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# Supporting Information

## Supplementary methods and results

**This appendix was part of the submitted manuscript and has been peer reviewed. It is posted as supplied by the authors.**

Appendix to: Kiburg KV, MacIsaac AI, Wilson A, et al. Hospital admissions for cardiovascular complications of people with or without diabetes, Victoria, 2004–2016. *Med J Aust* 2021; doi: 10.5694/mja2.51101.

## Design and methods

### Data sources

Hospital discharge data from the Victorian Admitted Episode Dataset were obtained between 1999 and 2016 to allow for a five-year clearance period and a 12-year observational period as described below. Diagnostic information was coded according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM).

Total numbers of people diagnosed with type 1 diabetes or type 2 diabetes were obtained through the National Diabetes Services Scheme (NDSS)(1), which captures 80-90% of Australians with known diabetes. Total numbers of people without diabetes were obtained from the publicly available Australian Census of Population and Housing available from the Australian Bureau of Statistics(2).

### Definitions

We identified incident cases for three cardiovascular disease outcomes: AMI, stroke and heart failure. The specific codes were as follows: AMI ICD-10-AM codes: I21-I21.9, stroke ICD-10-AM codes: G46.3, G46.4, I69.4 and I63.0-I63.9 and heart failure ICD-10-AM codes: I50, I50.1, I50.9, I11.0 and I13.0. A diagnosis of diabetes was established using ICD-10-AM codes E10.0-E10.9 for type 1 diabetes and E11.0-E11.9 for type 2 diabetes in the hospital discharge data. Incident cases were established by ensuring that in the previous five years (1999-2003) there were no admissions for the same complication.

**Statistical analysis**

We calculated rates for each cardiovascular related admission per 10,000 from 2004 to 2016 stratified by diabetes type. The total number of admissions for each cardiovascular complication together with the diabetes status of patients was obtained through The International Statistical Classification of Diseases and Related Health Problems 10$^{th}$ revision (ICD-10-AM) codes. Incident rate ratios were calculated for each cardiovascular complication, stratified by diabetes status, using Poisson regression models adjusted by age group and sex. An offset variable was included to account for changes in the prevalence of diabetes over the observational period of the study.

From the above we calculated incident rate ratios (relative to 2003) for each of the cardiovascular complications per year stratified by the three groups of patients according to their diabetes status. These changes were then analyzed by Joinpoint regression (version 4.7.0.0, Statistical Methodology and Applications Branch and Data Modeling Branch, Surveillance Research Program, National Cancer Institute)(3). Beginning with one straight overall line for the time period, permutation tests were then used to identify points where linear trends changed significantly ($p<0{\cdot}05$) in either direction or magnitude. Then up to 3 joinpoints were added to the model to identify significant changes in the slope. Each trend segment was described by an annual percentage change (APC) and the trend for the entire study period (2004-2016) described by the average annual percentage change (AAPC), a summary measure of the trend accounting for each trend segment.

All analysis was undertaken in Stata 15·1, except for the Joinpoint regression as described above. This study was approved by the St Vincent's Hospital Melbourne Human Research Ethics Committee (HREC/18/SVHM/146).

**References**


1. National Diabetes Service Scheme. Diabetes data snapshots. https://www.ndss.com.au/about-the-ndss/diabetes-facts-and-figures/diabetes-data-snapshots (viewed Aug 2020).
2. Australian Bureau of Statistics. Historical population. https://www.abs.gov.au/statistics/people/population/historical-population (viewed Aug 2020).
3. Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with applications to cancer rates. Stat Med 2000; 19: 335-351.

**Table. Annual percentage change (APC) in admissions for cardiovascular complications, Victoria, 2004–2016, by diabetes status**

| Cardiovascular complication and diabetes status | Admissions | Event rate (per 10 000 adults)* (95% CI) | | Overall change | Overall trend: mean APC (95% CI%) | Trends, by period: mean APC (95% CI) |
|---|---|---|---|---|---|---|
| | | 2004 | 2016 | | | |
| Acute myocardial infarction | | | | | | |
| No diabetes | 114 965 | 23.4 (22.9–23.9) | 17.6 (17.2–18.0) | –24.8% (–24.9% to –24.7%) | –5.0% (–6.7% to –3.4%) | — |
| Type 1 diabetes | 1272 | 44.3 (36.2–52.4) | 40.9 (33.0–48.9) | –7.7% (–8.8% to –6.7%) | –7.7% (–13.4% to –1.5%) | 2005–2009: +7.0% (–9.7% to +22.8%)<br>2009–2016: –15.1% (–21.3% to –8.7%) |
| Type 2 diabetes | 15 278 | 303 (292–313) | 94.0 (90.4–97.6) | –69.0% (–69.0% to –68.8%) | –11.4% (–13.0% to –9.9%) | — |
| Stroke | | | | | | |
| No diabetes | 52 320 | 11.0 (11.0–11.3) | 9.8 (9.5–10.1) | –10.9% (–13.6% to –10.6%) | –1.7% (–4.9% to +1.5%) | 2005–2014: –4.1% (–5.8% to –2.3%)<br>2014–2016: +9.6% (–10.2% to +33.8%) |
| Type 1 diabetes | 504 | 23.4 (17.4–29.5) | 13.0 (8.7–17.3) | –44.4% (–50.0% to –41.4%) | –7.2% (–12.2% to –1.9%) | — |
| Type 2 diabetes | 17 440 | 136 (128–143) | 43.4 (41.1–45.8) | –68.0% (–68.0% to –67.9%) | –11.9% (–17.0% to –6.5%) | 2005–2011: –14.7% (–17.6% to –11.7%)<br>2011–2014: +5.8% (–19.0% to +38.2%)<br>2014–2016: –26.1% (–39.8% to –9.2%) |
| Heart failure | | | | | | |
| No diabetes | 135 524 | 29.7 (29.1–30.2) | 23.1 (22.6–23.5) | –22.2% (–22.3% to –22.2%) | –2.8% (–4.1% to –1.5%) | — |
| Type 1 diabetes | 1393 | 71.2 (60.8–81.5) | 32.0 (25.2–38.8) | –55.1% (–58.6% to –52.4%) | –10.3% (–14.1% to –6.4%) | — |
| Type 2 diabetes | 52 831 | 385 (374–397) | 126 (122–130) | –67.3% (–67.4% to –67.3%) | –9.2% (–11.0% to –7.3%) | — |

CI = confidence interval.

* Adjusted for age and sex.