Supplemental materials for:

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Supplemental Appendix 1. Detailed variable definitions

Variable	Definition
Dementia Exclusion Codes	**ICD-9 codes:** 046.1x 046.3 290.x 291.1 291.2 294.0 294.1x 294.2x 331.x 332.x 333.0 333.4 438.0 780.93 797
Dementia Outcome Codes	**ICD-9 codes:** 290.0 290.1x 290.2x 290.3 290.4x 294.1x 294.2x 331.0 331.1x 331.2 331.82 - Pool inpatient, outpatient, and Medicare codes - 2 codes on same day count as 1 code. - 2 code occurrences within the same 12 month period - Date of dementia onset is the first date of diagnosis when criteria met
HbA1c levels	Laboratory value in year prior and closest to metformin or sulfonylurea use.
Glycemic burden	Average monthly glycemic burden (AMGB) is the average A1c units per month over 7.5 and is computed by dividing the total glycemic burden by the number of months between the first and last A1c measure relevant to the research design. Total glycemic burden is the cumulative amount by which A1c exceeds 7.5. It is assumed that the change between a pair of measurements represents a linear function such that the resulting total glycemic burden is an estimate of the area under the curve (e.g. sum of the differences between measured or interpolated A1c and threshold over all observed months). Each unit of total glycemic burden represents 1 month of an A1c that is one percentage point higher than an A1c > 7.5. AMGB calculated from first value after metformin or sulfonylurea start date to last value before end of

	follow-up.
Creatinine lab value	Laboratory value in year prior and closest to metformin or sulfonylurea start date.
Diabetic Nephropathy NOS	ICD-9 code: 249.4x, 250.40, 250.42, 583.81 Single occurrence. Date of onset = Date of first code
Diabetic Retinopathy	ICD-9 code: 249.5x, 250.50, 250.52, 362.0x Single occurrence. Date of onset = Date of first code
Diabetic Neuropathy	ICD-9-CM: 249.6x, 250.60, 250.62, 337.1, 357.2 Single occurrence. Date of onset = Date of first code
Smoking/nicotine dependence	ICD-9-CM code: V15.82 OR 305.1; or presence in health factor data as current smoker. Single occurrence. Date of onset = Date of first code/occurrence
Obesity	ICD-9-CM code: 278.00, 278.01 OR BMI ≥ 30 for last BMI before/on start of metformin or sulfonylurea use Single occurrence. Date of onset = Date of first code (or initial BMI ≥ 30)
Hypertension	ICD-9-CM code: 401.x Single occurrence. Date of onset = Date of first code
Hyperlipidemia	ICD-9-CM code: 272.0, 272.1, 272.2, 272.4 Single occurrence. Date of onset = Date of first code
Stroke or cerebrovascular	ICD-9-CM code: 431.x, 434.x, 438.x

accident	Single occurrence. Date of onset = Date of first code
Ischemic heart disease	ICD-9-CM code: 410.x-414.x Single occurrence. Date of onset = Date of first code
Congestive heart failure	ICD-9-CM code: 398.91, 402.11, 402.91, 404.11, 404.13, 404.91, 404.93, 428.x Single occurrence. Date of onset = Date of first code
Atrial fibrillation of flutter	ICD-9-CM code: 427.3x Single occurrence. Date of onset = Date of first code
Traumatic brain injury	ICD-9-CM code: 800.x-804.x, 850.x-854.x, 905.x, 907.x, 959.01, V15.52 Single occurrence. Date of onset = Date of first code
Vitamin B12 deficiency	ICD-9-CM code: 266.2, 281.1 Single occurrence. Date of onset = Date of first code
Depression	ICD-9-CM codes: 296.2x, 296.3x, 311 2 outpatient occurrences must occur in same 12 month period OR 1 inpatient occurrence. Date of depression onset: - If first episode in record is outpatient: date of second ICD-9-CM code - If first episode in record is inpatient: date of inpatient discharge

PTSD	ICD-9-CM codes: 309.81 2 outpatient occurrences must occur in same 12 month period OR 1 inpatient occurrence. Date of PTSD onset: - If first episode in record is outpatient: date of second ICD-9-CM code - If first episode in record is inpatient: date of inpatient discharge
Any anxiety disorder other than PTSD	ICD-9-CM codes: 2 outpatient occurrences must occur in same 12 month period OR 1 inpatient occurrence. Composite of panic disorder (300.01), generalized anxiety disorder (300.02), social phobia (300.23), obsessive compulsive disorder (300.3) and anxiety disorder not otherwise specified (300.00) Date of any other anxiety disorder onset = minimum date associated with composite variables
Bipolar Disorder	Single occurrence of ICD-9-CM codes 296.0x, 296.1x, 296.4x, 296.5x, 296.6x, 296.7x, 296.8x, 296.9x Date of onset=date of first code
Schizophrenia	Single occurrence of ICD-9-CM codes 295.x Date of onset=date of first code
Alcohol abuse/dependence	ICD-9-CM codes: 303.9x, 305.0x Single occurrence. Date of onset = Date of first code
Any drug abuse/dependence	ICD-9-CM code: Single occurrence Composite of sedative (304.1x, 305.4x), cocaine (304.2x, 305.6x), cannabis (304.3x, 305.2x), amphetamine (304.4x, 305.7x), hallucinogens (304.5x, 305.3x), 'other' (304.6x, 305.9x), opioid (304.0x, 305.5x), opioid with other SUD (304.7x), other SUD excluding opioid (304.8x), unspecified drug

	abuse/dependence (304.9x). Date of onset = minimum date associated with composite variables
High health services utilization	To control for detection bias related to more health care encounters, we compute a healthcare utilization variable defined as average number of outpatient clinic visits per month. Total visits is total number of visits in time period of interest. Number of months followed is months from first visit to last visit in time period of interest. Time period of interest is first visit in respective data time frames to metformin/sulfonylurea start. The distribution of the mean is then dichotomized into high utilizer, $>75^{th}$ percentile vs low utilizer, $\leq 75^{th}$ percentile.
Other medications, yes v no	Anticholinergic, NSAID, antihypertensive, Statins – defined by any sustained use. Sustained use is at least 2 fills in any 6 month period prior to metformin or sulfonylurea start date.
Age	Age in years calculated on October 1, 2001 (FY02).
Gender	Male, female
Marital status	Married vs. other (on/closest to date of metformin or sulfonylurea start date).
Neighborhood SES (nSES) (High v Low)	Use zip code on/closest to date of metformin or sulfonylurea. The neighborhood SES index was based on information from 7 measures of SES obtained from 2009-2013 5-year census estimates from the American Community Survey. The value of each variable was assigned based on US 5-digit zip code. The 7 variables included: 1) Percent of households with income below the poverty level, 2) Percent of households receiving public assistance, 3) Percent of households with an annual income below $35,000, 4) Percent of adult males age 20-64 not in the labor force, 5) Percent of adults 25 and older with less than high school education, 6) log of median household income, and 7) log of median value of single family homes (Roblin, 2013). Median household income and value of single family homes were log transformed so that values were on a similar scale to the other five measures. Using a principal components analysis on all US zip codes and their corresponding 7 measures of SES, a standardized factor score was assigned to each US zip code. *A higher standardized factor score indicates lower SES*. Standardized factor scores computed from all US zip codes were then matched to zip codes in the patient dataset. Based on SES factor score distribution in each patient cohort, patients were assigned to high nSES by a median split, where below median is high and at or above median is low.

VA only health insurance vs. VA+private	Insurance status variable indicating any access to non-VA health insurance. Coverage defined by most frequently occurring prior to metformin or sulfonylurea.
Year of observation	2002-2004, 2005-2006, 2007-2008, 2009-2010, 2011-2012

Supplemental Appendix 2

Incidence of dementia in patients with a new metformin fill or a new sulfonylurea fill between FY2002 to F stratified by age within race groups, among among VHA patients ≥50 years old (n=73,761)

	Overall (n=73,761)			Metformin (n=55,859)			Sulfonylurea (n=17,902)		
Race*Age	Total	Incidence %	Incidence rate	Total	Incidence %	Incidence rate	Total	Incidence %	Incidence rate
White	63,202	7.3%	11.4/1000PY	47,821	6.4%	10.1/1000PY	15,381	9.9%	15.4/1000PY
50-64	40811	2.8%	4.2/1000PY	32,914	2.7%	4.1/1000PY	7,897	3.3%	4.8/1000PY
65-74	16414	12.4%	19.9/1000PY	11,633	12.0%	19.2/1000PY	4,781	13.4%	21.7/1000PY
≥ 75	5977	23.4%	45.4/1000PY	3,274	24.1%	46.2/1000PY	2,703	22.6%	44.5/1000PY
African-American	10,559	5.6%	8.6/1000PY	8,038	4.7%	7.3/1000PY	2,521	8.5%	12.6/1000PY
50-64	8325	2.8%	4.2/1000PY	6,543	2.4%	3.6/1000PY	1,782	4.3%	6.2/1000PY
65-74	1824	14.0%	22.5/1000PY	1,276	12.8%	20.6/1000PY	548	16.8%	26.9/1000PY
≥ 75	410	25.1%	46.3/1000PY	219	26.9%	49.5/1000PY	191	23.0%	42.6/1000PY

Note: VHA=Veterans Health Administration; FY=Fiscal Year; MET=Metformin; SU=Sulfonylurea; PY=person-years