It is illegal to post this copyrighted PDF on any website. Ethnic Differences in Mental Illness Severity: A Population-Based Study of Chinese and South Asian Patients in Ontario, Canada

Maria Chiu, PhD^{a,*}; Michael Lebenbaum, MSc^a; Alice M. Newman, MSc^a; Juveria Zaheer, MD^b; and Paul Kurdyak, MD, PhD^{a,b,c}

ABSTRACT

Objective: Little is known about the sociocultural determinants of mental illness at hospital presentation. Our objective was to examine ethnic differences in illness severity at hospital admission among Chinese, South Asian, and the general population living in Ontario, Canada.

Methods: We conducted a large, population-based, crosssectional study of psychiatric inpatients aged from 19 to 105 years who were discharged between 2006 and 2014. A total of 133,588 patients were classified as Chinese (n = 2,582), South Asian (n = 2,452), or the reference group (n = 128,554) using a validated surnames algorithm (specificity: 99.7%). Diagnoses were based on *DSM-IV* criteria. We examined the association between ethnicity and 4 measures of disease severity: involuntary admissions, aggressive behaviors, and the number and frequency of positive symptoms (ie, hallucinations, command hallucinations, delusions, and abnormal thought process) (Positive Symptoms Scale, Resident Assessment Instrument-Mental Health [RAI-MH]).

Results: After adjusting for sociodemographic characteristics, immigration status, and discharge diagnosis, Chinese patients had greater odds of involuntary admissions (odds ratio [OR] = 1.79; 95% Cl, 1.64–1.95) and exhibiting severe aggressive behaviors (OR = 1.36; 95% Cl, 1.23–1.51) and \geq 3 positive symptoms (OR = 1.39; 95% Cl, 1.24–1.56) compared to the general population. South Asian ethnicity was also an independent predictor of most illness severity measures. The association between Chinese ethnicity and illness severity was consistent across sex, diagnostic and immigrant categories, and first-episode hospitalization.

Conclusions: Chinese and South Asian ethnicities are independent predictors of illness severity at hospital presentation. Understanding the role of patient, family, and health system factors in determining the threshold for hospitalization is an important future step in informing culturally specific care for these large and growing populations worldwide.

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^aInstitute for Clinical Evaluative Sciences, Toronto, Canada ^bCentre for Addiction and Mental Health, Toronto, Canada ^cDepartment of Psychiatry and Institute of Health Policy, Management and Evaluation, University of Toronto, Canada **Corresponding author:* Maria Chiu, PhD, Mental Health and Addictions Program, Institute for Clinical Evaluative Sciences, G-106, 2075 Bayview Ave, Toronto ON M4N 3M5, Canada (maria.chiu@ices.on.ca). A dmission to a psychiatric hospital is determined by several factors, including the nature and severity of the illness and the need for safety when the patients are a threat to themselves or others. While all individuals who are hospitalized for a given condition meet some threshold for admission, considerable variability is likely in the state and severity of the patient at presentation. To date, very little investigation into the sociocultural determinants of illness state at the time of hospitalization has been conducted.

Immigration and ethnicity have been shown to be key sociocultural factors in the development and severity of mental illness. The majority of the existing literature, however, has focused on black African and Caribbean populations in the United Kingdom and black African and Latin American populations in the United States, with minimal attention paid to Asian ethnic groups living in western countries.¹⁻⁶ Global migration is an increasingly common phenomenon, with European and North American countries receiving among the highest numbers of international migrants in 2013.⁷ In particular, the past few decades have seen a tremendous global diaspora of people of Chinese and South Asian (ie, Indian, Pakistani, Bangladeshi, and Sri Lankan) descent to many western countries; however, little is known about their mental health status. Canada has the highest proportion of foreign-born individuals of any G8 country⁸ and has among the largest Chinese and South Asian populations outside of Asia, thus making it an ideal setting to study cross-cultural differences in illness severity.

Despite access to a universal health care system, Chinese immigrants in Canada are far less likely to use mental health services, even among patients with severe and persistent mental illness.^{9,10} Lower levels of mental health service utilization have also been found among South Asians in the United Kingdom and Canada.^{11,12} Similarly, analysis of data from the Chinese American Psychiatric Epidemiology Study (CAPES)¹³ found that only 17% of Chinese Americans with prevalent mental health and addiction issues sought care in the past 6 months. Lower use of outpatient mental health care may influence the severity of psychiatric illnesses among Chinese and South Asian groups; however, no populationbased study to date has comprehensively compared illness severity at hospital presentation across Chinese and South Asian groups living in a western country. Specifically, the majority of previous studies of mental illness in Asian populations have been based on no more than about 200 patients (and usually many fewer), have largely been limited to a single measure of severity (usually admission rates or involuntary admissions), and have resulted in highly inconsistent findings.¹⁴⁻¹⁶ Moreover, previous studies on ethnic differences in disease severity have largely been restricted to individuals with

Chiu et al It is illegal to post this copyrighted PDF on any website. years that were voluntary or involuntary admissions and

- While ethnicity has been shown to be a key factor in the development of mental illness and the use of mental health services, very little information exists on how this impacts illness severity at psychiatric hospital presentation for Asian ethnic groups living in western countries.
 - People of Chinese and South Asian descent are more likely to experience higher levels of illness severity at hospital presentation, suggesting a potential need for targeted, culturally competent intervention in this population.

psychotic disorders; therefore, ethnic differences across other psychiatric conditions (eg, bipolar disorder and depression) remain unclear.

The objective of this study was to investigate whether a population-based sample of Chinese and South Asian patients in Ontario, the most populous province within Canada's single-payer universal health care system, differed in 4 measures of disease severity: involuntary admissions, aggressive behaviors, and the number and frequency of positive symptoms. We also examined the role of sex, diagnosis, and immigration status in the relationship between Chinese and South Asian ethnicities and disease severity.

METHODS

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Data Sources

Our study population was derived from the Ontario Mental Health Reporting System (OMHRS) database, which contains information on all adult inpatients in designated mental health beds across all hospitals in Ontario, Canada. Data in OMHRS are collected using the interRAI Resident Assessment Instrument-Mental Health (RAI-MH),17,18 a standardized minimum assessment clinical tool with demonstrated reliability and convergent validity. The RAI-MH captures information on patient-level sociodemographic characteristics; diagnoses according to Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria; and several clinical rating scales capturing various dimensions of mental health and level of functioning. We linked OMHRS to several administrative databases: the Canadian Institute for Health Information's Discharge Abstract Database to ascertain prior psychiatric hospitalizations; the Registered Persons Database to ascertain age, sex, area-level income, and rurality of residence; the ETHNIC database to ascertain ethnicity; and the Immigration, Refugees and Citizenship Canada Permanent Resident database for immigration status. All databases were linked at the Institute for Clinical Evaluative Sciences using unique, encoded identifiers.

Study Population

Using the OMHRS database, we identified all patients who were discharged between April 1, 2006, and March 31, 2014. Our inclusion criteria included hospitalizations among Ontario residents with valid health cards from age 19 to 105 years that were voluntary or involuntary admissions and that had data on psychiatric assessments at admission. We excluded hospitalizations with lengths of stay less than 3 days (because the diagnostic and assessment data were not complete) or greater than 90 days (because they reflect very complex patients that are not representative of the general hospitalized population). We also excluded patients with invalid diagnoses such as *DSM-IV* diagnoses listed as "7999" or starting with a letter and other data inconsistencies. For all analyses, we limited the sample to the first admission for each patient within the study period in hierarchical order of severity (ie, schizophrenia, bipolar disorder, depression, and other discharge diagnosis). Schizophrenia, bipolar disorder, and depression represent approximately three-quarters of all mental health hospitalizations in Ontario.¹⁹

Ethnicity

Patients were categorized as Chinese, South Asian, or other (henceforth called the "general population") by using the ETHNIC database, which was derived from a validated surnames algorithm designed to prioritize specificity (99.7% for both ethnic groups) and positive predictive value (South Asians, 89.3%; Chinese, 91.9%) over sensitivity.²⁰

Study Outcomes

Upon admission, patients were observed and an assessment was completed by a member of the clinical team that reflected the first 72 hours of the hospital stay. Four measures of disease severity were examined:

- 1. Involuntary admission. We examined whether individuals were involuntarily admitted or detained for the purpose of psychiatric assessment. Under the Ontario Mental Health Act, physicians may involuntarily detain patients if they are perceived to be a serious risk of harm to themselves, a serious risk to others, or unable to care for themselves due to their mental condition.
- 2. Score ≥ 3 on the Aggressive Behavior Scale.²¹ The RAI-MH Aggressive Behavior Scale (http://www. interrai.org/scales.html) was used to capture the presence and frequency of verbal abuse, physical abuse, socially inappropriate or disruptive behavior, and aggressive resistance to care. Each of the 4 symptoms were rated on a 4-point scale (0 [not exhibited in past 3 days], 1 [not exhibited in the last 3 days but was reported to be present], 2 [exhibited on 1 to 2 of the last 3 days], 3 [exhibited daily]) and summed to give an Aggressive Behavior Scale score ranging from 0 to 12.
- 3. ≥ Three positive symptoms. The RAI-MH was used to capture the presence of hallucinations, command hallucinations, delusions, and abnormal thought process or form in the preceding 3 days.
- Score ≥6 on the Positive Symptoms Scale (http:// www.interrai.org/scales.html). Each positive symptom was rated on a 4-point scale identical to the

It is illegal to post this cop scores for aggressive symptoms and summed to give a Positive Symptoms Scale score ranging from 0 to 12.

Statistical Analysis and Study Covariates

We separately compared both South Asian and Chinese patients to the general population using χ^2 tests for differences in proportions and Kruskal-Wallis test for continuous variables.

To examine whether ethnicity was independently associated with each study outcome, we used multivariable logistic regression models adjusted for age, sex, income, urban/rural dwelling, education, marital status, immigration status, and discharge diagnosis. Using Immigration, Refugees and Citizenship Canada Permanent Resident data, we categorized individuals as immigrants living <10 years in Canada, immigrants living ≥10 years in Canada, and nonimmigrants (eg, Canadian born or immigrants prior to 1985). Discharge diagnoses were based on *DSM-IV* Axis I criteria: schizophrenia (295), bipolar disorder (296, except 296.2, 296.3, 296.9), depression (296.2, 296.3, 311), and all other diagnoses.

We also conducted stratified multivariable logistic regression analyses to study whether the relationship between ethnicity and outcomes differed by sex, diagnosis, and immigrant status. All statistical analyses were conducted using SAS v9.3 (SAS Institute).

Sensitivity Analysis

A sensitivity analysis was conducted in which the cohort was restricted to first psychiatric admissions (ie, individuals without a psychiatric hospital admission in the prior 5 years).

Ethics Review

The study obtained ethics approval from the Sunnybrook Health Sciences Centre Research Ethics Board in Toronto, Ontario.

RESULTS

A total of 286,127 admissions met our inclusion criteria. After excluding hospitalizations with lengths of stay <3 days (n = 196) or >90 days (n = 12,647, 4.4% of admissions), missing (n = 18,840) or invalid (n = 1,044) diagnoses, and data inconsistencies (n = 21), we identified 253,379 hospitalizations, representing 245,088 unique hospital episodes (counting hospitalizations with transfers as a single episode) and 133,588 unique patients (2,582 Chinese, 2,452 South Asian, and 128,554 general population patients).

Sociodemographic and Inpatient Characteristics

Both Chinese and South Asian patients were significantly younger than the general population and were more likely to be immigrants (Table 1). Both Chinese and South Asian patients were significantly more likely to be admitted because they were a threat to others or they were unable to care for themselves (Table 2). At discharge, patients of both ethnic minority groups were significantly more likely to be diagnosed with schizophrenia than the general population.

Involuntary admissions were significantly more common among Chinese (67.1%) and South Asian (59.7%) patients than among patients in the reference group (46.0%) (P<.001 for both comparisons). Patients of both ethnic minority groups were also significantly more likely to demonstrate severe aggressive behaviors at hospital presentation, with 20.4% of Chinese and 16.3% of South Asian patients exhibiting Aggressive Behavior Scale scores of 3 or greater compared to 14% in the general population (P<.001 for both comparisons) (Table 2).

A large proportion of patients in both ethnic minority groups (55.2% Chinese and 49.2% South Asians) had at least 1 positive symptom, with a disproportionately large number exhibiting 3 or all 4 positive symptoms (Table 2). Both Chinese and South Asian patients also scored higher on the Positive Symptoms Scale than the general population. The ethnic gradient was the same for each of the positive symptoms, with Chinese patients showing the highest prevalence followed by South Asians and the general population.

Multivariable-Adjusted Odds Ratios

After adjusting for all study covariates, including discharge diagnosis, severe positive symptoms were significantly higher in both Chinese (OR = 1.42; 95% CI, 1.29–1.56) and South Asian (OR = 1.17; 95% CI, 1.06–1.30) patients, and Chinese patients also had significantly elevated severe aggressive behaviors (OR = 1.36; 95% CI, 1.23–1.51) relative to the reference group. Involuntary admissions were significantly higher in both Chinese (OR = 1.79; 95% CI, 1.64–1.95) and South Asian (OR = 1.31; 95% CI, 1.20–1.42) patients (Figure 1).

Multivariable adjusted odds ratios stratified by sex showed that the relationship between ethnicity and disease severity were largely the same magnitude between men and women, except among South Asian men (OR = 1.21; 95% CI, 1.04-1.41) who showed a trend toward elevated aggressiveness compared to their female counterparts (OR = 0.98; 95% CI, 0.82-1.17) (results available upon request). Figure 2 displays the multivariable-adjusted ORs stratified by discharge diagnosis. We observed that Chinese patients had higher odds of severe positive symptoms, aggressive behaviors, and involuntary admissions, irrespective of diagnosis. Among South Asians, however, the differences across the diagnostic categories were more nuanced. South Asians with depression had elevated odds for severe aggression, involuntary admissions, and severe positive symptoms, while those with bipolar disorder had elevated odds for positive symptoms.

Chinese patients generally showed greater illness severity than the general population, irrespective of immigrant status (Table 3). Among South Asians, however, Canadianborn patients showed significantly elevated odds for most severity measures.

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Table 1. Sociodemographic Characteristics of 133,588 Mental Health Inpatients Aged From 19 to 105 Years in Ontario, Canada (2006–2014), by Ethnicity

			Chinese $(n = 2.582)$		South Asian $(n = 2.452)$			
	(reference)		(II = 2,502)			(II = 2, +52)		
Characteristic	(n = 128,554), Value ^a	Value ^a	Statistic ^b	Pc	Value ^a	Statistic ^b	Pc	
Age at admission, mean (median), y	45.0 (44)	42.4 (41)	56.3	<.001	41.6 (40)	90.7	<.001	
Age, y								
19–44	51.2	58.3	51.2	<.001	60.9	91.5	<.001	
45–64	35.1	31.6	13.3	<.001	29.4	34.3	<.001	
≥65	13.8	10.1	28.6	<.001	9.7	33.5	<.001	
Sex								
Female	49.7	57.6	63.6	<.001	46.9	7.6	.006	
Male	50.3	42.4			53.1			
Income quintile								
1 (lowest)	28.5	29.0	0.3	.59	29.4	1.1	.30	
2	21.3	24.0	11.1	<.001	24.9	18.8	<.001	
3	17.8	17.6	0.1	.80	20.5	11.9	<.001	
4	16.7	15.6	2.0	.16	15.3	3.4	.07	
5 (highest)	15.1	13.1	7.7	.006	9.6	56.6	<.001	
Education								
Less than high school	23.7	14.4	120.2	<.001	19.5	23.0	<.001	
High school graduate	26.2	17.9	90.6	<.001	24.6	3.4	.07	
Any postsecondary	39.6	51.4	147.5	<.001	44.5	24.3	<.001	
Unknown	10.5	16.3	87.0	<.001	11.4	1.9	.16	
Marital status								
Single	45.1	49.8	23.3	<.001	41.4	12.9	<.001	
Married-common law	32.8	37.1	21.7	<.001	44.5	148.0	<.001	
Widowed/separated/divorced	22.1	13.0	122.9	<.001	14.1	90.3	<.001	
Immigration status								
Immigrant < 10 y in Canada	2.6	18.6	2267.4	<.001	15.7	1480.2	<.001	
Immigrant ≥ 10 y in Canada	5.3	25.7	1946.2	<.001	31.3	2957.1	<.001	
Nonimmigrant	92.0	55.7	4226.6	<.001	53.0	4623.8	<.001	
Rurality								
Urban	91.1	99.2	206.5	<.001	NR ^d	NR ^d	NR ^d	
Rural	8.8	0.8	204.4	<.001	NR ^d	NR ^d	NR ^d	

^aValues are percentages unless otherwise specified. Percentages that do not sum to 100% are due to missing values or rounding. ^bTest statistic is χ² for discrete variables and Kruskal-Wallis for continuous variables.

^cP values compare the Chinese and South Asian groups to the general population.

^dThe vast majority of South Asian patients lived in urban areas and only < 6 South Asian patients lived in rural areas. Values are suppressed to protect the confidentiality of individuals due to small cells.

Abbreviation: NR = not reported.

Sensitivity Analysis

Compared to the main analysis, the sensitivity analysis of 1,682 Chinese, 1,487 South Asian, and 77,158 general population patients who represented first hospitalizations produced very similar results across all study outcomes for both ethnic groups (Supplementary eTable 1).

DISCUSSION

In this large, population-based study in Ontario, Canada, we found significant differences in the severity of mental illness among Chinese and South Asian inpatients. In general, illness severity was greatest among the Chinese, followed by South Asians, and the general population, independent of diagnosis. Within each diagnostic category, Chinese patients were more likely to be involuntarily admitted, to exhibit aggressive behaviors, and to present with more positive symptoms than the reference group. The association between ethnicity and illness severity was largely consistent between sexes and across most immigrant categories. Chinese and South Asian ethnicities remained strong risk factors for severe mental illness among those whose index hospitalization was their first encounter with the hospital system.

The higher rates of involuntary admissions among Chinese patients in our study are consistent with those in an earlier study²² in the United States that reported 1.5-fold higher odds of involuntary admissions among Chinese Americans. Studies of involuntary admissions among South Asians in the United Kingdom have been inconclusive, largely due to very small samples within individual studies.^{16,23} We also report excess rates of schizophrenia similar to those estimated previously for South Asians in the United Kingdom and in Chinese Americans.^{2,22} Our study also showed striking differences in 3 additional severity dimensions, including the presence of multiple positive symptoms, more frequently observed positive symptoms, and more severe aggressive behaviors, thus providing compelling evidence of greater illness severity among Asian patients overall and across sex, immigration status, diagnostic categories, and for the first hospitalization, demonstrating these results were not solely due to increased prevalence of schizophrenia or patients being at later stages of illness.

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Table 2. Ethnic Differences at Hospital Assessment Among 133,588 Mental Health Inpatients Aged From 19 to 105 Years in Ontario, Canada (2006–2014)

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	General Population	Chinese (n = 2,582)			South Asian (n=2,452)		
	(reference)		Test			Test	Pc
Variable	(n = 128,554), Value ^a	Value ^a	Statistic ^b	Pc	Value ^a	Statistic ^b	
Reason for admission (not mutually exclusive)							
Threat to self	48.4	49.9	2.3	.13	45.2	10.0	.002
Threat to others	16.7	24.6	112.6	<.001	22.5	58.1	<.001
Inability to care for self	35.7	43.6	68.9	<.001	43.3	59.4	<.001
Justice system	3.9	3.6	0.4	.51	4.2	0.8	.38
Involuntary admission	46.0	67.1	451.0	<.001	59.7	180.0	<.001
Aggressive Behavior Scale							
0 (none)	76.2	65.8	151.4	<.001	71.2	33.6	<.001
1–2 (moderate)	9.8	13.8	45.5	<.001	12.5	19.7	<.001
≥3 (severe)	14.0	20.4	86.7	<.001	16.3	10.9	<.001
Positive symptoms (not mutually exclusive)							
Hallucinations	16.0	28.6	292.0	<.001	25.0	142.2	<.001
Command hallucinations	4.4	7.5	56.2	<.001	6.5	24.7	<.001
Delusions	22.9	37.5	300.6	<.001	32.1	114.6	<.001
Abnormal thought process/form	27.7	39.2	165.9	<.001	34.0	47.0	<.001
No. of positive symptoms							
0	62.4	44.8	332.2	<.001	50.9	136.1	<.001
1–2	28.5	38.2	114.9	<.001	35.5	56.6	<.001
≥3	9.1	17.0	190.7	<.001	13.7	61.3	<.001
Positive Symptoms Scale score ≥ 6	15.5	27.3	263.3	<.001	22.3	82.2	<.001
Negative symptoms (not mutually exclusive)							
Anhedonia	23.9	21.7	6.5	.01	20.4	16.2	<.001
Loss of interest	35.0	32.6	6.3	.01	34.4	0.4	.55
Lack of motivation	38.0	37.1	0.9	.34	41.9	15.5	<.001
Reduced interaction	44.7	48.5	14.6	<.001	50.6	33.8	<.001
No. of negative symptoms							
0	45.0	43.7	1.6	.20	42.7	5.1	.02
1–2	25.2	27.7	8.9	.03	26.1	1.1	.31
≥3	29.9	28.5	2.1	.15	31.2	2.2	.14
Length of stay, mean (median), d	20.2 (15)	19.0 (14)	12.2	<.001	17.9 (13)	38.4	<.001
Discharge diagnosis (hierarchical, mutually exclusive)		,					
Schizophrenia	20.3	36.2	387.9	<.001	30.6	155.2	<.001
Bipolar disorder	14.9	11.1	29.3	<.001	13.9	2	.15
Depression	28.3	25.5	10.2	.001	26.0	6.6	.01
Other	36.4	27.2	91.8	<.001	29.5	48.9	<.001

^aValues are percentages unless otherwise specified.

^bTest statistic is χ^2 for discrete variables and Kruskal-Wallis for continuous variables.

^cP values compare the Chinese and South Asian groups to general population.

Possible Explanations

The reasons for the greater illness severity at presentation are unclear but are most likely explained by a combination of patient/family factors and health system/provider factors. Higher rates of illness severity can be conceptualized as a consequence of limited access to primary health care or community-based services.¹⁵ Several studies^{11,15} have suggested that Asians in general have lower rates of mental health service utilization than their white counterparts, with Chinese individuals showing even lower rates of service use than South Asians. Lower use of outpatient mental health care may result in greater severity at hospital presentation, and that is indeed what we found: Chinese patients showed the worst illness severity at admission, followed by South Asian patients and the general population. Chinese and South Asians have also been shown to have lower rates of hospitalizations than the general population.¹⁵ In our study, Chinese individuals represented 2.0% and South Asians represented 1.9% of the inpatient population; whereas these ethnic groups represent 5.6% and 7.9%, respectively, of the overall Ontario population. It is possible that the threshold

for presenting to hospital is higher for individuals of Asian descent and that we might only be capturing those with greater illness severity in this hospitalized population.

Our findings suggest a progression of illness severity associated with a delay in seeking help. Previous evidence²⁴ has shown that duration of untreated psychosis is associated with increased illness severity at hospital presentation. This reluctance to seek help among the Chinese and South Asian populations may stem from feelings of shame and stigma, cultural differences in the recognition and conceptualization of mental illness and mental health care, or institutional racism, which in turn may have a profound impact on pathways into care and clinical presentation.²⁵⁻³⁰ Another explanation for the presumed delay in help seeking may be the view among Chinese and South Asian patients that symptoms of psychological distress should be managed within the family rather than through the mental health system and that help is sought only when symptoms are too profound to be managed at home.^{26,28}

Health system/provider factors including logistic barriers, such as language barriers; culturally insensitive health

Figure 1. Ethnic Differences in Involuntary Admissions and Mental Illness Severity Among 133,588 Mental Health Inpatients Aged From 19 to 105 Years in Ontario, Canada (2006–2014)^a



^aOdds ratios (95% CIs [denoted by error bars]) were derived from logistic regression models adjusted for age, sex, income quintiles, education, immigration status, marital status, urban/rural residence, and discharge diagnosis. Chinese (n = 2,582) and South Asian (n = 2,452) patients were compared to the general population (n = 128,554). *P* values compare the Chinese and South Asian groups to the general population for each illness severity measure.

Table 3. Ethnic Differences in Involuntary Admissions and Mental Illness Severity Among 133,588 Mental Health Inpatients Aged From 19 to 105 Years in Ontario, Canada (2006–2014), by Immigration Status^a

		Chinese (n =	2,582)	South Asian (n=2,452)				
Variable	Odds Ratio	95% Cl	Wald χ^2	Pb	Odds Ratio	95% Cl	Wald χ^2	Pb
Involuntary admission								
Immigrant, < 10 y in Canada	1.67	1.34-2.09	20.1	<.001	1.00	0.79-1.25	0.0	.97
Immigrant, ≥ 10 y in Canada	1.56	1.31–1.87	24.0	<.001	1.11	0.95-1.31	1.7	.20
Nonimmigrant	1.92	1.72-2.15	131.3	<.001	1.51	1.35-1.69	50.3	<.001
Aggressive Behavior Scale \geq 3								
Immigrant, < 10 y in Canada	1.43	1.12-1.82	8.5	.004	0.70	0.50-0.97	4.7	.03
Immigrant, ≥ 10 y in Canada	1.30	1.06-1.59	6.1	.01	1.12	0.92-1.37	1.2	.27
Nonimmigrant	1.38	1.20-1.59	21.2	<.001	1.26	1.08-1.47	8.8	.003
≥ 3 Positive symptoms								
Immigrant, < 10 y in Canada	1.39	1.08-1.80	6.5	.01	1.12	0.82-1.52	0.5	.47
Immigrant, ≥ 10 y in Canada	1.14	0.91-1.43	1.2	.27	1.25	1.01-1.54	4.4	.04
Nonimmigrant	1.51	1.30–1.76	29.0	<.001	1.11	0.93-1.33	1.3	.25
Positive Symptoms Scale score								
≥6								
Immigrant, < 10 y în Canada	1.36	1.09–1.70	7.2	.007	1.11	0.86–1.44	0.6	.43
lmmigrant, ≥ 10 y in Canada	1.11	0.92–1.35	1.2	.27	1.10	0.92–1.32	1.1	.29
Nonimmigrant	1.59	1.40–1.81	49.3	<.001	1.21	1.05–1.41	6.6	.01

^aThe reference group is the general population (ie, all other ethnicities) within each immigrant category. Odds ratios (95% Cls) were derived from logistic regression models adjusted for age, sex, income quintiles, education, marital status, urban/rural residence, and discharge diagnosis. Sample sizes for the immigrant < 10 years in Canada, immigrant \ge 10 years in Canada, and nonimmigrants: Chinese (n = 480, n = 664, and n = 1,438, respectively), South Asian (n = 385, n = 767, and n = 1,300, respectively), and general population (n = 3,367, n = 6,854, n = 118,333, respectively).

^b*P* values compare the Chinese and South Asian groups to the general population within each immigrant category.

services; and cultural mismatch between service providers and patients have been proposed as explanatory factors for ethnic differences in the use of mental health care.^{31,32} Given that we did not find any patterns to suggest differences across immigration status, it is unlikely that language barriers are a major contributor to our findings. A large body of literature stresses the importance of culturally appropriate services in health care and mental health care. However, while some evidence^{33,34} suggests that these interventions can improve access to care, high-quality studies examining the impact of these interventions are lacking. This is an important area for future study, given the clear ethnic differences in illness severity demonstrated in this study. Perhaps earlier access to culturally appropriate care would result in lower severity at hospitalization. Psychiatrists and other mental health care providers need to take ethnicity It is illegal to post this copyrighted PDF on any website

Figure 2. Ethnic Differences in Involuntary Admission and Illness Severity Among 133,588 Adult Mental Health Inpatients by Diagnosis (2006–2014)^a



^aThe reference group was the general population with the specific diagnosis. Odds ratios (95% CIs [denoted by error bars]) were derived from logistic regression models adjusted for age (19 to 105 years), sex, income quintiles, education, immigration status, marital status, and urban/rural residence. Diagnosis-specific sample sizes are as follows: schizophrenia (Chinese, n = 934; South Asian, n = 750; general population, n = 26,134), bipolar disorder (Chinese, n = 287; South Asian, n = 341; general population, n = 19,214), depression (Chinese, n = 658; South Asian, n = 637; general population, n = 36,437), and other diagnosis (Chinese, n = 703; South Asian, n = 724; general population, n = 46,769). *P* values compare the Chinese and South Asian groups to the general population within each diagnostic category.

and culture into consideration when taking patient histories and designing treatment plans in order to reduce a potential barrier to service use among these high-risk ethnic groups. Furthermore, given the reluctance of Chinese and South Asian populations to seek medical help in general or confront the stigma of seeking help for a mental health condition, involving other sectors including education, community and social services, and alternative health services may result in earlier access to more culturally appropriate services.³²

Strengths

This study represents by far the largest and most rigorous examination of mental illness severity among Asian populations living in a western country. Our study draws from a large, population-based sample; as such, our findings are most likely generalizable. Additionally, our large sample size and ability to link individual-level health data across numerous administrative databases allowed us to adjust for important confounders and study the impact of ethnicity by sex and diagnosis type. While earlier studies have underscored immigration as a predictor of psychosis, this study provides strong evidence that we need to consider Chinese or South Asian ethnicity, independent of immigration and diagnosis, as an important determinant of multiple dimensions of illness severity. Moreover, our study was set within Ontario's single-payer universal health care system, thus allowing us to investigate ethnic disparities while largely controlling for potential financial barriers to seeking mental health care. Finally, our ability to examine Chinese and South Asian groups separately facilitates more culturally relevant comparisons between these disparate ethnic groups.

Limitations

This study has some limitations worth noting. First, ethnicity was defined using a surnames algorithm with high specificity at the cost of reduced sensitivity. Some Chinese and South Asians may have been misclassified as belonging to the general population; therefore, our results were most likely biased toward the null. Additionally, the

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It is illegal to post this copyr general population also included other ethnic groups with greater disease severity than that in white individuals (eg, black African, Caribbean, and Aboriginal populations who could not be identified within the databases), thus further supporting our claim that our estimates of higher disease severity among Chinese and South Asians are most likely still conservative. Second, given that the Citizenship and Immigration Canada Permanent Resident database provided information on immigrants entering Canada from 1985 onward, we were unable to distinguish immigrants who entered Canada prior to 1985 from Canadian-born individuals; even so, the former group represents people who have lived in Canada for at least 22 years. Third, the South Asian group is heterogeneous, comprising Indian, Pakistani, Sri Lankan, and Bangladeshis who might have disparate severity of mental illness. Future examination of illness severity across various South Asian groups is warranted. Furthermore, the identification of mechanisms that could explain our findings of elevated illness severity in Chinese and South Asian Canadians was beyond the scope of this study. We acknowledge that symptom recognition and assessment may vary with the ethnicity of both patients

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Author contributions: Dr Chiu was the principal investigator and prepared the first draft of the manuscript. Drs Chiu and Kurdyak conceived the study. Ms Newman performed the statistical analyses. All authors interpreted the data, critically revised the manuscript for important intellectual content, and approved the final version of the manuscript. Ms Newman 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.

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Additional information: The Immigration, Refugees and Citizenship Canada Permanent Resident database is collected by Immigration, Refugees and Citizenship Canada. The Registered Persons database is collected by the Ontario Ministry of Health and Long-Term Care. The Ontario Mental Health Reporting System (OMHRS) database and the Discharge Abstract Database are collected by Canadian Institute for Health Information. All data sources used reside at ICES. The data cannot be shared due to privacy legislation..

Supplementary material: See accompanying pages.

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and clinicians; however, in this study we were unable to tease these apart from differences in symptom presentation. Future studies should examine factors that might explain the large ethnic differences in illness severity and whether these factors might be modifiable.

CONCLUSION

In conclusion, our study found that Chinese and South Asian patients present to hospital with greater mental illness severity, defined in multiple ways, compared to a general population. While our data do not permit a causal explanation of our findings, it is likely that cultural perceptions of mental illness among these different ethnic communities and the commensurate delay in seeking help resulted in greater illness severity at time of hospitalization. The contribution of health system factors is also likely significant. Future research should explore the relative contributions of patient/ family factors and health system/provider factors. A better understanding of the factors preventing individuals from seeking care earlier in their course of illness will help inform culturally specific care and interventions.

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Supplementary material follows this article.



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Supplementary Material

- Article Title: Ethnic Differences in Mental Illness Severity: A Population-Based Study of Chinese and South Asian Patients in Ontario, Canada
- Authors: Maria Chiu, PhD; Michael Lebenbaum, MSc; Alice M. Newman, MSc; Juveria Zaheer, MD; and Paul Kurdyak, MD, PhD
- **DOI Number:** 10.4088/JCP.15m10086

List of Supplementary Material for the article

1. <u>eTable 1</u> Sensitivity Analysis: Ethnic differences in involuntary admissions and mental illness severity among a subsample of first hospitalizations

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Supplementary eTable 1. Sensitivity Analysis: Ethnic differences in involuntary admissions and mental illness severity among a sub-sample of first hospitalizations Aged 19 to 105 Years in Ontario, Canada (2006 to 2014)^a

	Chinese (N=1,682)				South Asian (N=1,487)				
	Wald			Wald					
	Odds	95% (1	Chi-	Dp		Odds Ratio	95% Cl	Chi-	p ^b
	Ratio	5576 61	square		r			square	,
Involuntary Admission	1.88	(1.69 - 2.09)	131.6	<.001	-	1.27	(1.14 - 1.42)	18.6	<.001
Aggressive Behavior Scale ≥3	1.49	(1.31 - 1.71)	35.0	<.001		1.16	(1.00 - 1.36)	3.8	.05
≥3 Positive Symptoms	1.49	(1.29 - 1.73)	29.0	<.001		1.10	(0.93 - 1.31)	1.2	.27
Positive Symptoms Scale Score ≥6	1.50	(1.32 - 1.70)	40.4	<.001		1.17	(1.02 - 1.35)	5.1	.02

^aThe reference group is the general population (i.e. all other ethnicities). Odds ratios (95% confidence intervals (CI)) were derived from logistic regression models adjusted for age, sex, income quintiles, education, marital status, urban/rural residence, and discharge diagnosis.

^bP-values compare the Chinese and South Asian groups to the general population (n=77,158).