

Identifying Diagnoses of Schizophrenia Spectrum Disorder in Large Datasets

Supplementary Appendix

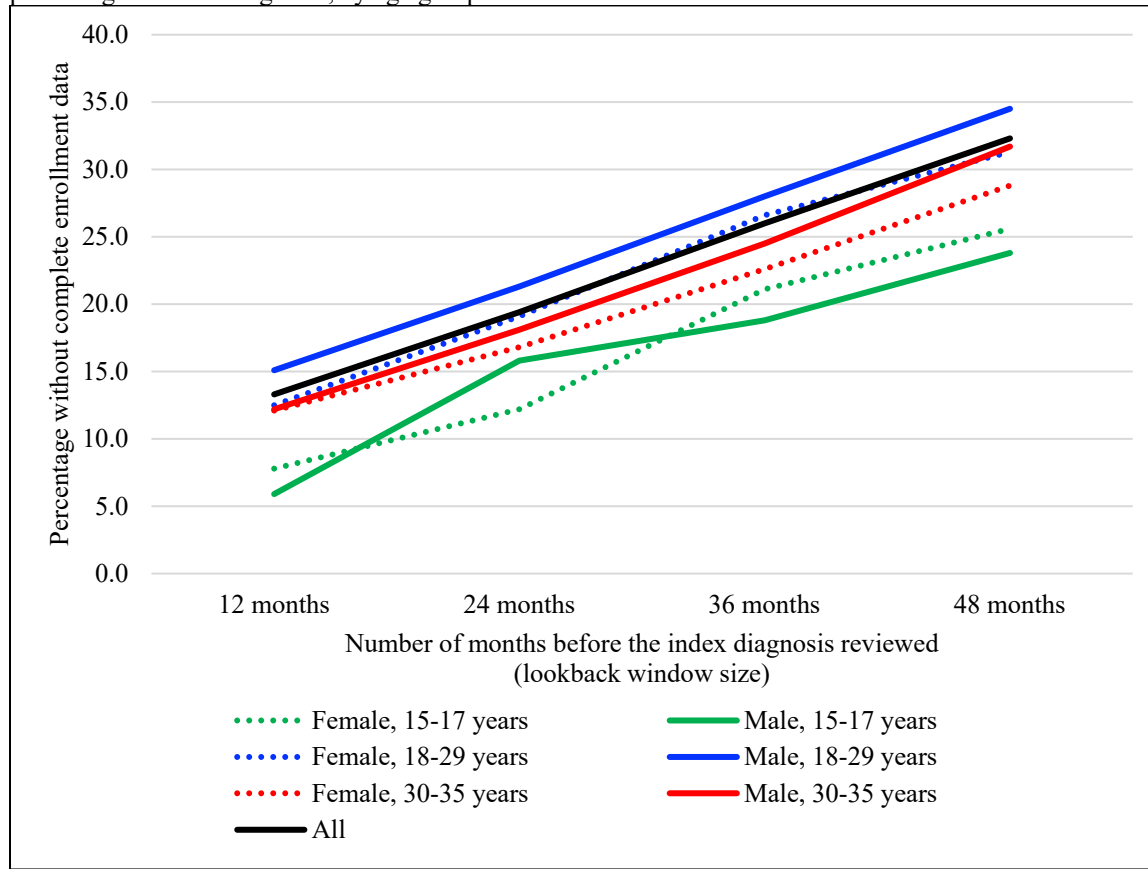
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Table S1. ICD-9 and ICD-10 codes included in the definition of a schizophrenia spectrum disorder diagnosis for main and sensitivity analyses

Diagnosis category	ICD-9 codes	ICD-10 codes
Schizophrenia	295.X <u>excl.</u> 295.7X Schizophrenic disorders, <u>excl.</u> Schizoaffective disorder	F20.X Schizophrenia
Schizoaffective disorder	295.7X Schizoaffective disorder	F25.X Schizoaffective disorder
<i>For sensitivity analysis:</i> Other and unspecified psychosis	298.8 Other and unspecified reactive psychosis 298.9 Unspecified psychosis	F23 Brief psychotic disorder F28 Other psychotic disorder not due to a substance or known physiological condition F29 Unspecified psychosis not due to a substance or known physiological condition

Notes: (1) ICD-9 codes were based on [Simon et al. \(2017\)](#), [Kuhl et al. \(2016\)](#). (2) ICD-9 to ICD-10 codes conversions were partially based on a [crosswalk](#) developed by the CMS and processed by the NBER.

Figure S1. Among patients with an index schizophrenia spectrum disorder diagnosis in 2016, proportion of patients without 12, 24, 36, or 48 months of complete enrollment data preceding the index diagnosis, by age group and sex



Note: Age grouping at time of index diagnosis.

Table S2. Patients with an index schizophrenia spectrum disorder diagnosis in 2016 and their enrollment data availability in the 12, 24, 36, or 48 months preceding the index diagnosis, by age group and sex

	N of patients with an index diagnosis in 2016 [A]	Among [A], percentage of patients without X months of complete enrollment data preceding the index diagnosis			
		X=12	X=24	X=36	X=48
Female, 15-17 years	90	7.8	12.2	21.1	25.6
Male, 15-17 years	101	5.9	15.8	18.8	23.8
Female, 18-29 years	1,161	12.5	19.1	26.6	31.3
Male, 18-29 years	3,110	15.1	21.3	28.0	34.5
Female, 30-35 years	858	12.1	16.8	22.6	28.8
Male, 30-35 years	1,897	12.2	18.1	24.5	31.7
All	7,217	13.3	19.4	26.0	32.3

Table S3. Distribution of insurance gaps among patients with an index schizophrenia spectrum disorder diagnosis in 2016, during the 48 months preceding the index diagnosis

N of gaps	N of patients with an index diagnosis in 2016 (column percentage)	Total gap month(s), cell percentage (N = 7,217)																Total enrollment month(s)		
		0	1	2	3	4	5	6	7	8	9	10	11	12	13-24	25-36	37-47	Mean	Median	Inter-quartile range
No enrollment data during the preceding 48 months	79 (1.1)	1.1	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
No gap: 48 months of continuous enrollment data	4,885 (67.7)	12.6	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	48.0	48.0	0.0
No gap: continuous enrollment data immediately preceding the first diagnosis, but fewer than 48 months	906 (12.6)	67.7	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	23.9	25.0	29.0
One gap	1,052 (14.6)	/	3.5	1.8	1.2	1.0	0.7	0.8	0.5	0.5	0.5	0.4	0.4	0.4	1.9	0.6	0.3	37.1	41.0	14.0
Two gaps	269 (3.7)	/	/	0.3	0.3	0.4	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.2	1.1	0.2	0.0	35.4	37.0	14.0
Three gaps	22 (0.3)	/	/	/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	33.1	35.0	10.0
Four gaps	4 (0.1)	/	/	/	/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.3	33.5	2.5

Note: No patient found with more than four gaps.

Table S4. Characteristics associated with having complete historical data during the 48 months preceding the index schizophrenia spectrum disorder diagnosis (vs. not having complete data)

Characteristic	Odds Ratio (95% CI)
Female	1.13 (1.01, 1.27)
Ages (reference group: Ages 18-29 years):	
15-17 years	1.55 (1.10, 2.17)
30-35 years	1.08 (0.97, 1.20)
Index diagnosis location (reference group: ED/observational):	
Inpatient, psychiatry	0.77 (0.61, 0.98)
Inpatient, non-psychiatry	1.07 (0.85, 1.35)
Outpatient, mental health	1.27 (1.11, 1.45)
Outpatient, primary care	1.15 (0.97, 1.36)
Outpatient, other	1.78 (1.47, 2.15)
Index diagnosis insurance (reference group: Medicaid):	
Commercial	0.99 (0.85, 1.15)
Other	0.60 (0.49, 0.72)
Residence in a low SES zip code at time of index diagnosis	0.93 (0.82, 1.05)
Index diagnosis (reference group: schizophrenia)	
Schizoaffective disorder	1.11 (1.00, 1.23)
Both	0.67 (0.47, 0.95)

Notes: Displays the odds ratios for characteristics associated with having 48 months of data prior to the index schizophrenia spectrum disorder diagnosis based on a logistic model. Including patients with an index spectrum disorder diagnosis in 2016 (N = 7,217). CI = confidence interval; ED = emergency department; SES = socioeconomic status.

Table S5. Proportion with one or more health insurance types or payers during the index month and 48 months preceding the index schizophrenia spectrum disorder diagnosis, by insurance type at time of index diagnosis

	Medicaid	Commercial	Other	All
N	3,948	674	263	4,885
Health insurance types:				
One	59.6	52.8	30.4	57.1
Two	31.8	33.4	56.3	33.3
Three	8.7	13.8	13.3	9.6
Health insurance payers:				
One	38.4	33.8	18.6	36.7
Two	29.3	30.1	28.1	29.3
Three	19.4	20.5	37.6	20.5
More than three	12.9	15.6	15.7	13.5

Notes: Index diagnoses refer the initial schizophrenia spectrum disorder diagnosis during the 2016 observation period. All subjects in the table must have complete historical data, defined as having 48 continuous months of data prior to the index diagnosis month. Insurance types include Medicaid, commercial, and other (Medicare Advantage, mixed, unspecified, missing, etc.). Insurance payers include individual health insurance companies, fee-for-service Medicaid, or Health Safety Net. If a health insurance company operated in multiple insurance types (such as commercial, Medicaid managed care, and/or other including Medicare Advantage), then each insurance type of this health insurance company was counted as a different payer.

Table S6. Patients with an index schizophrenia spectrum disorder diagnosis in 2016 and 48 months of complete historical data, with schizophrenia spectrum disorder diagnosis history in the 12, 24, 36, or 48 preceding months, by age group and sex

	N of patients with an index diagnosis in 2016 [A]	Among [A], N of patients with 48 months of historical data [B]	Percentage of [B] among [A]	Among [B], percentage of patients with a historical diagnosis during the X months preceding the index diagnosis			
				X=12	X=24	X=36	X=48
Female, 15-17 years	90	67	74.4	31.3	38.8	44.8	44.8
Male, 15-17 years	101	77	76.2	29.9	37.7	40.3	40.3
Female, 18-29 years	1,161	798	68.7	53.1	63.3	67.3	70.1
Male, 18-29 years	3,110	2,037	65.5	59.9	69.9	73.8	75.9
Female, 30-35 years	858	611	71.2	60.7	71.5	74.8	77.6
Male, 30-35 years	1,897	1,295	68.3	69.3	79.2	83.6	85.6
All	7,217	4,885	67.7	60.6	70.5	74.5	76.7

Table S7. Rate of new schizophrenia spectrum disorder diagnosis in 2016 (number of patients per 100,000 members available in MA APCD), by age group and sex

	Number of members available in MA APCD in 2016	Number of patients with:				Number of patients per 100,000 members available in MA APCD			
		Column A: X=12	Column B: X=24	Column C: X=36	Column D: X=48	Column A	Column B	Column C	Column D
		<ul style="list-style-type: none"> • an index schizophrenia spectrum disorder diagnosis in 2016, and • 48 months of complete historical data preceding the index diagnosis, and • no historical schizophrenia spectrum disorder diagnosis during the X months preceding the index diagnosis 							
Female, 15-17 years	100,204	46	41	37	37	46	41	37	37
Male, 15-17 years	104,612	54	48	46	46	52	46	44	44
Female, 18-29 years	530,582	374	293	261	239	70	55	49	45
Male, 18-29 years	492,974	816	614	533	491	166	125	108	100
Female, 30-35 years	255,276	240	174	154	137	94	68	60	54
Male, 30-35 years	233,699	397	269	213	186	170	115	91	80
All	1,717,347	1,927	1,439	1,244	1,136	112	84	72	66

Notes: Members available in MA APCD in 2016 including all members with at least one month of enrollment data in 2016; age determined in December 2016. MA APCD = Massachusetts All-Payer Claims Database.

Table S8. Rate of new schizophrenia spectrum disorder diagnosis in 2016 (number of patients per 100,000 members available in MA APCD), by age group and sex (for those with a single health insurance payer during index diagnosis and prior 48 months only)

	Number of members available in MA APCD in 2016	Number of patients with:				Number of patients per 100,000 members available in MA APCD			
		Column A: X=12	Column B: X=24	Column C: X=36	Column D: X=48	Column A	Column B	Column C	Column D
		<ul style="list-style-type: none"> • an index schizophrenia spectrum disorder diagnosis in 2016, and • 48 months of complete historical data preceding the index diagnosis, and • no historical schizophrenia spectrum disorder diagnosis during the X months preceding the index diagnosis, and • a single health insurance payer during index diagnosis and prior 48 months 							
Female, 15-17 years	100,204	15	15	15	15	15	15	15	15
Male, 15-17 years	104,612	17	17	17	17	16	16	16	16
Female, 18-29 years	530,582	113	84	77	67	21	16	15	13
Male, 18-29 years	492,974	280	218	188	171	57	44	38	35
Female, 30-35 years	255,276	89	58	52	44	35	23	20	17
Male, 30-35 years	233,699	180	111	81	70	77	47	35	30
All	1,717,347	694	503	430	384	40	29	25	22

Notes: Index diagnoses refer the initial schizophrenia spectrum disorder diagnosis during the 2016 observation period. All subjects in the table must have complete historical data, defined as having 48 continuous months of data prior to the index diagnosis month. Insurance types include Medicaid, commercial, and other (Medicare Advantage, mixed, unspecified, missing, etc.). Insurance payers include individual health insurance companies, fee-for-service Medicaid, or Health Safety Net. If a health insurance company operated in multiple insurance types (such as commercial, Medicaid managed care, and/or other including Medicare Advantage), then each insurance type of this health insurance company was counted as a different payer. MA APCD = Massachusetts All-Payer Claims Database.

Table S9. Patients with an index schizophrenia spectrum disorder diagnosis in 2016 and 48 months of complete historical data, with schizophrenia spectrum disorder diagnosis history in the 12, 24, 36, or 48 preceding months, by age group and sex (sensitivity analysis: historical diagnoses from an in an expanded set of claim lines)

	N of patients with an index diagnosis in 2016 [A]	Among [A], N of patients with 48 months of historical data [B]	Percentage of [B] among [A]	Among [B], percentage of patients with a historical diagnosis during the X months preceding the index diagnosis			
				X=12	X=24	X=36	X=48
Female, 15-17 years	90	67	74.4	35.8	43.3	47.8	47.8
Male, 15-17 years	101	77	76.2	33.8	40.3	42.9	42.9
Female, 18-29 years	1,161	798	68.7	58.6	67.5	71.2	73.4
Male, 18-29 years	3,110	2,037	65.5	65.3	73.4	76.8	78.5
Female, 30-35 years	858	611	71.2	65.3	74.0	76.9	79.2
Male, 30-35 years	1,897	1,295	68.3	75.4	82.6	86.3	87.6
All	7,217	4,885	67.7	66.0	74.0	77.5	79.2

Notes: Historical diagnoses from an expanded set of claim lines compared to the main analysis (including post-acute care, ambulatory, laboratory, etc., in addition to inpatient, ED/observational, and outpatient claims lines); ED = emergency department.

Table S10. Patients with an index schizophrenia spectrum disorder diagnosis in 2016 and 48 months of complete historical data, with schizophrenia spectrum disorder diagnosis history in the 12, 24, 36, or 48 preceding months, by age group and sex (sensitivity analysis: including other and unspecified psychosis diagnosis codes)

	N of patients with an index diagnosis in 2016 [A]	Among [A], N of patients with 48 months of historical data [B]	Percentage of [B] among [A]	Among [B], percentage of patients with a historical diagnosis during the X months preceding the index diagnosis			
				X=12	X=24	X=36	X=48
Female, 15-17 years	213	150	70.4	44.7	54.7	58.0	58.7
Male, 15-17 years	241	184	76.3	33.2	41.8	45.7	46.7
Female, 18-29 years	1,731	1,151	66.5	50.1	60.7	64.6	66.6
Male, 18-29 years	4,071	2,565	63.0	58.9	70.0	74.4	76.6
Female, 30-35 years	1,160	802	69.1	56.7	68.3	72.2	74.7
Male, 30-35 years	2,254	1,476	65.5	67.6	78.4	82.5	84.6
All	9,670	6,328	65.4	58.0	68.9	73.0	75.1

Table S11. Antipsychotic medication prescriptions prior to the index schizophrenia spectrum disorder diagnosis in 2016 for patients with complete historical data and without a historical schizophrenia spectrum diagnosis, by age group and sex

	N of patients with an index diagnosis in 2016 and 48 months of historical data [A]	Among [A], N of patients with no historical diagnosis during the 48 months preceding the index diagnosis [B]	Percentage of [B] among [A]	Among [B], percentage of patients with an antipsychotic medication prescription during the X months preceding the index diagnosis			
				X=12	X=24	X=36	X=48
Female, 15-17 years	67	37	55.2	62.2	67.6	70.3	70.3
Male, 15-17 years	77	46	59.7	43.5	52.2	54.3	54.3
Female, 18-29 years	798	239	29.9	59.0	66.5	70.7	72.0
Male, 18-29 years	2,037	491	24.1	50.5	58.9	63.3	65.4
Female, 30-35 years	611	137	22.4	45.3	53.3	55.5	59.1
Male, 30-35 years	1,295	186	14.4	47.8	60.2	66.1	69.4
All	4,885	1,136	23.3	51.3	60.0	64.3	66.4