Relative changes in earned income five years after diagnosis with diabetes: A register based study 1996-2012

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Objective: With previous studies indicating that diabetes affects employment status and lifetime earnings, the aim of this study was to determine the impact on earnings in the immediate period after diagnosis. Recognising that earnings and employment status are dynamic over the life course, we matched people with diabetes to counterparts in the general population and compared nominal growth in earned income five calendar years after diagnosis.

Research Design and Methods: The study draws upon Danish population registers. Residents aged 25-62 years between 1996 and 2007 were included in the study. We identified an individually matched control group from approximately 2,800,000 ‘diabetes-free’ Danish adults using propensity score matching. Matching was based on age, gender, residence, earned income, growth in earned income, and unemployment in the calendar year before diagnosis.

Results: 91,090 people with diabetes were included in the study and matched to 91,090 controls in the general population. The analysis revealed highly significant loss of earnings for people with diabetes when compared with people without diabetes, with an overall relative loss of US $ 3,694 (8.01%) among men and US $ 924 (3.03%) among women. The effect was generally largest in the youngest age-group, in lower earners and among men.

Conclusions: The results clearly indicate that a diagnosis of diabetes has a significant impact on earnings. Age and earnings at the time of diagnosis appear to play a moderating role.

Keywords: Income loss; diagnosis; work-related outcomes; socioeconomic disadvantage

Introduction

The costs associated with diabetes, both direct and indirect, have received considerable attention in recent years [1-3]. With the global prevalence of diabetes predicted to significantly increase in the near future [4], focus on the wider socioeconomic implications of diabetes is timely and important. In terms of indirect costs, several studies have highlighted how diabetes affects a range of labour market indicators, including early retirement, absenteeism and presenteeism [5-10]. Yet while it is important to focus on the wider socioeconomic implications of diabetes, the costs of diabetes are not exclusively societal [11], as the costs associated with early retirement and absenteeism are also experienced first-hand by individuals with diabetes. It is these costs that we have examined in this study. More specifically, we investigated how much a diagnosis with diabetes affects work-related income (hereafter ‘earnings’).

Previous studies of both young [12] and old workers [13] have shown that diabetes impairs earning potential, with longer diabetes duration [14] and the presence of complications [15] having the greatest impact on earnings. In this study we focus on the impact upon earnings in the five years after a diagnosis of diabetes. Although the interplay between disease and work life will be marked by a dynamic pattern during the whole life course [16], it is important to examine the relatively underexplored issue of comparative earnings pre- and post-diagnosis with diabetes.

In order to address the question of how much a diagnosis with diabetes affects earnings we utilised population registries available in Denmark and compared people who were diagnosed with diabetes between 1996-2007 with matched controls. Using the Danish population registries allows us to analyse the consequences of diabetes on earnings in a fully representative, nationwide-wide diabetes population.

Subjects, Materials and Methods

Every individual resident in Denmark is allocated a personal identity number, making it possible to link different registers and generate comprehensive population data. For the purposes of this analysis we coupled the Danish National Diabetes Register (DNDR) [17, 18] with the Register for Labour Market Statistics (RLMS) [19] and the Register for Personal Incomes (RPI) [20]. The RLMS provided us with data about employment, whereas the latter provided data on earnings from each individual’s annual tax statement.

DNDR is a register for diabetes acquired in adulthood (≥ 18 years) and does not cover incident diabetes among children. For the purposes of this analysis, which addresses the impact on earnings, we chose to exclude individuals diagnosed at ≤ 24 years, as they were less likely to be engaged in full-time work. Likewise, with earnings in later life influenced by numerous considerations, including eligibility for voluntary early retirement [21], we excluded potential participants who were or became ≥ 63 years. In summary, therefore, our study group comprised all individuals in Denmark aged 25-62 years who acquired diabetes in the period 1996-2007.

In order to determine the impact on earnings deriving from a diagnosis of diabetes, it was necessary to identify suitable controls in the general population without diabetes. To achieve this we applied the quasi-experimental statistical method, propensity score matching [22]. Propensity score matching identifies individual counterpart controls on the basis of objective observable characteristics. The observable characteristics which we applied in the matching procedure were as follows; age in the calendar year of diagnosis with diabetes, gender, earnings (one calendar year before diabetes), growth in earnings (from two calendar years before diabetes to one calendar year before diabetes), percentage of year unemployed (one calendar year before diabetes), and geography (region of residence one calendar year before diabetes).

The characteristics applied for the matching procedure were entered into a multivariate regression analysis to generate a profile for people being diagnosed with diabetes and on the basis of this we were able to identify suitable controls among people without diagnosed diabetes. For the propensity score matching, we specifically used the nearest-neighbour algorithm where we allowed replacement. This means that the same person without diabetes can potentially serve as a control for several newly diagnosed people with diabetes in a given year.

With the matching procedure in place, our analysis subsequently followed the respective earnings of persons with diabetes and their controls for a period of five years post-diagnosis. The findings are presented in terms of the mean changes in earnings for people with diabetes and their controls, that is, the difference between what people were earning at the point a diagnosis was obtained and their earnings five years later. We represent lost earnings for persons with diabetes by measuring the difference between mean changes in earnings for persons with diabetes and their controls. The difference between persons with diabetes and their controls is then calculated as a percentage of the earnings of controls in the year prior to diagnosis.

We stratified our results by gender, age bands (25-45 years; 46-55 years; 56-62 years) and earnings deciles, determined on the basis of earnings in the calendar year prior to diagnosis with diabetes. Stratification by gender is important to account for the different nature of labour market participation among men and women, whereas age-at-onset is important in terms of somatic and psychosocial outcomes related to diabetes. Likewise, we chose to stratify the findings by earnings deciles in recognition of the fact that socioeconomic status has a profound impact on the course of diabetes. We inflated all amounts to a 2014 price level using Statistics Denmark’s Statistikbanken.dk and converted the Danish Kroner prices into US Dollars using a conversion rate of 7.00 DKK per 1 USD using the official annual rate of exchange for 2016 as specified by the Inland Revenue Service (https://www.irs.gov/individuals/international-taxpayers/yearly-average-currency-exchange-rates). All statistical inferences reported are based on two-sample t-tests with the exception of interaction analysis to identify differences between men and women, which we examined using Chi-squared tests.

Results

During the study period, 91,090 individuals (50,133 men and 40,957 women) were registered as having newly diagnosed diabetes. The average annual earnings at baseline among these individuals was US $ 46,732 (See Table 1). The largest group at baseline are those individuals who had no registered earnings derived from wage labour in the calendar year up to diagnosis with diabetes (20.1% among men [See Table 2] and 36.6% among women [See Table 3]). Likewise, the largest proportion of participants categorised as having no earnings were identified in the age-range 56-62 years (23.8% among men and 43% among women). It is also clear that, taken as a whole, the earnings of men are significantly higher than those of women. As this indicates, there are quite extreme differences between men and women in terms of participation in the labour market and earnings, thus making it important to distinguish the two sexes when presenting our results.

The analysis revealed highly significant loss of earnings for people with diabetes when compared with people without diabetes across all three age groups. For the whole population of people with diabetes the relative loss of earnings in the five years after their diagnosis was $3,694 (US Dollars) among men and $924 among women: in the case of the former, the figure constitutes a loss of 8.01% of the annual earnings of controls in the calendar year prior to diagnosis with diabetes, whereas for women the equivalent figure was 3.03%. The highest overall mean loss of earnings was seen for the age group 25-45 years; $4,260 (8.96%) among men and $3,629 (10.57%) among women.

In addition to age and gender, the results also indicate the importance of baseline socioeconomic characteristics as a modifier of earnings after diagnosis with diabetes. In relative terms, it is the groups with the lowest earnings at baseline which appear to incur the greatest losses. This is particularly apparent in the 1st and 2nd earnings deciles in the youngest age group, where relative losses are exceptionally large for both men ($7,375: 122.22%) and women ($8,280: 244.49%). It is worth highlighting, however, that relative losses amongst the lowest earners are much less pronounced in the older age groups.

Although older age at diagnosis appears to attenuate the effect of diabetes on earnings, it is nonetheless true that, in the case of men, the differences between people with diabetes and their controls are significant for each earnings decile in the oldest age group. The same is not, however, true for women. Women in the oldest age group are, in fact, the only age-group as a whole where we do not observe statistically significant differences between people with diabetes and their controls.

Generally, analysis of the differences between men and women are less clear-cut. Overall, differences between men and women are statistically significant, and the degree of these differences also applies to all but the youngest age-group. There is, however, no discernible pattern in the different sub-groups with regards to significant differences between men and women.

In summary, our findings indicate that a diagnosis with diabetes has a significant impact on earnings, an impact which applies to both men and women and is particularly marked among the youngest and among those in the lowest earnings deciles. Although there are clear nominal differences between men and women, there is a good deal of similarity in the earning trends observed among both sexes. This is supported by the fact that interaction analyses only identified relatively few significant differences between men and women.

Conclusion

The results indicate that a diagnosis with diabetes reduces subsequent earnings to such an extent that there are observable and significant differences between people with diabetes and matched controls after five calendar years. Previous studies (e.g. [7, 11, 23] have found different effects of diabetes on wages. In one study, the impact of diabetes on wages was deemed modest and only applicable to men [24], whereas elsewhere a more profound impact of diabetes on wages was identified [25]. Some of this variation can, in part, be explained by the complexity of the problem, where a host of factors, e.g. diabetes type, duration, complications, individual self-management practices etc., may affect an individual’s earning capacity. Nonetheless, using robust population data, we believe our findings represent an important contribution to this literature, not least since we show that the observable and significant impact on earnings derived from a diagnosis of diabetes is already evident five years after diagnosis.

Age at onset has also been identified as a major factor in the wage differential between people with diabetes and the general population [11, 26]. Although our data do not directly address these questions, our findings provide support for the view that the impact on earnings differentials are, in relative terms, most severe among those who obtain their diagnosis between 25-45 years. The fact that we observe such relatively large differences between people with diabetes and their controls in this age-range can, in part, be accounted for on the basis that it is within this age-range that there is the greatest potential for growth in earnings. A number of individuals within this age-range will, for example, transition from full-time education to full-time employment and this may partly account for the larger relative losses. At the same time, it may also reflect the fact that this age group is likely to be the most complex in terms of their diabetes profile as at least 15% of cases in this age range are likely to be type 1 diabetes [27]. Likewise, we would anticipate that people diagnosed with type 2 diabetes at ≤ 45 years would generally be more likely to have individual characteristics, such as obesity, which could affect earning capacity independently of diabetes.

The loss of earnings for people with diabetes has previously been linked to increases in sickness absence, early retirement, diabetes-related disabilities and early mortality [28]. Data from Denmark regarding early retirement covering a broadly contemporaneous period, indicated that people with diabetes were significantly more likely to exit the labour market as a result of disability than individuals in the general population across all occupational groups [5]. Although it may seem intuitively implausible to believe that people with diabetes are affected by the condition in the first five years after diagnosis to the extent that it compels them to exit the labour market, previous studies have shown that the impact of diabetes on work disability already makes it mark in the first years after diagnosis [29].

This suggests that factors other than diabetes complications [15] also influence the loss of earnings among people with diabetes. People with type 2 diabetes may have developed complications prior to their diabetes diagnosis and the diagnosis may have followed a period of ill-health [30]. Individuals with newly diagnosed diabetes may also have a number of co-morbidities that, independent of diabetes and its symptoms, influence their ability to work [31, 32]. This finding accords with a recent study that reported that work disability among people with diabetes was already at levels higher than in the general population prior to a diagnosis of diabetes [29].

Even discounting the potential impact of diabetes complications and comorbid conditions, the challenges which accrue with a diagnosis of diabetes are potentially wide-ranging in the context of work life. Adopting diabetes self-management regimens which require continual actions throughout a day is potentially challenging and necessitates that self-management practices are adapted to accord with the demands of work life [33]. Work may also provide a further source of stress for people with diabetes [34] and given that stress is recognized as having a negative impact on diabetes self-management [35], people with diabetes may make compromises in both domains in order to achieve some level of balance between the two. This is supported by data which suggest that work productivity among people with diabetes may be reduced by as much as one hour per month from the point of diagnosis [7].

Diagnosis with a chronic disease may also be a watershed moment in a person’s life. Viewed from the perspective of psychological distress, the awareness of diabetes may increase sickness absence – ‘the labelling hypothesis’ [36]. It is interesting to note that Virtanen et al [37], while establishing that people with diabetes were more prone to all-cause work disability, also found that mental disorders constituted the greatest discrepancy to the general population.

Our findings support the view that earnings differentials attributable to onset of disease are greatest among the lower earners [38]. It would be wrong, however, to conclude that it is only the young with low earnings who feel the economic impact of a diabetes diagnosis. Although financial strain is most common among people with low earnings it can affect all socioeconomic classes [39] and the financial obligations associated with middle-age may only require minor losses in earnings before they become burdensome. Diabetes may affect savings of people who obtain their diagnosis in late middle-age, before they become eligible for retirement [13]. As such the implications on economic prosperity may impact on individuals long after they have exited the labour market.

While the results we provide point to a very clear case for the impact of a diagnosis with diabetes in adulthood on subsequent earnings, there are also reasons to urge caution when interpreting these findings. The system of civil registration in Denmark provides unique opportunities for the collation of population data, allowing for the application of methods such as propensity score matching. At the same time, registers are only as useful as the information they contain and are often limited by the information that they do not contain.

Much as the DNDR is a well-used and validated register, it is not able to distinguish between type 1 and type 2 diabetes. It has been suggested that distinguishing between type 1 and type 2 diabetes is essential when considering impact on labour market outcomes [40], not least because the majority of people with type 1 diabetes will have acquired the condition prior to entering the labour market. While the challenge of adapting well established self-management regimens in a working context may make the transition to work life a challenge for this group [12, 41], their situation can be characterized as qualitatively different to that of individuals who are first diagnosed in adult life. In this sense, the timing of diagnosis may be of more relevance on subsequent performance in the labour market than the type of diabetes. A further limitation is the lack of information about diabetes complications or comorbidities, when they are established modifiers of work related outcomes [2].

The choice of earnings as our marker of socioeconomic status is not without implications in regard to the final results. In the case of our propensity matching procedure, it was not possible to acquire a reliable measure for education and, to the extent to which education is a known moderator of health outcomes[42], this may be considered an important weakness of our study. This is compounded by the absence of data about lifestyle among our participants, since lifestyle is generally considered to be one of the main mechanisms linking educational level to health outcomes. Yet while we must acknowledge this weakness, we do not believe it represents a fatal flaw in our design. The use of earnings as our marker is in accord with the focus of our study and previous work has identified close accord between level of education and subsequent earnings.

The Danish context provides strength in relation to the breadth of the data studied but the context also imposes possible limitations with respect to the wider extrapolation of our findings. In contrast to many studies focusing on health and socioeconomic status, it is women who are, in relative terms, less affected by the impact of diabetes. This may, however, be partly accounted for by the levels of participation in the public sector workforce among women, where approximately half of the entire female labour force are employed. The equivalent figure for men is approximately 20%. Given that public sector wages are structured according to more or less fixed pay-scales, the potential for significant wage differentiation among women in Denmark is smaller than is the case for men.

The extensive welfare support available in Denmark means that people have access to benefits which buffer against the impact of lost earnings and thus may influence decision-making regarding participation in the labour market. There is relatively little formal employment protection, allowing employers greater freedom to hire and fire employees, in the wake of prolonged or continual sickness absences for example. The relative ease with which people can exit and re-enter the labour market in Denmark means that patterns of labour market transitions for people with chronic illness may be dynamic over time [16]. Our findings indicate a dramatic impact on earnings in the immediate aftermath of diagnosis with diabetes, but more research is required to determine how diabetes type, disease duration, self-management outcomes and the presence of complications and comorbidities may modify the earning potential of people with diabetes.

In summary, register data are an invaluable resource in identifying particular problems, but often less helpful with respect to what is causing problems and what can be done to address them. More work is now needed to apprehend the reasons why people with diabetes experience such a large relative loss of earnings in the wake of their diagnosis. Only with such knowledge can we begin to design and implement preventative strategies and resources that will enable people with diabetes to better maintain full, productive and financially rewarding work lives.

While there may be a number of mitigating factors making it difficult to determine who feels financial strain accruing from diagnosis with diabetes most keenly, the figures we present with respect to young people who are low earners are especially alarming. Although we do not know whether the relative losses observed in this population would continue beyond five years post-diagnosis, the losses experienced after five years already mark an economic disadvantage that could potentially affect an individual throughout their adult life.

This study presents a rather negative picture for people with diabetes of working age in terms of the impact that diagnosis has on their earning potential. The relative losses were greatest among the youngest and those with lower incomes, but more generally the data point to the period immediately after diagnosis with diabetes as one in which everyone is potentially vulnerable to financial strain.

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|  |  |  |
| --- | --- | --- |
|  | **Means\*** | **SD** |
|  | **People with diabetes** | **Controls** | **Difference** | **People with diabetes** | **Controls** | **P-value‡** |
| **Age** | 50.84 | 50.98 | -0.14 | 8.92 | 9.22 | 0.001 |
| **Male:****Female** | 55.0%:45.0% | 53.7%: 46.3% | 1.3% | 49.7% | 49.9% | 0.000 |
| **Income, USD, 2014 prices†** | 46,732 | 48,443 | -1,711 | 46,698 | 41,337 | <.0001 |
| **Unemployment, % of year†** | 6.70% | 6.34% | 0.36% | 19.39% | 18.88% | <.0001 |
| **N** | 91,090 | 91,090 | - | - | - | - |

Table 1: Descriptive statistics

\*Means on the sample of people whom we can follow for at least five calendar years after the date of diagnosis.

†Income and unemployment indicate the calendar year before the date of diagnosis.

‡The P-value is the probability that the mean income difference between PWDs and the controls is zero and is calculated using two-sample t-tests with an alpha value of 0.05.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **No. of observations** | **Mean earnings in year prior to diagnosis**\* | **Mean change in annual earnings 5 calendar years post-diagnosis**† | **Mean earnings loss among PWD relative to controls**‡ | **Lost earnings among PWD as % of mean earnings among controls at baseline** |  |
|  | **PWD** | **Controls** | **PWD** | **Controls** | **PWD** | **Controls** |  | **P-value**§ |
|  |  |  | **Mean** | **CI 95%** | **Mean** | **CI 95%** | **Mean** | **CI 95%** | **Mean** | **CI 95%** |  |  |
| **All Men** |
| *All* | 50,133 | 48,939 | 46,839 | 46,468 - 47,209 | 46,130 | 45,806 - 46,454 | -9,174 | -9,403 - -8,944 | -5,480 | -5,691 - -5,269 | -3,694 | -8.01% | <.0001 |
| *No earnings* | 10,066 | 8,594 | - | - | - | - | 2,877 | 2,682 - 3,071 | 4,328 | 4,068 - 4,588 | -1,451 | - | <.0001 |
| *Earnings, 1st decile* | 4,248 | 3,794 | 5,222 | 5,080 - 5,364 | 5,517 | 5,369 - 5,665 | 4,662 | 4,208 - 5,117 | 8,258 | 7,680 - 8,837 | -3,596 | -65.18% | <.0001 |
| *Earnings, 2nd decile* | 4,018 | 4,023 | 26,455 | 26,268 - 26,643 | 26,289 | 26,103 - 26,476 | -4,296 | -4,916 - -3,676 | 834 | 212 - 1,455 | -5,130 | -19.51% | <.0001 |
| *Earnings, 3rd decile* | 3,870 | 4,171 | 41,302 | 41,220 - 41,384 | 41,387 | 41,307 - 41,466 | -10,571 | -11,200 - -9,943 | -6,470 | -7,040 - -5,899 | -4,101 | -9.91% | <.0001 |
| *Earnings, 4th decile* | 3,862 | 4,179 | 47,803 | 47,758 - 47,848 | 47,807 | 47,763 - 47,850 | -12,339 | -12,941 - -11,737 | -8,391 | -8,941 - -7,842 | -3,948 | -8.26% | <.0001 |
| *Earnings, 5th decile* | 3,829 | 4,212 | 52,366 | 52,326 - 52,406 | 52,379 | 52,340 - 52,417 | -12,138 | -12,754 - -11,522 | -7,999 | -8,523 - -7,476 | -4,138 | -7.90% | <.0001 |
| *Earnings, 6th decile* | 3,851 | 4,191 | 57,038 | 56,993 - 57,083 | 57,044 | 57,001 - 57,087 | -12,165 | -12,816 - -11,514 | -8,999 | -9,555 - -8,443 | -3,166 | -5.55% | <.0001 |
| *Earnings, 7th decile* | 3,769 | 4,272 | 62,332 | 62,280 - 62,385 | 62,383 | 62,334 - 62,432 | -12,648 | -13,316 - -11,979 | -9,846 | -10,424 - -9,268 | -2,801 | -4.49% | <.0001 |
| *Earnings, 8th decile* | 3,908 | 4,132 | 69,317 | 69,238 - 69,396 | 69,369 | 69,292 - 69,446 | -14,232 | -14,972 - -13,492 | -10,404 | -11,025 - -9,782 | -3,828 | -5.52% | <.0001 |
| *Earnings, 9th decile* | 4,064 | 3,977 | 81,307 | 81,163 - 81,452 | 81,016 | 80,869 - 81,164 | -16,447 | -17,259 - -15,634 | -11,629 | -12,393 - -10,864 | -4,818 | -5.95% | <.0001 |
| *Earnings, 10th decile* | 4,648 | 3,394 | 133,136 | 131,481 - 134,791 | 124,763 | 123,033 - 126,494 | -29,990 | -31,531 - -28,449 | -22,188 | -23,939 - -20,438 | -7,802 | -6.25% | <.0001 |
| **Men Diagnosed between age 25 and 45** |
| *All* | 10,535 | 12,456 | 44,179 | 43,486 - 44,872 | 47,557 | 46,928 - 48,185 | -999 | -1,435 - -563 | 3,261 | 2,872 - 3,650 | -4,260 | -8.96% | <.0001 |
| *No earnings* | 1,805 | 1,681 | - | - | - | - | 6,280 | 5,600 - 6,959 | 10,205 | 9,339 - 11,072 | -3,926 | - | <.0001 |
| *Earnings, 1st decile* | 1,057 | 1,059 | 5,604 | 5,319 - 5,888 | 6,035 | 5,754 - 6,315 | 10,768 | 9,664 - 11,871 | 18,143 | 16,794 - 19,491 | -7,375 | -122.22% | <.0001 |
| *Earnings, 2nd decile* | 1,028 | 1,166 | 26,546 | 26,173 - 26,919 | 26,286 | 25,938 - 26,633 | 2,905 | 1,613 - 4,197 | 10,070 | 8,952 - 11,188 | -7,165 | -27.26% | <.0001 |
| *Earnings, 3rd decile* | 954 | 1,169 | 41,256 | 41,093 - 41,420 | 41,110 | 40,958 - 41,262 | -2,429 | -3,726 - -1,132 | 2,129 | 1,130 - 3,127 | -4,558 | -11.09% | <.0001 |
| *Earnings, 4th decile* | 870 | 1,102 | 47,734 | 47,639 - 47,828 | 47,869 | 47,784 - 47,954 | -4,027 | -5,070 - -2,984 | -201 | -1,005 - 603 | -3,826 | -7.99% | <.0001 |
| *Earnings, 5th decile* | 850 | 1,157 | 52,410 | 52,325 - 52,494 | 52,443 | 52,370 - 52,516 | -4,312 | -5,398 - -3,226 | 450 | -301 - 1,202 | -4,762 | -9.08% | <.0001 |
| *Earnings, 6th decile* | 905 | 1,143 | 57,057 | 56,963 - 57,150 | 57,046 | 56,964 - 57,127 | -4,745 | -5,965 - -3,526 | -561 | -1,371 - 248 | -4,184 | -7.33% | 0.007 |
| *Earnings, 7th decile* | 805 | 1,067 | 62,280 | 62,165 - 62,395 | 62,356 | 62,255 - 62,457 | -3,554 | -4,781 - -2,326 | -1,448 | -2,358 - -537 | -2,106 | -3.38% | <.0001 |
| *Earnings, 8th decile* | 818 | 1,105 | 69,224 | 69,053 - 69,395 | 69,527 | 69,380 - 69,674 | -6,443 | -7,696 - -5,191 | -1,557 | -2,499 - -615 | -4,886 | -7.03% | <.0001 |
| *Earnings, 9th decile* | 745 | 985 | 81,071 | 80,738 - 81,404 | 81,001 | 80,707 - 81,295 | -6,685 | -8,353 - -5,016 | -1,428 | -2,716 - -140 | -5,256 | -6.49% | <.0001 |
| *Earnings, 10th decile* | 698 | 822 | 126,046 | 122,412 - 129,680 | 128,331 | 124,712 - 131,950 | -13,375 | -17,107 - -9,643 | -6,037 | -9,508 - -2,566 | -7,338 | -5.72% | 0.005 |
| **Men Diagnosed between age 46 and 55** |
| *All* | 18,615 | 16,893 | 50,166 | 49,553 - 50,778 | 48,983 | 48,435 - 49,530 | -5,872 | -6,201 - -5,544 | -2,407 | -2,704 - -2,111 | -3,465 | -7.07% | <.0001 |
| *No earnings* | 3,274 | 2,635 | - | - | - | - | 3,586 | 3,216 - 3,956 | 5,246 | 4,738 - 5,755 | -1,660 | - | <.0001 |
| *Earnings, 1st decile* | 1,364 | 1,029 | 5,272 | 5,020 - 5,524 | 5,669 | 5,380 - 5,959 | 5,617 | 4,803 - 6,431 | 9,559 | 8,481 - 10,638 | -3,942 | -69.54% | <.0001 |
| *Earnings, 2nd decile* | 1,367 | 1,266 | 26,673 | 26,358 - 26,988 | 26,511 | 26,178 - 26,843 | -903 | -1,912 - 106 | 3,421 | 2,402 - 4,440 | -4,324 | -16.31% | <.0001 |
| *Earnings, 3rd decile* | 1,442 | 1,380 | 41,303 | 41,169 - 41,437 | 41,465 | 41,326 - 41,604 | -6,680 | -7,572 - -5,788 | -1,907 | -2,698 - -1,116 | -4,772 | -11.51% | <.0001 |
| *Earnings, 4th decile* | 1,438 | 1,463 | 47,776 | 47,702 - 47,851 | 47,786 | 47,711 - 47,861 | -7,421 | -8,277 - -6,565 | -2,922 | -3,639 - -2,205 | -4,499 | -9.41% | <.0001 |
| *Earnings, 5th decile* | 1,540 | 1,552 | 52,358 | 52,295 - 52,421 | 52,378 | 52,314 - 52,442 | -7,299 | -8,048 - -6,550 | -3,800 | -4,368 - -3,233 | -3,499 | -6.68% | <.0001 |
| *Earnings, 6th decile* | 1,503 | 1,572 | 57,043 | 56,971 - 57,115 | 56,987 | 56,917 - 57,057 | -7,345 | -8,124 - -6,567 | -4,643 | -5,263 - -4,022 | -2,703 | -4.74% | <.0001 |
| *Earnings, 7th decile* | 1,518 | 1,624 | 62,359 | 62,277 - 62,441 | 62,380 | 62,300 - 62,460 | -7,672 | -8,510 - -6,834 | -4,660 | -5,275 - -4,045 | -3,012 | -4.83% | <.0001 |
| *Earnings, 8th decile* | 1,609 | 1,567 | 69,325 | 69,202 - 69,448 | 69,321 | 69,196 - 69,447 | -8,220 | -9,180 - -7,260 | -5,556 | -6,255 - -4,858 | -2,664 | -3.84% | <.0001 |
| *Earnings, 9th decile* | 1,643 | 1,548 | 81,239 | 81,011 - 81,467 | 80,929 | 80,692 - 81,165 | -10,563 | -11,598 - -9,528 | -7,285 | -8,262 - -6,308 | -3,278 | -4.05% | <.0001 |
| *Earnings, 10th decile* | 1,917 | 1,257 | 133,474 | 130,951 - 135,997 | 123,194 | 120,237 - 126,150 | -22,261 | -24,341 - -20,180 | -16,711 | -19,140 - -14,282 | -5,550 | -4.50% | 0.001 |
| **Men Diagnosed between 56 and 61** |
| *All* | 20,983 | 19,590 | 45,223 | 44,619 - 45,827 | 42,764 | 42,245 - 43,282 | -16,207 | -16,595 - -15,818 | -13,688 | -14,043 - -13,332 | -2,519 | -5.89% | <.0001 |
| *No earnings* | 4,987 | 4,278 | - | - | - | - | 1,180 | 1,009 - 1,350 | 1,453 | 1,254 - 1,651 | -273 | - | 0.041 |
| *Earnings, 1st decile* | 1,827 | 1,706 | 4,964 | 4,748 - 5,181 | 5,104 | 4,888 - 5,319 | 417 | -90 - 925 | 1,338 | 801 - 1,875 | -921 | -18.04% | 0.015 |
| *Earnings, 2nd decile* | 1,623 | 1,591 | 26,215 | 25,916 - 26,514 | 26,116 | 25,820 - 26,413 | -11,715 | -12,574 - -10,856 | -7,994 | -8,885 - -7,103 | -3,721 | -14.25% | <.0001 |
| *Earnings, 3rd decile* | 1,474 | 1,622 | 41,330 | 41,195 - 41,465 | 41,519 | 41,392 - 41,646 | -19,648 | -20,595 - -18,701 | -16,548 | -17,430 - -15,667 | -3,100 | -7.47% | <.0001 |
| *Earnings, 4th decile* | 1,554 | 1,614 | 47,866 | 47,795 - 47,936 | 47,783 | 47,713 - 47,853 | -21,544 | -22,499 - -20,589 | -18,941 | -19,870 - -18,012 | -2,603 | -5.45% | <.0001 |
| *Earnings, 5th decile* | 1,439 | 1,503 | 52,348 | 52,283 - 52,413 | 52,330 | 52,266 - 52,395 | -21,939 | -23,042 - -20,836 | -18,840 | -19,836 - -17,845 | -3,099 | -5.92% | <.0001 |
| *Earnings, 6th decile* | 1,443 | 1,476 | 57,021 | 56,947 - 57,096 | 57,102 | 57,028 - 57,176 | -21,839 | -23,013 - -20,665 | -20,174 | -21,243 - -19,105 | -1,665 | -2.92% | 0.040 |
| *Earnings, 7th decile* | 1,446 | 1,581 | 62,333 | 62,248 - 62,419 | 62,404 | 62,325 - 62,483 | -22,934 | -24,085 - -21,782 | -20,841 | -21,933 - -19,749 | -2,092 | -3.35% | 0.010 |
| *Earnings, 8th decile* | 1,481 | 1,460 | 69,359 | 69,232 - 69,487 | 69,300 | 69,170 - 69,429 | -25,065 | -26,391 - -23,739 | -22,301 | -23,498 -21,104 | -2,764 | -3.99% | 0.002 |
| *Earnings, 9th decile* | 1,676 | 1,444 | 81,479 | 81,253 - 81,705 | 81,121 | 80,873 - 81,368 | -26,554 | -27,931 - -25,177 | -23,244 | -24,647 - -21,840 | -3,310 | -4.08% | 0.001 |
| *Earnings, 10th decile* | 2,033 | 1,315 | 135,252 | 132,590 - 137,913 | 124,034 | 121,417 - 126,651 | -42,982 | -45,499 - -40,465 | -37,519 | -40,537 - 34,502 | -5,463 | -4.40% | 0.006 |

Table : Comparison of mean income among men in calendar year before diabetes, mean income change 5 calendar years post-diagnosis and mean loss of income 5 calendar years post-diagnosis. All amounts have been converted from DKK to USD (7.00:1.00) using the official annual rate of exchange for 2016 as specified by the US Inland Revenue Service. \*The mean income in the calendar year before PWDs were diagnosed. †Mean income in the first five calendar years after the PWD's were diagnosed minus their income in the calendar year before the diagnosis. ‡The mean loss of income is the difference in mean nominal income changes 5 years post-diagnosis between PWD's and their controls. §The p-value is the probability of equal mean between PWDs and the controls and is calculated using two-sample t-tests.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **No. of observations** | **Mean earnings in year prior to diagnosis**\* | **Mean change in annual earnings 5 calendar years post-diagnosis**† | **Mean earnings loss among PWD relative to controls**‡ | **Lost earnings among PWD as % of mean earnings among controls at baseline** |  |  |
|  | **PWD** | **Controls** | **PWD** | **Controls** | **PWD** | **Controls** |  | **P-value**§ | **P-value, men vs. women+** |
|  |  |  | **Mean** | **CI 95%** | **Mean** | **CI 95%** | **Mean** | **CI 95%** | **Mean** | **CI 95%** |  |  |  |
| **All Women** |
| *All* | 40,957 | 42,151 | 26,071 | 25,816 - 26,325 | 30,449 | 30,198 - 30,701 | -4,427 | -4,586 - -4,267 | -3,503 | -3,666 - -3,340 | -924 | -3.03% | <.0001 | <0.0001 |
| *No earnings* | 14,151 | 11,187 | - | - | - | - | 2,023 | 1,906 - 2,140 | 2,782 | 2,617 - 2,947 | -759 | - | <.0001 | 0.8072 |
| *Earnings, 1st decile* | 3,003 | 2,774 | 2,936 | 2,840 - 3,032 | 3,164 | 3,064 - 3,264 | 4,898 | 4,453 - 5,343 | 6,958 | 6,406 - 7,509 | -2,059 | -65.09% | <.0001 | 0.0042 |
| *Earnings, 2nd decile* | 2,817 | 2,960 | 15,646 | 15,497 - 15,794 | 15,907 | 15,758 - 16,055 | 578 | 5 - 1,151 | 4,167 | 3,519 - 4,816 | -3,589 | -22.57% | <.0001 | 0.0183 |
| *Earnings, 3rd decile* | 2,631 | 3,146 | 27,665 | 27,556 - 27,774 | 27,759 | 27,660 - 27,858 | -6,153 | -6,759 - -5,548 | -4,264 | -4,819 - -3,708 | -1,889 | -6.81% | 0.0002 | 0.0004 |
| *Earnings, 4th decile* | 2,621 | 3,156 | 35,307 | 35,247 - 35,368 | 35,273 | 35,218 - 35,328 | -9,049 | -9,654 - -8,444 | -7,494 | -8,036 - -6,952 | -1,554 | -4.41% | <.0001 | <0.0001 |
| *Earnings, 5th decile* | 2,753 | 3,024 | 40,200 | 40,152 - 40,249 | 40,144 | 40,099 - 40,189 | -10,402 | -10,991 - -9,813 | -7,420 | -7,968 - -6,872 | -2,982 | -7.43% | <.0001 | 0.0530 |
| *Earnings, 6th decile* | 2,647 | 3,130 | 44,194 | 44,151 - 44,236 | 44,205 | 44,166 - 44,244 | -10,922 | -11,549 - -10,295 | -8,191 | -8,739 - -7,642 | -2,731 | -6.18% | <.0001 | 0.4923 |
| *Earnings, 7th decile* | 2,666 | 3,111 | 48,372 | 48,322 - 48,421 | 48,377 | 48,331 - 48,423 | -10,710 | -11,342 - -10,078 | -8,147 | -8,714 - -7,579 | -2,563 | -5.30% | <.0001 | 0.7129 |
| *Earnings, 8th decile* | 2,600 | 3,177 | 53,198 | 53,138 - 53,257 | 53,271 | 53,218 - 53,325 | -10,405 | -11,063 - -9,747 | -8,899 | -9,491 - -8,307 | -1,507 | -2.83% | 0.0009 | 0.0010 |
| *Earnings, 9th decile* | 2,498 | 3,279 | 59,687 | 59,598 - 59,776 | 59,820 | 59,741 - 59,899 | -11,993 | -12,774 - -11,212 | -9,590 | -10,199 - -8,981 | -2,403 | -4.02% | <.0001 | 0.0035 |
| *Earnings, 10th decile* | 2,570 | 3,207 | 79,977 | 79,051- 80,903 | 78,986 | 78,124 - 79,847 | -16,833 | -17,947 - -15,719 | -12,543 | -13,494 - -11,592 | -4,290 | -5.43% | <.0001 | 0.0394 |
| **Women Diagnosed between age 25 and 45** |
| *All* | 11,637 | 9,690 | 28,349 | 27,904 - 28,795 | 34,344 | 33,832 - 34,856 | 422 | 139 - 705 | 4,050 | 3,697 - 4,404 | -3,629 | -10.57% | <.0001 | 0.0891 |
| *No earnings* | 2,965 | 1,543 | - | - | - | - | 5,752 | 5,354 - 6,151 | 11,351 | 10,579 - 12,124 | -5,599 | - | <.0001 | 0.0132 |
| *Earnings, 1st decile* | 951 | 672 | 3,060 | 2,893 - 3,228 | 3,386 | 3,187 - 3,585 | 10,782 | 9,802 - 11,762 | 19,062 | 17,661 - 20,463 | -8,280 | -244.49% | <.0001 | 0.4647 |
| *Earnings, 2nd decile* | 1,060 | 982 | 15,734 | 15,489 - 15,979 | 15,688 | 15,428 - 15,948 | 7,346 | 6,373 - 8,320 | 14,372 | 13,299 - 15,445 | -7,026 | -44.79% | <.0001 | 0.9029 |
| *Earnings, 3rd decile* | 928 | 790 | 27,639 | 27,457 - 27,822 | 27,842 | 27,642 - 28,042 | 525 | -468 - 1,517 | 5,764 | 4,707 - 6,821 | -5,239 | -18.82% | <.0001 | 0.5394 |
| *Earnings, 4th decile* | 888 | 790 | 35,324 | 35,220 - 35,429 | 35,307 | 35,197 - 35,417 | -3,000 | -3,945 - -2,055 | -143 | -1,080 - 794 | -2,857 | -8.09% | <.0001 | 0.3091 |
| *Earnings, 5th decile* | 973 | 851 | 40,237 | 40,156 - 40,318 | 40,169 | 40,084 - 40,255 | -5,406 | -6,263 - -4,550 | -706 | -1,504 - 91 | -4,700 | -11.70% | <.0001 | 0.9445 |
| *Earnings, 6th decile* | 899 | 838 | 44,193 | 44,119 - 44,267 | 44,245 | 44,171 - 44,320 | -5,935 | -6,782 - -5,087 | -1,100 | -1,776 - -423 | -4,835 | -10.93% | <.0001 | 0.4771 |
| *Earnings, 7th decile* | 879 | 853 | 48,356 | 48,271 - 48,441 | 48,358 | 48,269 - 48,447 | -5,582 | -6,480 - -4,685 | -1,376 | -2,132 - -620 | -4,206 | -8.70% | <.0001 | 0.0296 |
| *Earnings, 8th decile* | 803 | 857 | 53,147 | 53,039 - 53,256 | 53,277 | 53,171 - 53,383 | -4,302 | -5,128 - -3,477 | -1,799 | -2,589 - -1,009 | -2,503 | -4.70% | <.0001 | 0.0153 |
| *Earnings, 9th decile* | 676 | 751 | 59,445 | 59,277 - 59,614 | 59,583 | 59,418 - 59,748 | -5,399 | -6,617 - -4,182 | -2,624 | -3,532 - -1,716 | -2,775 | -4.66% | 0.0003 | 0.0627 |
| *Earnings, 10th decile* | 615 | 763 | 79,756 | 78,163 - 81,349 | 81,664 | 79,438 - 83,890 | -8,785 | -10,611 - -6,960 | -4,484 | -6,709 - -2,258 | -4,302 | -5.27% | 0.0034 | 0.3313 |
| **Women Diagnosed between age 46 and 55** |
| *All* | 13,404 | 13,607 | 28,474 | 28,020 - 28,929 | 35,197 | 34,756 - 35,638 | -2,588 | -2,826 - -2,350 | -747 | -975 - -519 | -1,841 | -5.23% | <.0001 | <0.0001 |
| *No earnings* | 4,349 | 2,787 | - | - | - | - | 1,900 | 1,690 - 2,110 | 3,348 | 3,008 - 3,687 | -1,448 | - | <.0001 | 0.5461 |
| *Earnings, 1st decile* | 846 | 679 | 2,952 | 2,767 - 3,136 | 3,083 | 2,878 - 3,287 | 5,232 | 4,414 - 6,050 | 8,770 | 7,693 - 9,846 | -3,538 | -114.77% | <.0001 | 0.6898 |
| *Earnings, 2nd decile* | 790 | 803 | 15,625 | 15,343 - 15,906 | 16,064 | 15,778 - 16,350 | 1,895 | 857 - 2,934 | 7,282 | 6,028 - 8,536 | -5,387 | -33.53% | <.0001 | 0.3578 |
| *Earnings, 3rd decile* | 824 | 1,032 | 27,777 | 27,584 - 27,970 | 27,842 | 27,667 - 28,016 | -3,699 | -4,702 - -2,696 | -598 | -1,412 - 215 | -3,101 | -11.14% | <.0001 | 0.0780 |
| *Earnings, 4th decile* | 881 | 1,101 | 35,342 | 35,237 - 35,448 | 35,273 | 35,178 - 35,369 | -5,791 | -6,713 - -4,868 | -2,043 | -2,732 - -1,353 | -3,748 | -10.62% | <.0001 | 0.3811 |
| *Earnings, 5th decile* | 897 | 1,068 | 40,163 | 40,079 - 40,247 | 40,151 | 40,076 - 40,226 | -5,989 | -6,868 - -5,111 | -1,698 | -2,387 - -1,009 | -4,291 | -10.69% | <.0001 | 0.2985 |
| *Earnings, 6th decile* | 949 | 1,135 | 44,226 | 44,155 - 44,297 | 44,179 | 44,113 - 44,244 | -6,325 | -7,230 - -5,419 | -2,339 | -2,958 - -1,719 | -3,986 | -9.02% | <.0001 | 0.0965 |
| *Earnings, 7th decile* | 919 | 1,195 | 48,418 | 48,334 - 48,502 | 48,413 | 48,338 - 48,487 | -6,503 | -7,399 - -5,607 | -3,179 | -3,808 - -2,550 | -3,324 | -6.87% | <.0001 | 0.6961 |
| *Earnings, 8th decile* | 979 | 1,195 | 53,247 | 53,151 - 53,343 | 53,312 | 53,227 - 53,397 | -6,481 | -7,386 - -5,576 | -3,755 | -4,436 - -3,073 | -2,726 | -5.11% | <.0001 | 0.9446 |
| *Earnings, 9th decile* | 924 | 1,277 | 59,806 | 59,660 - 59,952 | 59,958 | 59,831 - 60,084 | -6,049 | -6,997 - -5,102 | -3,636 | -4,230 - -3,042 | -2,413 | -4.02% | <.0001 | 0.4128 |
| *Earnings, 10th decile* | 1,046 | 1,335 | 79,278 | 78,063 - 80,492 | 78,813 | 77,519 - 80,107 | -10,933 | -12,331 - -9,535 | -8,265 | -9,341 - -7,189 | -2,668 | -3.39% | 0.0030 | 0.2172 |
| **Women Diagnosed between age 56 and 61** |
| *All* | 15,916 | 18,854 | 22,381 | 21,966 - 22,795 | 25,021 | 24,655 - 25,388 | -9,521 | -9,794 - -9,248 | -9,375 | -9,617 - -9,132 | -146 | -0.58% | 0.4331 | <0.0001 |
| *No earnings* | 6,837 | 6,857 | - | - | - | - | 484 | 407 - 562 | 624 | 517 - 731 | -140 | - | 0.0388 | 0.3353 |
| *Earnings, 1st decile* | 1,206 | 1,423 | 2,828 | 2,677 - 2,979 | 3,098 | 2,957 - 3,239 | 24 | -348 - 396 | 377 | -10 - 763 | -353 | -11.39% | 0.1971 | 0.2713 |
| *Earnings, 2nd decile* | 967 | 1,175 | 15,567 | 15,317 - 15,816 | 15,982 | 15,748 - 16,215 | -7,917 | -8,583 - -7,251 | -6,490 | -7,165 - -5,814 | -1,428 | -8.93% | 0.0032 | 0.0112 |
| *Earnings, 3rd decile* | 879 | 1,324 | 27,588 | 27,397 - 27,778 | 27,645 | 27,494 - 27,796 | -15,504 | -16,338 - -14,669 | -13,104 | -13,822 - -12,387 | -2,399 | -8.68% | <.0001 | 0.4669 |
| *Earnings, 4th decile* | 852 | 1,265 | 35,253 | 35,149 - 35,358 | 35,252 | 35,167 - 35,338 | -18,722 | -19,694 - -17,749 | -16,830 | -17,657 - -16,004 | -1,892 | -5.37% | 0.0037 | 0.4946 |
| *Earnings, 5th decile* | 883 | 1,105 | 40,198 | 40,111 - 40,285 | 40,117 | 40,041 - 40,192 | -20,390 | -21,417 - -19,362 | -18,121 | -19,018 - -17,224 | -2,269 | -5.66% | <.0001 | 0.4552 |
| *Earnings, 6th decile* | 799 | 1,157 | 44,156 | 44,079 - 44,233 | 44,202 | 44,137 - 44,267 | -21,993 | -23,184 - -20,803 | -19,067 | -20,053 - -18,082 | -2,926 | -6.62% | 0.0002 | 0.3088 |
| *Earnings, 7th decile* | 868 | 1,063 | 48,339 | 48,252 - 48,426 | 48,353 | 48,275 - 48,430 | -20,357 | -21,553 - -19,160 | -19,164 | -20,268 - -18,059 | -1,193 | -2.47% | 0.1507 | 0.4649 |
| *Earnings, 8th decile* | 818 | 1,125 | 53,188 | 53,080 - 53,296 | 53,224 | 53,135 - 53,312 | -21,094 | -22,420 - -19,767 | -19,771 | -20,903 - -18,638 | -1,323 | -2.49% | 0.1368 | 0.3025 |
| *Earnings, 9th decile* | 898 | 1,251 | 59,747 | 59,596 - 59,897 | 59,822 | 59,692 - 59,952 | -23,071 | -24,527 - -21,616 | -19,850 | -21,019 - -18,681 | -3,221 | -5.39% | 0.0007 | 0.9542 |
| *Earnings, 10th decile* | 909 | 1,109 | 80,932 | 78,995 - 82,869 | 77,351 | 76,159 - 78,544 | -29,067 | -31,266 - -26,868 | -23,238 | -24,948 - -21,528 | -5,829 | -7.54% | <.0001 | 0.9081 |

**Table 3: Comparison of mean income among women in calendar year before diabetes, mean income change 5 calendar years post-diagnosis and mean loss of income 5 calendar years post-diagnosis.**

All amounts have been converted from DKK to USD (7.00:1.00) using the official annual rate of exchange for 2016 as specified by the US Inland Revenue Service. \*The mean income in the calendar year before PWDs were diagnosed. †Mean income in the first five calendar years after the PWD's were diagnosed minus their income in the calendar year before the diagnosis. ‡The mean loss of income is the difference in mean nominal income changes 5 years post-diagnosis between PWD's and their controls. §The p-value is the probability of equal mean between PWDs and the controls and is calculated using two-sample t-tests. + The p-value is the probability that the differences between men and women in terms of relative foregone earnings are non-random and was calculated using Chi squared tests.