**SUPPLEMENTARY MATERIALS**

**Supplementary Figure 1**. Map of the Ontario health care service regions [referred to as Local Health Integration Networks (LHINs)].



Map from Statistics Canada, 2015 (https://www150.statcan.gc.ca/n1/pub/82-003-x/2015003/article/14144/c-g/ g1-eng.htm).

**Supplementary Table 1**. The RECORD statement: Checklist of items, extended from the STROBE statement that should be reported in observational studies using routinely collected health data.

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| **Section** | **Item Number** | **STROBE Items** | **Location in Article Where Items Are Reported** | **RECORDS Items** | **Location in Article Where Items Are Reported** |
| **Title and Abstract**  |
|  | 1 | (a) Indicate the study’s design with a commonly used term in the title or the abstract. (b) Provide in the abstract an informative and balanced summary of what was done and what was found. | Abstract | RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included. RECORD 1.2: If applicable, the geographic region and time frame within which the study took place should be reported in the title or abstract. RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract. | Abstract (individual databases are also described in the methods section and in Supplementary Table 2) |
| **Introduction**  |
| Background rationale  | 2 | Explain the scientific background and rationale for the investigation being reported. | Introduction |  |  |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses. | Abstract and Introduction |  |  |
| **Methods** |
| Study design  | 4 | Present key elements of study design early in the paper. | Methods |  |  |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection. | Methods |  |  |
| Participants | 6 | (a) Cohort study: Give the eligibility criteria and the sources and methods of selection of participants. Describe methods of follow-up. Case-control study: Give the eligibility criteria and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls. Cross-sectional study: Give the eligibility criteria and the sources and methods of selection of participants. (b) Cohort study: For matched studies, give matching criteria and number of exposed and unexposed. Case-control study: For matched studies, give matching criteria and the number of controls per case.  | Methods | RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided. RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided. RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.  | Supplementary Table 3, Methods, Discussion |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable. | Methods | RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.  | Supplementary Table 3 |
| Data sources / measurement | 8 | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group.  | Methods |  |  |
| Bias | 9 | Describe any efforts to address potential sources of bias.  | Methods and Discussion |  |  |
| Study size | 10 | Explain how the study size was arrived at. | Methods, Figure 1 |  |  |
| Quantitative variables  | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why.  | Methods |  |  |
| Statistical methods  | 12 | (a) Describe all statistical methods, including those used to control for confounding. (b) Describe any methods used to examine subgroups and interactions. (c) Explain how missing data were addressed. (d) Cohort study: If applicable, explain how loss to follow-up was addressed. Case-control study: If applicable, explain how matching of cases and controls was addressed. Cross-sectional study: If applicable, describe analytical methods taking account of sampling strategy. (e) Describe any sensitivity analyses.  | (a) Methods(b) Methods(c) Methods; Table 1a; Supplementary Table 4(d) Methods(e) Methods |  |  |
| Data access and cleaning methods |  | N/A |  | RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population. RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.  | Figure 1, Supplementary Table 2, Data Sharing Statement |
| Linkage |  | N/A |  | RECORD 12.3: State whether the study included person- level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided. | Methods, Supplementary Table 2, Data Sharing Statement |
| **Results** |
| Participants  | 13 | (a) Report the numbers of individuals at each stage of the study (e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed). (b) Give reasons for nonparticipation at each stage. (c) Consider use of a flow diagram. | Results, Figure 1 | RECORD 13.1: Describe in detail the selection of the persons included in the study (i.e., study population selection), including filtering based on data quality, data availability, and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram. | Results, Figure 1 |
| Descriptive data  | 14 | (a) Give characteristics of study participants (e.g., demographic, clinical, and social) and information on exposures and potential confounders. (b) Indicate the number of participants with missing data for each variable of interest. (c) Cohort study: summarise follow-up time (e.g., average and total amount). | Results, Tables 1a and 1b, Table 2, Supplementary Table 4 and 5 |  |  |
| Outcome data  | 15 | Cohort study: Report numbers of outcome events or summary measures over time. Case-control study: Reportnumbers in each exposure category or summary measures of exposure. Cross-sectional study: Report numbers of outcome events or summary measures. | Results, Tables 1a and 1b, Table 2, Supplementary Table 4 and 5 |  |  |
| Main results  | 16 | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included. (b) Report category boundaries when continuous variables were categorized. (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | Results, Table 2 |  |  |
| Other analyses  | 17 | Report other analyses done—e.g., analyses of subgroups and interactions and sensitivity analyses | Results, Supplementary Table 6 |  |  |
| **Discussion** |
| Key results  | 18 | Summarise key results with reference to study objectives. | Discussion |  |  |
| Limitations  | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias. | Discussion | RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported. | Discussion |
| Interpretation  | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results fromsimilar studies, and other relevant evidence. | Discussion |  |  |
| Generalizability  | 21 | Discuss the generalisability (external validity) of the study results. | Discussion |  |  |
| **Other Information**  |
| Funding  | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original studyon which the present article is based. | Funding acknowledgements |  |  |
| Accessibility of protocol, raw data, and programming code  |  | N/A |  | RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.  | Data Sharing Statement |

**Supplementary Table 2**. Data sources used in this study.

|  |  |  |
| --- | --- | --- |
| **Sourcea** | **Full Name** | **Description** |
| DAD | Discharge Abstract Database | Contains detailed hospital discharge data on individuals receiving inpatient care in non-mental health designated beds, including encounter dates and information on diagnoses and procedures. |
| HCD | Home Care Database | Contains data on all home care services, including information on client, intake, assessment, admission, diagnostic and surgical procedures, and service delivery.  |
| NACRS | National Ambulatory Care Reporting System | Contains detailed information on outpatient care, including visits to hospital and community-based ambulatory care, day surgery, outpatient clinics, and emergency departments. Dataset details include demographic, clinical, administrative, and cost information.  |
| ODB | Ontario Drug Benefit Claims | Contains detailed prescription drug claim data for individual Ontarians covered under the program, the majority of who are 65 years of age or older. Elements within the dataset include patient, pharmacy, and physician identifiers, as well as detailed information on prescribed medications (such as DIN and quantity supplied).  |
| OHIP | Ontario Health Insurance Plan Claims Database | Contains in-depth physician claim data from physicians, groups, laboratories, and out-of-province providers who may claim under OHIP. Key elements within the dataset include patient and physician identifiers, code for services provided, associated diagnosis, and fee paid.  |
| OMHRS | Ontario Mental Health Reporting System | Contains detailed information on individuals admitted to adult inpatient mental health beds. Data elements within OMHRS include but are not limited to patient identifiers and demographics, admission and discharge dates, and psychiatric and non-psychiatric diagnoses.  |
| SDS | Same Day Surgery Database | Derived from NACRS and includes detailed patient-level data for day surgery institutions. Key data elements include demographic data, clinical data, administrative data, and costs data.  |
| IPDB | ICES Physician Database | Includes annual information on all physicians in Ontario, including demographics, specialty, location, and various measures of physician activity.  |
| RPDB | Registered Persons Database | Contains demographic data on anyone who has ever been issued an Ontario health card number. These data include date of birth, sex, date of death, eligibility periods for OHIP coverage, and postal code, and may be linked to other datasets at ICES.  |
| CAPE | Client Agency Program Enrolment | Includes compensation model enrolment data. The dataset indicates the enrolment of an individual in a program with a specific clinician or care group.  |
| ON-Marg | Ontario Marginalization Index | A geographically based index that enables the quantification of the degree of marginalization across Ontario according to 4 major dimensions: residential instability, material deprivation, dependency, and ethnic concentration. |

aData sources included in our study were selected based on their ability to provide distinct sociodemographic, clinical, and/or provider information.

**Supplementary Table 3**. Codes for diagnoses and procedures examined within our study.

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| **Diagnosis or Procedure** | **Code Type** | **Codes** | **Description** |
| Parkinson's disease | ICD-9 | 3320 | Paralysis agitans (Parkinson's disease) |
|   | ICD-10 | G20 | Parkinson's disease |
|   | OHIP DXCODE | 332 | Parkinson's disease |
| Secondary parkinsonism | ICD-9 | 3321 | Secondary parkinsonism |
|   | ICD-10 | G21 | Secondary parkinsonism |
|   |   | G22 | Parkinsonism in diseases classified elsewhere |
| Atypical parkinsonism | ICD-9 | 3330 | Other degenerative diseases of basal ganglia |
|   | ICD-10 | G23 | Other degenerative diseases of basal ganglia |
| Deep brain stimulation surgery  | OHIP FEECODE | G547 | Clinical programming of deep brain stimulators |
| and deep brain stimulator programming |   | G548 | Electrophysiological assessment of deep brain stimulators |
|   |   | G549 | One or more additional implantation sites |
|   | CCP | 1593 | Implantation of intracranial neurostimul |
|   | CCI | 1AE53SEJA | Implantation, thalamus and basal ganglia, of electrodes (e.g. recording, stimulating) using burr hole approach |
|   |   | 1AE53SZJA | Implantation of internal device, thalamus and basal ganglia of electrodes (e.g. recording, stimulating) using open approach |
|   |   | 1AJ53SEJA | Implantation of internal device, cerebellum of electrode using open approach with burr hole technique |
|   |   | 1AN53SEJA | Implantation of internal device, brain burr hole technique for access of electrodes (e.g. recording, stimulating) |
|   |   | 1AN53SZJA | Implantation of internal device, brain craniotomy (or craniectomy) flap technique for access of electrodes (e.g. recording, stimulating) |
|   |   | 1AP53SEJA | Implantation of internal device, brain stem burr hole technique for access of electrodes (e.g. recording, stimulating) |
|   |   | 1AP53SZJA | Implantation of internal device, brain stem craniotomy (or craniectomy) flap technique for access of electrodes (e.g. recording, stimulating) |
|   |   | 1BA53SZDV | Implantation of internal device, cranial nerves of neurostimulator device |
| Brain tumour | ICD-9 | 2250 | Benign neoplasm brain |
|   |   | 2252 | Benign neoplasm of cerebral meninges |
|   |   | 191 | Primary malignant neoplasm of brain |
|   |   | 1921 | Primary malignant neoplasm of cerebral meninges |
|   | ICD-10 | D320 | Benign neoplasm of cerebral meninges |
|   |   | D329 | Benign neoplasm of meninges, unspecified |
|   |   | D330 | Benign neoplasm of brain, supratentorial |
|   |   | D331 | Benign neoplasm of brain, infratentorial |
|   |   | D332 | Benign neoplasm of brain, unspecified |
|   |   | C700 | Malignant neoplasm of cerebral meninges |
|   |   | C709 | Malignant neoplasm of meninges, unspecified |
|   |   | C71 | Malignant neoplasm of brain |
| Dementia and borderline dementia | ICD-9 | 0461 | Jakob-Creutzfeldt disease |
|   |   | 2900 | Senile dementia uncomplicated |
|   |   | 2901 | Presenile dementia |
|   |   | 2902 | Senile delusion |
|   |   | 2903 | Senile delirium |
|   |   | 2904 | Arterioscler dement nos |
|   |   | 294 | Dementias (amnestic syndrome; dementia in oth diseases; organic brain synd nec; organic brain synd nos) |
|   |   | 3310 | Alzheimer's disease |
|   |   | 3311 | Pick's disease |
|   |   | 3315 | Idiopathic normal pressure hydrocephalus (inph) |
|   |   | 33182 | Dementia with lewy bodies |
|   | ICD-10 | F00 | Dementia in alzheimer's disease (g30.-+) |
|   |   | F01 | Vascular dementia |
|   |   | F02 | Dementia in other diseases classified elsewhere |
|   |   | F03 | Unspecified dementia |
|   |   | G30 | Alzheimer's disease |
|   | OHIP DXCODE | 290 | Senile dementia, presenile dementia |
|   |   | 331 | Other cerebral degenerations |
| Psychosis | ICD-9 | 2921 | Drug paranoid state  |
|   |   | 2928 | Drug-induced delirium  |
|   |   | 2938 | Organic delusional synd  |
|   |   | 2950 | Simpl schizophren-unspec  |
|   |   | 2951 | Hebephrenia-unspec  |
|   |   | 2952 | Catatonia-unspec  |
|   |   | 2953 | Paranoid schizo-unspec |
|   |   | 2954 | Ac schizophrenia-unspec |
|   |   | 2955 | Latent schizophren-unsp |
|   |   | 2956 | Resid schizophren-unsp |
|   |   | 2957 | Schizoaffective-unspec |
|   |   | 2958 | Schizophrenia nec-unspec |
|   |   | 2959 | Schizophrenia nos-unspec |
|   |   | 2960 | Manic disorder-unspec |
|   |   | 2962 | Depress psychosis-unspec |
|   |   | 2964 | Bipol aff, manic-unspec |
|   |   | 2966 | Bipol aff, mixed-unspec |
|   |   | 2967 | Bipolar affective nos  |
|   |   | 2968 | Manic-depressive nos |
|   |   | 2969 | Affective psychosis nos |
|   |   | 2970 | Paranoid state, simple |
|   |   | 2971 | Paranoia |
|   |   | 2972 | Paraphrenia |
|   |   | 2973 | Shared paranoid disorder |
|   |   | 2978 | Paranoid states nec |
|   |   | 2979 | Paranoid state nos |
|   |   | 2980 | React depress psychosis |
|   |   | 2981 | Excitativ type psychosis |
|   |   | 2982 | Reactive confusion |
|   |   | 2983 | Acute paranoid reaction |
|   |   | 2984 | Psychogen paranoid psych |
|   |   | 2988 | React psychosis nec/nos |
|   |   | 2989 | Psychosis nos |
|   |   | 7801 | Hallucinations |
|   | ICD-10 | F150 | Mental and behavioural disorders due to use of other stimulants including caffeine, acute intoxication |
|   |   | F155 | Mental and behavioural disorders due to use of other stimulants including caffeine, psychotic disorder |
|   |   | F157 | Mental and behavioural disorders due to use of other stimulants including caffeine, residual and late-onset psychotic disorder |
|   |   | F195 | Mental and behavioural disorders due to multiple drug use and use of psychoactive substances, psychotic disorder |
|   |   | F197 | Mental and behavioural disorders due to multiple drug use and use of psychoactive substances, residual and late-onset psychotic disorder |
|   |   | F200 | Paranoid schizophrenia |
|   |   | F201 | Hebephrenic schizophrenia |
|   |   | F202 | Catatonic schizophrenia |
|   |   | F203 | Undifferentiated schizophrenia |
|   |   | F205 | Residual schizophrenia |
|   |   | F206 |  simple schizophrenia |
|   |   | F208 | Other schizophrenia |
|   |   | F209 | Schizophrenia, unspecified |
|   |   | F21 | Schizotypal disorder |
|   |   | F220 | Delusional disorder |
|   |   | F228 | Other persistent delusional disorders |
|   |   | F229 | Persistent delusional disorder, unspecified |
|   |   | F230 | Acute polymorphic psychotic disorder without symptoms of schizophrenia |
|   |   | F231 | Acute polymorphic psychotic disorder with symptoms of schizophrenia |
|   |   | F232 | Acute schizophrenia-like psychotic disorder |
|   |   | F233 | Other acute predominantly delusional psychotic disorders |
|   |   | F238 | Other acute and transient psychotic disorders |
|   |   | F239 | Acute and transient psychotic disorder, unspecified |
|   |   | F24 | Induced delusional disorder |
|   |   | F250 | Schizoaffective disorder, manic type |
|   |   | F251 | Schizoaffective disorder, depressive type |
|   |   | F252 | Schizoaffective disorder, mixed type |
|   |   | F258 | Other schizoaffective disorders |
|   |   | F259 | Schizoaffective disorder, unspecified |
|   |   | F28 | Other nonorganic psychotic disorders |
|   |   | F29 | Unspecified nonorganic psychosis |
|   |   | F300 | Hypomania |
|   |   | F301 | Mania without psychotic symptoms |
|   |   | F302 | Mania with psychotic symptoms |
|   |   | F308 | Other manic episodes |
|   |   | F309 | Manic episode, unspecified |
|   |   | F311 | Bipolar affective disorder, current episode manic without psychotic symptoms |
|   |   | F312 | Bipolar affective disorder, current episode manic with psychotic symptoms |
|   |   | F316 | Bipolar affective disorder, current episode mixed |
|   |   | F318 | Other bipolar affective disorders |
|   |   | F319 | Bipolar affective disorder, unspecified |
|   |   | F323 | Severe depressive episode with psychotic symptoms |
|   |   | F380 | Other single mood [affective] disorders |
|   |   | F388 | Other specified mood [affective] disorders |
|   |   | F39 | Unspecified mood [affective] disorder |
|   |   | R443 | Hallucinations, unspecified |
|   |   | R442 | Other hallucinations |
|   |   | R441 | Visual hallucinations |
|   |   | R440 | Auditory hallucinations |
|   | OHIP DXCODE | 292 | Drug psychosis |
|   |   | 295 | Schizophrenia |
|   |   | 296 | Manic depressive psychosis, involutional melancholia |
|   |   | 297 | Paranoid states |
|   |   | 298 | Other psychoses |
| Stroke | ICD-9 | 430 | Subarachnoid hemorrhage |
|   |   | 431 | Intracerebral hemorrhage |
|   |   | 432 | Other and unspecified intracranial hemorrhage |
|   |   | 4340 | Occlusion of cerebral arteries, cerebral thrombosis |
|   |   | 4341 | Occlusion of cerebral arteries, cerebral embolism |
|   |   | 4349 | Occlusion of cerebral arteries, cerebral artery occlusion, unspecified |
|   |   | 436 | Cva |
|   | ICD-10 | I600 | Subarachnoid haemorrhage from carotid siphon and bifurcation |
|   |   | I601 | Subarachnoid haemorrhage from middle cerebral artery |
|   |   | I602 | Subarachnoid haemorrhage from anterior communicating artery |
|   |   | I603 | Subarachnoid haemorrhage from posterior communicating artery |
|   |   | I604 | Subarachnoid haemorrhage from basilar artery |
|   |   | I605 | Subarachnoid haemorrhage from vertebral artery |
|   |   | I606 | Subarachnoid haemorrhage from other intracranial arteries |
|   |   | I607 | Subarachnoid haemorrhage from intracranial artery, unspecified |
|   |   | I609 | Subarachnoid haemorrhage, unspecified |
|   |   | I61 | Intracerebral haemorrhage |
|   |   | I62 | Other nontraumatic intracranial haemorrhage |
|   |   | I630 | Cerebral infarction due to thrombosis of precerebral arteries |
|   |   | I631 | Cerebral infarction due to embolism of precerebral arteries |
|   |   | I632 | Cerebral infarction due to unspecified occlusion or stenosis of precerebral arteries |
|   |   | I633 | Cerebral infarction due to thrombosis of cerebral arteries |
|   |   | I634 | Cerebral infarction due to embolism of cerebral arteries |
|   |   | I635 | Cerebral infarction due to unspecified occlusion or stenosis of cerebral arteries |
|   |   | I638 | Other cerebral infarction |
|   |   | I639 | Cerebral infarction, unspecified |
|   |   | I64 | Stroke, not specified as haemorrhage or infarction |
|   | OHIP DXCODE | 436 | Acute cerebrovascular accident, c.v.a., stroke |
| Suicide attempt | ICD-9: E-Code | 950 | Suicide & selfinflicted poisoning by solid/liquid substances |
|   |   | 951 | Suicide & selfinflicted poisoning by gases in domestic use |
|   |   | 952 | Suicide & selfinflicted poisoning by oth gases & vapours |
|   |   | 953 | Suicide & selfinflicted injury by hanging, strangulation & suffocation |
|   |   | 954 | Suicide & selfinflicted injury by submersion (drowning) |
|   |   | 955 | Suicide & selfinflicted injury by firearms & explosives |
|   |   | 956 | Suicide & selfinflicted injury by cutting & piercing instruments |
|   |   | 957 | Suicide & selfinflicted injury by jumping f high place |
|   |   | 958 | Suicide & selfinflicted injury by oth & unspcfd means |
|   |   | 959 | Late effects of selfinflicted injury |
|   | ICD-10 | X60 | Intentional self-poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics |
|   |   | X61 | Intentional self-poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified |
|   |   | X62 | Intentional self-poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified |
|   |   | X63 | Intentional self-poisoning by and exposure to other drugs acting on the autonomic nervous system |
|   |   | X64 | Intentional self-poisoning by and exposure to other and unspecified drugs, medicaments and biological substances |
|   |   | X65 | Intentional self-poisoning by and exposure to alcohol |
|   |   | X66 | Intentional self-poisoning by and exposure to organic solvents and halogenated hydrocarbons and their vapours |
|   |   | X67 | Intentional self-poisoning by and exposure to other gases and vapours |
|   |   | X68 | Intentional self-poisoning by and exposure to pesticides |
|   |   | X69 | Intentional self-poisoning by and exposure to other and unspecified chemicals and noxious substances |
|   |   | X70 | Intentional self-harm by hanging, strangulation and suffocation |
|   |   | X71 | Intentional self-harm by drowning and submersion |
|   |   | X72 | Intentional self-harm by handgun discharge |
|   |   | X73 | Intentional self-harm by rifle, shotgun and larger firearm discharge |
|   |   | X7400 | Intentional self-harm by bb gun discharge |
|   |   | X7401 | Intentional self-harm by air gun discharge |
|   |   | X7408 | Intentional self-harm by other specified firearm discharge |
|   |   | X7409 | Intentional self-harm by unspecified firearm discharge |
|   |   | X75 | Intentional self-harm by explosive material |
|   |   | X76 | Intentional self-harm by smoke, fire and flames |
|   |   | X77 | Intentional self-harm by steam, hot vapours and hot objects |
|   |   | X78 | Intentional self-harm by sharp object |
|   |   | X79 | Intentional self-harm by blunt object |
|   |   | X80 | Intentional self-harm by jumping from a high place |
|   |   | X81 | Intentional self-harm by jumping or lying before moving object |
|   |   | X82 | Intentional self-harm by crashing of motor vehicle |
|   |   | X83 | Intentional self-harm by other specified means |
|   |   | X84 | Intentional self-harm by unspecified means |
| Falls | ICD-9: E-Code | 880 | Fall on/f stairs/steps |
|   |   | 881 | Fall on/f ladders/scaffolding |
|   |   | 882 | Fall f/out of building/other structure |
|   |   | 883 | Fall into hole/other opening in surface |
|   |   | 884 | Oth fall f one level to another |
|   |   | 885 | Fall on same level f slipping, tripping/stumbling |
|   |   | 886 | Fall on same level f collision, pushing/shoving, by/w oth person |
|   |   | 887 | Fracture, cause unspcfd |
|   |   | 888 | Oth & unspcfd fall |
|   | ICD-10 | All S codes | Injury codes |
|   |   | T00 | Superficial injuries involving multiple body regions |
|   |   | T01 | Open wounds involving multiple body regions |
|   |   | T02 | Fractures involving multiple body regions |
|   |   | T03 | Dislocations, sprains and strains involving multiple body regions |
|   |   | T04 | Crushing injuries involving multiple body regions |
|   |   | T05 | Traumatic amputations involving multiple body regions |
|   |   | T06 | Other injuries involving multiple body regions, not elsewhere classified |
|   |   | T07 | Unspecified multiple injuries |
|   |   | T08 | Fracture of spine, level unspecified |
|   |   | T09 | Other injuries of spine and trunk, level unspecified |
|   |   | T10 | Fracture of upper limb, level unspecified |
|   |   | T11 | Other injuries of upper limb, level unspecified |
|   |   | T12 | Fracture of lower limb, level unspecified |
|   |   | T13 | Other injuries of lower limb, level unspecified |
|   |   | T14 | Injury of unspecified body region |
|   |   | W00 | Fall on same level involving ice and snow |
|   |   | W01 | Fall on same level from slipping, tripping and stumbling |
|   |   | W02 | Fall involving skates, skis, sport boards and rollerblades |
|   |   | W03 | Other fall on same level due to collision with, or pushing by, another person |
|   |   | W04 | Fall while being carried or supported by other persons |
|   |   | W05 | Fall involving wheelchair and other types of walking devices |
|   |   | W06 | Fall involving bed |
|   |   | W07 | Fall involving chair |
|   |   | W08 | Fall involving other furniture |
|   |   | W09 | Fall involving playground equipment |
|   |   | W10 | Fall on and from stairs and steps |
|   |   | W11 | Fall on and from ladder |
|   |   | W12 | Fall on and from scaffolding |
|   |   | W13 | Fall from, out of or through building or structure |
|   |   | W14 | Fall from tree |
|   |   | W15 | Fall from cliff |
|   |   | W16 | Diving or jumping into water causing injury other than drowning or submersion |
|   |   | W17 | Other fall from one level to another |
|   |   | W18 | Other fall on same level |
|   |   | W19 | Unspecified fall |

**Supplementary Table 4**. Sociodemographic characteristics of unmatched cohort.

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| --- | --- | --- | --- |
|   | **Total (n = 23,290)** | **No DBS (n = 22,654)** | **DBS (n = 636)** |
| Age (years), mean (SD)a | 73.6 ± 10.5 | 73.9 ± 10.4 | 61.7 ± 7.3 |
| Female, n (%)a | 10,225 (43.9%) | 10,024 (44.2%) | 201 (31.6%) |
| ON-Marg: Residential instability, n (%)b |   |   |   |
| Quintile 1 (least marginalized) | 3,589 (15.4%) | 3,455 (15.3%) | 134 (21.1%) |
| Quintile 2 | 4,061 (17.4%) | 3,938 (17.4%) | 123 (19.3%) |
| Quintile 3 | 4,381 (18.8%) | 4,262 (18.8%) | 119 (18.7%) |
| Quintile 4 | 4,560 (19.6%) | 4,448 (19.6%) | 112 (17.6%) |
| Quintile 5 (most marginalized) | 6,505 (27.9%) | 6,361 (28.1%) | 144 (22.6%) |
| Missing | 194 (0.8%) | 190 (0.8%) | <=5  |
| ON-Marg: Material deprivation, n (%)b |   |   |   |
| Quintile 1 (least marginalized) | 4,738 (20.3%) | 4,558 (20.1%) | 180 (28.3%) |
| Quintile 2 | 4,654 (20.0%) | 4,521 (20.0%) | 133 (20.9%) |
| Quintile 3 | 4,552 (19.5%) | 4,426 (19.5%) | 126 (19.8%) |
| Quintile 4 | 4,606 (19.8%) | 4,496 (19.8%) | 110 (17.3%) |
| Quintile 5 (most marginalized) | 4,546 (19.5%) | 4,463 (19.7%) | 83 (13.1%) |
| Missing | 194 (0.8%) | 190 (0.8%) | <=5  |
| ON-Marg: Dependency, n (%)b |   |   |   |
| Quintile 1 (least marginalized) | 3,026 (13.0%) | 2,915 (12.9%) | 111 (17.5%) |
| Quintile 2 | 3,730 (16.0%) | 3,597 (15.9%) | 133 (20.9%) |
| Quintile 3 | 4,039 (17.3%) | 3,930 (17.3%) | 109 (17.1%) |
| Quintile 4 | 4,651 (20.0%) | 4,523 (20.0%) | 128 (20.1%) |
| Quintile 5 (most marginalized) | 7,650 (32.8%) | 7,499 (33.1%) | 151 (23.7%) |
| Missing | 194 (0.8%) | 190 (0.8%) | <=5  |
| ON-Marg: Ethnic concentration, n (%)b |   |   |   |
| Quintile 1 (least marginalized) | 4,362 (18.7%) | 4,243 (18.7%) | 119 (18.7%) |
| Quintile 2 | 4,564 (19.6%) | 4,442 (19.6%) | 122 (19.2%) |
| Quintile 3 | 4,393 (18.9%) | 4,260 (18.8%) | 133 (20.9%) |
| Quintile 4 | 4,592 (19.7%) | 4,458 (19.7%) | 134 (21.1%) |
| Quintile 5 (most marginalized) | 5,185 (22.3%) | 5,061 (22.3%) | 124 (19.5%) |
| Missing | 194 (0.8%) | 190 (0.8%) | <=5  |
| Health Care Service Region (LHIN), n (%) |   |   |   |
| Erie St. Clair (1) | 1,465 (6.3%) | 1,429 (6.3%) | 36 (5.7%) |
| South West (2) | 1,875 (8.1%) | 1,805 (8.0%) | 70 (11.0%) |
| Waterloo Wellington (3) | 1,164 (5.0%) | 1,127 (5.0%) | 37 (5.8%) |
| Hamilton Niagara Haldimand Brant (4) | 2,591 (11.1%) | 2,518 (11.1%) | 73 (11.5%) |
| Central West (5) | 1,005 (4.3%) | 975 (4.3%) | 30 (4.7%) |
| Mississauga Halton (6) | 1,674 (7.2%) | 1,622 (7.2%) | 52 (8.2%) |
| Toronto Central (7) | 2,105 (9.0%) | 2,052 (9.1%) | 53 (8.3%) |
| Central (8) | 3,269 (14.0%) | 3,200 (14.1%) | 69 (10.8%) |
| Central East (9) | 2,922 (12.5%) | 2,860 (12.6%) | 62 (9.7%) |
| South East (10) | 835 (3.6%) | 804 (3.5%) | 31 (4.9%) |
| Champlain (11) | 2,288 (9.8%) | 2,229 (9.8%) | 59 (9.3%) |
| North Simcoe Muskoka (12) | 820 (3.5%) | 797 (3.5%) | 23 (3.6%) |
| North East (13) | 882 (3.8%) | 857 (3.8%) | 25 (3.9%) |
| North West (14) | 350 (1.5%) | 336 (1.5%) | 14 (2.2%) |
| Missing | 45 (0.2%) | 43 (0.2%) | <=5  |
| Grouped Regions, n (%)c |   |   |   |
| Southern Ontario (all southern LHINs) | 22,013 (94.5%) | 21,418 (94.5%) | 595 (93.6%) |
| Northern Ontario (North East & North West) | 1,232 (5.3%) | 1,193 (5.3%) | 39 (6.1%) |
| Missing | 45 (0.2%) | 43 (0.2%) | <=5  |

**Abbreviations:** DBS, deep brain stimulation; LHIN, Local Health Integration Network; ON-Marg, Ontario Marginalization Index; PD, Parkinson's disease; SD, standard deviation.

aCovariate used in matching of controls to cases.

bCovariate used in propensity score model.

cOntario's three DBS surgery sites are all located in Southern Ontario.

**Supplementary Table 5**. Clinical and provider characteristics of unmatched cohort.

|  |  |  |  |
| --- | --- | --- | --- |
|   | **Total (n = 23,290)** | **No DBS (n = 22,654)** | **DBS (n = 636)** |
| PD Diagnosis and Duration |   |   |   |
| Year of PD diagnosis (cohort entry), n (%)a |   |   |   |
| 1997 | 1,743 (7.5%) | 1,606 (7.1%) | 137 (21.5%) |
| 1998 | 725 (3.1%) | 692 (3.1%) | 33 (5.2%) |
| 1999 | 817 (3.5%) | 783 (3.5%) | 34 (5.3%) |
| 2000 | 829 (3.6%) | 801 (3.5%) | 28 (4.4%) |
| 2001 | 860 (3.7%) | 824 (3.6%) | 36 (5.7%) |
| 2002 | 1,013 (4.3%) | 980 (4.3%) | 33 (5.2%) |
| 2003 | 1,050 (4.5%) | 1,007 (4.4%) | 43 (6.8%) |
| 2004 | 1,209 (5.2%) | 1,170 (5.2%) | 39 (6.1%) |
| 2005 | 1,437 (6.2%) | 1,395 (6.2%) | 42 (6.6%) |
| 2006 | 1,553 (6.7%) | 1,506 (6.6%) | 47 (7.4%) |
| 2007 | 1,736 (7.5%) | 1,701 (7.5%) | 35 (5.5%) |
| 2008 | 1,907 (8.2%) | 1,866 (8.2%) | 41 (6.4%) |
| 2009 | 2,026 (8.7%) | 2,000 (8.8%) | 26 (4.1%) |
| 2010 | 2,293 (9.8%) | 2,257 (10.0%) | 36 (5.7%) |
| 2011 | 2,365 (10.2%) | 2,347 (10.4%) | 18 (2.8%) |
| 2012 | 1,727 (7.4%) | 1,719 (7.6%) | 8 (1.3%) |
| Time with PD (years), mean (SD)a | 5.9 ± 4.4 | 5.8 ± 4.4 | 9.1 ± 3.6 |
| Comorbidities in Previous 2 Years |   |   |   |
| ADGs, n (%) |   |   |   |
| 0 | 840 (3.6%) | 840 (3.7%) | 0 (0.0%) |
| 1-2 | 985 (4.2%) | 970 (4.3%) | 15 (2.4%) |
| 3-4 | 2,562 (11.0%) | 2,468 (10.9%) | 94 (14.8%) |
| 5-6 | 4,033 (17.3%) | 3,902 (17.2%) | 131 (20.6%) |
| 7+ | 14,870 (63.8%) | 14,474 (63.9%) | 396 (62.3%) |
| ADG Summary Score, mean (SD)b | 22.9 ± 12.9 | 23.0 ± 13.0 | 18.5 ± 8.9 |
| Dementia, n (%)b | 1,917 (8.2%) | 1,911 (8.4%) | 6 (0.9%) |
| Psychosis, n (%)b | 2,337 (10.0%) | 2,282 (10.1%) | 55 (8.6%) |
| Stroke, n (%)b | 2,504 (10.8%) | 2,476 (10.9%) | 28 (4.4%) |
| Injuries in Previous 5 Years, n (%) |   |   |   |
| Suicide attemptb | 140 (0.6%) | 133 (0.6%) | 7 (1.1%) |
| Fallb | 5,387 (23.1%) | 5,263 (23.2%) | 124 (19.5%) |
| Health Care Utilization in Previous 2 Years, n (%) |   |   |   |
| Prior Home Careb | 8,556 (36.7%) | 8,359 (36.9%) | 197 (31.0%) |
| All Health Care Visitsb |   |   |   |
| Mean (SD) | 45.8 ± 43.3 | 45.7 ± 43.6 | 49.9 ± 29.3 |
| Emergency Department Visitsb |   |   |   |
| Any Visit | 11,958 (51.3%) | 11,636 (51.4%) | 322 (50.6%) |
| No visit | 11,332 (48.7%) | 11,018 (48.6%) | 314 (49.4%) |
| Psychiatrist Visitsb |   |   |   |
| Any Visit | 3,109 (13.3%) | 2,748 (12.1%) | 361 (56.8%) |
| No Visit | 20,181 (86.7%) | 19,906 (87.9%) | 275 (43.2%) |
| Geriatrician Visitsb |   |   |   |
| Any Visit | 2,495 (10.7%) | 2,479 (10.9%) | 16 (2.5%) |
| No Visit | 20,795 (89.3%) | 20,175 (89.1%) | 620 (97.5%) |
| Neurologist Visitsb |   |   |   |
| 4+ Visits | 9,259 (39.8%) | 8,773 (38.7%) | 486 (76.4%) |
| 1-3 Visits | 7,216 (31.0%) | 7,074 (31.2%) | 142 (22.3%) |
| No Visit | 6,815 (29.3%) | 6,807 (30.0%) | 8 (1.3%) |
| Primary Care Physician Status |   |   |   |
| Rostered to a Primary Care Physician; n (%)b | 18,367 (78.9%) | 17,856 (78.8%) | 511 (80.3%) |

**Abbreviations:** ADG, Aggregated Diagnosis Group; DBS, deep brain stimulation; LHIN, Local Health Integration Network; PD, Parkinson's disease; SD, standard deviation.

aCovariate used in matching of controls to cases.

bCovariate used in propensity score model.

**Supplementary Table 6**. Hazard ratios for primary and secondary outcomes by age and sex.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Outcome** | **Subgroup** | **P value DBS Interaction** | **HR (95% CI)** | **P value** |
| All-Cause Mortalitya | Age | <0.01 |   |   |
|  | < 65 years |   | 0.49 (0.28 - 0.84) | 0.01 |
|  | 65+ years |   | 1.36 (0.92 - 2.00) | 0.12 |
|  | Sex | 0.62 |   |   |
|  | Female |   | 0.78 (0.40 - 1.51) | 0.46 |
|  | Male |   | 0.93 (0.67 - 1.31) | 0.69 |
| Injurious Fallsb | Age | 0.84 |   |   |
|   | < 65 years |   | 1.52 (1.09 - 2.12) | 0.01 |
|   | 65+ years |   | 1.60 (1.10 - 2.32) | 0.01 |
|   | Sex | 0.26 |   |   |
|   | Female |   | 1.92 (1.25 - 2.95) | <0.01 |
|   | Male |   | 1.45 (1.06 - 1.99) | 0.02 |
| Long-Term Careb | Age | 0.02 |   |   |
|   | < 65 years |   | 0.68 (0.35 - 1.30) | 0.24 |
|   | 65+ years |   | 1.58 (1.01 - 2.45) | 0.04 |
|   | Sex | 0.42 |   |   |
|   | Female |   | 0.85 (0.39 - 1.87) | 0.69 |
|   | Male |   | 1.20 (0.79 - 1.84) | 0.39 |
| Home Careb | Age | 0.24 |   |   |
|   | < 65 years |   | 1.44 (1.13 - 1.83) | <0.01 |
|   | 65+ years |   | 1.74 (1.37 - 2.21) | <0.01 |
|   | Sex | 0.17 |   |   |
|   | Female |   | 1.31 (0.94 - 1.84) | 0.11 |
|   | Male |   | 1.69 (1.39 - 2.05) | <0.01 |

**Abbreviations:** CI, confidence interval; DBS, deep brain stimulation; HR, hazard ratio; LHIN, Local Health Integration Network.

aPrimary outcome.

bSecondary outcome.