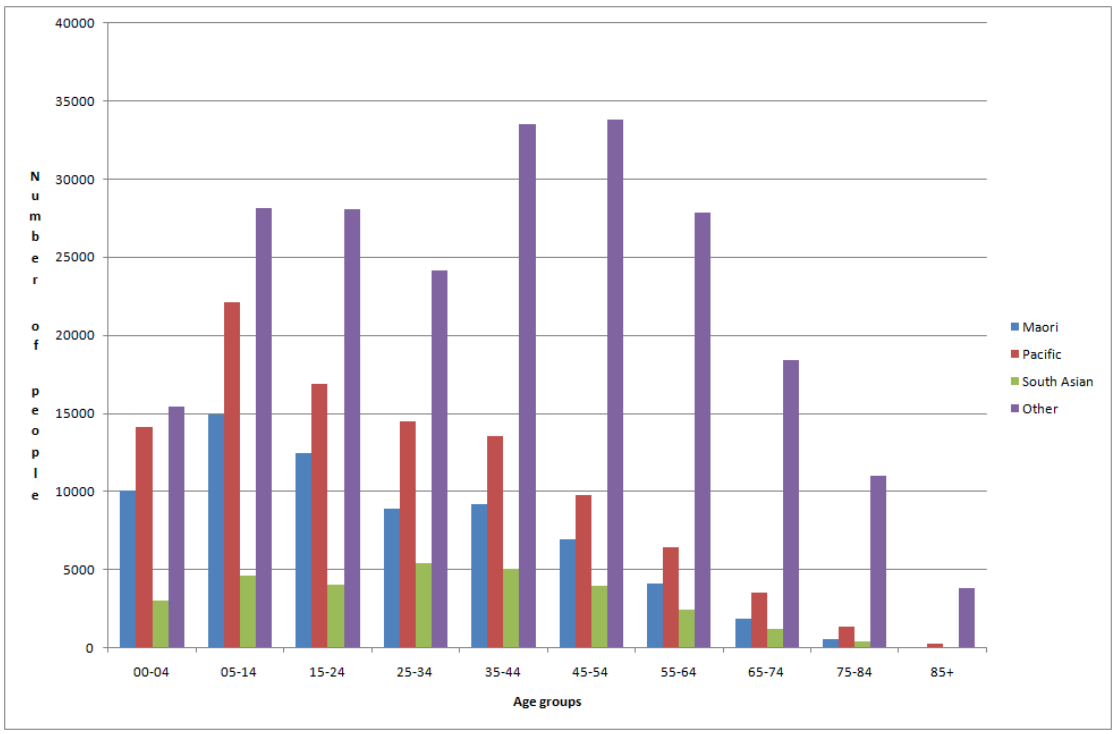
People who were recorded as diseased in the provisional Mortality Collection in 2008 were excluded from the health contact population. People who died with CVD and diabetes in 2008 were identified by the methods described above. Inpatient hospitalisation, pharmaceutical and laboratory costs were calculated for the 12 month period prior to the respective date of death of an individual person.

Results

Demography

There were 426,105 people in the health contact population in CMDHB in 2008. This compares to the census population estimates of 473,270 for 2008. In the health contact population, 313,569 people were 15 years and older in CMDHB.

Figure 1. Age and ethnic distribution of the health contact population in CMDHB in 2008



Cardiovascular disease prevalence

This study estimated that there were 20,357 people with existing cardiovascular disease in CMDHB (15 year of age or over) in 2008. Age specific prevalence of CVD increased rapidly with age. Maaori had the highest age standardised CVD prevalence compared to other ethnic groups (Table 1). Maaori male prevalence was 54% higher than 'other' male and Maaori female was 120% higher than the 'other' female group. While the South Asian male had the second highest age standardised CVD prevalence among males (8%), the CVD prevalence of their female counterparts was much lower (4.4%).

Figure 2. Age specific prevalence of cardiovascular disease in CMDHB by ethnicity (males) in 2008

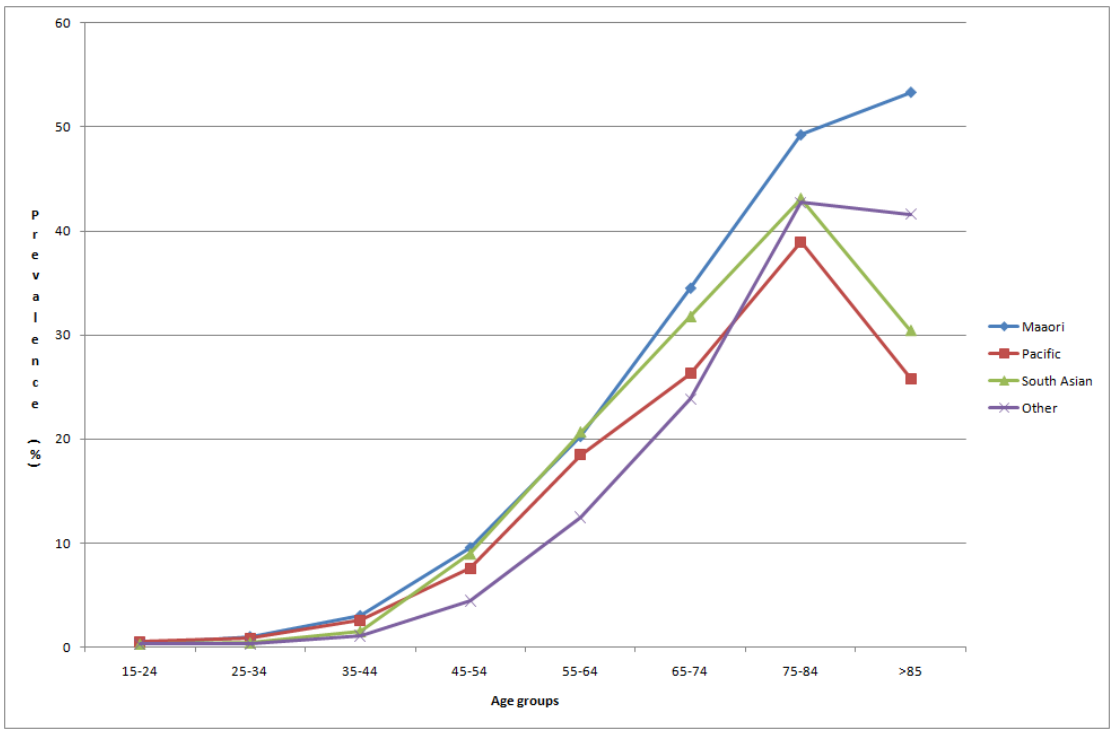


Figure 3. Age specific prevalence of cardiovascular disease in CMDHB by ethnicity (females) in 2008

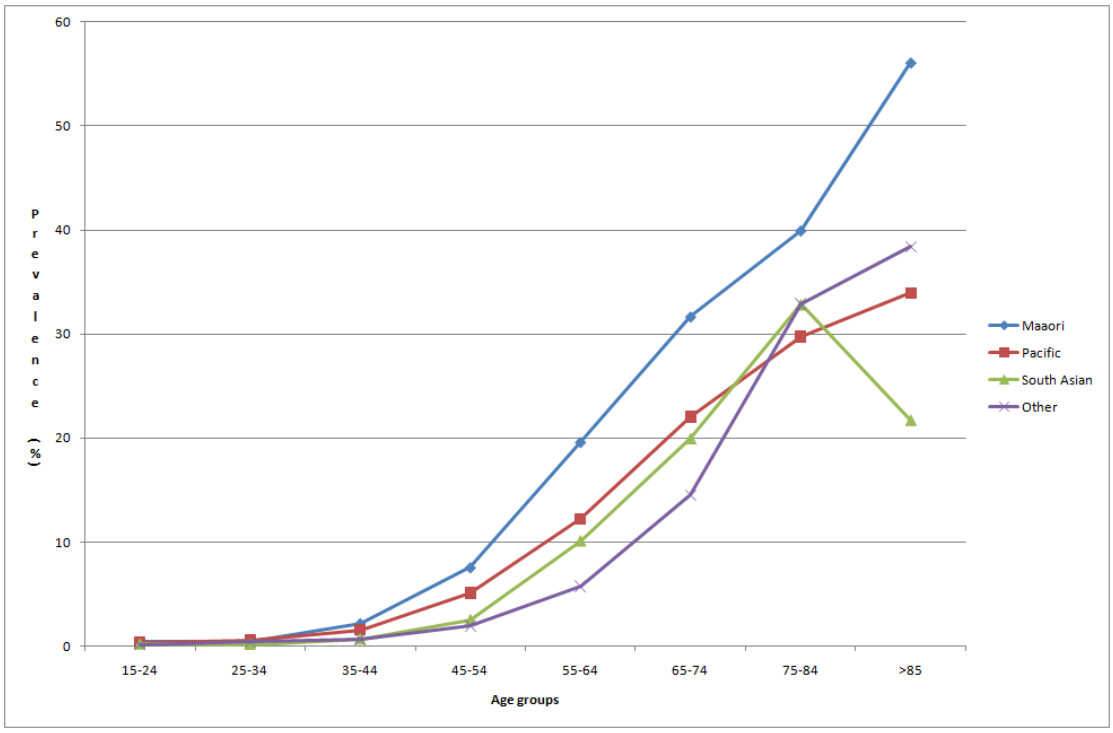


Table 1. Age standardised CVD prevalence (age 15+) in CMDHB in 2008

	Maaori	Pacific	South Asian	Other	Total
Males	9.1%	7.4%	8.0%	5.9%	6.6%
Females	8.0%	5.4%	4.4%	3.6%	4.4%

(WHO population as standard)

Health care cost related to cardiovascular disease and diabetes

The cost estimates are based on the costs related inpatient hospitalisation, pharmaceutical dispensing and laboratory tests utilisation as documented in the method section.

The health contact population estimated that there were 40,910 people living with CVD or diabetes in CMDHB 15 years of age and over (26,581 with diabetes and 20,357 with CVD). They accounted for 13% of the (health contact) population but contributed 46% of the total inpatient hospitalisation costs in 2008 ($101 million) (Table 2).

Restricting the analysis to people aged 35 years and over with CVD or diabetes (n=38,704), they accounted for 19% of the 35+ population, yet contributed to 54% of inpatient hospitalisation costs in 2008 for the age group ≥35 years.

Table 2. Total health care cost for people with CVD or diabetes compared with people without CVD or diabetes (15 years and over) in CMDHB in 2008 (deaths excluded)

	Pharmaceuti-cal claims	Laboratory claims	Hospital discharges	Total cost	Number of people	Average cost per person
People with CVD	$24,673,000	$4,024,000	$81,957,000	$110,654,000	20,357	$5,400
People with diabetes	$28,211,000	$5,483,000	$49,387,000	$83,081,000	26,581	$3,100
People with CVD or diabetes	$41,868,000	$7,767,000	$101,534,000	$151,169,000	40,910	$3,700
People without CVD or diabetes	$47,951,754	$17,202,795	$118,332,000	$183,486,548	272,659	$670
Total cost in CMDHB	$89,820,000	$24,970,000	$219,870,000	$334,660,000		

Table 3. Additional cost associated with CVD and diabetes in 2008

	Age-std cost per person with CVD or DM	Age-std cost per person without CVD or diabetes	Difference per person	Number with CVD or diabetes	Additional cost
Pharmaceutical claims	$892	$176	$716	40,910	$29,290,000
Laboratory claims	$167	$63	$104	40,910	$4,250,000
Hospital discharges	$1,995	$434	$1,561	40,910	$63,860,000
Total cost	$3,054	$673	$2,381	40,910	$97,410,000

Health care cost in the last year of life

There were 2,131 deaths in CMDHB in 2008 who were 15 years and over. Sixty-six percent of people (n=1,400) who died had existing CVD or diabetes prior to death. The health care costs in the 12 month period prior to their death are almost $24 million.

Table 4. Health care cost for people who died in 2008 for the 12 month period prior to death in CMDHB.

	Pharmaceuti-cal claims	Laboratory claims	Hospital discharges	Total cost	Number of deaths in 2008	Average cost per person
People with CVD	$2,495,000	$375,000	$18,104,000	$20,974,000	1,250	$16,779
People with diabetes	$1,505,000	$216,000	$9,118,000	$10,839,000	540	$20,072
People with CVD or diabetes	$2,835,000	$429,000	$20,643,000	$23,907,000	1,400	$17,076
People without CVD or diabetes	$1,121,312	$192,629	$8,597,000	$9,910,941	731	$13,558

Based on the cost calculations in 2008, the age standardised average health care costs of pharmaceutical, laboratory and hospitalisation per person with CVD or diabetes was more than 4 times the corresponding costs per person without CVD or diabetes (Table 5). Moreover, the health care costs in the last year of life (age standardised) for people with CVD or diabetes were about $10,000 more than the people without CVD or diabetes.

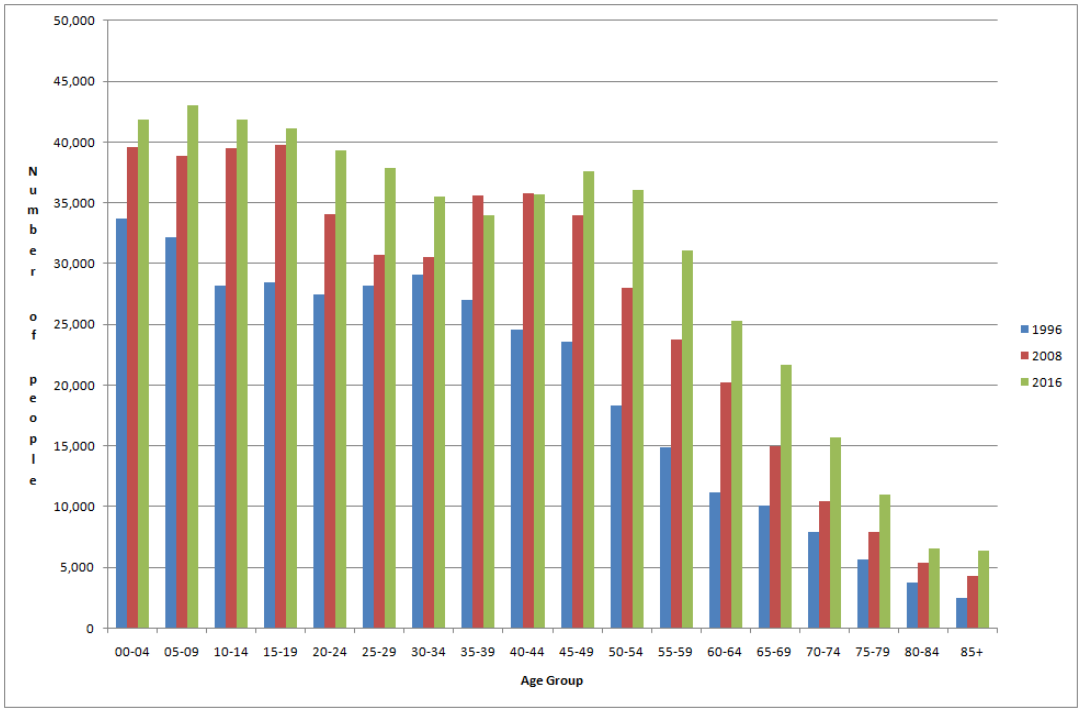
Table 5. Age standardised health care cost per year for people with CVD or DM compared to people without CVD or diabetes (aged 15 or above) in 2008.

Age standardised cost per person	Hospital, Pharmaceutical Laboratory cost
Person with CVD or DM	$3,054
Person without CVD or diabetes	$673
Person with CVD or DM in the year prior to death	$21,600
Person without CVD or diabetes in the year prior to death	$11,800

Discussion

CVD is the leading cause of death in CMDHB.[2] People with CVD and diabetes are associated with high level of health care costs. CMDHB spent a total of $151 million for people living with CVD and/or diabetes (aged 15 and above) in inpatient hospitalisations, pharmaceuticals, and laboratory services over the 12 month period in 2008. Furthermore, an extra 24 million were spent on people who died with CVD and/or diabetes in their last year of life. The current budget for prevention activities is only a small fraction compared to the cost in providing health care for people with diabetes and/or CVD.

Figure 4. CMDHB population structure in 1996, 2008 and 2016 by age groups (based on census estimates and projections).



The age specific CVD prevalence (the proportion of people who have CVD within a particular age group) increases rapidly with age (figures 2 and 3). The age structure of CMDHB population has aged considerably in the last 12 years and this trend is expected to continue based on census projections (green columns in Figure 4).

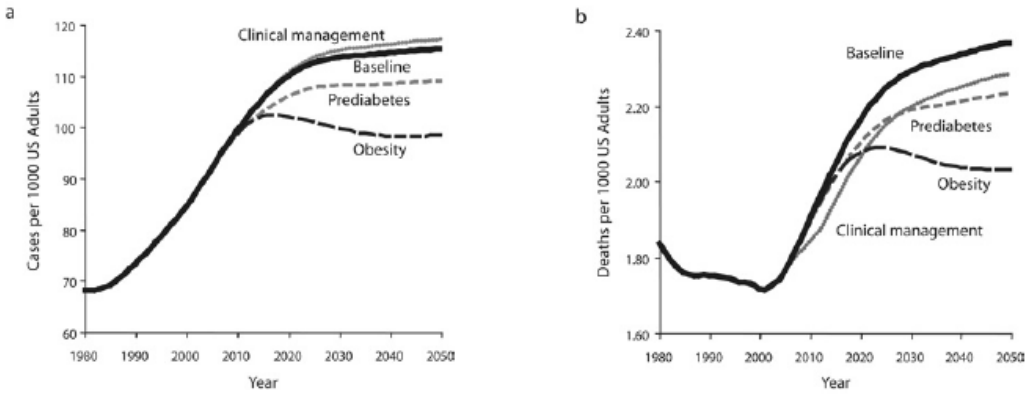
If little prevention is carried out in context of ageing population, and unfavourable obesogenic environment, the actual number of people with diabetes and CVD will increase significantly. This will translate to substantial increase in health care costs in the future.

We used census population projections to illustrate the potential impact of ageing and growing population. If the age specific CVD prevalence for Maaori, Pacific and other groups remained the same as in 2008, the number of people with CVD will increase by 52% from 20,357 in 2008 to 30,900 in 2016.

International and local CMDHB system dynamic models for diabetes had projected that prevalence of people with diabetes are expected to continue to increase in the future.[3-5] Improving clinical management for people with existing diabetes will reduce the rate of deaths related to diabetes complications in the short to medium term. On the other hand, interventions that reduce the obesity prevalence will provide a sustained benefit in the longer term. For example, the CMDHB system dynamic model for diabetes, projected that if the level of obesity prevalence remain at the same level for 20 years as in 2007, the number of people with diabetes will reduce by 31% (n=22,500).[3]

The finding from CMDHB system dynamic diabetes model is consistent to the one published by the Centers for Disease Control and Prevention (CDC) in the US as shown in Figure 5.[5]

Figure 5. CDC system dynamic model illustrating the potential benefits of improved management of diabetes, pre-diabetes, and reducing obesity prevalence. Graph A: diabetes prevalence. Graph B: deaths related to diabetes complications.[5]



One of the major limitations of this study is that people with diabetes, and/or CVD may also have other medical conditions at the same time. It is unlikely that all of health care costs for people with diabetes and/or CVD were only related to diabetes or CVD. However, the presence of diabetes and/or CVD would inevitably increase the health care costs of the management of many other conditions, e.g. patients with diabetes may need to be on a glucose insulin infusion during an operation and they are more likely to suffer from complications. Furthermore, addressing the risk factors of diabetes and CVD will also be beneficial in reducing the cost burden of other diseases. For example, prevention programs that reduce smoking initiation and/or increase smoking cessation are likely to reduce the incidence of cancer and many chronic lung diseases, etc. Creating a supportive environment

that reduce incidence of morbid obesity is likely reduce the incidence of obesity related respiratory diseases, and the costs of disability support for people with morbid obesity.

Therefore, the cost estimates provided in this report are only for illustrative purposes. Nevertheless they demonstrated that that diabetes and CVD are associated with major health care cost currently, and are expected to rise in the future.

Conclusion

Cardiovascular disease and diabetes accounted for a substantial proportion of health care expenditure in CMDHB in 2008. The health care expenditure for people with diabetes and cardiovascular disease is likely to increase in the future. Investment in prevention programs has a great potential in reducing morbidity and mortality as well as saving health service costs in the future.

Appendix 1

People with CVD are identified by the following hospital discharge or intervention codes from 1990-2008.

Table 6: Hospital discharge codes used to identify people with cardiovascular disease

Diagnosis description (groupings)	ICD 9	ICD 10 (v2)	ICD 10 (v3 or v6)
Coronary heart disease (CHD)	410x to 414x	I20x to I25x, E1053, E1153, E1453, E1059, E1159, E1459	I20x to I25x, E1053, E1153, E1453
Cerebrovascular disease (CVA)	430x to 438x	I60x to I69x, and G45x to G46x	I60x to I69x, and G45x to G46x
Peripheral vascular disease (PVD)	440x to 449x	I70x to I79x and E1050, E1051, E1052, E1150, E1151, E1152, E1450, E1451, E1152.	I70x to I79x and E1051, E1052, E1151, E1152, E1451, E1152
Heart failure (HF)	428x, 40201, 40211, 40291, 40401, 40403, 40411, 40413, 40491, 40493	I50x, I11.0, I13.0, I13.2	I50x, I11.0, I13.0, I13.2

Table 2: Interventional codes used to identify people with cardiovascular disease

Intervention description	ICD 9	ICD 10
For coronary heart disease (CHD)		
Coronary angioplasty or stent or Percutaneous coronary intervention	36.0x	3530400 to 3530501, 3531000 to 3531005
CABG (including re-do procedures)	36.1x to 36.2x	3849700 to 3850304, 9020100 to 9020103 3863700, 3845619, 3865308 3850500
For peripheral vascular disease (PVD)		
Peripheral procedures (including carotid procedures)	39.22, 39.24, 39.25, 39.26, 39.28, 38.0x, 38.1x	3857200, 3855000 to 3857101, 3270000 to 3276318, 330x to 331x, 3531200 to 3531501, 3380000 to 3380612, 9023000, 3350000 to 3355400, 9022900

Additionally, the anti-angina agents that were used to identify people with CVD were

- glyceryl trinitrate
- isosorbide dinitrate
- isosorbide mononitrate
- nicorandil
- perhexiline

People who received 2 or more dispensing of the above anti-angina agents from 2007 and 2008 were identified as people with CVD.

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