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Exploring changes in recognition and stigmatisation towards individuals with schizophrenia in Singapore

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ABSTRACT

Introduction: Schizophrenia is a debilitating illness that causes long-term impairment in individuals and imposes an economic burden on society. Early recognition is essential for successful treatment outcomes. Mental health literacy—including recognition of and stigma towards mental illnesses—is crucial for guiding policy and informing targeted interventions. This study examined changes in schizophrenia recognition and stigma in Singapore over an 8-year period (2015–2023), as well as current trends in their sociodemographic correlates.

Methods: The study used data from 2 nationwide cross-sectional studies on mental health literacy using a vignette approach. Singapore residents aged 18–65 years were recruited via disproportionate stratified sampling. Respondents were presented with a vignette of a person with schizophrenia, and recognition was assessed using an open-ended question. Stigmatising attitudes were assessed using the Personal Stigma Scale and the Social Distance Scale.

Results: Correct recognition of schizophrenia increased from 11.5% to 15.1%, though the difference was not statistically significant. A lower "weak-not-sick" stigma score in the 2023 survey persisted after adjusting for sociodemographic differences between survey cohorts. Younger age and social contact with individuals with schizophrenia were associated with better recognition and less stigma. Individuals of Malay and Indian ethnicities attributed schizophrenia to a personal weakness but showed less social distancing.

Conclusion: The lack of significant improvement in recognition may reflect the continued need for schizophrenia-specific public education. The lower personal stigma score observed in the 2023 survey may also reflect broader changes in mental health awareness. Future initiatives should focus on culturally tailored anti-stigma interventions for schizophrenia that are accessible to older individuals and leverage social contact.

Keywords: ethnicity, mental health literacy, population-based survey, social stigma, socioeconomic

CLINICAL IMPACT

What is New

- This nationwide study examined changes in schizophrenia recognition and stigma in Singapore over 8 years.
- Personal stigma decreased, but public recognition of schizophrenia remained limited.

Clinical Implications

- Poor recognition of schizophrenia may delay help-seeking and access to early intervention.
- Schizophrenia-specific public education and culturally tailored, contact-based anti-stigma initiatives may improve mental health literacy, facilitate earlier detection, and encourage timely treatment.

INTRODUCTION

Schizophrenia is a common yet debilitating illness that affects 1% of the global population and is associated with a reduction in life expectancy of about 15 years compared with the general population.[1] With a typical onset in early adulthood, schizophrenia causes long-term social and occupational impairment and a substantial economic burden, with an annual cost ranging from USD94 million in Puerto Rico to USD102 billion in the US.[2] Schizophrenia is usually characterised by positive symptoms (hallucinations, delusions, disorganised speech and behaviour) and negative symptoms (diminished expression or avolition).[1] The duration of untreated psychosis is associated with poorer treatment response and other adverse long-term outcomes.[3] The relapse rate within the first year of schizophrenia onset is estimated to be up to 37%. Patients' impaired insight into their illness

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is associated with medication non-adherence, and increased relapse risk.[4,5] Early recognition is therefore critical for timely help-seeking and improved treatment outcomes.

Mental health literacy refers to knowledge and beliefs about mental disorders that aid their recognition, management, or prevention.[6] More recently, mental health literacy has been defined as understanding mental disorders, decreasing stigma, and promoting help-seeking efficacy.[7] Social stigma occurs when mental illness cues lead to stereotypes, prejudices, and discrimination, affecting not only individuals with mental illness but also their families, treatment institutions, and mental health professionals.

Mental health literacy has been studied widely in Western countries, but fewer studies have been conducted in Asian countries.[8] In Asia, mental illness is generally perceived as less socially acceptable and associated with personal weakness. A systematic review of stigma towards mental illnesses in Asian countries revealed that individuals with mental illness were considered dangerous and aggressive, especially those with schizophrenia and bipolar disorder.[9] Studies on mental health literacy are even scarcer in Singapore, a multi-ethnic country in Southeast Asia. The first Singapore population-based study on mental health literacy was conducted in 2015, and reported schizophrenia as the least recognised and the most stigmatised condition.[10, 11]

Public attitudes towards mental illness may evolve over time in response to awareness campaigns and policy initiatives. Reassessing schizophrenia recognition and stigma over time provides an opportunity to evaluate whether such efforts have translated into measurable improvements in mental health literacy.

The current study aimed to (1) examine changes in schizophrenia recognition, personal stigma, and social stigma in Singapore over an 8-year period, and (2) explore sociodemographic factors associated with recognition and stigmatising attitudes.

METHODS

Study design and sample

This study used data from 2 nationwide cross-sectional studies on mental health literacy, employing a vignette approach: one from March 2014 to April 2015 and the other from September 2022 to February 2024. The 2022–2024 study served as a follow-up to examine changes in mental health literacy among Singapore residents over time. Both studies employed the same survey design, sampling strategy, and eligibility criteria to enable meaningful comparison. Ethical approval was obtained from the Institutional Research Review Committee of the Institute of Mental Health and the National Healthcare Group Domain Specific Review Board (2021/00695). The study population comprised Singapore citizens and permanent residents aged 18–65 years who were literate in English, Chinese, Malay, or Tamil and residing in Singapore during the study period. Informed consent was obtained from study respondents and legally acceptable representatives for respondents below 21 years, as the age of majority in Singapore is 21.

Participants were randomly selected from a regularly updated national population registry of Singapore citizens and permanent residents using a disproportionate stratified sampling design with 12 strata defined by ethnicity (Chinese, Malay, Indian, and Others) and age group (18–34, 35–49, and 50–65 years). Malay and Indian residents and those aged 50–65 years were over-sampled to ensure an adequate sample size for subgroup analyses. Data were collected through interviewer-administered face-to-face structured interviews that were conducted in the respondents' preferred language. Interviewers from the contracted survey company underwent centralised training on recruitment procedures, informed consent, and standardised questionnaire administration. The target sample size was determined based on the study objectives, accounting for subgroup analyses, the complex survey design, and anticipated non-response.

Questionnaires (sociodemographic information, vignette-related questions, Personal Stigma Scale [PSS], and Social Distance Scale [SDS])

Sociodemographic information, including age, sex, ethnicity, marital status, education, employment, and income, was collected. Subsequently, respondents were presented with a vignette describing a person with schizophrenia, developed by research psychiatrists and reviewed by a panel of senior clinical psychiatrists to ensure it met the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) diagnostic criteria[12] for schizophrenia. The vignette character's name was matched to the respondent's sex and ethnicity to facilitate identification. The terms "schizophrenia" and "psychosis" were not used within vignette descriptions or questionnaires to avoid variations in interpretation of clinical terminology. The vignettes and questionnaires underwent standardised forward- and back-translation and cognitive testing across all language versions to ensure conceptual equivalence and cultural appropriateness.

Respondents were asked what they believed the character in the vignette was suffering from. Responses were recorded in an open-ended format and categorised by the study team. Responses mentioning schizophrenia or psychosis were classified as correct recognition. Delusions, hallucinations, and other schizophrenia-specific symptoms described in DSM-IV were categorised as schizophrenia-specific

symptoms. General terms, such as "mental health issues", "problems", "mental", and "crazy", were classified as psychological/mental/emotional problems. Responses reflecting themes of loneliness, stress, or "not a problem" were categorised accordingly. All other responses were classified as "others".

Stigmatising attitudes towards schizophrenia were assessed using PSS and SDS. PSS is a 9-item subscale of the Depression Stigma Scale, validated for assessing stigma towards mental disorders. For this study, the 8-item PSS subscale was administered ("I would not vote for a politician if I knew they had a mental illness" was excluded) in order to maintain methodological consistency with previous Singapore studies.[11] Responses were recorded on a 5-point Likert scale (1 = strongly agree to 5 = strongly disagree). Responses were reverse-coded, and the mean score was calculated by summing up the item scores, with higher scores indicating higher personal stigma.[13,14] SDS includes 5 items measuring willingness to interact with the person described in the vignette. Responses were recorded on a 4-point Likert scale (1 = definitely willing to 4 = definitely unwilling), and mean scores were calculated, with higher scores indicating greater social distancing.[15] To describe item endorsement, for each item of the PSS, "strongly agree" and "agree" responses were combined, as were "disagree" and "strongly disagree" responses for analysis.

Statistical analyses

All estimates were weighted to adjust for oversampling and post-stratified for age and ethnicity to reflect the Singapore resident population. Descriptive statistics were used to describe the sociodemographic characteristics of the sample, the recognition of the schizophrenia vignette, and the stigma scale scores. Frequencies and percentages were calculated for categorical variables, whereas weighted mean and standard error of the mean were calculated for continuous variables. Differences in sociodemographic variables between surveys were assessed by cross-tabulation using the chi-square test. Multiple logistic regression analysis was performed to determine sociodemographic correlates of correct recognition of schizophrenia. All analyses were conducted using Stata software version 18.0 (StataCorp, College Station, TX, US), with statistical significance set at $P<0.05$ (2-sided).

For stigma analysis, the stigma items were grouped based on the previously established factor structure reported by Yap et al.[16] Prior exploratory structural equation modelling has revealed 2 distinct dimensions within PSS ("weak-not-sick" and "dangerous-unpredictable") and 1 "social distance" dimension within SDS. That validation study evaluated a 3-factor model using polychoric correlation matrices and demonstrated improved model fit compared with an equivalent confirmatory factor analysis solution. These validated stigma dimensions were applied in the present analysis. Separate multivariable linear regressions were conducted to examine sociodemographic correlates of each stigma dimension score.

To account for sociodemographic differences between survey cohorts, additional pooled survey-weighted regression analyses were conducted, combining data from both survey years. Survey year was included as the primary predictor of interest. Sociodemographic characteristics were entered as covariates to assess whether differences in recognition and stigma persisted after adjustment for changes in sample composition. Sensitivity analyses using doubly robust inverse probability-weighted regression models were additionally performed to evaluate the robustness of findings after balancing baseline sociodemographic characteristics between survey cohorts.

RESULTS

Sociodemographic characteristics of the sample

Table 1 presents the sociodemographic characteristics of the respondents receiving the schizophrenia vignette in the Mind Matters 2015 (MM15) study and Mind Matters 2023 (MM23) study. Sample characteristics differed significantly in education and personal income. In both cohorts, most respondents were male, Chinese, married, employed, with a monthly income of less than SGD2000, without personal experience similar to the vignette, and without family or close friends with an experience similar to the vignette. In MM15, the largest proportion of respondents (35.1%) were from the 18–34 age group, whereas in MM23, the largest proportion (36.9%) were from the 50–65 age group. University graduates formed the largest group (46.9%) in MM23, while A-level, polytechnic, and other diploma holders formed the largest group (29.7%) in MM15.

Recognition of schizophrenia vignette and sociodemographic correlates of recognition

Table 2a presents the correct recognition of schizophrenia in both cohorts. Only 11.5% of the respondents correctly recognised the vignette in MM15 and 15.1% correctly recognised it in MM23. However, the difference in correct recognition was not statistically significant. Table 2b presents the categorisation of recognition responses for both surveys. There was a significant difference in how respondents categorised the problem described in the vignette. In MM23, a higher proportion of respondents categorised the vignette as another mental disorder (32.4%) than in MM15 (20.9%). Additionally, fewer

Table 1. Sociodemographic characteristics of the schizophrenia cohort sample of the Mind Matters 2015 study and Mind Matters 2023 study.

		Mind Matters 2015		Mind Matters 2023			
		No.	**Weighted %**	**No.**	**Weighted %**	**Chi-square test**	***P* value**
Age group	18–34 years	231	35.1	201	32.0	0.46	0.634
	35–49 years	167	31.3	188	31.1		
	50–65 years	197	33.6	213	36.9		
Sex	Female	276	46.4	308	48.5	0.27	0.601
	Male	319	53.6	294	51.5		
Ethnicity	Chinese	203	74.6	166	74.2	0.02	0.992
	Malay	191	12.9	191	13.0		
	Indian	192	9.2	193	9.3		
	Others	9	3.2	52	3.4		
Marital status	Never married	178	29.7	181	29.9	0.04	0.962
	Married	384	64.2	375	63.5		
	Divorced, widowed, separated	33	6.1	46	6.6		
Education	6 years of education and below	95	15.0	28	4.0	9.42	**<0.001**
	Secondary education	163	25.9	135	20.3		
	A level, polytechnic, and other diploma	190	29.7	198	28.8		
	University	147	29.3	224	46.9		
Employment	Employed	448	80.1	494	85.2	1.53	0.217
	Unemployed	21	4.0	22	3.6		
	Economically inactive	126	15.9	86	11.2		
Personal income	<SGD2000	268	39.6	202	29.3	6.73	**<0.001**
	SGD2000–3999	175	33.0	165	24.5		
	SGD4000–5999	66	15.9	103	22.4		
	SGD6000–9999	41	8.5	78	14.7		
	Above SGD10,000	18	3.1	45	9.1		
Personal experience similar to the vignette	No	566	93.8	572	95.6	0.79	0.374
	Yes	29	6.2	28	4.4		
Family or close friends with experience similar to the vignette	No	489	85.8	499	81.2	2.49	0.115
	Yes	106	14.2	102	18.8		

SGD: Singapore dollars

respondents described the vignette as a general psychological, mental, or emotional problem in MM23 (20.6%) than in MM15 (29.4%).

Pooled survey-weighted regression analysis was conducted, with survey year as the key predictor and sociodemographic variables as covariates (Supplementary Table S1). After adjustment, survey year was not significantly associated with correct recognition of schizophrenia (odds ratio [OR]=0.97, 95% confidence interval [CI] 0.54–1.74, *P*=0.911).

Table 3 describes the sociodemographic correlates of correct recognition. Sex and marital status were not significantly associated with correct recognition in either survey. In MM15, respondents with incomes between SGD6000 and SGD9999 had significantly higher odds of correct recognition. In MM23, unemployment and having family or friends with an experience similar to the vignette yielded higher odds of correct recognition. Conversely, in both surveys, respondents with personal experiences similar to the vignette had significantly lower odds of correct recognition. In MM23, respondents aged 35–49 years, with 6 years or less of education, and with income between SGD2000 and SGD5999 also had lower odds of recognising the vignette.

Table 2a. Correct and incorrect recognition of the schizophrenia vignette for the Mind Matters 2015 study and Mind Matters 2023 study.

	Mind Matters 2015 Schizophrenia		Mind Matters 2023 Schizophrenia			
	No.	**Weighted percentage [95% CI]**	**No.**	**Weighted percentage [95% CI]**	**Chi-square test**	***P* value**
Correct recognition	60	11.45 [8.36–15.50]	82	15.08 [11.36–19.75]	1.71	0.192
Incorrect recognition	535	88.55 [84.50–91.64]	520	84.92 [80.25–88.64]		

CI: confidence interval

Table 2b. Distributions of categories describing the problem in the schizophrenia vignette for the Mind Matters 2015 study and Mind Matters 2023 study.

	Mind Matters 2015 Schizophrenia		Mind Matters 2023 Schizophrenia			
	No.	**Weighted percentage [95% CI]**	**No.**	**Weighted percentage [95% CI]**	**Chi-square**	***P* value**
Schizophrenia	60	11.5 [8.4–15.5]	82	15.1 [11.4–19.7]	2.734	0.0109
Schizophrenia-specific symptoms	92	16.2 [12.6–20.6]	66	13.2 [9.7–17.7]		
Recognised as other mental disorder	129	20.9 [16.9–25.7]	222	32.4 [27.3–37.9]		
Psychological/mental/emotional problems	184	29.4 [24.8–34.5]	114	20.6 [16.2–25.9]		
Psychological stress	41	6.3 [4.1–9.6]	29	5.5 [3.3–9.1]		
Loneliness	53	8.8 [6.2–12.5]	57	7.3 [4.9–10.7]		
Others	32	6.7 [4.4–10.2]	28	4.5 [2.7–7.5]		
Not a problem	4	0.2 [0.1–0.5]	4	1.4 [0.5–4.2]		

CI: confidence interval

Table 3. Sociodemographic correlates of correct recognition of schizophrenia vignette.

		Mind Matters 2015		Mind Matters 2023	
		OR [95% CI]	*P* value	OR [95% CI]	*P* value
Age group	18–34 years	Ref		Ref	
	35–49 years	1.04 [0.39–2.79]	0.939	0.37 [0.16–0.85]	**0.020**
	50–65 years	0.96 [0.34–2.70]	0.933	0.31 [0.09–1.05]	0.059
Sex	Female	1.43 [0.66–3.08]	0.364	1.74 [0.82–3.72]	0.151
	Male	Ref		Ref	
Ethnicity	Chinese	Ref		Ref	
	Malay	0.54 [0.24–1.22]	0.138	0.87 [0.38–1.98]	0.743
	Indian	0.78 [0.38–1.58]	0.490	0.85 [0.43–1.69]	0.647
	Others	1.09 [0.11–11.03]	0.939	0.40 [0.10–1.53]	0.179
Marital status	Never married	0.95 [0.39–2.28]	0.902	1.31 [0.57–2.98]	0.524
	Married	Ref		Ref	
	Separated/divorced/widowed	1.03 [0.15–6.94]	0.977	3.95 [0.72–21.52]	0.112
Education	6 years of education and below	0.36 [0.04–3.49]	0.375	0.04 [0.00–0.73]	**0.030**
	Secondary education	0.72 [0.24–2.14]	0.553	0.49 [0.10–2.39]	0.380
	A level, polytechnic, and other diploma	1.14 [0.41–3.15]	0.796	0.89 [0.28–2.84]	0.848
	University	Ref		Ref	
Employment status	Employed	Ref		Ref	
	Unemployed	2.88 [0.55–15.18]	0.211	7.86 [1.54–40.15]	**0.013**
	Economically inactive	0.90 [0.29–2.83]	0.861	1.59 [0.38–6.63]	0.522
Income	<SGD2000	4.10 [0.60–27.82]	0.149	0.27 [0.05–1.53]	0.139
	SGD2000–3999	2.60 [0.46–14.68]	0.278	0.10 [0.02–0.45]	**0.002**
	SGD4000–5999	3.55 [0.54–23.51]	0.189	0.14 [0.03–0.56]	**0.006**
	SGD6000–9999	11.16 [1.91–65.22]	0.008	0.34 [0.09–1.24]	0.102
	Above SGD10,000	Ref		Ref	
Personal experience similar to the vignette	No	Ref		Ref	
	Yes	0.03 [0.00–0.36]	0.005	0.03 [0.00–0.42]	**0.009**
Family or close friends with experience similar to the vignette	No	Ref		Ref	
	Yes	2.04 [0.76–5.46]	0.157	3.54 [1.31–9.57]	**0.013**

CI: confidence interval; OR: odds ratio; SGD: Singapore dollars
Ref: reference categories
Values in bold represent statistically significant results ($P<0.05$)

Stigma towards schizophrenia and sociodemographic correlates of stigma dimensions

Table 4 reports descriptive statistics of stigma scores in terms of "weak-not-sick", "dangerous-unpredictable", and "social distance." There was a statistically significant reduction in "weak-not-sick" and "dangerous-unpredictable" scores between the 2 periods. Supplementary Tables S2–S4 show pooled survey-weighted regression analyses on stigma dimensions. MM23 remained significantly associated with lower "weak-not-sick" stigma scores (β=–0.65, 95% CI –0.99 to –0.31, *P*<0.001). Differences in "dangerous-unpredictable" (β=–0.35, 95% CI –0.77 to 0.06, *P*=0.096) and "social distance" stigma (β=0.03, 95% CI –0.56 to 0.61, *P*=0.933) were not statistically significant after adjustment. Sensitivity analyses using doubly robust inverse probability weighting demonstrated largely consistent findings (Supplementary Tables S5–S9).

Table 5 presents the linear regression analyses of factors associated with stigma dimensions. For the "weak-not-sick" dimension, respondents in the 35–49 and 50–65 age groups consistently had significantly higher scores in both periods. In MM15, Malay ethnicity was associated with a higher score, while income of SGD6000–9999 was associated with a lower score. In MM23, secondary education, SGD2000–5999 income, and personal experience similar to the vignette were associated with higher scores, whereas unemployed individuals exhibited lower scores in this dimension.

For the "dangerous-unpredictable" dimension, in MM15, being in the 35–49 age group and having 6 years of education or less were associated with higher scores. In contrast, in MM23, income emerged as a significant factor. Compared with respondents in the highest income bracket (>SGD10,000), all other income groups had higher stigma scores in the "dangerous-unpredictable" dimension, with the strongest associations in the <SGD2000 and SGD4000–5999 groups

For the "social distance" dimension, Malay and Indian ethnicities were consistently associated with lower stigma scores across both periods. In MM23, having family or close friends with an experience similar to the vignette was associated with significantly lower stigma scores.

Relationship between stigma and recognition

Table 6 illustrates the relationship between stigma and recognition by survey year. Across both time periods, a higher "weak-not-sick" dimension score was associated with significantly lower odds of recognition of schizophrenia.

OR was derived from multivariable logistic regression after adjusting for sociodemographic factors (i.e. age, sex, ethnicity, marital status, education, employment, income), personal experience similar to the vignette and family or close friends with an experience similar to the vignette.

DISCUSSION

Despite a slight increase from 11.5% to 15.1%, there was no significant improvement in schizophrenia recognition between the 2 time periods. This finding remained consistent in pooled regression analyses adjusting for sociodemographic differences between survey cohorts, suggesting that differences in sample composition did not account for the lack of significant improvement in recognition. This finding is consistent with recognition rates reported in other Asian countries.[17-21]

Lower stigma scores observed in MM23 may reflect broader changes in public attitudes towards mental health, potentially associated with recent anti-stigma initiatives in Singapore. Several national initiatives including the "Beyond the Label" movement, the Health Promotion Board's "It's OKAY to Reach Out" campaign, and the Mind SG portal have aimed to improve mental health awareness in Singapore.[22,23]

Furthermore, higher scores on the "weak-not-sick" stigma dimension, which reflects the belief that schizophrenia arises from personal weakness rather than a medical condition, were consistently associated with lower odds of schizophrenia recognition. This suggests that individuals endorsing such beliefs may

Table 4. Descriptive statistics of stigma dimension score.

	Mind Matters 2015			Mind Matters 2023			t-test	*P* value
	Mean	SD	CI	Mean	SD	CI		
Weak-not-sick	10.14	2.09	9.94–10.35	9.25	2.20	9.02–9.49	5.24	**0.001**
Dangerous-unpredictable	12.69	2.47	12.44–12.93	12.18	2.33	11.91–12.45	2.71	**0.007**
Social distance	13.24	3.26	12.86–13.59	13.07	2.86	12.75–13.39	0.70	0.481

CI: confidence interval; SD: standard deviation
Values in bold represent statistically significant results (*P*<0.05)

Table 5. Survey-weighted linear regression analysis for factors predicting stigma dimension by survey year.

		Mind Matters 2015						Mind Matters 2023					
		Weak-not-sick		Dangerous-unpredictable		Social distance		Weak-not-sick		Dangerous-unpredictable		Social distance	
		Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value
Age group	18–34 years	Ref		Ref		Ref		Ref		Ref		Ref	
	35–49 years	0.96 [0.31–1.62]	**0.004**	0.70 [–0.01 to 1.41]	0.053	0.04 [–0.90 to 0.97]	0.940	0.74 [0.12–1.36]	**0.020**	0.02 [–0.74 to 0.78]	0.955	0.69 [–0.18 to 1.56]	0.121
	50–65 years	1.15 [0.48–1.83]	**0.001**	1.50 [0.75–2.25]	**<0.001**	1.14 [0.00–2.29]	**0.050**	1.42 [0.74–2.11]	**<0.001**	0.10 [–0.76 to 0.95]	0.821	0.02 [–0.97 to 1.02]	0.964
Sex	Female	–0.13 [–0.55 to 0.30]	0.558	–0.16 [–0.66 to 0.34]	0.535	0.07 [–0.68 to 0.81]	0.863	–0.31 [–0.77 to 0.15]	0.186	–0.48 [–0.97 to 0.01]	0.057	–0.23 [–0.88 to 0.42]	0.487
	Male	Ref		Ref		Ref		Ref		Ref		Ref	
Ethnicity	Chinese	Ref		Ref		Ref		Ref		Ref		Ref	
	Malay	0.93 [0.49–1.36]	**<0.001**	–0.31 [–0.84 to 0.21]	0.240	–1.70 [–2.36 to –1.03]	**<0.001**	0.37 [–0.08 to 0.83]	0.110	–0.13 [–0.69 to 0.43]	0.645	–1.55 [–2.28 to –0.83]	**<0.001**
	Indian	0.19 [–0.28 to 0.65]	0.435	–0.05 [–0.58 to 0.48]	0.841	–0.88 [–1.57 to –0.19]	**0.012**	0.35 [–0.09 to 0.78]	0.116	–0.39 [–0.87 to 0.09]	0.113	–1.30 [–1.92 to –0.68]	**<0.001**
	Others	0.53 [–0.59 to 1.65]	0.355	–0.71 [–1.68 to 0.25]	0.147	–0.49 [–2.97 to 1.99]	0.700	–0.68 [–1.38 to 0.03]	0.062	–0.40 [–1.19 to 0.40]	0.328	–1.08 [–1.95 to –0.21]	**0.015**
Marital status	Never married	–0.11 [–0.68 to 0.46]	0.706	–0.09 [–0.69 to 0.51]	0.756	–0.13 [–1.01 to 0.75]	0.772	–0.31 [–0.94 to 0.32]	0.337	–0.38 [–1.07 to 0.31]	0.281	–0.03 [–0.86 to 0.81]	0.951
	Married	Ref		Ref		Ref		Ref		Ref		Ref	
	Separated/ divorced/ widowed	0.17 [–1.10 to 1.45]	0.789	0.51 [–0.72 to 1.74]	**0.414**	0.23 [–1.64 to 2.10]	0.811	–0.12 [–0.93–0.69]	0.766	–0.78 [–1.80 to 0.25]	0.137	–1.03 [–2.52 to 0.47]	0.179
Education	6 years of education and below	0.70 [–0.31 to 1.72]	0.175	1.15 [0.05–2.26]	0.041	0.00 [–1.58 to 1.58]	1.000	0.90 [–0.13 to 1.93]	0.086	0.53 [–0.87 to 1.93]	0.459	0.58 [–1.69 to 2.85]	0.615
	Secondary education	0.21 [–0.60 to 1.02]	0.609	0.05 [–0.93 to 1.03]	0.922	–0.40 [–1.62 to 0.83]	0.526	0.66 [0.04–1.29]	**0.038**	0.04 [–0.80 to 0.88]	0.931	–1.00 [–2.15 to 0.15]	0.089

Table 5. Survey-weighted linear regression analysis for factors predicting stigma dimension by survey year. (Cont'd)

		Mind Matters 2015						Mind Matters 2023					
		Weak-not-sick		Dangerous-unpredictable		Social distance		Weak-not-sick		Dangerous-unpredictable		Social distance	
		Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value	Coefficient [95% CI]	*P* value
	A level, polytechnic, and other diploma	0.34 [–0.34 to 1.01]	0.326	–0.05 [–0.83 to 0.74]	0.907	–0.34 [–1.20 to 0.52]	0.439	0.19 [–0.42 to 0.80]	0.541	–0.44 [–1.09 to 0.22]	0.193	–0.63 [–1.45 to 0.19]	0.134
	University	Ref		Ref		Ref		Ref		Ref		Ref	
Employment status	Employed	Ref		Ref		Ref		Ref		Ref		Ref	
	Unemployed	–0.94 [–1.95 to 0.07]	0.068	–0.13 [–1.41 to 1.15]	0.841	0.16 [–2.34 to 2.67]	0.897	–1.35 [–2.61 to –0.09]	**0.035**	–0.79 [–1.89 to 0.31]	0.156	0.61 [–1.63 to 2.86]	0.592
	Economically inactive	0.17 [–0.53 to 0.86]	0.634	0.31 [–0.49 to 1.10]	0.452	0.75 [–0.48 to 1.98]	0.229	0.01 [–0.74 to 0.75]	0.988	–0.68 [–1.51 to 0.16]	0.112	–0.92 [–2.39 to 0.56]	0.222
Income	<SGD2000	–0.19 [–1.40 to 1.02]	0.755	0.29 [–1.35 to 1.94]	0.726	1.73 [–0.39 to 3.85]	0.110	1.35 [0.32–2.37]	**0.010**	2.29 [1.09–3.49]	**<0.001**	1.04 [–0.69 to 2.78]	0.239
	SGD2000–3999	–0.42 [–1.54 to 0.69]	0.456	0.57 [–1.04 to 2.18]	0.490	1.86 [–0.05 to 3.77]	0.057	1.48 [0.40–2.55]	**0.007**	1.27 [0.13–2.42]	**0.030**	0.28 [–1.22 to 1.77]	0.717
	SGD4000–5999	–0.69 [–1.83 to 0.46]	0.242	0.84 [–0.73 to 2.41]	0.294	1.51 [–0.41 to 3.42]	0.122	1.23 [0.24–2.22]	**0.015**	2.09 [1.02–3.17]	**<0.001**	0.17 [–1.18 to 1.52]	0.804
	SGD6000–9999	–1.22 [–2.42 to –0.01]	**0.048**	0.13 [–1.64 to 1.91]	0.883	2.98 [0.91–5.06]	0.005	0.80 [–0.17 to 1.77]	0.106	1.28 [0.09–2.47]	**0.035**	0.15 [–1.34 to 1.63]	0.847
	Above SGD10,000	Ref		Ref		Ref		Ref		Ref		Ref	
Personal experience similar to the vignette	No	Ref		Ref		Ref		Ref		Ref		Ref	
	Yes	0.32 [–0.42 to 1.07]	0.397	–0.96 [–2.30 to 0.39]	0.163	–1.24 [–2.82 to 0.35]	0.127	0.95 [0.12–1.79]	**0.025**	1.27 [–0.04 to 2.59]	0.057	0.03 [–1.69 to 1.74]	0.974
Family or close friends with experience similar to the vignette	No	Ref		Ref		Ref		Ref		Ref		Ref	
	Yes	0.51 [–0.10 to 1.12]	0.104	0.52 [–0.13 to 1.17]	0.116	0.09 [–0.89 to 1.07]	0.853	–0.36 [–0.86 to 0.15]	0.165	–0.35 [–0.96 to 0.25]	0.255	–1.40 [–2.12 to –0.68]	**<0.001**

Ref = reference categories
Values in bold represent statistically significant results ($P<0.05$)

Table 6. Relationship between stigma dimensions and recognition by survey year.

Stigma dimension	Mind Matters 2015		Mind Matters 2023	
	OR [95% CI]	*P* value	OR [95% CI]	*P* value
Weak-not-sick	0.58 [0.46–0.73]	<0.001	0.61 [0.50–0.74]	<0.001
Dangerous-unpredictable	0.94 [0.79–1.11]	0.461	1.15 [0.96–1.38]	0.122
Social distance	0.95 [0.82–1.09]	0.449	0.93 [0.81–1.07]	0.340

CI: confidence interval; OR: odds ratio

be less likely to recognise schizophrenia as a mental health condition requiring professional care. While increasing public awareness of the biological basis of schizophrenia may improve recognition and encourage treatment-seeking, biological explanations alone may not be sufficient to reduce stigma and may reinforce perceptions of dangerousness or unpredictability.[24] Future interventions should therefore adopt a multifaceted approach that addresses both mental health literacy and stigmatising beliefs.

The absence of substantial improvement in recognition may reflect limited schizophrenia-specific public education, as existing campaigns emphasise broader mental well-being topics. Currently, schizophrenia-focused outreach is mainly conducted through the Early Psychosis Intervention Programme (EPIP).[25] Early evaluations of EPIP showed that the median duration of untreated psychosis decreased from 12 months to 4 months.[26] These findings highlight the importance of community-wide interventions to enhance early detection and treatment.

The complexity of schizophrenia symptoms may hinder recognition. Compared with those of depression and anxiety, schizophrenia symptoms are more multifaceted, making it more difficult to educate the public. Studies have found that laypeople are better at recognising positive symptoms than negative symptoms.[27,28] The current study also found that hallucinations and delusions accounted for the majority of schizophrenia-specific symptoms recognised by the respondents. Future interventions should increase awareness of negative symptoms and their clinical significance.

This study found that age and ethnicity are associated with mental health literacy. Both surveys revealed that people who were aged 50 years and above were less likely to recognise schizophrenia and more likely to attribute it to personal weakness, consistent with previous research.[29,30] In the Singapore context, many anti-stigma mental health campaigns use digital platforms. However, older adults, particularly those of lower socioeconomic status, often face digital literacy barriers that limit engagement with such initiatives.[31,32]

Across the 2 time periods, Malay and Indian respondents consistently had a higher "weak-not-sick" stigma score and lower "dangerous-unpredictable" and "social distance" stigma scores. This suggests that they are more likely to attribute schizophrenia to personal weakness but have a higher tolerance towards individuals with the illness. Cultural and religious beliefs may partly explain these patterns. In Islamic teachings, life adversities, including the experience of mental illness, are often regarded as a test from God.[33] Individuals with severe mental illnesses are considered less accountable for their actions, as the illness is understood to impair reasoning and judgement.[34] Moreover, the emphasis placed on familial and community responsibility for support and inclusion may partly account for the lower levels of social distancing observed among Malay respondents.[35,36] Among Indians, the perception of mental disorders is largely influenced by folk, Ayurvedic, or classic Indian medicine traditions. Ayurvedic practitioners treat people with mental illness humanely and sympathetically, which might explain the more tolerant view towards individuals with schizophrenia.[35,37]

Social contact is another factor associated with mental health literacy. Respondents with family members or friends with similar experiences were better able to recognise schizophrenia and reported lower stigma. A prior local study has shown that caregivers experience stigmatising attitudes and emotional distress by association with their care recipients.[38] Shared experience may thus foster empathy and understanding, contributing to more supportive attitudes towards people with mental illness.

Strengths and limitations

The current study has several strengths. It used 2 nationwide cross-sectional surveys conducted using the same methodology to identify changes in, and factors associated with, schizophrenia literacy over time. The disproportionate stratified sampling and oversampling of minority groups ensured a representative sample. Vignette and questionnaire development by psychiatrists and researchers, with professional translation, ensured cultural relevance and reduced language biases. However, the study is limited in certain aspects. As the study was conducted in Singapore, the findings might not be generalisable to other countries. A cross-sectional design limits causal inference, and interview-based responses may be subject to social desirability bias. Despite efforts to ensure conceptual equivalence, cultural and linguistic differences may have influenced interpretation of the vignette and stigma-related items. Differences in education and income between the 2 survey cohorts may reflect changes in the sociodemographic profile of the Singapore resident population over time, potentially introducing sampling heterogeneity and affecting comparability. Pooled regression analyses and doubly robust inverse probability-weighted sensitivity analyses were conducted to account for differences in sample composition. Nevertheless, given the repeated cross-sectional design, findings should be interpreted as adjusted differences between survey periods rather than individual-level longitudinal changes, and residual confounding cannot be fully excluded.

CONCLUSION

There was no significant improvement in schizophrenia recognition from 2015 to 2023, possibly reflecting limited schizophrenia-specific public education. A lower personal stigma score, particularly within the "weak-not-sick" dimension, was observed in 2023 and persisted after adjustment for sociodemographic differences between survey cohorts.

This study provides valuable insights into schizophrenia recognition and stigma in the context of Singapore. Although relatively uncommon, schizophrenia has a long-term impact and imposes an economic burden. Future initiatives should consider targeted schizophrenia-specific education and contact-based approaches involving individuals with lived experience to improve recognition, reduce stigma, and promote greater community acceptance.

Supplementary materials

Appendix S1. Schizophrenia vignette.

Table S1. Pooled survey-weighted logistic regression on changes of correct schizophrenia recognition over time with survey year as the key predictor and all sociodemographic variables as covariates.

Table S2. Pooled survey-weighted linear regression on "weak-not-sick" stigma with survey year as the key predictor and all sociodemographic variables as covariates.

Table S3. Pooled survey-weighted linear regression on "dangerous-unpredictable" stigma with survey year as the key predictor and all sociodemographic variables as covariates.

Table S4. Pooled survey-weighted linear regression on social distance stigma with survey year as the key predictor and all sociodemographic variables as covariates.

Table S5. Doubly robust IPW logistic regression on correct schizophrenia recognition.

Table S6. Doubly robust IPW linear regression on "weak-not-sick" stigma.

Table S7. Doubly robust IPW linear regression on "dangerous-unpredictable" stigma.

Table S8. Doubly robust IPW linear regression on social distance stigma.

Table S9. Covariate balance before and after IPW.

Ethics statement

The study was approved by the National Healthcare Group Domain Specific Review Board (2021/00695).

Declaration

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