

Paper delivered at the 10th Biennial Conference of the

Australian Population Association

POPULATION AND GLOBALISATION:

AUSTRALIA IN THE 21ST CENTURY

Melbourne 28th November to 1st December 2000

Melbourne Australia

Multiple causes of death:
Diabetes as a case study

Gabrielle Hodgson and Sushma Mathur

Australian Institute of Health and Welfare

Gabrielle Hodgson and Sushma Mathur, Multiple causes of death: Diabetes as a case study

Chronic disease is increasingly being recognised as an important issue, especially among the elderly. Its impact in Australia is likely to increase in the future because of our ageing population.

There can be difficulties when it comes to coding the underlying cause of death, from death certificates, for chronic diseases. The choice of a single disease as the underlying cause may not give an accurate picture of the cause of death, and the sequence of events leading to death may be unclear.

The underlying cause of death obtained from death certificates refers to the disease or injury initiating the sequence of events leading to death, ie the main cause of death. The death certificates also list other conditions/diseases leading directly to death or contributing to death (referred to as associated causes).

Prior to 1997, only the underlying cause of death was coded by the Australian Bureau of Statistics (ABS), which meant that, especially where chronic disease was present, we didn't necessarily have the complete picture when it came to examining causes of death. This suggests that in previous investigations of chronic diseases there might have been an incomplete assessment of their contribution to overall mortality in Australia.

However, since 1997, the ABS has coded all causes of death listed on death certificates. This new information will allow us to examine more completely the impact that particular diseases have on mortality, in particular how diseases are associated with each other on death certificates. This paper, based on *Diabetes as a cause of death, Australia, 1997 and 1998* (Mathur et al. 2000), discusses how this new information can be used using diabetes, considered to be a chronic disease, as a case study.

Diabetes causes death, both as a disease in its own right and as a risk factor for vascular complications such as kidney disease, nerve damage, coronary heart disease and peripheral vascular disease. It is often these complications, rather than diabetes, that tend to be coded as the underlying cause of death. This makes diabetes an interesting disease to investigate, particularly when it can be examined as the underlying cause of death and as an associated cause of death.

In 1997 and 1998 there were 18,982 deaths where diabetes was listed as the underlying or an associated cause of death (diabetes-related deaths), this is equivalent to 7.4% of all deaths in Australia. If we examine diabetes as the underlying cause of death, it accounts for only 2.2% of all deaths compared with 5.2% as an associated cause. This suggests that diabetes is twice as likely to be coded as an associated cause of death than as the underlying cause. Previous results would have significantly under reported the contribution that diabetes may have to overall mortality in Australia as only the underlying cause of death would have been used.

The proportion of diabetes-related deaths rises with increasing age. It increases from less than 1% to 9.4% in the 65–74 year age group, it then declines to 6.0% in those aged 85 and over. The same pattern was observed for diabetes as the underlying or associated cause of death. This highlights the impact that diabetes has in an ageing population.

As well as nationally diabetes-related deaths are examined for various population groups with which we are familiar; for each State and Territory, Aboriginal and Torres Strait Islander peoples, people living in rural and remote areas of Australia, and people who are at a

socioeconomic disadvantage. Diabetes as a cause of death varies considerably across these different population groups.

Aboriginal and Torres Strait Islander peoples have the highest proportion of diabetes-related deaths (16.4%), this is twice the proportion found at the national level. The difference is substantially larger when age-standardised rates are compared, for males, Indigenous death rates are 4 times that of the national rate and for females, 6.5 times the national. Among Indigenous Australians, diabetes is recorded as the underlying cause of death almost three times as often than at the national level. These numbers highlight that Indigenous Australians clearly experience higher diabetes mortality than other Australians.

While the differences are not as large, diabetes-related deaths in the Northern Territory are substantially higher (11.2%) than in the other States and Territories and nationally. This difference is even greater when age-standardised death rates are compared to the national rates (twice the rate for males and 4 times the rate for females). Rates were also high in South Australia and Victoria, with the lowest rate in the Australian Capital Territory. This pattern also occurs for diabetes as the underlying cause of death and for diabetes as an associated cause.

Similarly, diabetes-related deaths are also higher in remote areas of Australia (9.5%). Diabetes as the underlying cause is higher than that found nationally, however there is no marked difference when diabetes is an associated cause of death.

The higher rates in the Northern Territory and remote areas of Australia are not surprising given the high proportion of Indigenous Australians in these areas.

Why are diabetes deaths higher among Indigenous Australians?

Indigenous Australians are known to have one of the highest rates of Type 2 diabetes in the world (McCarty et al. 1996). The prevalence of diabetes among Indigenous Australians is suspected to be as high as 10-30%, which is 2-4 times that of other Australians. It is not clear why diabetes is more common among Indigenous Australians, but it is thought that it may be attributed to their risk factor profile. Indigenous Australians are far more likely to be obese and report no physical activity in their leisure time compared with other Australians (AIHW 1999). Increased physical activity is now being recognised as perhaps the most feasible way of modifying glucose intolerance, a risk factor for developing diabetes and macrovascular disease (Guest & O'Dea 1992).

We also examined diabetes-related deaths in terms of the quintiles of socioeconomic disadvantage, which are derived from social and economic characteristics of local areas such as low income, low educational attainment and high unemployment. The proportion of diabetes-related deaths increases with increasing socioeconomic disadvantage. For people living in the most disadvantaged area the proportion of diabetes-related deaths was 38% higher than that found among people living in the least disadvantaged area. This pattern is reflected for deaths with diabetes as the underlying cause of death as well as deaths with diabetes as an associated cause. However, the proportional increase is greater for diabetes as the underlying cause (an increase of 44%) than for diabetes as an associated cause (an increase of 35%).

Why do diabetes deaths increase with increasing socioeconomic disadvantage?

A possible explanation for this gradient in socioeconomic disadvantage relates to cardiovascular disease and its risk factors (Chaturvedi et al. 1998). As will be shown later in this paper cardiovascular disease is commonly listed on the death certificates as a cause of death when diabetes is the underlying or an associated cause of death. Cardiovascular disease mortality has been shown to be twice as high in the most disadvantaged quintile as compared with the least disadvantaged quintile for those aged 25–64. Further, smoking, high blood

pressure, physical inactivity and obesity, all risk factors for diabetes, have been shown to be higher among the most disadvantaged group as compared with the least disadvantaged group (AIHW 1999).

Another way of using multiple cause of death information is to examine which diseases tend to occur together on death certificates.

Diabetes is rarely listed alone as the underlying cause of death with no associated causes (1.6% of deaths), with the average number of associated causes being 2.7 compared with 1.7 on average for all other causes. Diabetes predominantly occurs with diseases of the circulatory system and to a lesser extent diseases of the genito-urinary system.

When diabetes is coded as the underlying cause of death, diseases of the circulatory system and diseases of the genito-urinary system are listed as associated causes in 82.8% and 22.0% of deaths. This pattern of association is reflected across all population groups. Other diseases were examined but these were not associated as frequently with diabetes as the underlying cause of death.

However, among Indigenous Australians and people living in the Northern Territory and remote areas of Australia, diseases of the circulatory system have a slightly weaker association with diabetes as the underlying cause of death while diseases of the genito-urinary system show a stronger association. A possible explanation is that among Indigenous Australians where diabetes is the underlying cause of death, renal disease (accounts for the majority of deaths from diseases of the genito-urinary system) may be selectively competing with coronary heart disease (leading cause of death from diseases of the circulatory system).

Diseases of the circulatory system also figure prominently when diabetes is an associated cause, accounting for 58.8% of these deaths. When diabetes is not an associated cause the proportion of deaths is considerably lower (40.2%). Similarly diseases of the genito-urinary system followed the same pattern with this disease more likely to be associated with diabetes than not associated with diabetes. Diabetes is, however, less often associated with neoplasms and injury and poisoning. This pattern is reflected across all population groups. Most notably, among Indigenous Australians and people living in the Northern Territory, diseases of the circulatory system are twice as likely to be listed as the underlying cause when diabetes is an associated cause than when it is not an associated cause.

Why are diseases of the circulatory system and diseases of the genito-urinary system commonly listed with diabetes as a cause of death on death certificates?

The strong association between diabetes and diseases of the circulatory system is not surprising given that diabetes shares several of the risk factors with and is itself a risk factor for diseases of the circulatory system and certain diseases of the genito-urinary system. Obesity, physical inactivity and poor nutrition in foetal and early infant life, which are risk factors for diseases of the circulatory system, are important factors in the development of Type 2 diabetes. The existence of diabetes is also known to magnify the effect of other conventional risk factors for diseases of the circulatory system such as hypertension and smoking.

In summary, this paper highlights that there are particular population groups, such as Indigenous Australians, people living in the Northern Territory and remote areas of Australia, and people who are at a socioeconomic disadvantage, who clearly experience higher diabetes-related mortality than other Australians. For these populations it is particularly important to identify the underlying causes of these health inequalities, such as the link between risk factors and social and economic circumstances.

What insight has this new information provided for diabetes?

It has allowed us to obtain a more complete picture than was previously available of the contribution that diabetes makes to mortality in Australia. This new information has shown that diabetes makes a greater contribution to mortality in Australia than previously reported.

It has also allowed us to demonstrate the association on death certificates between diabetes as a cause of death and other diseases, such as diseases of the circulatory system and genito-urinary system.

This new information is a valuable resource, not just for diabetes, but for all health research.

References

Australian Institute of Health and Welfare (AIHW) 1999. *Heart, stroke and vascular diseases, Australian facts*. AIHW Cat. No. CVD 7. Canberra: AIHW and the Heart Foundation of Australia (Cardiovascular Disease Series No. 10).

Chaturvedi N, Jarrett J, Shipley M & Fuller J 1998. Socioeconomic gradient in morbidity and mortality in people with diabetes: cohort study findings from the Whitehall study and the WHO multinational study of vascular disease in diabetes. *British Medical Journal* 316 (10 January):100–5.

Guest CS & O’Dea K 1992. Diabetes in Aborigines and other Australian populations. *Australian Journal of Public Health* 16:340–49.

McCarty DJ, Zimmet P, Dalton A, Segal L & Welborn TA 1996. *The rise and rise of diabetes in Australia, 1996*. Canberra: Diabetes Australia National Action Plan.

Mathur S, Gajanayake I & Hodgson G 2000. *Diabetes as a cause of death, Australia, 1997 and 1998*. AIHW Cat. No. CVD 12. Canberra: AIHW (Diabetes Series No. 1).