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RESEARCH ARTICLE

Epidemiology

Total and excess bed-days in people with diabetes in Australia

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Abstract

Aims: This study was conducted to describe the annual bed-day rate and excess bed-day rate related to diabetes and to investigate the main diagnoses that account for the excess bed-days in people with diabetes in Australia.

Methods: For the diabetes population, we linked data from the Australian National Diabetes Services Scheme to the National Morbidity Inpatient Register (NMIR) and the National Death Index from 2014 to 2017. General population data were sourced from the NMIR. We used quasi-Poisson regression to estimate rates by adjusting for age, sex and fiscal year.

Results: The adjusted annual all-cause bed-day rate per 100,000 people was 323,087 (95% CI: 303,186, 344,295) for the diabetes cohort and 196,363 (192,178, 200,639) for the general population. This resulted in an annual all-cause excess bed-day rate of 126,724 (106,003, 147,445) per 100,000 people with diabetes. Approximately 42% of excess bed-days were attributed to infections, endocrine disorders and cardiovascular diseases. Foot infection had the largest single-disease annual excess bed-day rate for foot infection at 8787 (7976, 9597) per 100,000 people with diabetes and accounted for more excess bed-days than most broad disease categories. Excess bed-days were greater among women with diabetes compared to men with diabetes (p-value <0.01).

Conclusion: People with diabetes experienced a higher rate of bed-days compared to the general population, with traditional complications significantly explaining most of the excess number of bed-days observed. The major impact of foot infection on hospital burden demands greater attention be paid to the prevention and early management of foot complications.

KEYWORDS

diabetes, excess bed-days, hospitalisation, length of stay, total bed-days

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1 | INTRODUCTION

Diabetes mellitus represents one of the most significant global public health challenges, characterised by chronic hyperglycaemia and associated with both traditional complications—including microvascular and macrovascular diseases[1]—and emerging comorbidities such as cancer, liver disease and neuropsychiatric disorders.[2] While these complications are well recognised, their relative impact on healthcare utilisation, particularly hospital bed-day occupancy, remains poorly quantified, as higher prevalence does not necessarily equate to greater bed-day use. According to the International Diabetes Federation, 537 million adults within the age group of 20–79 were living with diabetes in the year 2021, and by the year 2050, around 1.31 billion adults will have diabetes.[3,4] The rising prevalence of diabetes implies that more people with diabetes are expected to be admitted to hospitals.[5] The cost of inpatient diabetes care imposes a large economic burden on the government and on people with diabetes.[6] In 2018–19, Australia spent three billion dollars on diabetes care, and about one-third of this cost went to inpatient care.[7] Further, long hospital stays pose risks for additional disorders such as nosocomial infections, mental illness and bedsores.[8–10] Due to advances in diabetes care, the life expectancy of people with diabetes is increasing, and older people typically have more comorbidities. Relying solely on admission rates for diabetes care planning is potentially misleading, as such rates do not account for the prolonged hospital stays common among individuals with diabetes. However, there is a scarcity of literature on excess bed-days associated with diabetes in nationally representative populations, and little information on the extent to which non-traditional complications contribute to this burden. Therefore, this study aimed to estimate total and disease-specific bed-day rates and excess bed-day rates associated with diabetes in people with diabetes living in Australia compared to the general population.

What's new?

- People with diabetes in Australia spend 126,724 more hospital bed-days per 100,000 population each year than the general population, driven mainly by higher admission rates rather than longer stays.
- Foot infection is the leading specific cause of excess bed-days, outweighing most broad disease categories.
- Nearly half of the excess bed-day burden comes from traditional diabetes complications such as infections, cardiovascular disease and endocrine disorders.

2 | METHODS

2.1 | Data sources and procedures

Data for people with diabetes were obtained from the Australian National Diabetes Services Scheme (NDSS) and National Morbidity Inpatient Register linked to the National Death Index (NDI). NDSS acts as the national diabetes registry of Australia capturing 80%–90% of diagnosed diabetes in the country.[10,11] We included NDSS registrants from 01 July 2013 up until 30 June 2017 from Victoria and Queensland, which was estimated to represent 50% of people with diabetes in Australia. We excluded admissions from other jurisdictions due to the unavailability of data on private hospital admissions in those jurisdictions. Individuals from other jurisdictions who were hospitalised in Victoria or Queensland were excluded from the analysis, as they were not included in the denominator population.

The Australian Institute of Health and Welfare (AIHW) linked the NDSS with the National Morbidity Inpatient Register, and the primary diagnosis associated with each hospitalisation from the linked dataset was used in the analysis. Admission data for the general Australian population was obtained from the AIHW National Morbidity Inpatient Dataset. The general population data contain complete private and public hospital admission, but separation of public hospital from private admissions was not provided. Data for the population size of Australia were obtained from the Australian Bureau of Statistics.[11]

Human research ethics approval was obtained from the Alfred Hospital Ethics Committee (Approval number 463/18), the Australian Institute of Health and Welfare (EO2018/5/501) and the Monash University Human Research Ethics Committee (31945).

2.2 | Definition of outcomes

Total patient separations were defined as the total count of care episodes for hospitalised patients encompassing complete hospital stays or segments of stays that commence or conclude with a transition in care type, concluding within a specified reference period. The diagnosis codes used to define diseases were obtained from the International Statistical Classification of Diseases and Related Health

Problems, Tenth Revision, Australian Modification (ICD-10-AM) codes (Table S1). A principal diagnosis code was employed to define outcomes. The principal diagnosis refers to the main condition deemed responsible for the hospital admission, as recorded in the administrative hospital data and is represented by ICD codes.

Outcomes from 109 diseases (grouped into all-cause admissions, into 14 broad categories of diseases and into 94 subcategories of diseases) were defined using the ICD-10-AM codes. The annual bed-day rate was defined as the total number of days that a hospital bed was occupied per 100,000 people per year.

2.3 | Statistical analysis

Discharge coding changes during the observation period were reviewed, and data cleaning was performed using STATA software version 18. Individuals with diabetes were observed from either 1 July 2013, the date of registration on the NDSS, or the date of migration into one of the two states, whichever was the latest. Observation continued until 30 June 2017, or until their death, or migration out of the two states. *An individual may experience multiple hospital admissions during the observation period*. The profile of the groups was presented using descriptive statistics. Bed-day rates were estimated by modelling the quasi Poisson likelihood, using admission-specific bed-days as the outcome and the logarithm of the population size as the log offset. Rates were adjusted for fiscal year and to the age and sex profile of the diabetes cohort. The bed-day rate in people with diabetes was compared to the bed-day rate in the general population. We reported the bed-day rates for people with diabetes and the general population separately per 100,000 for each corresponding population. The annual excess bed-days per 100,000 people with diabetes was calculated by subtracting the bed-day rate in people with diabetes from the bed-day rate in the general population. Rates were reported for the overall population, and after stratification by age and by sex. To calculate the contribution of admission rates and average length of stay to the excess bed-day rate, we first determined the bed-day rate in people with diabetes and the general population. This was performed by multiplying the cohort-specific admission rate by the average length of stay. Next, we subtracted the general population bed-day rate from the diabetes cohort bed-day rate to obtain the diabetes-related excess bed-day rate (excess bed-day 1). Additionally, by assuming the average length of stay in people with diabetes was the same as that of the general population cohort, we calculated another diabetes-related excess bed-day rate (excess bed-day 2). We then determined the proportion of excess bed-days explained by admission rates alone by dividing excess bed-day 2 by excess bed-day 1. Data were analysed using R software version 4.3.0.

3 | RESULTS

From 2014 to 2017 the total number of people with diabetes increased from 431,930 to 493,259 (Table 1). For all-cause hospitalisations, 2,389,509 admissions were recorded. Among people with diabetes, cardiovascular diseases (CVD) were the largest contributors to all-cause admissions (162,168) followed by gastrointestinal diseases (155,958). During the observation period, the size of the general population increased from 23,490,736 to 24,598,933. In total, 41,300,000 hospitalisations were recorded in the general population over the time period, with hospitalisation due to digestive system diseases being the largest contributors to all-cause admissions (4,063,970), followed by cancer (2,606,451). The adjusted annual bed-day rates for all-cause hospital admission in the general population and in people with diabetes were 196,363 and 323,087 per 100,000, respectively. Infection was the largest contributor to total bed-days in people with diabetes, and mental health conditions were the largest contributors to the total bed-days in the general population.

3.1 | Total and excess diabetes-related bed-days

The annual rate of excess bed-days related to all-cause admissions was 126,724 days per 100,000 people with diabetes (Tables 2 and S2). Excess bed-days associated with diabetes were highest for the all infection category, corresponding to 22,165 days per 100,000 people with diabetes, with foot infections being the major contributor. The excess bed-days for foot infections were greater than for any other single condition and also exceeded the excess bed-days for all other broad categories except for infections, CVD and endocrine disorders.

CVD was the second largest contributor to all-cause excess bed-days, with the annual excess bed-days being 16,411 days per 100,000 people with diabetes; within the CVD category, angina and ischaemic heart disease were the largest contributors to the excess bed-days, followed by myocardial infarction. Endocrine disorders were the third top contributor to all-cause excess bed-days, corresponding to 14,861 days per 100,000 people with diabetes per year. Within this broad category, diabetes with multiple complications was the top contributor, followed by diabetes with unspecified complications. For admissions with a primary diagnosis of diabetes with multiple complications,

TABLE 1 Profile of people with diabetes and the general Australian population from 2013/14 to 2016/17.

Profile	Year 2013/14	2014/15	2015/16	2016/17
Population size (*n*)				
T1DM	31,712	32,834	33,892	35,084
T2DM	400,218	422,516	441,553	458,175
Population	23,490,736	23,781,169	24,127,159	24,598,933
Men (%)				
T1DM	55.5	55.4	55.3	55.5
T2DM	54.1	54.4	54.7	54.9
Population	49.7	49.7	49.8	48.8
Age,[a] median (years)				
T1DM	23.1	22.9	22.7	22.5
T2DM	58.0	57.8	57.7	57.5
Population	37.3	37.4	37.0	37.3
Age,[a] IQR (years)				
T1DM	12.4, 33.6	12.3, 33.4	12.2, 33.2	12.2, 33.0
T2DM	48.9, 66.6	48.8, 66.4	48.7, 66.2	48.5, 66.0
Population	19.9, 55.8	20.0, 56.0	19.5, 56.2	19.6, 56.3
Diabetes duration,[b] median (years)				
T1DM	14.9	15.1	15.2	15.4
T2DM	7.1	7.3	7.6	7.9
Diabetes duration,[b] IQR (years)				
T1DM	7.0, 23.3	7.1, 23.9	7.2, 24.6	7.3, 25.2
T2DM	3.4, 12.2	3.6, 12.6	3.9, 13.1	4.2, 13.6
Age[b] category, year (%)				
0–19				
T1DM	16.3	16.1	15.8	15.5
T2DM	0.1	0.1	0.1	0.1
Population	25.1	25.0	25.0	24.9
20–39				
T1DM	37.2	37.1	37.0	37.1
T2DM	3.5	3.4	3.3	3.3
Population	28.4	28.4	28.4	28.7
40–59				
T1DM	32.9	32.4	32.1	31.8
T2DM	29.1	28.6	28.0	27.3
Population	26.4	26.2	25.9	25.6
60–79				
T1DM	13.3	14.0	14.7	15.3
T2DM	52.6	52.9	53.2	53.5
Population	16.2	16.5	16.8	16.9
≥80				
T1DM	0.3	0.3	0.3	0.4
T2DM	14.8	15.0	15.4	15.9
Population	3.9	3.9	3.9	3.9

Abbreviations: IQR, inter quartile range; Population, general population of Australia; T1DM, Type 1 diabetes; T2DM, Type 2 diabetes.

[a]Age at diabetes diagnosis.

[b]At the end of the fiscal year.

TABLE 2 Annual crude bed-day rate and excess bed-day rate related to diabetes in Australia.

	Crude bed-days rate (95% CI)[a]		Excess bed-days (95% CI)[a,b]	
Diseases	**Diabetes**	**General population**	**Crude**	**Adjusted**[c]
All-cause	337,265 (336,738, 337,792)	120,102 (120,058, 120,146)	217,163 (216,680, 217,646)	126,724 (106,003, 147,445)
Total infection	39,162 (39,024, 39,300)	9777 (9765, 9789)	29,385 (29,259, 29,511)	22,165 (19,065, 25,266)
Foot infections	10,781 (10,693, 10,869)	743 (740, 747)	10,037 (9953, 10,122)	8787 (7976, 9597)
Osteomyelitis	4161 (4104, 4218)	406 (404, 409)	3755 (3700, 3810)	3318 (2951, 3685)
CVD	39,610 (39,472, 39,749)	9828 (9816, 9840)	29,782 (29,656, 29,909)	16,411 (13,381, 19,442)
Anginal and ischaemic heart disease	6667 (6595, 6739)	638 (634, 641)	6029 (5961, 6098)	4546 (4256, 4836)
Myocardial infarction	5312 (5248, 5377)	1061 (1057, 1065)	4251 (4191, 4312)	2846 (2313, 3379)
Heart failure	7210 (7137, 7283)	1665 (1659, 1670)	5545 (5478, 5613)	2603 (1706, 3499)
Endocrine disorders	19,377 (19,264, 19,490)	2287 (2281, 2293)	17,090 (16,983, 17,197)	14,861 (13,561, 16,160)
Diabetes with multiple complications	6536 (6466, 6607)	30 (30, 31)	6506 (6436, 6576)	6250 (5880, 6619)
Diabetes with unspecified complications	3972 (3915, 4028)	247 (245, 249)	3724 (3670, 3778)	3092 (2822, 3363)
Musculoskeletal diseases	26,157 (26,032, 26,283)	8140 (8129, 8151)	18,017 (17,903, 18,132)	8446 (5495, 11,398)
Digestive system diseases	21,087 (20,969, 21,204)	8481 (8470, 8493)	12,605 (12,499, 12,711)	6068 (4731, 7405)
Any injury	26,068 (25,943, 26,193)	8466 (8455, 8478)	17,601 (17,487, 17,715)	5934 (3370, 8497)
Lower extremity	12,471 (12,376, 12,565)	3496 (3488, 3503)	8975 (8888, 9062)	3264 (1976, 4552)
Genito urinary diseases	13,527 (13,429, 13,625)	4163 (4155, 4171)	9364 (9273, 9454)	5832 (4979, 6685)
Skin diseases	8945 (8863, 9027)	2409 (2403, 2415)	6536 (6461, 6612)	4948 (4378, 5519)
Cellulitis	5073 (5067, 5079)	1188 (1188, 1188)	3886 (3880, 3891)	3011 (2744, 3279)
Respiratory diseases	16,599 (16,494, 16,705)	6824 (6814, 6835)	9775 (9679, 9870)	4198 (2592, 5804)
Lower respiratory diseases	15,806 (15,702, 15,909)	6072 (6063, 6082)	9733 (9639, 9827)	4135 (2575, 5695)
Nervous system disorders	8312 (8233, 8391)	3094 (3087, 3101)	5218 (5146, 5290)	2676 (2161, 3191)
Mental health diseases	20,943 (20,826, 21,060)	14,693 (14,679, 14,707)	6250 (6147, 6353)	2457 (−623, 5537)
Eye or ear diseases	6795 (6722, 6867)	2014 (2009, 2020)	4780 (4714, 4847)	2449 (2248, 2650)
Pregnancy and labour	1803 (1765, 1841)	7739 (7728, 7749)	−5936 (−5963, −5908)	19 (−3, 42)
Cancer	17,997 (17,888, 18,106)	8934 (8923, 8945)	9063 (8965, 9160)	−1070 (−3190, 1049)

Note: A negative excess bed-day rate implies lower hospitalisation rates among people with diabetes compared to the general population.

Abbreviations: CI, confidence interval; CVD, cardiovascular diseases; NSTEMI, non-ST-elevation myocardial infarction.

[a]Rate adjusted for age and sex to the diabetes population and reported per 100,000 people.

[b]Excess rate is per 100,000 people with diabetes.

[c]Rate adjusted to the diabetes population.

foot infection was the most common secondary diagnosis. Following endocrine disorders, musculoskeletal diseases and digestive system diseases accounted for the most excess bed-days (8446 and 6068 excess bed-days per 100,000 people with diabetes, respectively).

The observed excess bed-days were mainly due to the higher admission rates, with a smaller contribution coming from greater length of stay (Figures 1 and 2, Table S3). However, the contribution varied across diseases. For example, higher admission rates accounted for 55% of excess

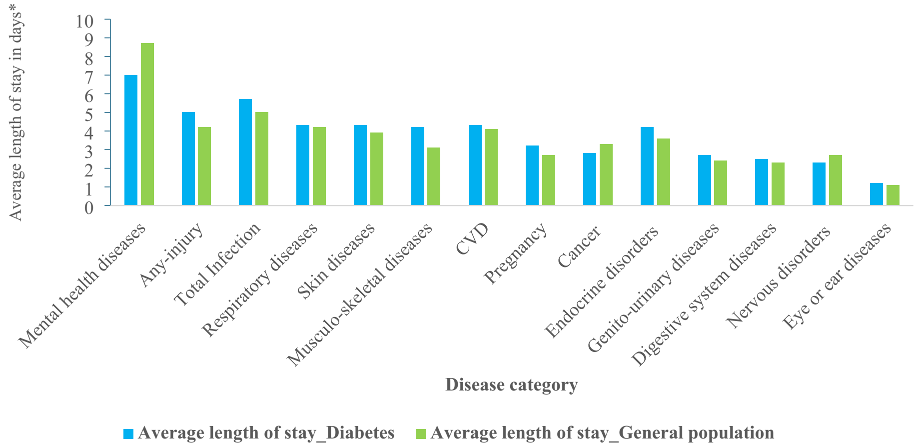

FIGURE 1 Average length of stay in people with diabetes and the general population. *Average length of stay was standardised by age and sex to the diabetes population. CVD, cardiovascular diseases.

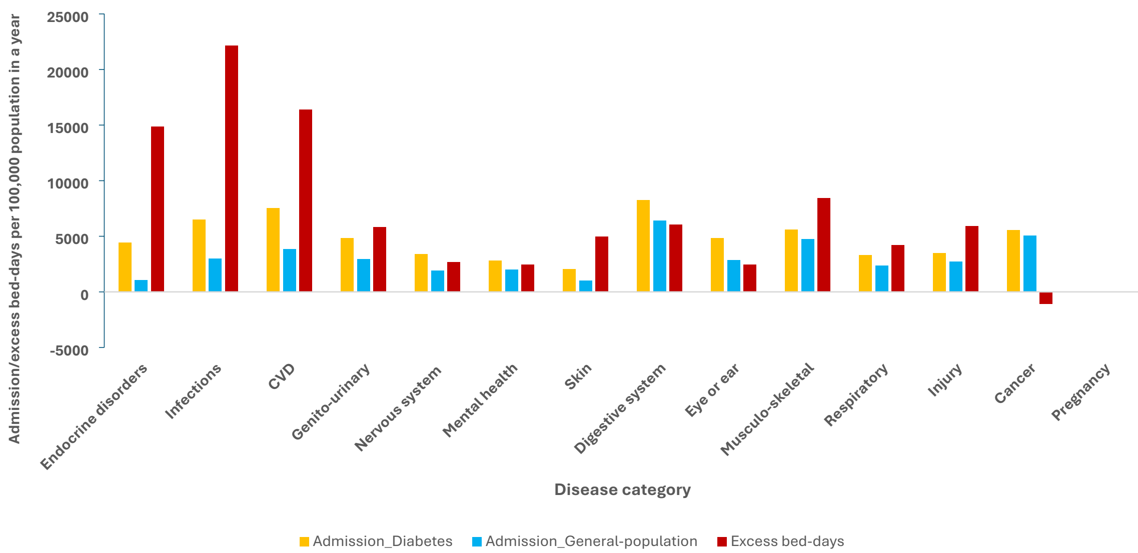

FIGURE 2 Adjusted annual admission rates in people with diabetes and the general population, and excess annual bed-days per 100,000 population. CVD, cardiovascular diseases.

injury bed-days, for 80% of excess infection bed-days and for 92% of excess CVD bed-days.

3.2 | Excess bed-days rate related to diabetes by sex

Compared to men with diabetes, the all-cause excess bed-day rate was higher among women with diabetes (Table S4). In women with diabetes, a higher excess bed-day rate was observed for musculoskeletal, injury, digestive system and mental health disorders as compared to men with diabetes. These conditions constituted approximately 27% of all-cause excess bed-days related to diabetes in women. However, a higher excess bed-day rate was observed in men with diabetes compared to women with diabetes for infection, cardiovascular diseases, endocrine disorders, genitourinary diseases, skin diseases and eye or ear diseases. These conditions constitute around 57% of all-cause excess bed-days in men with diabetes.

The foot infection bed-day rate in men was double the rate in women. Further, compared to women with diabetes, men with diabetes exhibited higher rates of excess bed-days for conditions such as stress adjustment disorders and sleep disorders. All infections, endocrine diseases and CVD contributed to 46% of excess bed-days in men with diabetes and 36% of excess bed-days in women with diabetes.

3.3 | Age-stratified analysis

The age-stratified analysis showed that the total annual excess bed-day rates related to diabetes were similar to each other among the four age groups under the age of 80 (Table S5), with the largest excess being observed among those aged 20–39 years. However, the disease groups contributing to these totals varied considerably. Endocrine disorders accounted for about 76% of excess bed-days in the 0–19 age group, dropping to only 19% in the 20–39 age group and falling further with increasing age. Mental health conditions accounted for 14% of excess bed-days in the 20–39 age group, but for a much smaller percentage in other age groups. Compared to the general population, the bed-day rate for cancer was lower for people with diabetes aged 60 years or older. The lower all-cause excess bed-day rate related to diabetes observed in the 80+ age group was mainly attributed to the lower bed-day rates for cancer, respiratory disease and mental health.

4 | DISCUSSION

In this analysis of bed-days and excess bed-day rates associated with diabetes, it was found that people with diabetes had a higher bed-day rate for all-cause as well as for each broad category of disease except for cancer and mental health. In people with diabetes, CVD was the leading cause of hospitalisation and the leading contributor to bed-days. Infection was the leading contributor to excess bed-days related to diabetes. Notably, the excess bed-days for foot infection were higher than for most broad categories (such as genitourinary diseases and musculoskeletal diseases). The excess bed-days for foot infection alone exceed the excess bed-days for most broad categories. Excess bed-days related to diabetes varied across genders and age, with higher excess bed-days exhibited among women with diabetes and among people aged 20–39 years.

Similar findings have been previously reported in the literature. For example, a study from Hong Kong reported that the bed-day rate was higher in people with type 2 diabetes (3359 per 1000 person year) compared to those without diabetes (2350 per 1000 person-years).[12] People with diabetes have excess bed-days mainly due to prolonged length of stay, as reported in the United Kingdom.[13] A study from New South Wales reported an all-cause length of stay for people with diabetes and those without was 8.2 days and 7.1 days, respectively.[14] Excess bed-days related to diabetes were recorded in Spain, with an average length of stay of 11.4 days for people with diabetes compared to 7.6 days for those without diabetes.[15]

Several factors may explain the excess bed-day rate associated with diabetes; one such reason is the compromised immune system of people with diabetes. High blood sugar level affects nearly all organs, weakening the immune system and increasing the severity of illnesses.[16] The presence of additional comorbidities, which have been reported in around 90% of individuals with type 2 diabetes,[17] also likely contributes to excess admission and greater length of stay. Polypharmacotherapy can lead to low medication adherence, which decreases the effectiveness of medical care and increases inpatient stays.[17,18]

Notably, foot infections alone accounted for more excess bed-days than did most broad diagnostic categories. Furthermore, additional bed-days for foot infections were almost certainly included in the categories of osteomyelitis and diabetes with multiple complications, but it was not possible to accurately calculate this contribution. This excess in bed-days was approximately twice as great in men than in women, though in women it was still the second largest cause of excess bed-days. This sex difference may be related to a number of factors. Peripheral neuropathy, a major contributor to foot complications, more significantly affects long nerves compared to short nerves, indicating that it is a length-dependent process, and therefore more common in men.[19,20] Men also have higher rates of CVD, the other major cause of diabetic foot disease, than do women.[21] Additionally, the lower foot self-care practice among men compared to women may also contribute to the observed difference.[22] These findings underscore the urgent need to improve preventive foot care in diabetes management. Key strategies could include enhanced patient education on daily foot care practices, expanded access to multidisciplinary foot clinics, regular foot examinations by diabetes care teams and better resource allocation for community-based foot care programmes.[23,24]

The stark difference observed in disease-specific excess bed-days associated with diabetes among men compared to women with diabetes calls for further investigations to gain insights into the underlying cause. Mental health diseases accounted for nearly 10 times as many excess bed-days in women than in men (4923 vs. 431 per 100,000 people per year), with depressive disorders and bipolar disorders being the largest contributors to this difference.

The marked difference in endocrine-related excess bed-days between age groups (76% in 0–19 years vs. 19% in 20–39 years) primarily reflects the higher proportion of type 1 diabetes in younger populations compared to older populations. This pattern aligns with the known epidemiology of type 1 diabetes and its associated acute complications. As supported by previous research,[25] younger individuals with type 1 diabetes are particularly vulnerable to acute metabolic complications such as diabetic ketoacidosis, which likely drive this observed bed-day burden.

Our data indicate that the excess bed-days associated with diabetes were mainly due to a higher number of admissions, with increased length of stay accounting for much less of the excess. In the diabetes cohort, the average length of stay for endocrine diseases, all infections, CVD, and any injury was four, six, four and five days, respectively. Longer hospital stays among people with diabetes may be attributed to the severity of illnesses compared to those without diabetes.[26] Additionally, people with diabetes may not respond as effectively to treatments as the general population, which could lead to extended hospital stays.[27] Furthermore, hospitalisation among people with diabetes is often associated with additional complications such as hypoglycaemia, hyperglycaemia including conditions like diabetic ketoacidosis and hyperosmolar hyperglycaemic state, all of which can contribute to prolonged length of stay.[28,29] Moreover, the time taken to achieve adequate management of blood glucose levels in people with diabetes may further delay discharge from hospital.[30] Inpatient hospital stay is associated with a higher burden of disease conditions such as mental health disorders, infections, sleep deprivation, physical deconditioning and risk of falling.[8,31,32] Since staying in hospital is expensive, it has financial implications for the government and for the person in hospital.[33]

This study possesses numerous strengths, including the use of a nationally representative sample, comprehensive inclusion of all-cause admissions subdivided by broad and specific categories of diseases and the implementation of robust methodologies. However, the study is not without limitations. NDSS and hospitalisation data sources lacked many clinical covariates necessary to identify the reasons for excess hospital stays associated with diabetes. Furthermore, we were unable to stratify by readmission cases. Moreover, comparing the length of stay between people with diabetes and the general population may be limited because we are dealing with separation rates, not whole-of-admission rates. People with diabetes may have more separations per admission, and so the length of separation may underestimate the length of admission to a greater degree in people with diabetes than in the general population and may mean that we have underestimated the contribution of length of stay to excess bed-day rates. However, this does not influence the calculation of the bed-days, which is the main focus of the study. Additionally, we were unable to exclude people with diabetes from the general population data, as the diabetes cohort was limited to two states and state-specific general population data was unavailable. This may lead to an underestimation of diabetes-related excess bed-day rates. However, in the absence of practical alternatives, the general population may serve as a proxy control group. The accuracy of the data depended on the validity of ICD-10-AM codes, which may not have been uniform across all disease categories.

In conclusion, our study revealed that, compared to the general population, people with diabetes experienced a higher bed-day rate for all-cause admissions and across broad categories of diseases, except for cancer and mental health. Traditional complications explained most of the excess number of bed-days observed, with foot disease being the single biggest contributor to excess bed-days. These findings underscore the need for comprehensive interventions to reduce hospital admissions in diabetes, including both non-pharmacological approaches (regular physical activity, healthy eating and lifestyle modification) and pharmacological strategies (targeting control of lipids blood pressure and blood glucose).

AUTHOR CONTRIBUTIONS

B.E.F., D.J.M. and J.E.S. contributed to the design of the study and acquisition and interpretation of data. B.E.F. and A.S. performed the statistical analysis. B.E.F. searched the literature and wrote the manuscript. B.E.F., A.S., D.J.M. and J.E.F. revised the manuscript. J.E.S. and D.J.M. are co-senior authors of this research work. B.E.F. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors have read and approved the final version of this manuscript.

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CONFLICT OF INTEREST STATEMENT

None declared.

DATA AVAILABILITY STATEMENT

The datasets analysed during the current study are not publicly available due to privacy concerns.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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