BMJ Open

Recognition of mental disorders among medical students

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-019038
Article Type:	Research
Date Submitted by the Author:	07-Aug-2017
Complete List of Authors:	Picco, Louisa; Institute of Mental Health, Research Division Seow, Esmond; Institute of Mental Health, Research Division Chua, Boon Yiang; Institute of Mental Health, Research Division Mahendran, Rathi; National University of Singapore, Psychological Medicine Verma, S; Institute of Mental Health, Singapore, Department of Early Psychosis Intervention Chong, Siow Ann ; Institute of Mental Health, Research Subramaniam, M; Institute of Mental Health, Singapore, Research
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Health services research, Medical education and training
Keywords:	MEDICAL EDUCATION & TRAINING, MENTAL HEALTH, PSYCHIATRY

Recognition of mental disorders among medical students

Ms Louisa Picco[1]
Mr Esmond Seow[1]
Mr Boon Yiang Chua[1]
Prof Rathi Mahendran[2,3]
Prof Swapna Verma[3,4]
Prof Siow Ann Chong[1]
Adj/Asst Prof Mythily Subramaniam[1]

[1]Research Division, Institute of Mental Health, Singapore
[2]Psychological Medicine, Yong Loo Lin School of Medicine, National University of Singapore
[3]Clinical, Academic and Faculty Affairs, Duke-NUS Graduate Medical School
[4]Department of General Psychiatry and Early Psychosis Intervention Programme, Institute of Mental Health, Singapore

Corresponding author:
Louisa Picco
Manager, Research Division
Institute of Mental Health
Buangkok Green Medical Park
10 Buangkok View
Singapore 539747
Tel: 65-6389 2961
Email: louisa_picco@imh.com.sg

ABSTRACT

Objectives: To assess recognition of five mental disorders (alcohol abuse, dementia, depression, obsessive-compulsive disorder (OCD) and schizophrenia) amongst a sample of medical students, using a vignette based approach. Socio-demographic predictors of correct recognition were also explored.

Design: cross-sectional online survey

Participants: medical students studying in Singapore

Methods: This was a cross-sectional online study among medical students (n=502) who were randomly assigned one of the five vignettes. Students were instructed to read the vignette then answer the open text question "What do you think the person in the vignette is suffering from?" Multiple logistic regression was performed to determine the predictors of correct recognition.

Results: 81.7% could correctly recognise the condition described in the vignette. Depression was most well recognised (93.0%), followed by alcohol abuse (89.0%), OCD (87.1%) and dementia (79.2%), while only 60.0% of students correctly recognised schizophrenia. Females were significantly more likely to correctly recognise the disorders, while the odds of correct recognition were significantly higher among fourth and fifth year students, compared to first year students. Compared to depression, dementia and schizophrenia were significantly more likely to be mislabeled.

Conclusion: Whilst overall correct recognition was high (81.7%), this did vary by disorder, where schizophrenia (60%) was the most poorly recognised condition. Medical students, particularly those in their initial years of their course, should be equipped with the skills and ability to recognise signs and symptoms of various mental illnesses, especially given that primary care providers are often the first professional help-seeking source for people with mental health problems.

Keywords: mental health literacy, vignettes, correct recognition, Singapore

Strengths and limitations of the study

- This was a cross-sectional online survey, among medical students in Singapore which adopted a vignette based approach to assess recognition of five mental disorders: alcohol abuse, dementia, depression, obsessive-compulsive disorder (OCD) and schizophrenia.
- This is the first study to explore recognition among a sample of Asian medical students, across various psychiatric disorders.

- The study has some limitations including the cross-sectional design and lacks generalizability due to inclusion criteria.

INTRODUCTION

Mental illnesses cause tremendous human, social and economic burden worldwide and this has been consistently substantiated in the extant literature. For example, the World Health Organisation found the prevalence of mental disorders ranged from 12-47% with most countries reporting a lifetime prevalence of at least one in four people **[1]**. Recent estimates have also revealed that the global burden of mental illness accounts for 32.4% of years lived with disability (YLDs) and 13% of disability-adjusted life-years (DALYs), placing mental illnesses as the largest global burden of disease in terms of YLDs, and equal with that of cardiovascular and circulatory diseases in terms of DALYs **[2].** Then there is the actual cost of mental illness; the Global Economic Burden of Non-communicable Diseases report showed mental disorders to be the largest cost driver, equating to $2.5 trillion in global costs in 2010, where the costs for mental disorders were greater than the costs of diabetes, respiratory disorders, and cancer combined **[3]**.

The impact of mental illness not only has a significant social and economic burden on society but the direct impact on people with mental illness is also extensive. A large body of evidence has consistently shown outcomes for people with mental illness are often much poorer **[4]** in terms of mortality, morbidity **[5]**, and access to appropriate services **[6].** Mental illness also impacts on the psychosocial facets of life such as education, employment and social relationships, **[7]** often resulting in poorer quality of life, lower self-esteem and a sense of hopelessness. A myriad of factors are likely to contribute to these poorer psychosocial outcomes, of which two significant aspects include stigma and poor mental health literacy **[8,9]**.

Mental health literacy refers to 'knowledge and beliefs about mental disorders, which aid their recognition, management or prevention' **[10]**. Equipping people with the skills and knowledge to identify the signs and symptoms of mental illness is imperative and has been linked to early help-seeking which can ultimately reduce the burden of disease associated with mental disorders **[11]**. Despite this, it is not uncommon for people to be unable to recognise common signs and symptoms of mental disorders, and recognition can also vary considerably across mental illnesses. A recent national study in Singapore, which adopted a vignette based approach to explore mental health literacy relating to five disorders, alcohol abuse, dementia, depression, obsessive compulsive disorder (OCD) and schizophrenia,

revealed that under half the Singapore population (43.7%) could correctly recognise mental illnesses. The most well recognised disorder was dementia (66.3%), followed by alcohol abuse (57.1%) and depression (55.2%), while only 28.7% and 11.5% could recognise OCD and schizophrenia, respectively **[12]**.

Far less is known about the mental health literacy of medical students in Singapore. Whilst very few studies have explored mental health literacy solely among medical students, studies have investigated this concept amongst university and college students. Findings have revealed that in comparison, medical students could better recognise mental illnesses **[13]** or had better mental health literacy than students studying within other disciplines **[14,15]**. Despite this, medical students report feeling underprepared to manage mental health problems **[16]**. **Chur-Hansen et al., [17]** in their review of the medical education literature revealed that most medical students receive limited and insufficient behavioral health education and training.

Given the severe shortage of specialist psychiatric care worldwide, primary care has been dubbed the de-facto mental health care system **[18]**. Primary care providers are therefore often the first point of contact for many people with mental illness **[19]**. Despite this, mental health problems often go undiagnosed or undetected by primary care providers **[20,21]**. As part of their course curricula, it is imperative that adequate knowledge is imparted to medical students, who will be part of the future healthcare workforce, and hence need to be equipped with the skills and ability to recognise signs and symptoms of mental illness.

The current study aimed to assess recognition of five mental disorders (alcohol abuse, dementia, depression, OCD and schizophrenia) amongst a sample of medical students in Singapore. Socio-demographic predictors of correct recognition were also explored. These five disorders were selected based on various factors including their relatively high prevalence in the local population, the large treatment gap associated with them **[22,23]** as well as the strong case for early detection and treatment of conditions such as psychosis which significantly impact outcomes **[24]**.

METHODS

Study participants

Students from two medical schools in Singapore were informed of and invited to participate in the study, via their institutional email. In all, 502 medical students were recruited during the period from August to September 2016. Limits were set across groups to ensure adequate representation across institutions and academic year levels. Additionally, medical

students were required to be Singapore citizens or permanent residents and aged 16-35 years, in order to be eligible to participate. The survey was administered via an online platform, while all participants were required to provide informed consent, which was obtained when students read and indicated they were willing to partake in the study by clicking on the 'agree' link in the online consent form. Before data collection commenced, ethical approval was granted from the relevant institutional review board (National Healthcare Group, Domain Specific Review Board).

Survey

A structured questionnaire was used to gather socio-demographic information pertaining to the student's age, gender, ethnicity and academic year, in addition to specific questions relating to their interest in psychiatry prior to starting medical school. To assess mental health literacy, a vignette based approach was adopted, which modeled the Depression Literacy Questionnaire by **Jorm et al [10]** and that of a recent national mental health literacy study in Singapore **[12]**. Students were randomly assigned one of five vignettes, which described a person with alcohol abuse, dementia, depression, OCD, or schizophrenia. Vignettes were approximately 150 words in length and described classic and common symptoms of the five respective disorders. All vignettes were developed and revised in consultation with experienced research psychiatrists, specializing in each of the five disorders, and then further vetted by a panel of senior clinical psychiatrists to ensure they reflected DSM-IV and ICD-10 diagnostic criteria for the five disorders. These vignettes were also cognitively tested prior to their use, where trained interviewers systematically probed on what they thought the vignette was about, what came to their mind when they heard a particular phrase or term and whether there were any words they did not understand and any words or expression that they found offensive or unacceptable. Where alternative words or expressions exist for certain terms, the respondent was asked which of the alternatives conforms better to their usual language. The five vignettes pertaining to this study have been included in Supplementary File 1.

After reading the assigned vignette, students were asked a series of questions relating to the person in the vignette. They were asked an open text question: "What do you think the person in the vignette is suffering from?" which was used to ascertain whether students could accurately recognise or name the mental illness being described. In addition, students were also asked to indicate if anyone in their family or close circle of friends had ever had problems similar to the person in the vignette and if they had any experience in dealing with a person with problems similar to those described in the vignette. The current study was a part of a larger study that explored mental health literacy and factors associated with

choosing psychiatry practice as a career and the entire survey took on average 30-40 minutes to complete.

Coding

Two members of the research team (LP and ES) independently coded the open text responses in relation to correct recognition. Responses were coded as "Correct recognition" if the respondent was able to accurately name the specific condition. The two coders then compared responses to ensure consistency and in the case of an ambiguous response, the two coders (LP and ES) would come to a consensus on how the response should be coded. Firstly, responses were coded as either being 'correct' or 'incorrect'. For those responses that were incorrect or mislabeled, these were further classified as: (i) disorder specific symptoms, (ii) other mental disorder (anxiety), (iii) other mental disorder (depression), (iv) other mental disorder (miscellaneous), (v) mental illness, (vi) psychological stress (vii) not an illness and (viii) don't know/irrelevant response and were similar to codes used in an earlier national mental health literacy study that used the same vignettes **[12]**. Responses pertaining to 'disorder specific symptoms' included short term memory/memory loss or mild cognitive impairment for dementia, germophobia for OCD, and hallucinations, delusions or paranoia for schizophrenia. "Not an illness" refers to responses such as loneliness or lack of social interaction.

Statistical analysis

Statistical analyses were performed using IBM SPSS, version 23.0. Descriptive statistics were tabulated for the overall sample, with frequency and percentage calculated for all categorical variables. Given the exploratory nature of the current study, multiple logistic regression, using the enter method was performed to determine the predictors of correct recognition as this would take into account the effects of all predictors and select the stronger covariates. This generated odd ratios (ORs) and 95% confidence intervals for the relationship between correct recognition (dependent variable) and various predictors including age group, gender, ethnicity, academic year, vignette type, interest in psychiatry prior to medical school, experience dealing with someone who had similar mental health problems and family or friends who have similar problems to those in the vignette. Statistical significance was set at $p<0.05$ level.

RESULTS

The sample characteristics of the medical students are displayed in Table 1. The majority of the sample were above 21 years of age (69.3%), female (58.8%) and Chinese (93.0%).

25.3% of students had experience in dealing with problems similar to those described in the vignette and 32.7% reported they had friends or family with similar problems.

Table 2 shows the percentage of respondents endorsing each category in relation to recognition of the vignettes. In total, 81.7% could correctly recognise the condition described in the vignette, where depression was the most well recognised (93.0%), followed by alcohol abuse (89.0%), OCD (87.1%) and dementia (79.2%), while only 60.0% of students correctly recognised schizophrenia. In relation to schizophrenia, students commonly used terms to describe the symptoms of the disorders such as hallucinations or delusions (12.0%) or mislabeled this as another mental illness such as delusional disorder or autism (10%).

Predictors of correct recognition of mental disorders are shown in Table 3. Multiple logistic regression analyses revealed that females (p=0.013) were significantly more likely to correctly recognise the disorder being described in the vignette, while the odds of correct recognition were significantly higher among fourth (p=0.019) and fifth year students (p<0.001), compared to first year students. Differences across vignettes were also observed. When compared to depression, the dementia (p=0.009) and schizophrenia vignettes (p<0.001) were significantly more likely to be mislabeled.

DISCUSSION

This mental health literacy study among medical students has explored recognition rates for common mental disorders, namely alcohol abuse, dementia, depression, OCD and schizophrenia, using a vignette based approach. The study also sought to identify socio-demographic predictors of correct recognition. A similar protocol was used in earlier mental health literacy studies in Singapore, allowing for comparisons in recognition to be made across samples. Findings from the current study revealed that correct recognition of mental disorders overall was quite high (81.7%). In comparison to other local studies, recognition was considerably higher than that of the general Singapore population (43.7%) **[12]** and slightly higher than that of a nursing student sample (70.4%) **[25]**.

Correct recognition did, however, vary across disorders, with the most well recognised disorder being depression (93.0%), followed by alcohol abuse, (89.0%), OCD (87.1%) and dementia (79.2%) whilst the most poorly recognised condition was schizophrenia (60.0%). Regression analysis further substantiated this where compared to depression, medical students were significantly less likely to correctly recognise dementia (p=0.009) and schizophrenia (p<0.001). The latter corroborates findings of other local mental health literacy studies amongst the general population **[12]** and nursing students **[25]** in Singapore, which

also found recognition was poorest for schizophrenia in comparison to the other four disorders. Mental health literacy studies elsewhere have also found schizophrenia to be more poorly recognised when compared to depression **[26,27].**

Schizophrenia recognition is consistently poor across different population sub-groups in Singapore, and this coupled with its severity and chronicity, impacts patients their families and the wider community. In addition, 20% of medical students also incorrectly identified this as another mental illness (e.g. depression, anxiety, delusional disorder etc). As expected, further analysis revealed that both incorrect recognition and mislabeling schizophrenia for another mental illness was most common in first year students, however still occurred more frequently in fourth and fifth year students, as compared to the other vignettes, and therefore course curricula pertaining to psychiatry may benefit from focusing on specific symptomology of schizophrenia, given recognition was poorest for this condition.

With regards to dementia recognition amongst medical students, this was higher than that of the general population (79.2% versus 66.3%) - where dementia was the most well recognised disorder **[12]** - and similar to that of nursing students (77%) **[25]**. However, when compared to the other disorders, it was the second most poorly recognised disorder, after schizophrenia. One in 10 students described disorder specific symptoms such as short term memory/memory loss or mild cognitive impairment and 5.9% incorrectly recognised it as depression. Similarly, 8% and 4% of students also mislabeled alcohol abuse and schizophrenia as depression, respectively. So whilst depression was very well recognised amongst medical students, it was also 'over-generalized' and used to incorrectly label all four of the other disorders, a finding which is consistent with local and international studies **[12,25,26]**. Although it is important that medical students can identify the person has a mental illness, it is important they can differentiate the symptoms of depression from that of other mental illnesses.

Correct recognition of both alcohol abuse (89%) and OCD (87.1%) was high among medical students. When comparing correct recognition rates to that of the general Singapore population and nursing students, the greatest differences were also observed for these disorders; 87.1% of medical students correctly recognised OCD, versus just 28.7% of the general population **[12]**, whilst 89% correctly labeled alcohol abuse compared to 58% of nursing students **[25]**. Correct recognition for OCD among the general population was quite poor, which is likely to be a result of less emphasis being placed on this mental illness in the local media, compared to conditions such as depression or dementia and consequently the general population are less familiar with the term 'obsessive compulsive disorder' or 'OCD'.

In addition, 15% of Singaporeans did not think this was a problem **[12]**, which somewhat normalizes the symptoms and may further explain the contrasting recognition rates. Conversely, alcohol abuse was the second most well recognised condition amongst medical students and the general population, yet was the second most poorly recognised condition among nursing students, after schizophrenia. It is possible that medical students may have the ability to more objectively assess recognition based on the symptoms described in the vignette or their course curriculum may provide them the skills to better identify the symptoms of alcohol abuse when compared to nursing students.

The current study identified a number of socio-demographic predictors of correct recognition, including gender and academic year level as well as experience in dealing with similar problems to those described in the vignette. Females were nearly two times more likely to correctly recognise the disorder described in the vignette, when compared to their male counterparts. Gender differences have long been investigated in relation to mental and physical illness prevalence, incidence, mortality and morbidity. More specifically gender differences in mental health literacy have consistently found females are better able to recognise the signs and symptoms of mental illnesses compared to males, in university student populations **[15,27]**, adolescents and young adults **[28]** as well as adult populations **[12]**. These findings have been attributed to females often having greater awareness of symptoms, whereas males are less aware of health problems. Consideration should be given to how course content is communicated and whether there is a need for different types of information and educational strategies to better target these gender differences **[28]**.

As expected, fourth and fifth year medical students, were significantly more likely to correctly recognise the disorder described in the vignette when compared to students in their first year of medicine, a finding which concurs with previous research **[13]**. Medical school curricula for first year students only includes very limited and preliminary information relating to psychiatry, where the majority of psychiatric teaching clerkship and placements occurs in the latter years of the course. Therefore it is not surprising that the knowledge and ability to correctly recognise signs and symptoms of various disorders among first year students is poorer than students in their final years of medicine. This finding also lends itself to the importance and impact of undertaking clinical psychiatry placements and how the experience coupled with psychiatry education in these final years of a medicine course can contribute to significantly better recognition in fourth and fifth year students.

Previous experience in dealing with problems similar to those described in the vignette, was also associated with better recognition, and although this finding was not significant, it was

approaching significance (p=0.056). Students were not explicitly asked about the type or duration of their experience in dealing with people with mental illness, however this could be in the form of volunteering or work experience, helping family or friends or they may have gained exposure through practical placements as part of their course. The literature has also consistently reported that experience or exposure in dealing with someone who has a mental illness also results in improved mental health literacy **[15]**. Furthermore, studies have also found that history of personal contact with people with mental health issues is also associated with reduced stigma and improved attitudes towards people with mental illness **[29,30]**.

When interpreting these findings, it is also important to consider the socio-demographic characteristics of the person in the vignette and how these may impact and influence correct recognition. More specifically, factors such as gender, age and race/ethnicity **[31,32]** of the person depicted in the vignette have been found to influence recognition. Similarly, a vignette based study similarly found that patient characteristics and factors play a role in decision to provide self-management support among primary care physicians and nurses **[33]**. In the current study, the gender for all vignettes was male, and whilst ethnicity was not stipulated, nor was there specific reference to socio-economic indicators, future studies could benefit from incorporating such information in the vignette to see if such characteristics influence recognition.

Some limitations must be acknowledged in view of the current findings. The vignettes used describe classic symptoms of each of the five disorders but may not describe all symptoms or reflect real life cases. As the current sample are future medical professionals, further exploration of student's ability to recognize more complicated cases such as those with comorbidities, and those with prodromal or uncommon symptoms is recommended. The sample was also restricted to Singapore citizens and permanent residents and therefore the findings may not be generalizable to international medical students studying in Singapore. Finally, correct recognition was based on students correctly identifying one of five randomly assigned vignettes, describing someone with alcohol abuse, dementia, depression, OCD or schizophrenia. Future studies could assign multiple or all vignettes to the same student in order to gain a greater and more in depth understanding of recognition rates across disorders and how these may differ.

These limitations notwithstanding, the current study recruited a reasonable sample of medical students, whereby correct recognition was assessed across common mental illnesses. It adopted a similar protocol to that of a local national mental health literacy study

[12] allowing for comparisons to be made between the general population as well as amongst a sample of nursing students **[17]**. Whilst overall recognition was high (81.7%), disorders such as schizophrenia were more poorly recognised (60%), highlighting the need for greater emphasis and increased awareness on such aspects given the severity of this mental illness. Furthermore predictors of correct recognition were also identified such as being female and having previous experience in dealing with mental health problems. Accordingly, gender-specific interventions should be considered while providing exposure or contact with people with mental illness would be beneficial to not only improve recognition and overall mental health literacy, but also in reducing stigma and improving attitudes towards people with mental illness **[30].**

The implications of medical student's mental health literacy are significant. Given that these students are the next generation of doctors, it is imperative that they are equipped with the skills and ability to recognise signs and symptoms of mental illness, especially given primary care providers are often the first professional help-seeking source for people with mental health problems **[19,22]**. Ongoing consideration should also be given to ensure medical school psychiatry education and curricula are routinely reviewed and updated in order to assist in the preparation of qualifying doctors to successfully recognise and manage common mental disorders **[34]** upon entering the workforce. Furthermore given that students in their final years of their degree (versus first year) were significantly better able to recognise mental disorders, this substantiates the importance of psychiatric clinical placements in terms of knowledge and recognition of such conditions.

As appropriate and timely help-seeking is associated with improved long-term outcomes for people with mental illness **[35]** it is fundamental that the future medical workforce gain knowledge and psychiatric exposure as part of their medical course, with the long term goal to improve outcomes for people with mental illness and ultimately the wider community at large. Furthermore, as recognition of schizophrenia was poorest and often mislabeled as other common mental illnesses, increased efforts are needed to better educate medical students, especially those in their initial years of their course, about specific signs and symptoms of individual mental disorders, so they can differentiate between these in future.

Competing Interests

The authors declare that they have no competing interests.

Acknowledgement

This research is supported by the Singapore Ministry of Health's National Medical Research

Council under the Centre Grant Programme (Grant No.: NMRC/CG/004/2013).

Ethics approval

The study was approved by the National Healthcare Group Domain Specific Review Board and all participants provided written informed consent.

Author contributions

LP was responsible for writing the manuscript. ES was responsible for the study design, data analysis and provided inputs into the manuscript. BYC was responsible for the study design, and provided inputs into the manuscript. RM and SV provided inputs into data interpretation and edits to the manuscript. SAC and MS supervised the overall study and provided intellectual inputs on the manuscript.

Data sharing

Data are not available for online access; however, readers who wish to gain access to the data can write to the senior author Dr Mythily Subramaniam at mythily@imh.com.sg with their requests. Access can be granted subject to the Institutional Review Board (IRB) and the research collaborative agreement guidelines. This is a requirement mandated for this research study by our IRB and funders.

Table 1: Profile of medical students (N=502)

		n	%
Age Group	<21years	154	30.7
	≥21years	348	69.3
Gender	Male	207	41.2
	Female	295	58.8
Ethnicity	Chinese	467	93.0
	Non-Chinese	35	7.0
Academic Year	1st year	132	26.3
	2nd year	116	23.1
	3rd year	71	14.1
	4th year	87	17.3
	5th year	96	19.1
Interest in psychiatry prior to medical school	Yes	20	4.0
	No	482	96.0
Has experience dealing with someone having problems similar to "X"	Yes	127	25.3
	No	375	74.7
Has friends and family with problems similar to "X"	Yes	164	32.7
	No	338	67.3

Table 2: Percentage of medical students mentioning each category to describe the problem in the vignette

	Total (n=502)	Alcohol abuse (n=100)	Dementia (n=101)	Depression (n=100)	OCD (n=101)	Schizophrenia (n=100)
Recognition						
Correct recognition	81.7	89.0	79.2	93.0	87.1	60.0
Disorder specific symptoms	5.6	-	9.9	1.0	5.0	12.0
Other mental disorder- any anxiety disorder	2.2	1.0	1.0	-	3.0	6.0
Other mental disorder- depression	3.8	8.0	5.9	-	1.0	4.0
Other mental disorder- miscellaneous	3.0	1.0	1.0	1.0	2.0	10.0
Mental illness	1.4	-	1.0	2.0	1.0	3.0
Psychosocial stress	1.0	-	1.0	3.0	1.0	-
Not an illness	1.0	1.0	1.0	-	-	3.0
Not sure/ irrelevant response	0.4	-	-	-	-	2.0

Table 3: Predictors of correct recognition of mental disorders (N=502)

		OR	Lower	Upper	p-value
Age group	<21years	1.02	0.54	1.94	0.949
	≥21years	Ref.	-	-	-
Gender	Female	1.91	1.15	3.18	**0.013**
	Male	Ref.	-	-	-
Ethnicity	Chinese	Ref.	-	-	-
	Non-Chinese	0.55	0.23	1.34	0.188
Academic year	1st year	Ref.	-	-	-
	2nd year	1.15	0.61	2.16	0.672
	3rd year	1.70	0.72	4.03	0.228
	4th year	2.97	1.20	7.36	**0.019**
	5th year	6.52	2.24	19.03	**<0.001**
Interest in psychiatry prior to medical school	Yes	2.28	0.46	11.39	0.316
	No	Ref.	-	-	-
Vignette type	Depression	Ref.	-	-	-
	Dementia	0.28	0.11	0.73	**0.009**
	Alcohol abuse	0.58	0.20	1.64	0.301
	OCD	0.48	0.17	1.36	0.167
	Schizophrenia	0.09	0.04	0.23	**<0.001**
Experience dealing with someone similar to "X"	No	Ref.	-	-	-
	Yes	1.84	0.98	3.44	0.056
Has friends and family with problems similar to "X"	No	Ref.	-	-	-
	Yes	0.90	0.46	1.78	0.764

REFERENCES

1. Kessler RC, Angermeyer M, Anthony JC, DE Graaf R, Demyttenaere K, Gasquet I et al. Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organization's World Mental Health Survey Initiative. World Psychiatry. 2007;6:168-76.
2. Vigo D, Thornicroft G and Atun R. Estimating the true global burden of mental illness. Lancet Psychiatry 2016;3:171-178
3. Bloom, D.E., Cafiero, E.T., Jané-Llopis, E., Abrahams-Gessel, S., Bloom, L.R., Fathima, S., Feigl, A.B., Gaziano, T., Mowafi, M., Pandya, A., Prettner, K., Rosenberg, L., Seligman, B., Stein, A.Z., & Weinstein, C. (2011). The Global Economic Burden of Noncommunicable Diseases. Geneva: World Economic Forum
4. Thornicroft G. Physical health disparities and mental illness: the scandal of premature mortality. The British Journal of Psychiatry 2011; 199, 441–442
5. Prince, M., Patel, V., Saxena, S., Maj, M., Maselko, J., Phillips, M. R. & Rahman, A. No health without mental health. The Lancet, 2007;370, 859-877
6. Demyttenaere, K, Bruffaerts R, Posada-Villa J, Gasquet I, et al. Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. JAMA : the journal of the American Medical Association, 2004;291, 2581-90.
7. The Organisation for Economic Co-operation and Development (OECD) 2012. Sick on the Job? Myths and Realities about Mental Health and Work, OECD Publishing
8. Jorm AF. Mental Health Literacy: public knowledge and beliefs about mental disorders. British Journal of Psychiatry 2000;177, 396–401.
9. Hatzenbuehler ML, Phelan JC, Link BG. Stigma as a Fundamental Cause of Population Health Inequalities. American Journal of Public Health 2013; 103: 813-21
10. Jorm AF, Korten AE, Jacomb PA, Christensen H, Rodgers B, Pollitt P (1997). 'Mental health literacy': a survey of the public's ability to recognise mental disorders and their beliefs about the effectiveness of treatment. Medical Journal of Australia 166, 182–186.
11. Wang PS, Berglund P, Olfson M, Pincus HA, Wells KB, Kessler RC. Failure and delay in initial treatment contact after first onset of mental disorders in the National Comorbidity Survey Replication. Achieves of General Psychiatry 2005;62, 603–613.
12. Chong SA, Abdin E, Picco L, Pang S, Jeyagurunathan A, Vaingankar JA, Kwok KW, Subramaniam M. Mental Health Literacy among a multiracial population in South East Asia. *BMC Psychiatry 2016:* 16:121
13. Amarasuriya SD, Jorm AF, Reavley NJ. Quantifying and predicting depression literacy of undergraduates: a cross sectional study in Sri Lanka. BMC Psychiatry 2015;15:269
14. Furnham A, Cook R, Martin N, Batey M. Mental health literacy among university students, Journal of Public Mental Health, 2011;10:198 – 210
15. Lauber C, Ajdacic-Gross V, Fritschi N, Stulz N, Rössler W Mental health literacy in an educational elite – an online survey among university students *BMC Public Health* 2005, 5:44
16. Sahhar, D., & O'Connor, D. How well do Australian medical schools prepare general practitioners to care for patients with mental disorders? Australian Psychiatry, 2004;12, 26–30.
17. Chur-Hansen, A., Carr, J. E., Bundy, C., Sanchez-Sosa, J. J., Tapanya, S., & Wahass, S. H. An international perspective on behavioral science education in medical schools. *Journal of Clinical Psychology Medical Settings, 2008;15*, 45-53.
18. Kessler R and Stafford D (Ed) Collaborative Medicine Case Studies. 2008. Springer-Verlag New York

19. Bristow K, Edwards S, Funnel E et al: Help Seeking and Access to Primary Care for People from “Hard-to-Reach” Groups with Common Mental Health Problems. Int J Family Med. 2011; 1-10
20. Smith DJ, Griffiths E, Kelly M et al: Unrecognised bipolar disorder in primary care patients with depression. The British Journal of Psychiatry 2011; 199: 49-56
21. Bor, J.S., *Among the elderly, many mental illnesses go undiagnosed.* Health Aff (Millwood), 2015. 34(5):727-31.
22. Chong SA, Abdin E, Vaingankar JA, Heng D, Sherbourne C, Yap M, et al. A population-based survey of mental disorders in Singapore. Ann Acad Med Singapore. 2012;41:49–66.
23. Subramaniam M, Chong SA, Vaingankar JA, Abdin E, Chua BY, Chua HC, et al. Prevalence of dementia in people aged 60 years and above: results from the WiSE study. J Alzheimers Dis. 2015;45:1127–38.
24. Verma, S., et al., *Symptomatic and functional remission in patients with first-episode psychosis.* Acta Psychiatr Scand, 2012. 126: 282-9.
25. Seow E, Chua BY, Xie H, Wang J, Ong HL, Abdin E, Chong SA, Subramaniam M. Correct Recognition and Continuum Belief of Mental Disorders in a Nursing Student Population. BMC Psychiatry, submitted
26. Reavley NJ, Jorm AF. Recognition of mental disorders and beliefs about treatment and outcome: findings from an Australian National Survey of Mental Health Literacy and Stigma. Aust N Z J Psychiatry. 2011;45:947–56.
27. Gorczynski, P, Sims-Schouten, W, Hill, DM, Wilson, C. Examining mental health literacy, help seeking behaviours, and mental health outcomes in UK university students. The Journal of Mental Health Training, Education and Practice, 2017; 12: 2
28. Cotton SM, Wright A, Harris MG, Jorm AF, McGorry PD. Influence of gender on mental health literacy in young Australians. Australian and New Zealand Journal of Psychiatry 2006; 40:790–796
29. Subramaniam M, Abdin E, Picco L, Pang S, Shafie S, Vaingankar JA, Kwok KW, Verma K and Chong SA. Stigma towards people with mental disorders and its components – a perspective from multi-ethnic Singapore. Epidemiology and Psychiatric Sciences 2016; 28:1-12
30. Evans-Lacko S, London J, Japhet S, Rüsch N, Flach C, Corker E, Henderson C, Thornicroft G. Mass social contact interventions and their effect on mental health related stigma and intended discrimination. BMC Public Health 2012;12, 489.
31. Hadjimina E and Furnham A. Influence of age and gender on mental health literacy of anxiety disorders. Psychiatry Research, 2017; 251:8-13
32. Morley C.P. The effects of patient characteristics on ADHA diagnosis and treatment: a factorial study of family physicians. BMC Family Practice, 2010;11:11
33. Bos-Touwen I.D, Trappenburg J.C.A, van der Wulp. I, Schuurmans M.J and de Wit. N.J. Patient factors that influence clinicians’ decision making in self-management support: A clinical vignette study. Plos One 2017;12(2)
34. Thomas S, Pai N, Dawes K, Wilson C, Williams V. Updating medical school psychiatry curricula to meet projected mental health needs. Australasian Psychiatry 2013; 21(6) 578–582
35. McGorry PD, Purcell R, Hickie IB, Jorm AF. Investing in youth mental health is a best buy. Med J Aust. 2007;187:S5–7.

Vignettes used in this study

Alcohol abuse- XX (insert name) started drinking when he was a student. He was very popular at parties. By the time he had graduated and got married he was drinking heavily every weekend. This sometimes resulted in him getting into fights when he was out drinking. Although his wife insisted that he drank too much, XX argued that he was in control. But his work and appearance deteriorated so much that his supervisor began to suspect that he might be drinking on the job. A few months later he was involved in a serious car accident, where he crashed into two cars, seriously damaging them and his own car. The police who arrived at the scene of the accident did a breathalyzer test. The test turned out to be positive and so they took his blood for alcohol analysis. As his alcohol level was much higher than the legal limit he was charged with drunk driving.

Dementia- XX is 75 years old and retired. His wife has noticed that he has problems remembering things that happened recently but recalls things from earlier in their marriage quite well. He repeats questions which she has already answered, misplaces his things and occasionally gets confused during their conversations. Sometimes XX and his wife quarrel as he accuses her of taking his things. He lost his way once or twice whilst driving to their son's home, and has written some cheques for the wrong amount when paying bills. When his wife points out these problems to XX, he loses his temper. He does not think he has a problem.

Depression- XX is 30 years old. He has been feeling unusually sad and miserable for the last three weeks. Friends noticed he is no longer his usual cheerful self and he has declined all social gatherings over the past two weeks. Even though he is tired all the time, he has trouble sleeping almost every night. XX doesn't feel like eating and has lost weight. He can't focus on his work and puts off making decisions. XX feels worthless and even everyday tasks seem too much for him. This has come to the attention of his boss, who is concerned about XX's poor work performance.

OCD- XX (insert name) is 37 years old and each day he spends 4 hours washing his hands. He usually takes one shower a day but he spends 60–90 min in the shower. When XX washes his hair he keeps the shampoo in his hair until he has counted to 100 to ensure that his head and hair are clean enough and free of contaminants, such as germs. XX also repeatedly cleans things he touches, including dishes, clothes, furniture, and doorknobs. XX feels extremely anxious if he does not wash his hands or cleans things he touches and finds it difficult to stop himself from doing these things.

Schizophrenia- XX (insert name) is 44 years old. He is staying in a 1-room HDB rental flat. He has not worked for years. He wears the same clothes every day and has left his hair to grow long and untidy. He is always on his own and is often seen sitting in the park talking to himself. Sometimes he stands and moves his hands as if to communicate to someone in nearby trees. He rarely drinks alcohol. At times he accuses shopkeepers of giving information about him to other people. He has put extra locks on his door. He says spies are watching him all the time. His neighbors complain that he does not clean his room which is becoming increasingly dirty and is filled with glass objects. XX says he is using these "to receive messages from space".

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **Page 1**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **Page 1**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **Page 2-3**
Objectives	3	State specific objectives, including any prespecified hypotheses **Page 3**
Methods		
Study design	4	Present key elements of study design early in the paper **Page 4**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **Page 4**
Participants	6	*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants **Page 3- 4**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **Page 4**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **Page 4**
Bias	9	Describe any efforts to address potential sources of bias **NA**
Study size	10	Explain how the study size was arrived at **NA**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why **5**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **Page 5**
		(*b*) Describe any methods used to examine subgroups and interactions **Page 5**
		(*c*) Explain how missing data were addressed **NA**
		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy **NA**
		(*e*) Describe any sensitivity analyses **NA**
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **NA**
		(b) Give reasons for non-participation at each stage **NA**
		(c) Consider use of a flow diagram **NA**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **Page 5**
		(b) Indicate number of participants with missing data for each variable of interest **NA**
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount) **NA**
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time **NA**

		Case-control study—Report numbers in each exposure category, or summary measures of exposure **NA**
		Cross-sectional study—Report numbers of outcome events or summary measures **NA**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **Page 5**
		(*b*) Report category boundaries when continuous variables were categorized **NA**
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period **NA**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **NA**
Discussion		
Key results	18	Summarise key results with reference to study objectives **Page 5-8**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **Page 8**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **8-9**
Generalisability	21	Discuss the generalisability (external validity) of the study results **8-9**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based **Page 9**

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Recognition of mental disorders: findings from a cross sectional study among medical students in Singapore

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-019038.R1
Article Type:	Research
Date Submitted by the Author:	29-Sep-2017
Complete List of Authors:	Picco, Louisa; Institute of Mental Health, Research Division Seow, Esmond; Institute of Mental Health, Research Division Chua, Boon Yiang; Institute of Mental Health, Research Division Mahendran, Rathi; National University of Singapore, Psychological Medicine Verma, S; Institute of Mental Health, Singapore, Department of Early Psychosis Intervention Chong, Siow Ann ; Institute of Mental Health, Research Subramaniam, M; Institute of Mental Health, Singapore, Research
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Health services research, Medical education and training
Keywords:	MEDICAL EDUCATION & TRAINING, MENTAL HEALTH, PSYCHIATRY

Recognition of mental disorders: findings from a cross sectional study among medical students in Singapore

Ms Louisa Picco[1]
Mr Esmond Seow[1]
Mr Boon Yiang Chua[1]
Prof Rathi Mahendran[2,3]
Prof Swapna Verma[3,4]
Prof Siow Ann Chong[1]
Adj/Asst Prof Mythily Subramaniam[1]

[1]Research Division, Institute of Mental Health, Singapore
[2]Psychological Medicine, Yong Loo Lin School of Medicine, National University of Singapore
[3]Clinical, Academic and Faculty Affairs, Duke-NUS Graduate Medical School
[4]Department of General Psychiatry and Early Psychosis Intervention Programme, Institute of Mental Health, Singapore

Corresponding author:
Louisa Picco
Manager, Research Division
Institute of Mental Health
Buangkok Green Medical Park
10 Buangkok View
Singapore 539747
Tel: 65-6389 2961
Email: louisa_picco@imh.com.sg

ABSTRACT

Objectives: To assess recognition of five mental disorders (alcohol abuse, dementia, depression, obsessive-compulsive disorder (OCD) and schizophrenia) amongst a sample of medical students, using a vignette based approach. Socio-demographic predictors of correct recognition were also explored.

Design: cross-sectional online survey

Participants: medical students studying in Singapore

Methods: This was a cross-sectional online study among medical students (n=502) who were randomly assigned one of the five vignettes. Students were instructed to read the vignette then answer the open text question "What do you think the person in the vignette is suffering from?" Multiple logistic regression was performed to determine the predictors of correct recognition.

Results: 81.7% could correctly recognise the condition described in the vignette. Depression was most well recognised (93.0%), followed by alcohol abuse (89.0%), OCD (87.1%) and dementia (79.2%), while only 60.0% of students correctly recognised schizophrenia. Females were significantly more likely to correctly recognise the disorders, while the odds of correct recognition were significantly higher among fourth and fifth year students, compared to first year students. Compared to depression, dementia and schizophrenia were significantly more likely to be mislabeled.

Conclusion: Whilst overall correct recognition was high (81.7%), this did vary by disorder, where schizophrenia (60%) was the most poorly recognised condition. Given that primary care providers are often the first professional help-seeking source for people with mental health problems, medical students, should be equipped with the skills and ability to recognise signs and symptoms of various mental illnesses.

Keywords: mental health literacy, vignettes, correct recognition, Singapore

Strengths and limitations of the study

- A vignette based approach was adopted to assess recognition relating to alcohol abuse, dementia, depression, obsessive-compulsive disorder (OCD) and schizophrenia.
- This is the first study to explore recognition among a sample of Asian medical students, across various psychiatric disorders.
- Multiple logistic regression allowed for predictors of correct recognition to be determined.
- The study has some limitations including the cross-sectional design and lacks generalizability due to inclusion criteria.

INTRODUCTION

Mental illnesses cause tremendous human, social and economic burden worldwide and this has been consistently substantiated in the extant literature. For example, the World Health Organisation found the prevalence of mental disorders ranged from 12-47% with most countries reporting a lifetime prevalence of at least one in four people **[1]**. Recent estimates have also revealed that the global burden of mental illness accounts for 32.4% of years lived with disability (YLDs) and 13% of disability-adjusted life-years (DALYs), placing mental illnesses as the largest global burden of disease in terms of YLDs, and equal with that of cardiovascular and circulatory diseases in terms of DALYs **[2].** Then there is the actual cost of mental illness; the Global Economic Burden of Non-communicable Diseases report showed mental disorders to be the largest cost driver, equating to $2.5 trillion in global costs in 2010, where the costs for mental disorders were greater than the costs of diabetes, respiratory disorders, and cancer combined **[3]**.

The impact of mental illness not only has a significant social and economic burden on society but the direct impact on people with mental illness is also extensive. A large body of evidence has consistently shown outcomes for people with mental illness are often much poorer **[4]** in terms of mortality, morbidity **[5]**, and access to appropriate services **[6].** Mental illness also impacts on the psychosocial facets of life such as education, employment and social relationships, **[7]** often resulting in poorer quality of life, lower self-esteem and a sense of hopelessness. A myriad of factors are likely to contribute to these poorer psychosocial outcomes, of which two significant aspects include stigma and poor mental health literacy **[8,9]**.

Mental health literacy refers to 'knowledge and beliefs about mental disorders, which aid their recognition, management or prevention' **[10]**. Equipping people with the skills and knowledge to identify the signs and symptoms of mental illness is imperative and has been linked to early help-seeking which can ultimately reduce the burden of disease associated with mental disorders **[11]**. Despite this, it is not uncommon for people to be unable to recognise common signs and symptoms of mental disorders, and recognition can also vary considerably across mental illnesses. A recent national study in Singapore, which adopted a vignette based approach to explore mental health literacy relating to five disorders, alcohol abuse, dementia, depression, obsessive compulsive disorder (OCD) and schizophrenia, revealed that under half the Singapore population (43.7%) could correctly recognise mental illnesses. The most well recognised disorder was dementia (66.3%), followed by alcohol

abuse (57.1%) and depression (55.2%), while only 28.7% and 11.5% could recognise OCD and schizophrenia, respectively **[12]**.

Far less is known about the mental health literacy of medical students in Singapore. Whilst very few studies have explored mental health literacy solely among medical students, studies have investigated this concept amongst university and college students. Findings have revealed that in comparison, medical students could better recognise mental illnesses **[13]** or had better mental health literacy than students studying within other disciplines **[14,15]**. Despite this, medical students report feeling underprepared to manage mental health problems **[16]**. **Chur-Hansen et al., [17]** in their review of the medical education literature revealed that most medical students receive limited and insufficient behavioral health education and training.

Given the severe shortage of specialist psychiatric care worldwide, primary care has been dubbed the de-facto mental health care system **[18]**. Primary care providers are therefore often the first point of contact for many people with mental illness **[19]**. Despite this, mental health problems often go undiagnosed or undetected by primary care providers **[20,21]**. As part of their course curricula, it is imperative that adequate knowledge is imparted to medical students, who will be part of the future healthcare workforce, and hence need to be equipped with the skills and ability to recognise signs and symptoms of mental illness.

The current study aimed to assess recognition of five mental disorders (alcohol abuse, dementia, depression, OCD and schizophrenia) amongst a sample of medical students in Singapore. Socio-demographic predictors of correct recognition were also explored. These five disorders were selected based on various factors including their relatively high prevalence in the local population, the large treatment gap associated with them **[22,23]** as well as the strong case for early detection and treatment of conditions such as psychosis which significantly impact outcomes **[24]**.

METHODS

Study participants

Students from two medical schools in Singapore were informed of and invited to participate in the study, via their institutional email. In all, 502 medical students were recruited during the period from August to September 2016. Limits were set across groups to ensure adequate representation across institutions and academic year levels. Additionally, medical students were required to be Singapore citizens or permanent residents and aged 16-35 years, in order to be eligible to participate. The survey was administered via an online

platform, while all participants were required to provide informed consent, which was obtained when students read and indicated they were willing to partake in the study by clicking on the 'agree' link in the online consent form. Before data collection commenced, ethical approval was granted from the relevant institutional review board (National Healthcare Group, Domain Specific Review Board).

Survey

A structured questionnaire was used to gather socio-demographic information pertaining to the student's age, gender, ethnicity and academic year, in addition to specific questions relating to their interest in psychiatry prior to starting medical school. To assess mental health literacy, a vignette based approach was adopted, which modeled the Depression Literacy Questionnaire by **Jorm et al [10]** and that of a recent national mental health literacy study in Singapore **[12]**. Students were randomly assigned one of five vignettes, which described a person with alcohol abuse, dementia, depression, OCD, or schizophrenia. Vignettes were approximately 150 words in length and described classic and common symptoms of the five respective disorders. All vignettes were developed and revised in consultation with experienced research psychiatrists, specializing in each of the five disorders, and then further vetted by a panel of senior clinical psychiatrists to ensure they reflected DSM-IV and ICD-10 diagnostic criteria for the five disorders. These vignettes were also cognitively tested prior to their use, where trained interviewers systematically probed on what they thought the vignette was about, what came to their mind when they heard a particular phrase or term and whether there were any words they did not understand and any words or expression that they found offensive or unacceptable. Where alternative words or expressions exist for certain terms, the respondent was asked which of the alternatives conforms better to their usual language. The five vignettes pertaining to this study have been included in Supplementary File 1.

After reading the assigned vignette, students were asked a series of questions relating to the person in the vignette. They were asked an open text question: "What do you think the person in the vignette is suffering from?" which was used to ascertain whether students could accurately recognise or name the mental illness being described. In addition, students were also asked to indicate if anyone in their family or close circle of friends had ever had problems similar to the person in the vignette and if they had any experience in dealing with a person with problems similar to those described in the vignette. The current study was a part of a larger study that explored mental health literacy and factors associated with choosing psychiatry practice as a career and the entire survey took on average 30-40 minutes to complete.

Coding

Two members of the research team (LP and ES) independently coded the open text responses in relation to correct recognition. Responses were coded as "Correct recognition" if the respondent was able to accurately name the specific condition. The two coders then compared responses to ensure consistency and in the case of an ambiguous response, the two coders (LP and ES) would come to a consensus on how the response should be coded. Firstly, responses were coded as either being 'correct' or 'incorrect'. For those responses that were incorrect or mislabeled, these were further classified as: (i) disorder specific symptoms, (ii) other mental disorder (anxiety), (iii) other mental disorder (depression), (iv) other mental disorder (miscellaneous), (v) mental illness, (vi) psychological stress (vii) not an illness and (viii) don't know/irrelevant response and were similar to codes used in an earlier national mental health literacy study that used the same vignettes **[12]**. Responses pertaining to 'disorder specific symptoms' included short term memory/memory loss or mild cognitive impairment for dementia, germophobia for OCD, and hallucinations, delusions or paranoia for schizophrenia. "Not an illness" refers to responses such as loneliness or lack of social interaction.

Statistical analysis

Statistical analyses were performed using IBM SPSS, version 23.0. Descriptive statistics were tabulated for the overall sample, with frequency and percentage calculated for all categorical variables. Given the exploratory nature of the current study, multiple logistic regression, using the enter method was performed to determine the predictors of correct recognition as this would take into account the effects of all predictors and select the stronger covariates. This generated odd ratios (ORs) and 95% confidence intervals for the relationship between correct recognition (dependent variable) and various predictors including age group, gender, ethnicity, academic year, vignette type, interest in psychiatry prior to medical school, experience dealing with someone who had similar mental health problems and family or friends who have similar problems to those in the vignette. Statistical significance was set at $p<0.05$ level.

RESULTS

The sample characteristics of the medical students are displayed in Table 1. The majority of the sample were above 21 years of age (69.3%), female (58.8%) and Chinese (93.0%). 25.3% of students had experience in dealing with problems similar to those described in the vignette and 32.7% reported they had friends or family with similar problems.

Table 2 shows the percentage of respondents endorsing each category in relation to recognition of the vignettes. In total, 81.7% could correctly recognise the condition described in the vignette, where depression was the most well recognised (93.0%), followed by alcohol abuse (89.0%), OCD (87.1%) and dementia (79.2%), while only 60.0% of students correctly recognised schizophrenia. In relation to schizophrenia, students commonly used terms to describe the symptoms of the disorders such as hallucinations or delusions (12.0%) or mislabeled this as another mental illness such as delusional disorder or autism (10%).

Predictors of correct recognition of mental disorders are shown in Table 3. Multiple logistic regression analyses revealed that females (p=0.013) were significantly more likely to correctly recognise the disorder being described in the vignette, while the odds of correct recognition were significantly higher among fourth (p=0.019) and fifth year students (p<0.001), compared to first year students. Differences across vignettes were also observed. When compared to depression, the dementia (p=0.009) and schizophrenia vignettes (p<0.001) were significantly more likely to be mislabeled.

DISCUSSION

This mental health literacy study among medical students has explored recognition rates for common mental disorders, namely alcohol abuse, dementia, depression, OCD and schizophrenia, using a vignette based approach. The study also sought to identify socio-demographic predictors of correct recognition. A similar protocol was used in earlier mental health literacy studies in Singapore, allowing for comparisons in recognition to be made across samples. Findings from the current study revealed that correct recognition of mental disorders overall was quite high (81.7%). In comparison to other local studies, recognition was considerably higher than that of the general Singapore population (43.7%) **[12]** and slightly higher than that of a nursing student sample (70.4%) **[25]**.

Correct recognition did, however, vary across disorders, with the most well recognised disorder being depression (93.0%), followed by alcohol abuse, (89.0%), OCD (87.1%) and dementia (79.2%) whilst the most poorly recognised condition was schizophrenia (60.0%). Regression analysis further substantiated this where compared to depression, medical students were significantly less likely to correctly recognise dementia (p=0.009) and schizophrenia (p<0.001). The latter corroborates findings of other local mental health literacy studies amongst the general population **[12]** and nursing students **[25]** in Singapore, which also found recognition was poorest for schizophrenia in comparison to the other four

disorders. Mental health literacy studies elsewhere have also found schizophrenia to be more poorly recognised when compared to depression **[26,27].**

Schizophrenia recognition is consistently poor across different population sub-groups in Singapore, and this coupled with its severity and chronicity, impacts patients their families and the wider community. In addition, 20% of medical students also incorrectly identified this as another mental illness (e.g. depression, anxiety, delusional disorder etc). As expected, further analysis revealed that both incorrect recognition and mislabeling schizophrenia for another mental illness was most common in first year students, however still occurred more frequently in fourth and fifth year students, as compared to the other vignettes, and therefore course curricula pertaining to psychiatry may benefit from focusing on specific symptomology of schizophrenia, given recognition was poorest for this condition.

With regards to dementia recognition amongst medical students, this was higher than that of the general population (79.2% versus 66.3%) - where dementia was the most well recognised disorder **[12]** - and similar to that of nursing students (77%) **[25]**. However, when compared to the other disorders, it was the second most poorly recognised disorder, after schizophrenia. One in 10 students described disorder specific symptoms such as short term memory/memory loss or mild cognitive impairment and 5.9% incorrectly recognised it as depression. Similarly, 8% and 4% of students also mislabeled alcohol abuse and schizophrenia as depression, respectively. So whilst depression was very well recognised amongst medical students, it was also 'over-generalized' and used to incorrectly label all four of the other disorders, a finding which is consistent with local and international studies **[12,25,26]**. Although it is important that medical students can identify the person has a mental illness, it is important they can differentiate the symptoms of depression from that of other mental illnesses.

Correct recognition of both alcohol abuse (89%) and OCD (87.1%) was high among medical students. When comparing correct recognition rates to that of the general Singapore population and nursing students, the greatest differences were also observed for these disorders; 87.1% of medical students correctly recognised OCD, versus just 28.7% of the general population **[12]**, whilst 89% correctly labeled alcohol abuse compared to 58% of nursing students **[25]**. Correct recognition for OCD among the general population was quite poor, which is likely to be a result of less emphasis being placed on this mental illness in the local media, compared to conditions such as depression or dementia and consequently the general population are less familiar with the term 'obsessive compulsive disorder' or 'OCD'. In addition, 15% of Singaporeans did not think this was a problem **[12]**, which somewhat

normalizes the symptoms and may further explain the contrasting recognition rates. Conversely, alcohol abuse was the second most well recognised condition amongst medical students and the general population, yet was the second most poorly recognised condition among nursing students, after schizophrenia. It is possible that medical students may have the ability to more objectively assess recognition based on the symptoms described in the vignette or their course curriculum may provide them the skills to better identify the symptoms of alcohol abuse when compared to nursing students.

The current study identified a number of socio-demographic predictors of correct recognition, including gender and academic year level as well as experience in dealing with similar problems to those described in the vignette. Females were nearly two times more likely to correctly recognise the disorder described in the vignette, when compared to their male counterparts. Gender differences have long been investigated in relation to mental and physical illness prevalence, incidence, mortality and morbidity. More specifically gender differences in mental health literacy have consistently found females are better able to recognise the signs and symptoms of mental illnesses compared to males, in university student populations **[15,27]**, adolescents and young adults **[28]** as well as adult populations **[12]**. These findings have been attributed to females often having greater awareness of symptoms, whereas males are less aware of health problems. More specifically, females have been shown to be more intuitive than males in relation to emotional understanding and therefore may be more willing to use psychological labels than their male counterparts [29], whilst males are generally less likely to value assistance from health professionals [30]. Accordingly, consideration should be given to how course content is communicated and whether there is a need for different types of information and educational strategies to better target these gender differences **[28]**.

As expected, fourth and fifth year medical students, were significantly more likely to correctly recognise the disorder described in the vignette when compared to students in their first year of medicine, a finding which concurs with previous research **[13]**. Medical school curricula for first year students only includes very limited and preliminary information relating to psychiatry, where the majority of psychiatric teaching clerkship and placements occurs in the latter years of the course. Therefore it is not surprising that the knowledge and ability to correctly recognise signs and symptoms of various disorders among first year students is poorer than students in their final years of medicine. This finding also lends itself to the importance and impact of undertaking clinical psychiatry placements and how the experience coupled with psychiatry education in these final years of a medicine course can contribute to significantly better recognition in fourth and fifth year students.

Previous experience in dealing with problems similar to those described in the vignette, was also associated with better recognition, and although this finding was not significant, it was approaching significance (p=0.056). Students were not explicitly asked about the type or duration of their experience in dealing with people with mental illness, however this could be in the form of volunteering or work experience, helping family or friends or they may have gained exposure through practical placements as part of their course. The literature has also consistently reported that experience or exposure in dealing with someone who has a mental illness also results in improved mental health literacy **[15]**. Furthermore, studies have also found that history of personal contact with people with mental health issues is also associated with reduced stigma and improved attitudes towards people with mental illness **[31,32]**.

When interpreting these findings, it is also important to consider the socio-demographic characteristics of the person in the vignette and how these may impact and influence correct recognition. More specifically, factors such as gender, age and race/ethnicity **[33,34]** of the person depicted in the vignette have been found to influence recognition. Similarly, a vignette based study similarly found that patient characteristics and factors play a role in decision to provide self-management support among primary care physicians and nurses **[35]**. In the current study, the gender for all vignettes was male, and whilst ethnicity was not stipulated, nor was there specific reference to socio-economic indicators, future studies could benefit from incorporating such information in the vignette to see if such characteristics influence recognition.

Some limitations must be acknowledged in view of the current findings. The vignettes used describe classic symptoms of each of the five disorders but may not describe all symptoms or reflect real life cases. As the current sample are future medical professionals, further exploration of student's ability to recognize more complicated cases such as those with comorbidities, and those with prodromal or uncommon symptoms is recommended. The sample was also restricted to Singapore citizens and permanent residents and therefore the findings may not be generalizable to international medical students studying in Singapore. Finally, correct recognition was based on students correctly identifying one of five randomly assigned vignettes, describing someone with alcohol abuse, dementia, depression, OCD or schizophrenia. Future studies could assign multiple or all vignettes to the same student in order to gain a greater and more in depth understanding of recognition rates across disorders and how these may differ.

These limitations notwithstanding, the current study recruited a reasonable sample of medical students, whereby correct recognition was assessed across common mental illnesses. It adopted a similar protocol to that of a local national mental health literacy study **[12]** allowing for comparisons to be made between the general population as well as amongst a sample of nursing students **[17]**. Whilst overall recognition was high (81.7%), disorders such as schizophrenia were more poorly recognised (60%), highlighting the need for greater emphasis and increased awareness on such aspects given the severity of this mental illness. Furthermore predictors of correct recognition were also identified such as being female and having previous experience in dealing with mental health problems. Accordingly, gender-specific interventions should be considered while providing exposure or contact with people with mental illness would be beneficial to not only improve recognition and overall mental health literacy, but also in reducing stigma and improving attitudes towards people with mental illness **[32].**

The implications of medical student's mental health literacy are significant. Given that these students are the next generation of doctors, it is imperative that they are equipped with the skills and ability to recognise signs and symptoms of mental illness, especially given primary care providers are often the first professional help-seeking source for people with mental health problems **[19,22]**. Ongoing consideration should also be given to ensure medical school psychiatry education and curricula are routinely reviewed and updated in order to assist in the preparation of qualifying doctors to successfully recognise and manage common mental disorders **[36]** upon entering the workforce. Furthermore given that students in their final years of their degree (versus first year) were significantly better able to recognise mental disorders, this substantiates the importance of psychiatric clinical placements in terms of knowledge and recognition of such conditions.

As appropriate and timely help-seeking is associated with improved long-term outcomes for people with mental illness **[37]** it is fundamental that the future medical workforce gain knowledge and psychiatric exposure as part of their medical course, with the long term goal to improve outcomes for people with mental illness and ultimately the wider community at large. Furthermore, as recognition of schizophrenia was poorest and often mislabeled as other common mental illnesses, increased efforts are needed to better educate medical students, about specific signs and symptoms of individual mental disorders, so they can differentiate between these in future.

Competing Interests

The authors declare that they have no competing interests.

Acknowledgement

This research is supported by the Singapore Ministry of Health's National Medical Research Council under the Centre Grant Programme (Grant No.: NMRC/CG/004/2013).

Ethics approval

The study was approved by the National Healthcare Group Domain Specific Review Board and all participants provided written informed consent.

Author contributions

LP was responsible for writing the manuscript. ES was responsible for the study design, data analysis and provided inputs into the manuscript. BYC was responsible for the study design, and provided inputs into the manuscript. RM and SV provided inputs into data interpretation and edits to the manuscript. SAC and MS supervised the overall study and provided intellectual inputs on the manuscript.

Data sharing

Data are not available for online access; however, readers who wish to gain access to the data can write to the senior author Dr Mythily Subramaniam at mythily@imh.com.sg with their requests. Access can be granted subject to the Institutional Review Board (IRB) and the research collaborative agreement guidelines. This is a requirement mandated for this research study by our IRB and funders.

Table 1: Profile of medical students (N=502)

		n	%
Age Group	<21years	154	30.7
	≥21years	348	69.3
Gender	Male	207	41.2
	Female	295	58.8
Ethnicity	Chinese	467	93.0
	Non-Chinese	35	7.0
Academic Year	1st year	132	26.3
	2nd year	116	23.1
	3rd year	71	14.1
	4th year	87	17.3
	5th year	96	19.1
Interest in psychiatry prior to medical school	Yes	20	4.0
	No	482	96.0
Has experience dealing with someone having problems similar to "X"	Yes	127	25.3
	No	375	74.7
Has friends and family with problems similar to "X"	Yes	164	32.7
	No	338	67.3

Table 2: Percentage of medical students mentioning each category to describe the problem in the vignette

	Total (n=502)	Alcohol abuse (n=100)	Dementia (n=101)	Depression (n=100)	OCD (n=101)	Schizophrenia (n=100)
Recognition						
Correct recognition	81.7	89.0	79.2	93.0	87.1	60.0
Disorder specific symptoms	5.6	-	9.9	1.0	5.0	12.0
Other mental disorder- any anxiety disorder	2.2	1.0	1.0	-	3.0	6.0
Other mental disorder- depression	3.8	8.0	5.9	-	1.0	4.0
Other mental disorder- miscellaneous	3.0	1.0	1.0	1.0	2.0	10.0
Mental illness	1.4	-	1.0	2.0	1.0	3.0
Psychosocial stress	1.0	-	1.0	3.0	1.0	-
Not an illness	1.0	1.0	1.0	-	-	3.0
Not sure/ irrelevant response	0.4	-	-	-	-	2.0

Table 3: Predictors of correct recognition of mental disorders (N=502)

		OR	Lower	Upper	p-value
Age group	<21years	1.02	0.54	1.94	0.949
	≥21years	Ref.	-	-	-
Gender	Female	1.91	1.15	3.18	**0.013**
	Male	Ref.	-	-	-
Ethnicity	Chinese	Ref.	-	-	-
	Non-Chinese	0.55	0.23	1.34	0.188
Academic year	1st year	Ref.	-	-	-
	2nd year	1.15	0.61	2.16	0.672
	3rd year	1.70	0.72	4.03	0.228
	4th year	2.97	1.20	7.36	**0.019**
	5th year	6.52	2.24	19.03	**<0.001**
Interest in psychiatry prior to medical school	Yes	2.28	0.46	11.39	0.316
	No	Ref.	-	-	-
Vignette type	Depression	Ref.	-	-	-
	Dementia	0.28	0.11	0.73	**0.009**
	Alcohol abuse	0.58	0.20	1.64	0.301
	OCD	0.48	0.17	1.36	0.167
	Schizophrenia	0.09	0.04	0.23	**<0.001**
Experience dealing with someone similar to "X"	No	Ref.	-	-	-
	Yes	1.84	0.98	3.44	0.056
Has friends and family with problems similar to "X"	No	Ref.	-	-	-
	Yes	0.90	0.46	1.78	0.764

REFERENCES

1. Kessler RC, Angermeyer M, Anthony JC, DE Graaf R, Demyttenaere K, Gasquet I et al. Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organization's World Mental Health Survey Initiative. World Psychiatry. 2007;6:168-76.
2. Vigo D, Thornicroft G and Atun R. Estimating the true global burden of mental illness. Lancet Psychiatry 2016;3:171-178
3. Bloom, D.E., Cafiero, E.T., Jané-Llopis, E., Abrahams-Gessel, S., Bloom, L.R., Fathima, S., Feigl, A.B., Gaziano, T., Mowafi, M., Pandya, A., Prettner, K., Rosenberg, L., Seligman, B., Stein, A.Z., & Weinstein, C. (2011). The Global Economic Burden of Noncommunicable Diseases. Geneva: World Economic Forum
4. Thornicroft G. Physical health disparities and mental illness: the scandal of premature mortality. The British Journal of Psychiatry 2011; 199, 441–442
5. Prince, M., Patel, V., Saxena, S., Maj, M., Maselko, J., Phillips, M. R. & Rahman, A. No health without mental health. The Lancet, 2007;370, 859-877
6. Demyttenaere, K, Bruffaerts R, Posada-Villa J, Gasquet I, et al. Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. JAMA : the journal of the American Medical Association, 2004;291, 2581-90.
7. The Organisation for Economic Co-operation and Development (OECD) 2012. Sick on the Job? Myths and Realities about Mental Health and Work, OECD Publishing
8. Jorm AF. Mental Health Literacy: public knowledge and beliefs about mental disorders. British Journal of Psychiatry 2000;177, 396–401.
9. Hatzenbuehler ML, Phelan JC, Link BG. Stigma as a Fundamental Cause of Population Health Inequalities. American Journal of Public Health 2013; 103: 813-21
10. Jorm AF, Korten AE, Jacomb PA, Christensen H, Rodgers B, Pollitt P (1997). 'Mental health literacy': a survey of the public's ability to recognise mental disorders and their beliefs about the effectiveness of treatment. Medical Journal of Australia 166, 182–186.
11. Wang PS, Berglund P, Olfson M, Pincus HA, Wells KB, Kessler RC. Failure and delay in initial treatment contact after first onset of mental disorders in the National Comorbidity Survey Replication. Achieves of General Psychiatry 2005;62, 603–613.
12. Chong SA, Abdin E, Picco L, Pang S, Jeyagurunathan A, Vaingankar JA, Kwok KW, Subramaniam M. Mental Health Literacy among a multiracial population in South East Asia. *BMC Psychiatry 2016:* 16:121
13. Amarasuriya SD, Jorm AF, Reavley NJ. Quantifying and predicting depression literacy of undergraduates: a cross sectional study in Sri Lanka. BMC Psychiatry 2015;15:269
14. Furnham A, Cook R, Martin N, Batey M. Mental health literacy among university students, Journal of Public Mental Health, 2011;10:198 – 210
15. Lauber C, Ajdacic-Gross V, Fritschi N, Stulz N, Rössler W Mental health literacy in an educational elite – an online survey among university students *BMC Public Health* 2005, 5:44
16. Sahhar, D., & O'Connor, D. How well do Australian medical schools prepare general practitioners to care for patients with mental disorders? Australian Psychiatry, 2004;12, 26–30.
17. Chur-Hansen, A., Carr, J. E., Bundy, C., Sanchez-Sosa, J. J., Tapanya, S., & Wahass, S. H. An international perspective on behavioral science education in medical schools. *Journal of Clinical Psychology Medical Settings, 2008;15*, 45-53.
18. Kessler R and Stafford D (Ed) Collaborative Medicine Case Studies. 2008. Springer-Verlag New York

19. Bristow K, Edwards S, Funnel E et al: Help Seeking and Access to Primary Care for People from "Hard-to-Reach" Groups with Common Mental Health Problems. Int J Family Med. 2011; 1-10
20. Smith DJ, Griffiths E, Kelly M et al: Unrecognised bipolar disorder in primary care patients with depression. The British Journal of Psychiatry 2011; 199: 49-56
21. Bor, J.S., *Among the elderly, many mental illnesses go undiagnosed.* Health Aff (Millwood), 2015. 34(5):727-31.
22. Chong SA, Abdin E, Vaingankar JA, Heng D, Sherbourne C, Yap M, et al. A population-based survey of mental disorders in Singapore. Ann Acad Med Singapore. 2012;41:49–66.
23. Subramaniam M, Chong SA, Vaingankar JA, Abdin E, Chua BY, Chua HC, et al. Prevalence of dementia in people aged 60 years and above: results from the WiSE study. J Alzheimers Dis. 2015;45:1127–38.
24. Verma, S., et al., *Symptomatic and functional remission in patients with first-episode psychosis.* Acta Psychiatr Scand, 2012. 126: 282-9.
25. Seow E, Chua BY, Xie H, Wang J, Ong HL, Abdin E, Chong SA, Subramaniam M. Correct Recognition and Continuum Belief of Mental Disorders in a Nursing Student Population. BMC Psychiatry, submitted
26. Reavley NJ, Jorm AF. Recognition of mental disorders and beliefs about treatment and outcome: findings from an Australian National Survey of Mental Health Literacy and Stigma. Aust N Z J Psychiatry. 2011;45:947–56.
27. Gorczynski, P, Sims-Schouten, W, Hill, DM, Wilson, C. Examining mental health literacy, help seeking behaviours, and mental health outcomes in UK university students. The Journal of Mental Health Training, Education and Practice, 2017; 12: 2
28. Cotton SM, Wright A, Harris MG, Jorm AF, McGorry PD. Influence of gender on mental health literacy in young Australians. Australian and New Zealand Journal of Psychiatry 2006; 40:790–796
29. Burns J, Rapee R (2006) Adolescent mental health literacy: young people's knowledge of depression and help seeking. J Adolesc 29:225-239
30. Cotton S, Wright A, Harris M, Jorn A, McGorry P (2006) Influence of gender on mental health literacy in young Australians. Aust N Z J Psychiatry 40:790-796
31. Subramaniam M, Abdin E, Picco L, Pang S, Shafie S, Vaingankar JA, Kwok KW, Verma K and Chong SA. Stigma towards people with mental disorders and its components – a perspective from multi-ethnic Singapore. Epidemiology and Psychiatric Sciences 2016; 28:1-12
32. Evans-Lacko S, London J, Japhet S, Rüsch N, Flach C, Corker E, Henderson C, Thornicroft G. Mass social contact interventions and their effect on mental health related stigma and intended discrimination. BMC Public Health 2012;12, 489.
33. Hadjimina E and Furnham A. Influence of age and gender on mental health literacy of anxiety disorders. Psychiatry Research, 2017; 251:8-13
34. Morley C.P. The effects of patient characteristics on ADHA diagnosis and treatment: a factorial study of family physicians. BMC Family Practice, 2010;11:11
35. Bos-Touwen I.D, Trappenburg J.C.A, van der Wulp. I, Schuurmans M.J and de Wit. N.J. Patient factors that influence clinicians' decision making in self-management support: A clinical vignette study. Plos One 2017;12(2)
36. Thomas S, Pai N, Dawes K, Wilson C, Williams V. Updating medical school psychiatry curricula to meet projected mental health needs. Australasian Psychiatry 2013; 21(6) 578–582
37. McGorry PD, Purcell R, Hickie IB, Jorm AF. Investing in youth mental health is a best buy. Med J Aust. 2007;187:S5–7.

Vignettes used in this study

Alcohol abuse- XX (insert name) started drinking when he was a student. He was very popular at parties. By the time he had graduated and got married he was drinking heavily every weekend. This sometimes resulted in him getting into fights when he was out drinking. Although his wife insisted that he drank too much, XX argued that he was in control. But his work and appearance deteriorated so much that his supervisor began to suspect that he might be drinking on the job. A few months later he was involved in a serious car accident, where he crashed into two cars, seriously damaging them and his own car. The police who arrived at the scene of the accident did a breathalyzer test. The test turned out to be positive and so they took his blood for alcohol analysis. As his alcohol level was much higher than the legal limit he was charged with drunk driving.

Dementia- XX is 75 years old and retired. His wife has noticed that he has problems remembering things that happened recently but recalls things from earlier in their marriage quite well. He repeats questions which she has already answered, misplaces his things and occasionally gets confused during their conversations. Sometimes XX and his wife quarrel as he accuses her of taking his things. He lost his way once or twice whilst driving to their son's home, and has written some cheques for the wrong amount when paying bills. When his wife points out these problems to XX, he loses his temper. He does not think he has a problem.

Depression- XX is 30 years old. He has been feeling unusually sad and miserable for the last three weeks. Friends noticed he is no longer his usual cheerful self and he has declined all social gatherings over the past two weeks. Even though he is tired all the time, he has trouble sleeping almost every night. XX doesn't feel like eating and has lost weight. He can't focus on his work and puts off making decisions. XX feels worthless and even everyday tasks seem too much for him. This has come to the attention of his boss, who is concerned about XX's poor work performance.

OCD- XX (insert name) is 37 years old and each day he spends 4 hours washing his hands. He usually takes one shower a day but he spends 60–90 min in the shower. When XX washes his hair he keeps the shampoo in his hair until he has counted to 100 to ensure that his head and hair are clean enough and free of contaminants, such as germs. XX also repeatedly cleans things he touches, including dishes, clothes, furniture, and doorknobs. XX feels extremely anxious if he does not wash his hands or cleans things he touches and finds it difficult to stop himself from doing these things.

Schizophrenia- XX (insert name) is 44 years old. He is staying in a 1-room HDB rental flat. He has not worked for years. He wears the same clothes every day and has left his hair to grow long and untidy. He is always on his own and is often seen sitting in the park talking to himself. Sometimes he stands and moves his hands as if to communicate to someone in nearby trees. He rarely drinks alcohol. At times he accuses shopkeepers of giving information about him to other people. He has put extra locks on his door. He says spies are watching him all the time. His neighbors complain that he does not clean his room which is becoming increasingly dirty and is filled with glass objects. XX says he is using these "to receive messages from space".

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **Page 1**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **Page 1**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **Page 2-3**
Objectives	3	State specific objectives, including any prespecified hypotheses **Page 3**
Methods		
Study design	4	Present key elements of study design early in the paper **Page 4**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **Page 4**
Participants	6	*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants **Page 3- 4**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **Page 4**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **Page 4**
Bias	9	Describe any efforts to address potential sources of bias **NA**
Study size	10	Explain how the study size was arrived at **NA**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why **5**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **Page 5**
		(*b*) Describe any methods used to examine subgroups and interactions **Page 5**
		(*c*) Explain how missing data were addressed **NA**
		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy **NA**
		(*e*) Describe any sensitivity analyses **NA**
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **NA**
		(b) Give reasons for non-participation at each stage **NA**
		(c) Consider use of a flow diagram **NA**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **Page 5**
		(b) Indicate number of participants with missing data for each variable of interest **NA**
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount) **NA**
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time **NA**

		Case-control study—Report numbers in each exposure category, or summary measures of exposure **NA**
		Cross-sectional study—Report numbers of outcome events or summary measures **NA**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **Page 5**
		(*b*) Report category boundaries when continuous variables were categorized **NA**
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period **NA**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **NA**
Discussion		
Key results	18	Summarise key results with reference to study objectives **Page 5-8**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **Page 8**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **8-9**
Generalisability	21	Discuss the generalisability (external validity) of the study results **8-9**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based **Page 9**

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.