

Diabetes mellitus and work participation

Dunya Tomic¹, Karen Walker-Bone¹, Tessa Keegel¹, Ella Zomer², Sophia Zoungas^{1,2} & Dianna J. Magliano^{1,2,3}✉

Abstract

Work participation is beneficial for health. Diabetes mellitus is highly prevalent among adults, and although it poses a substantial healthcare cost burden, the true burden might be greater than is currently appreciated through effects on work participation. This Review summarizes the evidence regarding the effect of diabetes mellitus on paid employment. Several studies report increased risks of unemployment, early retirement and productivity loss among those with diabetes mellitus. The presence of diabetes mellitus complications and comorbidities probably further decreases work participation. Studies of workplace interventions demonstrate that work ability can be improved in people with diabetes mellitus. However, most existing research does not consider work characteristics (for example, type of work and working hours) in diabetes mellitus management. Whether diabetes mellitus itself increases occupational injury risk is unclear, with conflicting results reported. Most studies were cross-sectional and limited by use of self-reported diabetes mellitus and outcome measures, without consideration of the type of diabetes mellitus. Guidance on diabetes mellitus and employment has, to date, not been strongly grounded in evidence. Detailed research exploring factors implicated in work outcomes for people with diabetes mellitus, including age, sex, occupation and diabetes mellitus type, is needed to inform policy and support sustainable employment for those with diabetes mellitus.

Sections

Introduction

Work participation

Productivity

Complications, comorbidities and work ability

Effect of workplace interventions in people with diabetes mellitus

Effect of work characteristics on diabetes mellitus management

Occupational injury

Diabetes mellitus self-management in the workplace

Guidelines and recommendations

Conclusions

¹Monash Centre for Occupational and Environmental Health, School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia. ²School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia. ³Diabetes and Population Health, Baker Heart and Diabetes Institute, Melbourne, Victoria, Australia. ✉e-mail: Dianna.Magliano@baker.edu.au

Key points

- Diabetes mellitus is associated with a substantial indirect cost burden in terms of reduced employment and productivity loss; however, the relationship between diabetes mellitus and work participation is under-researched.
- Studies report increased risk of unemployment, early retirement, absenteeism and presenteeism in people with diabetes mellitus, with some reporting benefits of workplace interventions on productivity and glycaemic control.
- Evidence regarding diabetes mellitus self-management in the workplace, the effect of work characteristics on diabetes mellitus management, occupational injuries, workplace diabetes mellitus distress and workplace diabetes mellitus stigma is inconclusive.
- Most studies of work participation were cross-sectional in nature, included all individuals with diabetes mellitus without stratifying by type, and used self-reported diagnosis and self-reported work outcome measures.
- Future research on diabetes mellitus and work participation should stratify by age, sex, diabetes mellitus type and occupation, as current evidence lacks disaggregation, which limits development of tailored support and policies.
- Current guidelines show limited integration of evidence and should be updated regularly as new evidence emerges on effective strategies for secure and productive work with a diagnosis of diabetes mellitus.

Introduction

Participation in paid employment is good for health. In addition to financial independence, employment bridges socioeconomic inequities and provides status in society and purpose to individuals¹. Furthermore, unemployment is associated with reduced mental health², increased pain³, increased social care needs⁴ and a reduction of life expectancy by 5–10 years⁵. Diabetes mellitus is one of the major public health challenges of the twenty-first century; the global prevalence among those aged 20–64 years was 9.3% in 2024 and is projected to increase to 10.6% by 2050 (ref. 6). The direct healthcare costs from diabetes mellitus are already high; however, there are also notable indirect costs attributable to reduced labour force participation and/or productivity loss, which, according to 2022 estimates, might have cost US\$28.3–35.8 billion in the USA alone⁷.

Despite this substantial burden, the relationship between work participation and diabetes mellitus is understudied and infrequently considered. In the available literature, just three systematic reviews have explored work participation, absenteeism and presenteeism in people with diabetes mellitus^{8–10}, with the most recent of these published in 2019 (ref. 10). Since then, research has emerged on topics such as workplace interventions to improve glucose control¹¹ and the effect of work characteristics on diabetes mellitus management^{12,13}. Developments in treatment and technologies, such as continuous glucose monitoring (CGM) and insulin pumps, could also improve work participation¹⁴. Moreover, the shift towards remote and hybrid working arrangements has delivered benefits for many workers' productivity

and health, but studies have not yet looked at the effects in people with diabetes mellitus^{15,16}.

Therefore, this Review aimed to comprehensively summarize the contemporary evidence about participation in paid work in people with a diagnosis of diabetes mellitus, highlighting gaps in the evidence base. To provide a structured overview, we mapped outcomes reported across included studies into key thematic areas: work participation; productivity; complications, comorbidities and work ability; effect of workplace interventions in people with diabetes mellitus; effect of work characteristics on diabetes mellitus management; occupational injury; diabetes mellitus self-management in the workplace; and guidelines and recommendations. These thematic areas were identified by mapping reported outcomes across all included studies and grouping them into conceptually related domains, capturing both frequently reported metrics and broader components relevant to work participation in people with diabetes mellitus. Given that most of the literature on this topic does not specify the type of diabetes mellitus, the term is used here to refer to all types unless otherwise specified.

Work participation

The effect of diabetes mellitus on work participation often begins well before adulthood, as young people navigate education and early career decisions. For example, children with type 1 diabetes mellitus (T1DM) might experience differences in educational attainment compared with their peers^{17,18}, owing to factors such as reduced school attendance, which shapes subsequent career opportunities. In addition, people with diabetes mellitus might self-select into certain occupations, avoiding careers perceived as incompatible with their condition (such as military or transport roles) and that might have restrictions on whether people who use insulin can be employed in those roles. A study from the Netherlands found that unemployment levels were similar in people with or without diabetes mellitus aged 20–34 years, but suggested that this finding might reflect such early career self-selection¹⁹.

Employment

Most studies suggest that diabetes mellitus is associated with reduced levels of employment. However, estimated effect sizes and outcome measures vary substantially (see Table 1 for a summary of methodological limitations and sources of bias). The 2019 systematic review by Pedron et al.⁹ identified 16 studies exploring employment as an outcome, all of which showed reduced employment in people with diabetes mellitus. However, only three of these studies provided risk estimates in the form of odds ratios (ORs)^{20–22}; all found reduced odds of employment for people with diabetes mellitus, with adjusted ORs varying from 0.48 to 0.82 by population. Of the 13 studies from the Pedron et al. review that did not report ORs, effect estimates were presented as marginal effects, probit or logit coefficients, treatment effects or risk differences. Twelve of these studies reported negative associations between diabetes mellitus and employment^{23–34}, including two only in men^{30,31}, two only for those with type 2 diabetes mellitus (T2DM)^{32,33} and one only for those aged 45–64 years³⁴. Meanwhile, one study reported a positive association for women with T1DM but negative associations for both sexes with T2DM³⁵. In a more recent cross-sectional analysis (2020) from South Korea, T2DM reduced the likelihood of employment in women but not in men; however, this finding was based on a sample size of only 370 individuals with T2DM³⁶. No other studies published since the Pedron et al. review were identified that specifically examined employment rather than unemployment as an outcome.

Table 1 | Common limitations and sources of bias

Outcome	Included study designs	Common limitations and sources of bias
Employment	Cross-sectional, cohort, registry-based	Predominantly cross-sectional designs, variable outcome definitions (employment versus unemployment, minimum duration, health reasons), inconsistent adjustment for confounders, reliance on self-reported diabetes mellitus status, limited stratification by sex, complications or diabetes mellitus type, work factors not considered
Early retirement	Cross-sectional, cohort, registry-based	Variable outcome definitions (age, health reasons, follow-up duration), small number of studies, inconsistent adjustment for confounders, no stratification by diabetes mellitus type or complications, only two studies stratified by sex, reasons for early retirement insufficiently explored, all studies from high-income countries, work factors not considered
Disability pension, return to work, working life expectancy	Cross-sectional, cohort, registry-based	Variable outcome definitions (duration, comparator group for disability pension), small number of studies, inconsistent adjustment for confounders, limited differentiation by diabetes mellitus type or sex, complications and work factors not considered
Absenteeism and presenteeism	Cross-sectional, cohort, registry-based	Highly heterogeneous outcome definitions and measurement tools, few validated instruments used (only one study with WPAI), reliance on self-report in most studies, small sample sizes, cultural and workplace factors influencing sickness absence rarely considered, limited stratification by sex, diabetes mellitus type or complications
Other measures of productivity	Population-level life table and mathematical modelling	Modelled rather than observed outcomes, sensitive to assumptions (workforce participation, productivity levels, retirement age, mortality), variable inclusion of absenteeism, presenteeism and workforce participation, limited stratification by diabetes mellitus type, generalizability affected by economic context and healthcare systems
Effect of complications and comorbidities on work ability	Cross-sectional, cohort, registry-based	Heterogeneous outcome definitions (particularly for presenteeism), reliance on self-reported measures, small number of studies, limited adjustment for confounders, complications and comorbidities often considered individually rather than jointly, few stratified analyses by sex or diabetes mellitus type, all studies from high-income countries
Effect of workplace interventions	Non-randomized controlled trials, cohort, registry-based, RCT	Predominantly small studies with short follow-up, lack of control groups, only one RCT, reliance on self-reported outcomes (especially absenteeism and presenteeism), workplace characteristics rarely considered, selection bias owing to voluntary participation, all studies from high-income countries
Effect of work characteristics on diabetes mellitus management	Cross-sectional, cohort	Small number of studies, heterogeneous measures of work characteristics, limited adjustment for confounders, reliance on self-reported outcomes, few stratified analyses by sex or diabetes mellitus type, occupational differences often described but not statistically compared, all evidence from high-income countries
Occupational injury	Cross-sectional, cohort, case-control	Heterogeneous outcome definitions (overall versus specific injury types), reliance on self-reported outcomes, small sample sizes, limited adjustment for confounders, no differentiation by diabetes mellitus type, occupational characteristics rarely considered, healthy worker effect might bias null findings, all evidence from high-income countries
Self-management in the workplace	Cross-sectional, cohort, qualitative	Small number of studies, predominantly cross-sectional designs with small samples, heterogeneous outcome measures, limited adjustment for confounders, few stratified analyses by sex or diabetes mellitus type, all evidence from high-income countries

RCT, randomized controlled trial; WPAI, Work Productivity and Activity Impairment questionnaire.

When the outcome studied is unemployment, the findings are less conclusive. Among five studies in the systematic review by Pedron et al.⁹, four of which were cross-sectional, odds of unemployment were higher in people with diabetes mellitus than in those without diabetes mellitus, ranging from 1.2 to 3.1 times^{21,37–40} (Table 2). A cross-sectional Canadian study reported that people with diabetes mellitus had more than twice the odds of unemployment compared with people who did not have diabetes mellitus⁴¹. Meanwhile, a longitudinal Canadian study reported a similar effect size, but only for those with complications of diabetes mellitus who were not actively seeking work, whereas no association was found for those without complications³⁸. A study from the USA found an increased risk of unemployment among men but not women with diabetes mellitus²¹ and two studies found no association^{37,40}. Adjustment for confounding factors was applied inconsistently across studies and outcome measures were heterogeneous, which limits comparison of results, with definitions of unemployment variably specifying minimum duration, unemployment related to health reasons and other factors (Table 1). Furthermore, diabetes mellitus was self-reported in most studies, and none separated analyses by diabetes mellitus type.

A 2020 Danish study using national registry data found higher rates of unemployment in men with T1DM and T2DM, compared with people who did not have diabetes mellitus, and in women with T2DM only⁴². Given the earlier age of onset and greater treatment burden associated with T1DM than with T2DM, one might expect stronger associations with adverse employment outcomes; however, few studies have directly compared T1DM and T2DM in this context. A 2023 study from the Netherlands found that men without diabetes mellitus in 2009 who developed the disease in 2010 were more likely to exit the workforce owing to unemployment over a 9-year follow-up compared with those who did not, with no effect observed among women⁴³. The reasons for sex differences were not explored in any studies. One explanation might be that obesity, which is commonly comorbid with T2DM, seems to be more strongly associated with unemployment among older women (≥ 50 years old) compared with men regardless of diabetes mellitus presence⁴⁴. Possible reasons for this difference include stigma, impaired body image and reduced confidence in one's ability to cope with both general life challenges and health problems related to diabetes mellitus⁴⁵. In addition, as employment rates of older

Table 2 | Summary of studies reporting risk of unemployment associated with diabetes mellitus

Study	Study type	Diabetes mellitus type (n)	Outcome	Subgroup	Risk associated with diabetes mellitus (95% CI)
Pedron et al. (2019) systematic review ⁹					
Alavinia et al. (2008) ³⁷	Cross-sectional	All (799)	Unemployment	Overall	OR 1.38 (0.99–1.93)
Kraut et al. (2001) ³⁸	Cohort study	All (608)	Unemployment (among those not in labour force)	Complications absent	OR 1.20 (0.93–1.56)
				Complications present	OR 2.07 (1.49–2.87)
			Unemployment (among those in labour force)	Complications absent	OR 1.35 (0.83–2.19)
				Complications present	OR 1.69 (0.89–3.21)
Smith et al. (2014) ³⁹	Cross-sectional	All (4,591)	Unemployment (health reasons)	Overall	OR 2.22 (1.85–2.68)
van der Zee-Neuen et al. (2017) ⁴⁰	Cross-sectional	All (180)	Unemployment	Overall	OR 1.88 (0.95–3.72)
Yassin et al. (2002) ²¹	Cross-sectional	All (2,641)	Unemployment (health reasons)	Male	OR 3.1 (1.2–8.0)
				Female	OR 2.9 (1.0–8.8)
Other studies					
Hijdra et al. (2023) ⁴³	Cohort study	All (16,340)	Unemployment	Overall	HR 1.12 (1.08–1.17)
				Male	HR 1.20 (1.15–1.26)
				Female	HR 0.99 (0.92–1.05)
Nexø et al. (2020) ⁴²	Cohort study	All (4,478)	Unemployment	Male (T1DM)	HR 1.25 (1.01–1.53)
				Male (T2DM)	HR 1.17 (1.08–1.27)
				Female (T1DM)	HR 1.02 (0.85–1.22)
				Female (T2DM)	HR 1.09 (1.03–1.16)

CI, confidence interval; HR, hazard ratio; OR, odds ratio; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

women are lower than in older men⁴⁶, owing to factors including traditional household regimes and provision of informal care, the effect of diabetes mellitus per se might be more evident in men than in women.

Early retirement

A positive association between diabetes mellitus and early retirement has been reported, although the evidence is inconsistent, and definitions of early retirement vary considerably (Tables 1 and 3). For instance, in their 2013 systematic review, Breton et al.⁸ identified three studies reporting odds or risk of early retirement^{37,47,48}, two of which found an association with diabetes mellitus^{37,48}. The 2019 Pedron et al. systematic review⁹ included an additional four studies reporting odds or risk of early retirement associated with diabetes mellitus, three of which reported increased risk of early retirement^{22,49,50} (including one study among men only)²², whereas one found no effect⁵¹. The 2023 Netherlands register-based study that included people with incident diabetes mellitus, who were then followed up for 9 years, found no association with early retirement⁴³.

Although the evidence base surrounding diabetes mellitus and work participation is growing, with some high-quality studies emerging as national diabetes mellitus registries become more common, our understanding remains limited by the lack of granularity in terms of diabetes mellitus type, age, sex and work factors. The working-age population with diabetes mellitus is not homogeneous, yet most studies of work participation only analysed all individuals with diabetes mellitus as a group, often while concurrently exploring the effect of other chronic health conditions. T1DM and T2DM differ in aetiology, age of onset, management and associated health risks, which can influence

work participation in distinct ways. T1DM usually begins in childhood or adolescence and requires intensive insulin management, which can affect educational attainment, early career planning, employment stability, flexibility and absenteeism. T2DM generally occurs in adulthood, often alongside comorbidities, and might affect work participation through complications or treatment burden. However, as most existing studies of work participation among those with diabetes mellitus have not been stratified by type, our understanding of how T1DM and T2DM differentially affect people's working lives remains limited.

To appreciate the specific factors implicated in reduced work participation in people with diabetes mellitus, future research should separate age groups, sexes, diabetes mellitus types and treatments, presence of complications and comorbidities and occupations, taking account of physical and psychological demands. No studies explored reasons for unemployment or early retirement, other than four studies that asked about self-reported 'health reasons'^{21,22,39,50}. Mediation studies could explore this effect in more detail. Notably, only one study from a middle-income country was identified (from Mexico)³⁴, which found an association for unemployment among men with diabetes mellitus, potentially reflecting differences in social security systems and societal gender roles between middle-income and high-income countries.

Disability pension, return to work and working life expectancy

Other reported measures related to work participation among people with diabetes mellitus include disability pension, return to work and working life expectancy. Although disability benefits are not offered in all countries, when available, they can provide income replacement for people unable to work owing to health conditions, usually until

aged pension benefits can be accessed⁵². In the Pedron et al. systematic review⁹, four of five studies reported increased odds of disability pension associated with diabetes mellitus^{40,47,48,51,53}. Two more recent studies using Danish registry data explored other measures related to work participation. One found that women with T2DM were less likely to return to work following unemployment (hazard ratio (HR) 0.89, 95% confidence interval (CI) 0.85–0.94) or sickness absence of ≥4 consecutive weeks (HR 0.91, 95% CI 0.86–0.98)⁴² than women without T2DM; however, no association was observed for women with T1DM or men with either T1DM or T2DM. Another study from the same authors reported reduced working life expectancies among those with diabetes mellitus, which corresponded to up to 8.0 and 7.0 working years lost in women and men, respectively, with diabetes mellitus at age 35 years⁵⁴. For some context, this finding is similar to the effect of depression on working life expectancy^{55,56}.

Productivity
Absenteeism and presenteeism

Various measures of productivity have been explored in studies including people with diabetes mellitus; however, definitions and measurement tools are inconsistent, with few studies using validated measures (Table 1). Studies generally reported that diabetes mellitus increased the risk of absenteeism (absence from work due to illness) and presenteeism (reduced productivity and/or efficiency while at work due to illness). However, most studies used self-reported productivity measures (Table 4), with only one study⁵⁷ using the validated Work Productivity and Activity Impairment (WPAI) questionnaire⁵⁸. In their 2013 systematic review, Breton et al.⁸ identified 17 studies of absenteeism, 8 of which reported odds or risk of absenteeism associated with diabetes mellitus (Fig. 1), with mixed results^{47,57,59–64}. The two studies reporting the highest risk estimates were small cross-sectional studies^{57,64}. The largest cohort

study included 556 individuals with diabetes mellitus and only reported associations with diabetes mellitus in relation to absenteeism lasting ≥7 days occurring three or more times during the 12-month follow-up (that is, repeated periods of absence)⁶⁰. Absenteeism is a social phenomenon as well as a health phenomenon; employees take sickness absence based not only on their assessment of their health but also on how acceptable it is to take sick leave in their workplace and culture⁶⁵. As such, the definition of absenteeism that used ≥3 repetitive periods of ≥7 days might be more likely to represent a true health effect in those with diabetes mellitus than alternative definitions using single periods of absenteeism, which people without diabetes mellitus might be inclined to take where acceptable in their workplace.

More recent studies, published since 2013, have also found higher rates of absenteeism in people with diabetes mellitus than in those without diabetes mellitus (Fig. 1). Two analyses of Danish registry data reported associations between both T1DM and T2DM and long-term sickness absence of ≥4 consecutive weeks^{42,66}. A 2022 Japanese cohort study reported higher rates of absenteeism owing to mental health disorders, especially stress and adjustment disorders (that is, disorders characterized by a maladaptive response to a psychosocial stressor), among employees with diabetes mellitus than in those without diabetes mellitus⁶⁷, which is consistent with two other studies of adjustment disorders in people with diabetes mellitus^{68,69} and might relate to the phenomenon of diabetes distress. Other recent studies from the past 5 years have found associations between diabetes mellitus and absenteeism owing to musculoskeletal conditions⁷⁰ and symptoms of upper extremity impairment⁷¹, which might be explained by musculoskeletal pathologies that are reported to occur more frequently among those with diabetes mellitus than in those without the condition (for example, carpal tunnel syndrome and adhesive capsulitis)^{72,73}. A 2021 Israeli study found that public sector employees with diabetes mellitus had

Table 3 | Summary of studies reporting risk of early retirement associated with diabetes mellitus

Study	Study type	Diabetes mellitus type (n)	Outcome	Subgroup	Risk associated with diabetes mellitus (95% CI)
Breton et al. (2013) systematic review⁸					
Alavinia et al. (2008) ³⁷	Cross-sectional	All (799)	Retirement before age 65 years	Overall	OR 1.33 (1.05–1.68)
Herquelot et al. (2011) ⁴⁸	Cohort study	All (2,530)	Retirement over follow-up	Overall	HR 1.6 (1.5–1.8)
Vijan et al. (2004) ⁴⁷	Cross-sectional	All (NS)	Currently retired	Overall	OR 1.3 (1.0–1.07)
Pedron et al. (2019) systematic review⁹					
Kang et al. (2015) ⁵⁰	Cohort study	All (264)	Retirement (health reasons)	Overall	HR 1.47 (1.05–2.06)
				Male	HR 1.52 (0.99–2.31)
				Female	HR 1.40 (0.79–2.49)
Kouwenhoven-Pasmooij et al. (2016) ⁵¹	Cohort study	All (241)	Retirement before country-specific retirement age	Overall	OR 1.06 (0.73–1.53)
Pit et al. (2013) ²²	Cross-sectional	All (2,546)	Retirement (health reasons)	Male	OR 1.44 (1.09–1.89)
				Female	OR 1.30 (0.96–1.76)
			Retirement (other reasons)	Male	OR 1.16 (0.90–1.50)
				Female	OR 1.07 (0.84–1.37)
Shultz and Wang (2007) ⁴⁹	Cohort study	All (NS)	Retirement over 8-year follow-up	Overall	OR 3.37 (no CI reported)
Other studies					
Hijdra et al. (2023) ⁴³	Cohort study	All (16,340)	Retirement before age 65 years	Overall	HR 0.99 (0.96–1.03)

CI, confidence interval; HR, hazard ratio; NS, not stated; OR, odds ratio; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

Table 4 | Outcome definitions and data collection tools in studies reporting absenteeism or presenteeism risk

Study	Outcome definition(s)	Data collection instruments
Studies of absenteeism risk		
Boles et al. (2004) ⁵⁷	Percentage of work time lost due to illness in the past 7 days	WPAI
Collins et al. (2005) ⁵⁹	Hours of work lost in the past 4 weeks	SPS
De Backer et al. (2006) ⁶⁰	(1) Days of work lost to illness in the previous year (M/F: ≥12 days for men and ≥15 days for women) (2) Days of work lost (≥7 consecutive days) (3) ≥3 repetitive sick leave periods in the previous year	Records of sick leave
Fukunaga et al. (2022) ⁶⁷	Long-term sickness absence due to mental health disorders (≥30 consecutive days)	Registry data
Holden et al. (2011) ⁶¹	Whole or half days lost from work in previous 4 weeks	WHO-HPQ
Kessler et al. (2001) ⁶²	Days of work lost due to illness or work-cutback days in the past 4 weeks	Questionnaire
Nexø et al. (2018) ⁶⁶	Long-term sickness absence (minimum of 4 consecutive weeks)	National registry data
Nexø et al. (2020) ⁴²	Long-term sickness absence (minimum of 4 consecutive weeks)	National registry data
Robinson et al. (1990) ⁶³	(1) Any time of work lost due to illness in the previous year (2) >10 days of work lost in the previous year (3) >20 days of work lost in the previous year	Questionnaire
Vamos et al. (2009) ⁶⁴	≥10 days of work lost due to illness in the previous year	Questionnaire
Vijan et al. (2004) ⁴⁷	Days of work lost in the previous year	Questionnaire
Wagner et al. (2024) ⁷¹	Selected option 'Long-term sick leave' as employment status (no time frame given), subsequent question regarding primary reason for long-term sick leave	Questionnaire
Studies of presenteeism risk		
Boles et al. (2004) ⁵⁷	Percentage of time impaired at work due to illness in the past 7 days	WPAI
Holden et al. (2011) ⁶¹	Performance in the past 4 weeks (score)	WHO-HPQ
Mori et al. (2021) ⁷⁶	Performance in the past month due to any of 14 specified health conditions (score)	Questionnaire

SPS, Stanford Presenteeism Scale; WHO-HPQ, World Health Organization Health and Productivity Questionnaire; WPAI, Work Productivity and Activity Impairment questionnaire.

higher rates of absenteeism than private sector employees⁷⁴, which is consistent with findings in the general population⁷⁵ and might reflect an increased likelihood of receiving paid sick leave in the public sector.

Compared with absenteeism, there is less research regarding presenteeism in those with diabetes mellitus. The 2013 systematic review by Breton et al.⁸ identified four studies of presenteeism; two of these reported odds or risk of presenteeism^{57,61} but neither showed an association with diabetes mellitus. One of these studies included only 67 people with diabetes mellitus⁵⁷, highlighting the need for larger studies. In 2021, a Japanese cross-sectional study of employees with diabetes mellitus aged >40 years found associations between diabetes mellitus and presenteeism at all levels of glycaemic control, including the largest group of 300 employees with good glycaemia (HbA1c <7%) (OR 1.48, 95% CI 1.11–1.96)⁷⁶.

Other measures of productivity

Several studies have estimated productivity loss associated with diabetes mellitus through productivity-adjusted life years (PALYs); a novel measure developed in a 2018 study of people in Australia with diabetes mellitus⁷⁷. In the same way that quality-adjusted life years adjust years of life lived for a reduction in quality of life, PALYs adjust years lived over a person's lifetime for productivity loss attributable to a condition such as diabetes mellitus. Productivity loss might include absenteeism, presenteeism and/or workforce participation. Five population-based studies that used life table modelling methods reported average PALYs lost per person with diabetes mellitus^{77–81}

(Table 5), which ranged from 1.3 in China⁸¹ to 3.1 in South Africa⁸⁰. A 2021 German study used a mathematical projection model to estimate PALYs, reporting an average 2.6 PALYs lost per person with diabetes mellitus⁸². Variations might reflect differences in retirement ages, average age of diabetes mellitus onset, healthcare provision and diabetes mellitus-related mortality rates between populations, as well as differences in methodology (including differences in what was captured in terms of productivity loss). Calculating PALYs provides countries with an estimate of productivity loss that might occur at a population level owing to diabetes mellitus. In middle-income countries, the average age of diabetes mellitus onset is lower than that in high-income countries⁸³. As such, high PALYs in middle-income countries, as observed in the South African study⁸⁰, could have profound economic effects on national economies in terms of affecting GDP. This finding emphasizes the importance of effectively managing diabetes mellitus complications, both in improving individual health outcomes and in reducing the broader societal and economic effects associated with diabetes mellitus.

Complications, comorbidities and work ability

The body of evidence regarding the effect of diabetes mellitus complications and comorbidities on work participation is growing. A 2019 systematic review by Mori et al.¹⁰ explored factors implicated in presenteeism among people with diabetes mellitus, with populations and outcome measures varying greatly (Table 1). Notable findings included associations between peripheral neuropathy and absenteeism

in two population-based studies in the USA^{84,85}. A large Canadian cross-sectional study found a stronger association for presenteeism in people with comorbid diabetes mellitus and mood disorders than in those with diabetes mellitus alone⁸⁶; however, associations were weaker than those found for mood disorders co-occurring with arthritis or back pain. Other factors associated with presenteeism in people with diabetes mellitus included medication non-adherence during the past year, assessed using the medication possession ratio⁸⁷ and self-reported tolerability of glucose-lowering drugs⁸⁸.

Other studies have provided additional insights. A 2019 UK cohort study found that depression worsened presenteeism and unemployment in people with T2DM, but not absenteeism⁸⁹. The results were similar to those from the earlier Canadian study⁸⁶. A 2020 Swedish register-based study found that stroke, end-stage kidney disease and vision loss in people with T2DM were associated with absenteeism⁹⁰.

Effect of workplace interventions in people with diabetes mellitus

Workplace interventions for employees with diabetes mellitus have focused on lifestyle and education programmes, digital health approaches and technology-assisted self-management. Lifestyle and education programmes have typically combined nutritional guidance, counselling and structured workplace support. In one non-randomized study of employees with T2DM in the USA, a vegan nutrition programme reduced health-related productivity impairment by 40% as measured with the WPAI⁹¹; however, the sample size was small ($n = 87$) and the follow-up was short (22 weeks) (Table 1). A larger prospective study of 151 employees with T2DM reported improvements in presenteeism after a 12-month wellness programme that incorporated education, telephonic support and laboratory monitoring⁹². Finally, a cohort analysis of >3,000 adults aged 45–75 years with T2DM from a randomized controlled trial of an intensive lifestyle intervention involving one-on-one sessions with

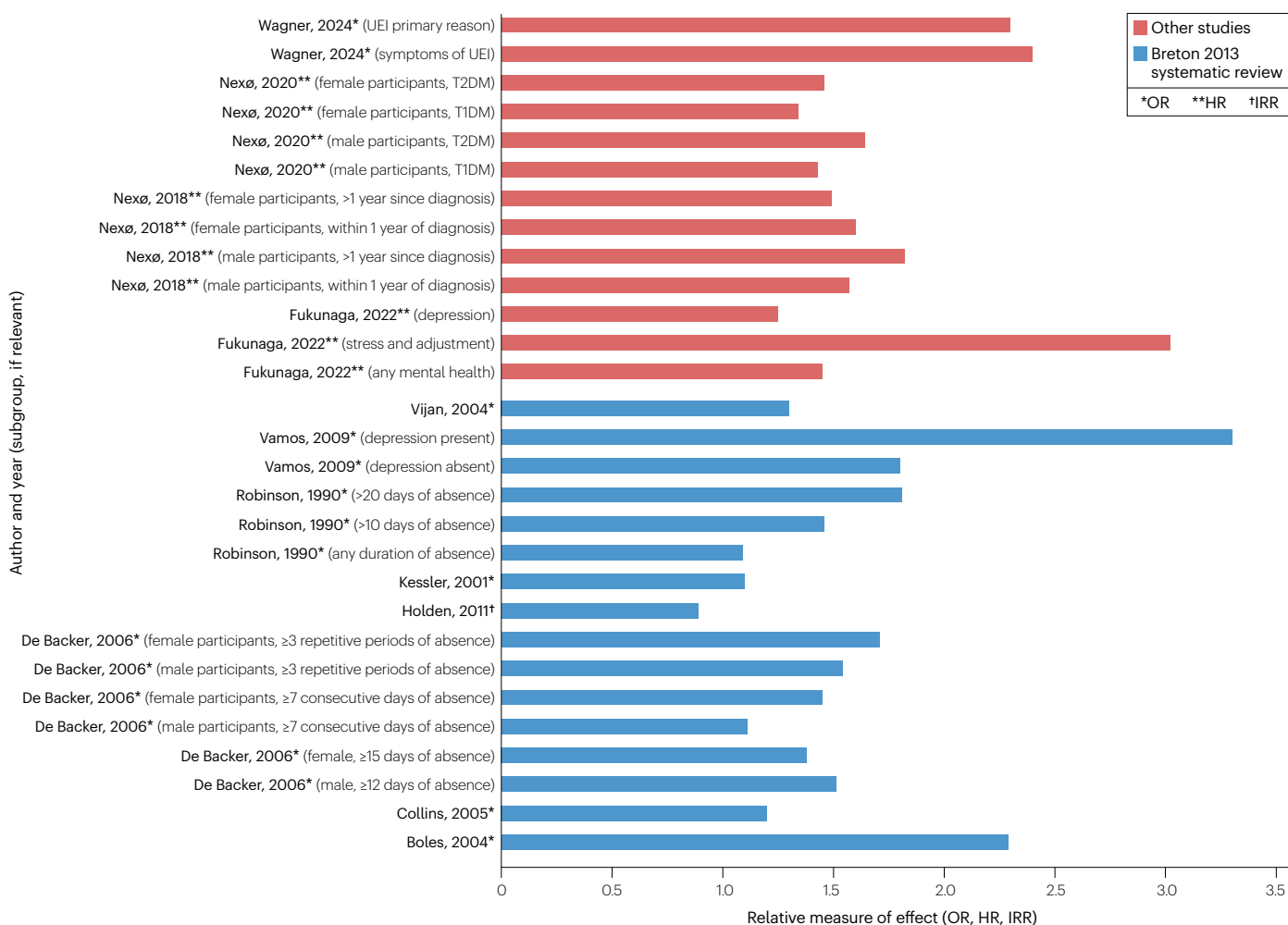


Fig. 1 | Findings from studies reporting absenteeism risk associated with diabetes mellitus. This figure presents relative effect estimates (odds ratio (OR), relative risk (RR), hazard ratio (HR) or incidence rate ratio (IRR)) for absenteeism associated with diabetes mellitus, based on studies from the 2013 Breton et al.⁸ systematic review and more recent research^{42,47,57,59–64,66,67,71}. Most studies report increased absenteeism risk among individuals with diabetes mellitus, with all recent studies (published since 2013) showing effect sizes >1.

Several studies conducted subgroup analyses by sex, diabetes mellitus type (type 1 diabetes mellitus (T1DM) versus type 2 diabetes mellitus (T2DM)) and time since diagnosis (first year versus subsequent years (>1 year since diagnosis)). One study (Vamos⁶⁴) examined the modifying effect of comorbid depression, whereas others reported absenteeism specifically due to mental health conditions (for example, depression, or stress and adjustment disorders; Fukunaga⁶⁷) or upper extremity impairment (UEI; Wagner⁷¹).

Table 5 | Summary of studies reporting productivity-adjusted life years associated with diabetes mellitus

Study	Location	Years of data	Diabetes mellitus type (n)	Subgroup	PALYs lost per person
Afroz et al. (2020) ⁷⁸	Bangladesh	2017	All (5,733,089)	Overall	1.6
				Male	1.7
				Female	1.5
Banker et al. (2021) ⁷⁹	India	2017	All (54,361,305)	Overall	1.6
				Male	1.9
				Female	1.3
Hellebo et al. (2024) ⁸⁰	South Africa	2019	T2DM (3,200,658)	Overall	3.1
				Male	2.6
				Female	3.6
Hird et al. (2019) ⁸¹	China	2017	All (56,436,638)	Overall	1.3
				Male	1.4
				Female	1.3
Magliano et al. (2018) ⁷⁷	Australia	2011	All (565,298)	Overall	1.4
				Male	1.41
				Female	1.39
Tönnies et al. (2021) ⁸²	Germany	2020	T2DM (4,604,000)	Overall	2.6
				Male	2.1
				Female	3.4

PALY, productivity-adjusted life year; T2DM, type 2 diabetes mellitus.

counsellors, dieticians and exercise specialists found a modest (2.9%) increase in employment over 15 years⁹³. Collectively, some evidence from high-income countries suggests that lifestyle programmes might improve presenteeism and might modestly enhance employment outcomes.

Digital and technology-assisted interventions have targeted self-management through mobile applications and CGM. In the USA, a randomized controlled trial of 125 adults with T2DM found a mobile health programme that included an app and Bluetooth-connected glucose meter improved presenteeism measured using the WPAl, although follow-up was short (3 months)¹¹. Two registry-based studies of CGM in the Netherlands ($n = 1,365$)⁹⁴ and Belgium ($n = 1,913$)⁹⁵ found substantial reductions in self-reported absenteeism over 12 months, although both lacked control groups. CGM reduces self-care burden and hypoglycaemia risk^{96,97}, but its long-term effect on work remains underexplored. No studies examined work outcomes of insulin pumps or closed-loop systems, despite strong evidence that these technologies improve glycaemic control^{98,99}, which highlights an important evidence gap.

Effect of work characteristics on diabetes mellitus management

Compared with studies exploring the effect of diabetes mellitus characteristics on work outcomes, there is less evidence regarding the reverse effect of work characteristics on diabetes mellitus management. Work is not homogeneous and different types of work have different physical and psychosocial demands. In particular, women are more likely to work in health, social care or education, whereas men have traditionally

worked in industrial, manufacturing and construction settings. These different occupational roles will have different effects on the management of diabetes mellitus. Although these gendered boundaries are changing, it is important to consider the types of jobs that are more or less suitable for people with diabetes mellitus.

The effect of long working hours on glycaemic control has been the focus of three studies. The best evidence comes from a 2022 South Korean cohort study, in which people with diabetes mellitus working ≥ 55 h per week (adjusted HR 1.40, 95% CI 1.01–1.96) and 35–44 h per week (adjusted HR 1.51, 95% CI 1.09–2.09) were more likely to experience worse glycaemic control than those working 45–54 h per week¹³. A small cross-sectional study from the USA reported similar findings¹⁰⁰, whereas another South Korean study only found this effect among women aged ≥ 60 years¹⁰¹. Possible mechanisms linking long working hours to worse glycaemic control include job stress and time constraints, leading to reduced adherence to medications, skipping or delaying meals and less regular exercise^{102–104}. The authors of the 2022 South Korean study did not discuss potential reasons for worse glycaemic control among those working shorter (35–44) hours; this effect might in part be due to reverse causation or health selection, whereby individuals with more advanced or poorly controlled diabetes mellitus reduce their working hours.

A cross-sectional Scottish study reported increased HbA1c levels in people with T1DM engaged in shift work¹⁰⁵. Shift work, which is known to disrupt circadian rhythms and increase cardiometabolic risk in the general population¹⁰⁶, might be particularly problematic for people with diabetes mellitus. Disruptions to sleep, meal timing and medication routines could negatively affect glycaemic control; however, evidence specific to diabetes mellitus remains scarce. More research is needed to understand how shift work patterns interact with self-management and long-term outcomes in this population. In Germany, a cohort study found that T2DM severity, measured using the Diabetes Complications Severity Index–Complication Count (DSCI–CC), was highest in those working in the transport, logistics and construction sectors¹². However, no statistical comparison was made between occupations, which limits the conclusions that could be drawn. More detailed research about diabetes mellitus in relation to specific occupational requirements is needed to determine appropriate interventions. No studies exploring the effects of remote or hybrid work arrangements were identified. It is important to consider whether hybrid arrangements could address some of the barriers to work participation for people with diabetes mellitus.

Occupational injury

Several studies have reported the risk of occupational injury associated with diabetes mellitus, with mixed results (Table 6). Of two cohort studies on the topic, one found an association between diabetes mellitus and occupational injury risk using incident management system data¹⁰⁷, whereas the other found associations only in women, including specific injury types such as bone fractures and dislocations, using workers' compensation data¹⁰⁸. A large cross-sectional study, which did not stratify by sex, found higher odds of self-reported occupational injury among individuals with diabetes mellitus of ≥ 13 years' duration (versus < 13 years) and those not receiving pharmacological treatment (versus receiving treatment)¹⁰⁹. This finding is counter-intuitive, as untreated diabetes mellitus is typically assumed to be less severe than treated diabetes mellitus; however, it might reflect suboptimal glycaemic control or limited access to care in this group. Smaller cross-sectional and case-control studies either found no

association¹¹⁰ or only found increased risks among women⁴¹. Potential mechanisms implicated in occupational injury in people with diabetes mellitus include hypoglycaemia¹¹¹, peripheral neuropathy¹¹², sarcopenia leading to falls¹¹³ and osteoporosis increasing fracture risk¹¹⁴, which is consistent with the association found between diabetes mellitus and occupational fractures in the only study that explored injury types in detail¹⁰⁸.

This observation is further supported by evidence showing that insulin-treated individuals have a higher risk of falls than those not receiving insulin, potentially due to hypoglycaemia or disease severity¹¹⁵. The null findings reported in some studies might in part be explained by the healthy worker effect, whereby those with diabetes mellitus who are at highest risk of injury are no longer in the workplace. Overall, studies of occupational injury in people with diabetes mellitus should be interpreted with caution as most used self-reported outcomes (Table 1). No studies separated diabetes mellitus by type or reported differences by occupational characteristics. These factors should be explored in future research using objective data sources and for specific injury types.

Diabetes mellitus self-management in the workplace

An important, although poorly researched, area is diabetes mellitus self-management in the workplace. The earliest evidence on the topic comes from a small 2005 Scottish cohort study of employed people with insulin-dependent diabetes mellitus, which reported 0.14 episodes of severe hypoglycaemia at work per person per annum¹¹⁶. Since then, three cross-sectional studies have explored intentional hyperglycaemia at work; all found that intentional hyperglycaemia was associated with work-related diabetes distress^{117–119}. Similarly, a survey of adults with T1DM found that higher levels of social diabetes-related distress were associated with lower job satisfaction¹²⁰; however, job satisfaction has otherwise rarely been examined in people with diabetes mellitus. Another small cross-sectional study using the Work Ability Index found that only 33% of employees with T1DM or T2DM reported excellent work ability¹²¹. In this study, co-worker support and work–life balance were independently associated with improved work ability; however, the small sample size ($n = 101$) and lack of stratification by diabetes mellitus type limit generalizability (Table 1).

Table 6 | Summary of studies reporting risk of occupational injury associated with diabetes mellitus

Study	Study type	Diabetes mellitus type (n)	Outcome	Subgroup	Risk associated with diabetes mellitus (95% CI)
Kouvonen et al. (2017) ¹⁰⁸	Cohort study	All (1,020)	Occupational injury	Male	HR 0.88 (0.67–1.16)
				Female	HR 1.37 (1.11–1.69)
			Commuting injury	Male	HR 1.33 (0.76–2.33)
				Female	HR 1.36 (1.03–1.79)
Kubo et al. (2014) ¹⁰⁷	Cohort study	All (2,373)	Occupational injury	Overall	HR 1.17 (1.08–1.27)
Palmer et al. (2014) ¹¹⁰	Case-control	All (199)	Occupational injury	Overall	OR 1.01 (0.69–1.48)
			Occupational injury (medication)	Insulin	OR 1.02 (0.49–2.09)
				Oral treatment only	OR 1.19 (0.67–2.09)
				No medication	OR 0.82 (0.42–1.62)
			Occupational injury (complications)	Complications with eye involvement	OR 0.72 (0.37–1.41)
				Other complications	OR 1.50 (0.63–3.54)
			Occupational injury (glycaemia)	Poor glycaemic control (clinical record)	OR 0.52 (0.21–1.31)
Smith et al. (2012) ⁴¹	Cross-sectional	All (1,883)	Occupational injury	Male	OR 1.43 (0.94–2.16)
				Female	OR 1.37 (0.70–2.70)
			Occupational repetitive strain injury	Male	OR 1.05 (0.78–1.41)
				Female	OR 1.47 (1.12–1.92)
Sprince et al. (2008) ¹⁰⁹	Cross-sectional	All (7,704)	Occupational injury	Overall	OR 1.18 (0.86–1.61)
			Occupational injury (medication)	Insulin	OR 1.61 (1.00–2.60)
				Oral treatment only	OR 0.75 (0.46–1.21)
				No medication	OR 1.87 (1.01–3.47)
			Occupational injury (duration of diabetes mellitus)	1–4 years of diabetes mellitus	OR 0.91 (0.59–1.42)
				5–12 years of diabetes mellitus	OR 1.08 (0.63–1.88)
				13+ years of diabetes mellitus	OR 1.83 (1.05–3.18)

CI, confidence interval; HR, hazard ratio; OR, odds ratio.

Given the lack of quantitative evidence regarding factors implicated in suboptimal diabetes mellitus self-management at work, additional insights can be gained from qualitative studies. Work-related time pressures, the non-routine nature of work, disrupted food consumption, the local food environment and the perceived social working environment have been identified as key barriers to workplace self-management^{122–124}. Notably, one of the more recent qualitative studies from 2019 found that CGM improved many of these issues by enabling more frequent and discreet glucose monitoring¹²⁵, further reinforcing the need for workplace studies to inform government and business CGM strategies.

Stigma around diabetes mellitus has been reported in workplaces, which in many people with diabetes mellitus is compounded by stigma around obesity¹²⁶. One qualitative study found that employees with diabetes mellitus were reluctant to disclose their diagnosis or raise support issues because of stigmatization¹²⁴. It has also been suggested that perceptions of stigma might lead some employees with diabetes mellitus to delay self-management requirements, such as finger prick testing or insulin injections¹²⁷. However, the effects of diabetes mellitus-related workplace stigma, including on work outcomes, remain understudied to date.

Guidelines and recommendations

Guidelines and recommendations regarding diabetes mellitus and employment are consistent, albeit with limited consideration of the literature. In general, guidelines support employment rights across three domains. First, people with diabetes mellitus have a right to participate in any paid employment for which they are qualified. Second, a person with diabetes mellitus who is seeking employment in a safety-critical role has the right to be assessed against reasonable standards. Third, people with diabetes mellitus have the right to request reasonable workplace adjustments^{128–131}.

The debate is ongoing regarding the employment of people with insulin-treated diabetes mellitus in safety-critical roles, such as transport, emergency services and the armed forces¹³². Advances in CGM and closed-loop insulin delivery have reduced hypoglycaemia risk, prompting changes in legislation and greater access to these occupations. For example, Canada became the first country to permit pilots with insulin-treated diabetes mellitus to fly commercial airplanes in 2002 under strict conditions, and several other countries have since followed¹³³. Similar changes have occurred for commercial driving: the UK introduced access to commercial driving under regulated conditions in 2011 (ref. 134), and in the USA eligibility requires both clinician evaluation and federal medical examiner approval¹³⁵. Globally, regulations remain highly variable, with a 2017 survey reporting that two-thirds of countries had no restrictions, some had partial restrictions and a small number still prohibited commercial driving altogether¹³⁶.

Many countries also have legislation that protects individuals with diabetes mellitus from workplace discrimination^{137–140}. This legislation usually includes protected rights for an employee to request reasonable workplace adjustments. These might include: the permission to store, access and consume food in the workplace; the requirement of a private space for the injection of insulin and monitoring of blood levels of glucose; and flexibility with work schedules. With the uptake of CGM, employees with diabetes mellitus might require workplace access to a Bluetooth or a wireless-connected mobile phone¹⁴¹. The right to access flexible working arrangements is also extended to employees who are carers of people with diabetes mellitus.

Conclusions

The literature regarding work participation among people with diabetes mellitus is limited considering the high prevalence and cost burden of the disease. Evidence points towards higher rates of unemployment, earlier retirement and absenteeism in people with diabetes mellitus compared with those without the condition, as well as adverse effects of complications, including neuropathy and mental health conditions. Interventions that have been studied include digital health programmes, nutritional programmes and CGM, all of which improve work participation. Data regarding occupational injury are inconsistent, whereas diabetes mellitus management in the workplace and the effects of work characteristics on diabetes mellitus management are under-researched.

Most studies were cross-sectional, conducted in high-income countries and used self-reported outcome measures. Few accounted for differences in diabetes mellitus type (T1DM versus T2DM), treatment regimen (insulin versus oral agents), glycaemic control or presence of complications (such as neuropathy and mental health conditions). These limitations restrict the ability to draw nuanced conclusions, as these diabetes-related factors can substantially modify work participation outcomes and the effectiveness of interventions. Large-scale longitudinal research using validated outcome measures, such as registry-based employment data and the WPAI questionnaire, is needed. These studies should stratify by diabetes mellitus type, age, sex and occupation and be undertaken across diverse settings, particularly in low-income and middle-income countries where evidence is limited. In particular, mental health comorbidities, such as depression, anxiety, diabetes distress and sleep disturbance, are common in people with diabetes mellitus but remain poorly studied in relation to work outcomes and are a critical priority for future research.

As retirement ages continue to rise in high-income countries, a growing number of people with diabetes mellitus will remain in the workforce for longer periods than previously. Additionally, the prevalence of diabetes mellitus in middle-income countries is high, up to 20% among working-age adults in some regions⁶, which indicates that the global workforce will increasingly include people living with diabetes mellitus. Given the health benefits of work, clinicians should discuss work participation with their patients and direct them to sources of guidance about work and workplace adjustments. Treatment decisions should consider the nature and type of work individuals perform. Work participation challenges differ across the life course, including for those diagnosed in youth and those facing new-onset diabetes mellitus at older ages (for example, ≥50 years old), which highlights the need for tailored guidance. Work participation should be integrated into diabetes mellitus guidelines and recommendations to support fulfilling, sustainable employment for people with diabetes mellitus and to reduce the economic effects on the individual, their families and the wider society.

Published online: 20 October 2025

References

1. Black, C. M. *Working for a Healthier Tomorrow: Dame Carol Black's Review of the Health of Britain's Working Age Population*. The Stationery Office. <https://assets.publishing.service.gov.uk/media/5a7c55bee5274a1b0042313c/hwwb-working-for-a-healthier-tomorrow.pdf> (2008).
2. Collie, A., Sheehan, L., Lane, T. J. & Illes, R. Psychological distress in workers' compensation claimants: prevalence, predictors and mental health service use. *J. Occup. Rehabil.* **30**, 194–202 (2020).
3. Macchia, L., Daly, M. & Delaney, L. The effect of adverse employment circumstances on physical pain: evidence from Australian panel data. *Prev. Med.* **173**, 107574 (2023).

4. Collie, A., Sheehan, L. & McAllister, A. Health service use of Australian unemployment and disability benefit recipients: a national, cross-sectional study. *BMC Health Serv. Res.* **21**, 249 (2021).
5. Nylén, L., Voss, M. & Floderus, B. Mortality among women and men relative to unemployment, part time work, overtime work, and extra work: a study based on data from the Swedish twin registry. *Occup. Environ. Med.* **58**, 52–57 (2001).
6. International Diabetes Federation. *IDF Diabetes Atlas* 11th edn. <https://diabetesatlas.org/resources/idf-diabetes-atlas-2025/> (International Diabetes Federation, 2025).
7. Parker, E. D. et al. Economic costs of diabetes in the U.S. in 2022. *Diabetes Care* **47**, 26–43 (2024).
8. Breton, M. C. et al. Burden of diabetes on the ability to work: a systematic review. *Diabetes Care* **36**, 740–749 (2013).
9. Pedron, S., Emmert-Fees, K., Laxy, M. & Schwettmann, L. The impact of diabetes on labour market participation: a systematic review of results and methods. *BMC Public Health* **19**, 25 (2019).
10. Mori, K. et al. Factors of occurrence and improvement methods of presenteeism attributed to diabetes: a systematic review. *J. Occup. Health* **61**, 36–53 (2019).
11. Lavaysse, L. M. et al. One drop improves productivity for workers with type 2 diabetes: one drop for workers with type 2 diabetes. *J. Occup. Environ. Med.* **64**, e452–e458 (2022).
12. Safieddine, B. et al. Type 2 diabetes severity in the workforce: an occupational sector analysis using German claims data. *PLoS ONE* **19**, e0309725 (2024).
13. Seo, E., Lee, Y. & Lee, W. Association between working hours and poor glycemic control in patients with diabetes: the Kangbuk Samsung Health Study. *J. Occup. Environ. Med.* **64**, e629–e634 (2022).
14. Uhl, S., Choure, A., Rouse, B., Loblack, A. & Reaven, P. Effectiveness of continuous glucose monitoring on metrics of glycemic control in type 2 diabetes mellitus: a systematic review and meta-analysis of randomized controlled trials. *J. Clin. Endocr. Metab.* **109**, 1119–1131 (2024).
15. Hall, C. E., Brooks, S. K., Mills, F., Greenberg, N. & Weston, D. Experiences of working from home: umbrella review. *J. Occup. Health* **66**, uiad013 (2023).
16. Galanti, T., Guidetti, G., Mazzei, E., Zappalà, S. & Toscano, F. Work from home during the COVID-19 outbreak: the impact on employees' remote work productivity, engagement, and stress. *J. Occup. Environ. Med.* **63**, e426–e432 (2021).
17. Fleming, M. et al. Educational and health outcomes of children treated for type 1 diabetes: Scotland-wide record linkage study of 766,047 children. *Diabetes Care* **42**, 1700–1707 (2019).
18. Mitchell, R. J. et al. The impact of type 1 diabetes mellitus in childhood on academic performance: a matched population-based cohort study. *Pediatr. Diabetes* **23**, 411–420 (2022).
19. Bergers, J., Nijhuis, F., Janssen, M. & van der Horst, F. Employment careers of young type 1 diabetic patients in the Netherlands. *J. Occup. Environ. Med.* **41**, 1005–1010 (1999).
20. Klarenbach, S., Padwal, R., Chuck, A. & Jacobs, P. Population-based analysis of obesity and workforce participation. *Obesity* **14**, 920–927 (2006).
21. Yassin, A. S., Beckles, G. L. & Messonnier, M. L. Disability and its economic impact among adults with diabetes. *J. Occup. Environ. Med.* **44**, 136–142 (2002).
22. Pit, S. W., Shrestha, R., Schofield, D. & Passey, M. Partial and complete retirement due to ill-health among mature age Australians. *Public Health* **127**, 561–571 (2013).
23. Ng, Y. C., Jacobs, P. & Johnson, J. A. Productivity losses associated with diabetes in the US. *Diabetes Care* **24**, 257–261 (2001).
24. Brown, H. S. III, Pagán, J. A. & Bastida, E. The impact of diabetes on employment: genetic IVs in a bivariate probit. *Health Econ.* **14**, 537–544 (2005).
25. Latif, E. The impact of diabetes on employment in Canada. *Health Econ.* **18**, 577–589 (2009).
26. Zhang, X., Zhao, X. & Harris, A. Chronic diseases and labour force participation in Australia. *J. Health Econ.* **28**, 91–108 (2009).
27. Nielsen, H. B., Ovesen, L. L., Mortensen, L. H., Lau, C. J. & Joensen, L. E. Type 1 diabetes, quality of life, occupational status and education level — a comparative population-based study. *Diabetes Res. Clin. Pract.* **121**, 62–68 (2016).
28. Tunceli, K. et al. The impact of diabetes on employment and work productivity. *Diabetes Care* **28**, 2662–2667 (2005).
29. Harris, A. Diabetes, cardiovascular disease and labour force participation in Australia: an endogenous multivariate probit analysis of clinical prevalence data. *Econ. Rec.* **85**, 472–484 (2009).
30. Bastida, E. & Pagán, J. A. The impact of diabetes on adult employment and earnings of Mexican Americans: findings from a community based study. *Health Econ.* **11**, 403–413 (2002).
31. Lin, S.-J. Estimating the impact of diabetes on employment in Taiwan. *Econ. Bull.* **31**, 3089–3102 (2011).
32. Minor, T. The effect of diabetes on female labor force decisions: new evidence from the National Health Interview Survey. *Health Econ.* **20**, 1468–1486 (2011).
33. Minor, T. An investigation into the effect of type I and type II diabetes duration on employment and wages. *Econ. Hum. Biol.* **11**, 534–544 (2013).
34. Seuring, T., Goryakin, Y. & Suhrcke, M. The impact of diabetes on employment in Mexico. *Econ. Hum. Biol.* **18**, 85–100 (2015).
35. Minor, T. & MacEwan, J. P. A comparison of diagnosed and undiagnosed diabetes patients and labor supply. *Econ. Hum. Biol.* **20**, 14–25 (2016).
36. Kim, J.-H., Lee, W.-Y., Lim, S. S., Kim, Y. T. & Hong, Y.-P. Gender differences in the relationship between type 2 diabetes mellitus and employment: evidence from the Korea Health Panel study. *Int. J. Environ. Res. Public Health* **17**, 7040 (2020).
37. Alavinia, S. M. & Burdorf, A. Unemployment and retirement and ill-health: a cross-sectional analysis across European countries. *Int. Arch. Occup. Environ. Health* **82**, 39–45 (2008).
38. Kraut, A., Walld, R., Tate, R. & Mustard, C. Impact of diabetes on employment and income in Manitoba, Canada. *Diabetes Care* **24**, 64–68 (2001).
39. Smith, P. et al. Examining the relationship between chronic conditions, multi-morbidity and labour market participation in Canada: 2000–2005. *Ageing Soc.* **34**, 1730–1748 (2014).
40. van der Zee-Neuen, A. et al. Work outcome in persons with musculoskeletal diseases: comparison with other chronic diseases & the role of musculoskeletal diseases in multimorbidity. *BMC Musculoskelet. Disord.* **18**, 10 (2017).
41. Smith, P., Bielecky, A. & Mustard, C. The relationship between chronic conditions and work-related injuries and repetitive strain injuries in Canada. *J. Occup. Environ. Med.* **54**, 841–846 (2012).
42. Nexa, M. A., Pedersen, J., Cleal, B. & Björner, J. B. Increased risk of long-term sickness absence, lower rate of return to work and higher risk of disability pension among people with type 1 and type 2 diabetes mellitus: a Danish retrospective cohort study with up to 17 years' follow-up. *Diabet. Med.* **37**, 1861–1865 (2020).
43. Hijdra, R. W., Robroek, S. J. W., Burdorf, A. & Schuring, M. The influence of onset of disease on exit from paid employment among workers in The Netherlands: a longitudinal register-based study with 9 years follow-up. *Scand. J. Work Environ. Health* **49**, 33–42 (2023).
44. Linaker, C. H. et al. Body mass index (BMI) and work ability in older workers: results from the Health and Employment After Fifty (HEAF) prospective cohort study. *Int. J. Environ. Res. Public Health* **17**, 1647 (2020).
45. Nilsson, T. et al. Perceived coping capacity: a comparison between obese patients and patients on long-term sick leave. *Eat. Weight Disord.* **2**, 182–187 (1997).
46. McAllister, A. et al. Inequalities in employment rates among older men and women in Canada, Denmark, Sweden and the UK. *BMC Public Health* **19**, 319 (2019).
47. Vijan, S., Hayward, R. A. & Langa, K. M. The impact of diabetes on workforce participation: results from a national household sample. *Health Serv. Res.* **39**, 1653–1669 (2004).
48. Herquelot, E., Gueguen, A., Bonenfant, S. & Dray-Spira, R. Impact of diabetes on work cessation: data from the GAZEL cohort study. *Diabetes Care* **34**, 1344–1349 (2011).
49. Shultz, K. S. & Wang, M. The influence of specific physical health conditions on retirement decisions. *Int. J. Aging Hum. Dev.* **65**, 149–161 (2007).
50. Kang, M. Y., Yoon, C. G. & Yoon, J. H. Influence of illness and unhealthy behavior on health-related early retirement in Korea: results from a longitudinal study in Korea. *J. Occup. Health* **57**, 28–38 (2015).
51. Kouwenhoven-Pasmooij, T. A., Burdorf, A., Roos-Hesseling, J. W., Hunink, M. G. & Robroek, S. J. Cardiovascular disease, diabetes and early exit from paid employment in Europe: the impact of work-related factors. *Int. J. Cardiol.* **215**, 332–337 (2016).
52. Stattin, M. Retirement on grounds of ill health. *Occup. Environ. Med.* **62**, 135 (2005).
53. Ervasti, J. et al. Health- and work-related predictors of work disability among employees with a cardiometabolic disease — a cohort study. *J. Psychosom. Res.* **82**, 41–47 (2016).
54. Nexa, M. A., Pedersen, J., Cleal, B., Andersen, I. & Björner, J. B. Working life expectancies among individuals with type 1 and type 2 diabetes over a 30-year period. *Scand. J. Work Environ. Health* **47**, 540–549 (2021).
55. Pedersen, J. et al. Impact of depressive symptoms on worklife expectancy: a longitudinal study on Danish employees. *Occup. Environ. Med.* **76**, 838 (2019).
56. Knudsen, A. K., Øverland, S., Hotopf, M. & Mykletun, A. Lost working years due to mental disorders: an analysis of the Norwegian disability pension registry. *PLoS ONE* **7**, e24567 (2012).
57. Boles, M., Pelletier, B. & Lynch, W. The relationship between health risks and work productivity. *J. Occup. Environ. Med.* **46**, 737–745 (2004).
58. Reilly, M. C., Zbrozek, A. S. & Dukes, E. M. The validity and reproducibility of a work productivity and activity impairment instrument. *Pharmacoeconomics* **4**, 353–365 (1993).
59. Collins, J. J. et al. The assessment of chronic health conditions on work performance, absence, and total economic impact for employers. *J. Occup. Environ. Med.* **47**, 547–557 (2005).
60. De Backer, G. et al. Diabetes mellitus in middle-aged people is associated with increased sick leave: the BELSTRESS study. *Int. J. Occup. Environ. Health* **12**, 28–34 (2006).
61. Holden, L. et al. Which health conditions impact on productivity in working Australians? *J. Occup. Environ. Med.* **53**, 253–257 (2011).
62. Kessler, R. C., Greenberg, P. E., Mickelson, K. D., Meneades, L. M. & Wang, P. S. The effects of chronic medical conditions on work loss and work cutback. *J. Occup. Environ. Med.* **43**, 218–225 (2001).
63. Robinson, N., Yateman, N. A., Protopapa, L. E. & Bush, L. Employment problems and diabetes. *Diabet. Med.* **7**, 16–22 (1990).
64. Vámos, E. P., Mucsi, I., Keszei, A., Kopp, M. S. & Novak, M. Comorbid depression is associated with increased healthcare utilization and lost productivity in persons with diabetes: a large nationally representative Hungarian population survey. *Psychosom. Med.* **71**, 501–507 (2009).
65. Pihl-Thingvad, S., Vera, W., Michelle, S. H. & Willems, J. Relationships matter: how workplace social capital affects absenteeism of public sector employees. *Public Manag. Rev.* **26**, 1033–1060 (2024).
66. Nexa, M. A. et al. Long-term sickness absence of 32 chronic conditions: a Danish register-based longitudinal study with up to 17 years of follow-up. *BMJ Open* **8**, e020874 (2018).

67. Fukunaga, A. et al. Diabetes, prediabetes, and long-term sickness absence due to mental disorders: Japan Epidemiology Collaboration on Occupational Health Study. *J. Psychosom. Res.* **158**, 110925 (2022).
68. Tomic, D., Salim, A., Morton, J. I., Magliano, D. J. & Shaw, J. E. Reasons for hospitalisation in Australians with type 2 diabetes compared to the general population, 2010–2017. *Diabetes Res. Clin. Pract.* **194**, 110143 (2022).
69. Kovacs, M., Ho, V. & Pollock, M. H. Criterion and predictive validity of the diagnosis of adjustment disorder: a prospective study of youths with new-onset insulin-dependent diabetes mellitus. *Am. J. Psychiatry* **152**, 523–528 (1995).
70. Gutefeldt, K. et al. Low health-related quality of life is strongly linked to upper extremity impairments in type 1 diabetes with a long duration. *Disabil. Rehabil.* **43**, 2578–2584 (2021).
71. Wagner, S., Norgaard, K., Willaing, I., Olesen, K. & Andersen, H. U. The impact of upper extremity impairments on work and everyday life of people with type 1 diabetes — a nationwide controlled study. *Diabet. Med.* **41**, e15158 (2024).
72. Zimmerman, M., Gottsäter, A. & Dahlin, L. B. Carpal tunnel syndrome and diabetes — a comprehensive review. *J. Clin. Med.* **11**, 1674 (2022).
73. Zreik, N. H., Malin, R. A. & Charalambous, C. P. Adhesive capsulitis of the shoulder and diabetes: a meta-analysis of prevalence. *Muscles Ligaments Tendons J.* **6**, 26–34 (2016).
74. Zack, O. et al. The correlation between clinical and demographic parameters and sickness absence in diabetic employees. *Healthcare* **9**, 1309 (2021).
75. Mastekaasa, A. Absenteeism in the public and the private sector: does the public sector attract high absence employees? *J. Public Adm. Res. Theory* **30**, 60–76 (2019).
76. Mori, T. et al. Diabetes severity measured by treatment control status and number of anti-diabetic drugs affects presenteeism among workers with type 2 diabetes. *BMC Public Health* **21**, 1865 (2021).
77. Magliano, D. J., Martin, V. J., Owen, A. J., Zomer, E. & Liew, D. The productivity burden of diabetes at a population level. *Diabetes Care* **41**, 979–984 (2018).
78. Afroz, A. et al. The impact of diabetes on the productivity and economy of Bangladesh. *BMJ Global Health* **5**, e002420 (2020).
79. Banker, K. K. et al. The impact of diabetes on productivity in India. *Diabetes Care* **44**, 2714–2722 (2021).
80. Hellebo, A., Kengne, A. P., Ademi, Z. & Alaba, O. The burden of type 2 diabetes on the productivity and economy in Sub-Saharan Africa: a life table modelling analysis from a South African perspective. *Pharmacoeconomics* **42**, 463–473 (2024).
81. Hird, T. R. et al. The impact of diabetes on productivity in China. *Diabetologia* **62**, 1195–1203 (2019).
82. Tonnies, T., Hoyer, A. & Brinks, R. Productivity-adjusted life years lost due to type 2 diabetes in Germany in 2020 and 2040. *Diabetologia* **64**, 1288–1297 (2021).
83. Xie, J. et al. Global burden of type 2 diabetes in adolescents and young adults, 1990–2019: systematic analysis of the Global Burden of Disease Study 2019. *BMJ* **379**, e072385 (2022).
84. Stewart, W. F., Ricci, J. A., Chee, E., Hirsch, A. G. & Brandenburg, N. A. Lost productive time and costs due to diabetes and diabetic neuropathic pain in the US workforce. *J. Occup. Environ. Med.* **49**, 672–679 (2007).
85. daCosta DiBonaventura, M., Cappelleri, J. C. & Joshi, A. V. A longitudinal assessment of painful diabetic peripheral neuropathy on health status, productivity, and health care utilization and cost. *Pain Med.* **12**, 118–126 (2011).
86. Bielecky, A. et al. The impact of co-morbid mental and physical disorders on presenteeism. *Scand. J. Work Environ. Health* **41**, 554–564 (2015).
87. Loepfke, R. et al. Medication adherence, comorbidities, and health risk impacts on workforce absence and job performance. *J. Occup. Environ. Med.* **53**, 595–604 (2011).
88. DiBonaventura, M., Link, C., Pollack, M. F., Wagner, J. S. & Williams, S. A. The relationship between patient-reported tolerability issues with oral antidiabetic agents and work productivity among patients having type 2 diabetes. *J. Occup. Environ. Med.* **53**, 204–210 (2011).
89. Moulton, C. D. et al. Depression and change in occupational functioning in type 2 diabetes. *Occup. Med.* **69**, 322–328 (2019).
90. Persson, S. et al. Days absent from work as a result of complications associated with type 2 diabetes: evidence from 20 years of linked national registry data in Sweden. *Diabetes Obes. Metab.* **22**, 1586–1597 (2020).
91. Katcher, H. I., Ferdowsian, H. R., Hoover, V. J., Cohen, J. L. & Barnard, N. D. A worksite vegan nutrition program is well-accepted and improves health-related quality of life and work productivity. *Ann. Nutr. Metab.* **56**, 245–252 (2010).
92. Bevis, C. C. et al. Diabetes wellness care: a successful employer-endorsed program for employees. *J. Occup. Environ. Med.* **55**, 1052–1061 (2014).
93. Huckfeldt, P. J. et al. Association of intensive lifestyle intervention for type 2 diabetes with labor market outcomes. *JAMA Intern. Med.* **183**, 1071–1079 (2023).
94. Fokkert, M. et al. Improved well-being and decreased disease burden after 1-year use of flash glucose monitoring (FLARE-NL4). *BMJ Open Diabetes Res. Care* **7**, e008089 (2019).
95. Charleer, S. et al. Quality of life and glucose control after 1 year of nationwide reimbursement of intermittently scanned continuous glucose monitoring in adults living with type 1 diabetes (FUTURE): a prospective observational real-world cohort study. *Diabetes Care* **43**, 389–397 (2020).
96. Charleer, S. et al. Effect of continuous glucose monitoring on glycemic control, acute admissions, and quality of life: a real-world study. *J. Clin. Endocrinol. Metab.* **103**, 1224–1232 (2018).
97. Polonsky, W. H., Hessler, D., Ruedy, K. J. & Beck, R. W. The impact of continuous further findings from the DIAMOND randomized clinical trial. *Diabetes Care* **40**, 736–741 (2017).
98. Brown, S. A. et al. Six-month randomized, multicenter trial of closed-loop control in type 1 diabetes. *N. Engl. J. Med.* **381**, 1707–1717 (2019).
99. Tauschmann, M. et al. Closed-loop insulin delivery in suboptimally controlled type 1 diabetes: a multicentre, 12-week randomised trial. *Lancet* **392**, 1321–1329 (2018).
100. Davila, E. P. et al. Long work hours is associated with suboptimal glycemic control among US workers with diabetes. *Am. J. Ind. Med.* **54**, 375–383 (2011).
101. Lee, J. et al. Poor glycemic control in workers with diabetes mellitus in relation to long working hours: a cross-sectional study. *Ind. Health* **58**, 451–459 (2020).
102. Weijman, I. et al. The role of work-related and personal factors in diabetes self-management. *Patient Educ. Couns.* **59**, 87–96 (2005).
103. Jakubowicz, D. et al. Fasting until noon triggers increased postprandial hyperglycemia and impaired insulin response after lunch and dinner in individuals with type 2 diabetes: a randomized clinical trial. *Diabetes Care* **38**, 1820–1826 (2015).
104. Hackett, R. A. & Steptoe, A. Type 2 diabetes mellitus and psychological stress — a modifiable risk factor. *Nat. Rev. Endocrinol.* **13**, 547–560 (2017).
105. Young, J., Waclawski, E., Young, J. A. & Spencer, J. Control of type 1 diabetes mellitus and shift work. *Occup. Med.* **63**, 70–72 (2013).
106. Brum, M. C. B., Filho, F. F. D., Schnorr, C. C., Bottega, G. B. & Rodrigues, T. C. Shift work and its association with metabolic disorders. *Diabetol. Metab. Syndr.* **7**, 45 (2015).
107. Kubo, J. et al. Contribution of health status and prevalent chronic disease to individual risk for workplace injury in the manufacturing environment. *Occup. Environ. Med.* **71**, 159–166 (2014).
108. Kouvonen, A. et al. Diabetes and risk of occupational injury: a cohort study. *Diabet. Med.* **34**, 1629–1636 (2017).
109. Sprince, N. L., Pospisil, S., Peek-Asa, C., Whitten, P. S. & Zwerling, C. Occupational injuries among workers with diabetes: the National Health Interview Survey, 1997–2005. *J. Occup. Environ. Med.* **50**, 804–808 (2008).
110. Palmer, K. T., D'Angelo, S., Harris, E. C., Linaker, C. & Coggon, D. Epilepsy, diabetes mellitus and accidental injury at work. *Occup. Med.* **64**, 448–453 (2014).
111. Amiel, S. A. The consequences of hypoglycaemia. *Diabetologia* **64**, 963–970 (2021).
112. Toftagen, C., Visovsky, C. & Berry, D. L. Strength and balance training for adults with peripheral neuropathy and high risk of fall: current evidence and implications for future research. *Oncol. Nurs. Forum* **39**, E416–E424 (2012).
113. Chen, H. et al. The association between sarcopenia and diabetes: from pathophysiology mechanism to therapeutic strategy. *Diabetes Metab. Syndr. Obes.* **16**, 1541–1554 (2023).
114. Sharma, P., Sharma, R. K. & Gaur, K. Understanding the impact of diabetes on bone health: a clinical review. *Metab. Open* **24**, 100330 (2024).
115. Feleke, B. E. et al. Excess risk of injury in individuals with type 1 or type 2 diabetes compared with the general population. *Diabetes Care* **47**, 1457–1462 (2024).
116. Leckie, A. M., Graham, M. K., Grant, J. B., Ritchie, P. J. & Frier, B. M. Frequency, severity, and morbidity of hypoglycemia occurring in the workplace in people with insulin-treated diabetes. *Diabetes Care* **28**, 1333–1338 (2005).
117. Hakkarainen, P., Moilanen, L., Hänninen, V., Heikkinen, J. & Räsänen, K. Work-related diabetes distress among Finnish workers with type 1 diabetes: a national cross-sectional survey. *J. Occup. Med. Toxicol.* **11**, 11 (2016).
118. Hansen, U. M., Skinner, T., Olesen, K. & Willaing, I. Diabetes distress, intentional hyperglycemia at work, and glycemic control among workers with type 1 diabetes. *Diabetes Care* **42**, 797–803 (2019).
119. Elhadidi, S. S., El-Gilany, A.-H., Abdel Ghani Badawi, M. R. & Elbially, A. M. Intentional hyperglycemia at work, glycemic control, work-related diabetes distress and work ability among workers with diabetes. *J. ASEAN Fed. Endocrinol. Soc.* **39**, 70–78 (2024).
120. Cook, A. S. & Zill, A. Working with type 1 diabetes: investigating the associations between diabetes-related distress, burnout, and job satisfaction. *Front. Psychol.* **12**, 697833 (2021).
121. McCarthy, M., Vorderstrasse, A., Yan, J., Portillo, A. & Dickson, V. V. Managing diabetes in the workplace. *Workplace Health Saf.* **69**, 216–223 (2021).
122. Balfe, M. et al. Why do young adults with type 1 diabetes find it difficult to manage diabetes in the workplace? *Health Place* **26**, 180–187 (2014).
123. Loerbroks, A. et al. Psychosocial working conditions and diabetes self-management at work: a qualitative study. *Diabetes Res. Clin. Pract.* **140**, 129–138 (2018).
124. Ruston, A., Smith, A. & Fernando, B. Diabetes in the workplace — diabetic's perceptions and experiences of managing their disease at work: a qualitative study. *BMC Public Health* **13**, 386 (2013).
125. Scharf, J., Nguyen, X. Q., Vu-Eickmann, P., Krichbaum, M. & Loerbroks, A. Perceived usefulness of continuous glucose monitoring devices at the workplace: secondary analysis of data from a qualitative study. *J. Diabetes Sci. Technol.* **13**, 242–247 (2019).
126. Olesen, K., Cleal, B. & Willaing, I. Discrimination and stigma among people with type 2 diabetes in the workplace: prejudice against illness or obesity? *Public Health* **180**, 100–101 (2020).
127. Browne, J. L., Ventura, A., Mosely, K. & Speight, J. 'I'm not a druggie, I'm just a diabetic': a qualitative study of stigma from the perspective of adults with type 1 diabetes. *BMJ Open* **4**, e005625 (2014).
128. American Diabetes Association. Diabetes and employment. *Diabetes Care* **37**, S112–S117 (2013).
129. Diabetes UK. Work and Diabetes. *Diabetes UK* <https://www.diabetes.org.uk/living-with-diabetes/life-with-diabetes/employment> (2023).
130. Diabetes Canada. Employment. *Diabetes Canada* <https://www.diabetes.ca/research-1/our-policy-positions/employment> (2024).
131. Diabetes Australia. In the Workplace — Diabetes & Employment. *Diabetes Australia* <https://www.diabetesaustralia.com.au/living-with-diabetes/in-the-workplace/> (2025).
132. Shaw, K. & Garden, G. Enabling equality of employment with insulin treated diabetes in safety-critical occupations. *Pract. Diabetes* **37**, 204–205 (2020).

133. Russell-Jones, D. L., Hutchison, E. J. & Roberts, G. A. Pilots flying with insulin-treated diabetes. *Diabetes Obes. Metab.* **23**, 1439–1444 (2021).
134. Graveling, A. & Frier, B. Driving and diabetes: are the changes in the European Union licensing regulations fit for purpose? *Br. J. Diabetes* **18**, 25–31 (2018).
135. Cox, D. J. et al. Diabetes and driving: a statement of the American Diabetes Association. *Diabetes Care* **47**, 1889–1896 (2024).
136. Beshyah, S., Beshyah, A., Yaghi, S., Beshyah, W. & Frier, B. A global survey of licensing restrictions for drivers with diabetes. *Br. J. Diabetes* **17**, 3–10 (2017).
137. Government of Canada. *Canadian Human Rights Act*, RSC 1985, c. H-6. <https://laws-lois.justice.gc.ca/eng/acts/h-6/page-1.html#h-256800> (2025).
138. Golden, M. The Americans with Disabilities Act of 1990. *J. Vocat. Rehabil.* **1**, 13–20 (1991).
139. Legislation.gov.uk. *Equality Act 2010*, c39. <https://www.legislation.gov.uk/ukpga/2010/15/section/6> (2025).
140. European Union. *European Union Employment Equality Directive (2000/78/EC)*. <https://eur-lex.europa.eu/eli/dir/2000/78/oj/eng> (2000).
141. American Diabetes Association. Your Job and Your Rights: Diabetes Technology Accommodations in the Workplace. *American Diabetes Association* <https://diabetes.org/sites/default/files/2024-05/2024-05-diabetes-tech-in-employment.pdf> (2024).

Author contributions

D.T. researched data for the article, contributed to discussion of the content, wrote the article and reviewed and/or edited the article before submission. K.W.-B., T.K. and D.J.M. contributed to discussion of the content, wrote the article and reviewed and/or edited the article before submission. E.Z. and S.Z. contributed to discussion of the content and reviewed and/or edited the article before submission.

Competing interests

The authors declare no competing interests.

Additional information

Peer review information *Nature Reviews Endocrinology* thanks Frank Snoek and the other, anonymous, reviewer(s) for their contribution to the peer review of this work.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.

Review criteria We conducted a Medline search identifying 1,434 articles published in English between 2000 and 2024 using the terms 'diabetes mellitus' AND 'employment' OR 'retirement' OR 'absenteeism' OR 'presenteeism' OR 'productivity' OR 'occupational health' OR 'workplace', which were mapped to subject headings. As a narrative review, we did not include all studies reporting any work-related outcome; rather, we aimed to provide a comprehensive overview of work participation among people living with diabetes mellitus, prioritizing high-quality evidence. Although we did not apply a specific quality assessment to each study, we were cognisant of summarizing data primarily from high-quality studies, emphasizing those with large sample sizes (particularly registry-based data), validated outcome measures, longitudinal designs and analyses stratified by diabetes mellitus type, age, sex and occupation. Qualitative studies were also included to provide contextual understanding of lived experiences of work among people with diabetes mellitus. Studies in which the effect of diabetes mellitus on work was not the primary focus were excluded. Data from systematic reviews were included. Additional primary studies were incorporated if they addressed gaps not covered in existing reviews or provided novel insights on previously reported outcomes. The final synthesis summarized 78 studies in a narrative manner. Regarding guidelines and recommendations, we sourced information from leading national diabetes mellitus organizations, in addition to 13 related articles retrieved from the search.

© Springer Nature Limited 2025