BMJ Open

Common Mental Disorders among Women in Rural Western India: association with self-perceived health status, healthcare utilization, and care related costs.

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010834
Article Type:	Research
Date Submitted by the Author:	14-Dec-2015
Complete List of Authors:	Soni, Apurv; University of Massachusetts Medical School, Quantitative Health Sciences / School of Medicine Fahey, Nisha; Des Moines University, College of Osteopathic Medicine Byatt, Nancy; University of Massachusetts Medical School Prabhakaran, Anusha; Pramukhsawmi Medical College Moore Simas, Tiffany; University of Massachusetts Medical School Vankar, Jagdish; Pramukhsawmi Medical College Phatak, Ajay; Pramukhsawmi Medical College O'Keefe, Eileen; Boston University Allison, Jeroan; University of Massachusetts Medical School Nimbalkar, Somashekhar; Pramukhsawmi Medical College
Primary Subject Heading:	Global health
Secondary Subject Heading:	Mental health, Public health, Health policy, Epidemiology
Keywords:	MENTAL HEALTH, PUBLIC HEALTH, EPIDEMIOLOGY

Common Mental Disorders among Women in Rural Western India: association with self-perceived health status, healthcare utilization, and care related costs.

Apurv Soni [a], Nisha Fahey [b], Nancy Byatt [a], Anusha Prabhakaran[c], Tiffany Moore Simas [a], Jagdish Vankar[c], Ajay Phatak[c], Eileen O'Keefe [d], Jeroan Allison [a], Somashekhar Nimbalkar[c]

Affiliations: [a] University of Massachusetts Medical School, Worcester, Massachusetts; [b] Des Moines University, Des Moines, Iowa; [c] Pramukhswami Medical College, Gujarat, India; [d] Boston University, Boston, Massachusetts.

Address Correspondence: Apurv Soni, Clinical and Population Health Research, AS7.1064, 55 Lake Avenue N, Worcester, Massachusetts, 01605, Apurv.Soni@umassmed.edu, 508-856-8956

Keywords: Common Mental Disorders, Health Status, Healthcare Expenditure Healthcare Behavior, Rural India, Reproductive-aged Women.

Word Count: 2,910

References: 40

ABSTRACT

Objectives
To determine the prevalence of common mental disorders (CMD) and characterize its association with self-reported health status, healthcare utilization in the previous year, and portion of yearly household income spent on healthcare costs among women from rural western India based on a representative, cross-sectional survey.

Setting
Surveys were conducted in the waiting area of various outpatient clinics at a tertiary care hospital and in 16 rural villages in the Anand district of Gujarat, India.

Participants
700 Gujarat-speaking women between the ages of 18-45 years who resided in the Anand district of Gujarat, India were surveyed in a quasi-randomized manner. Data from 658 were used in this analysis; 19 surveys were excluded due to incompleteness, 18 participants were excluded because they were visiting hospitalized patients, and five surveys were classified as outliers.

Primary and secondary outcomes measures
Association of CMD with 1) number of healthcare visits in the prior year; 2) self-reported health status; and 3) portion of yearly income expended on healthcare.

Results
Overall, 155 (22·8%) participants screened positive for CMD with most (81.9%) not previously diagnosed despite contact with healthcare provider in the prior year. On adjusted analyses, positive screening for CMD was associated with worse category in self-reported health status (cumulative OR= 9.39; 95% CI: 5·97-14·76), higher portion of household income expended on healthcare (cumulative OR = 2·31; 95% CL: 1·52-3.52), and increased healthcare visits in the prior year (Incidence Rate Ratio = 1·24; 95% CI: 1·07-1·44).

Conclusions
The high prevalence of CMD among rural women in India that is undiagnosed and associated with adverse health and financial indicators highlights the individual and public health burden of CMD. There is a need for innovative programs that leverage technology and care management to overcome limited mental health resources.

Keywords: Common Mental Disorders, Health Status, Healthcare Expenditure Healthcare Behavior, Rural India, Reproductive-aged Women.

Strengths and limitations of this study

- Our novel dataset contains information about health status and healthcare of reproductive-aged women in rural Indian, an underserved and understudied population.
- This is the first study to report the association of common mental disorders (CMD) with self-reported health status, healthcare expenditure, and healthcare utilization among women in rural India.
- The multivariable negative binomial and ordinal logistic regression allowed robust estimation of disease-adjusted association, which preserved the data structure of self-reported measures.
- We are limited by our cross-section study design that limits causal interpretation. However, identification of the associations between vulnerable CMD positive women and healthcare related expenditure holds significance in the context of a system where the majority of healthcare costs are out of pocket.

INTRODUCTION

Depression is the leading cause of total years lived with disability globally. [1,2] In developed countries, depression has been associated with lower health status, increased ambulatory and emergency hospital visits, loss in productivity, and greater healthcare costs.[3,4] Despite recent estimates suggesting that low and middle-income countries (LMIC) experience over 80% of the worldwide burden attributed to depression,[1,5] there is disproportionately limited data regarding consequences from these countries. Within LMIC, further disparities exist such that regions with a relatively greater burden of common mental disorders (CMD) remain understudied.

While there is a higher prevalence of CMD among women living in rural, patriarchal regions outside of southern India,[6] the majority of mental health studies in India are conducted in urban settings, south India, or in the comparatively progressive state of Goa.[7,8] The western state of Gujarat experiences a greater prevalence of CMD in comparison to Goa and South India; additionally, there are reports of tremendous stigma against mental disorders among community members as well as healthcare providers.[9–12] This stigma could make detection of CMD less likely and exacerbate its consequences. Because healthcare priorities are often dictated by disease burden and its impact on individuals and their communities, information about CMD prevalence and its associated healthcare outcomes is necessary to guide prioritization of mental health programs.

The goal of this study was to determine the prevalence of CMD and characterize its association with self-reported health status, healthcare utilization in the previous year, and portion of yearly household income spent on healthcare costs among women from rural western India based on a representative, cross-sectional survey.

METHODS

Setting and Study Design: Data was collected through a cross-sectional survey among women currently living in rural settings in the Anand district of Gujarat, India. Trained interviewers conducted face-to-face surveys in Gujarati, the local language. Seven-hundred eligible women between the ages of 18-45 years, that could comprehend and speak Gujarati, and had a rural residence within the Anand district, consented and participated in the study. Participants were recruited from two different settings: 1) Shree Krishna Hospital, a tertiary care center serving the local rural population; and 2) 16 villages within a 20-kilometer radius from the hospital. In the hospital clinic waiting areas, participants were quasi-randomly selected with interviewers by approaching every third woman in the outpatient waiting area. Interviews were conducted in the waiting area but away from participants' family members and other patients in the clinic. Prior to recruitment in the villages, the layout of each village was obtained. Every third household in each of the village's colonies was approached and the first female who encountered the interviewer was asked to participate in the study. Community interviews were conducted at participants' residences. In both settings, two research supervisors, a male and a female, ensured privacy of all participants. The data collection was funded by an institutional travel grant by Boston University. Boston University Institutional Review Board and the Human Research Ethics Committee of HM Patel Center for Medical Care and Education reviewed the study independently and approved it.

Data Collection: The study survey was drafted in English and underwent two iterations of translation back and forth between Gujarati and English. The survey was comprised of 150 items total and was divided into five modules: a) health status, b) current and past medical history, c) lifestyle choices, d) healthcare seeking behavior, and e) affordability of healthcare. Five trained

female interviewers conducted all interviews from October 1 – October 13, 2011. An average survey lasted 20-30 minutes. Of the 700 participants interviewed for the study, data from 658 were used in this analysis; 19 surveys were excluded due to incompleteness, 18 participants were excluded because they were visiting hospitalized relatives, and five surveys were classified as outliers due to their healthcare behavior (these participants had more than 20 clinical visits in the previous year due to serious health conditions).

Data Variables: The outcome of CMD was determined using the World Health Organization (WHO) Self-Reporting Questionnaire (SRQ-20).[13] SRQ-20 demonstrated excellent internal reliability in our population as measured by the Kuder Richardson 20 score of 0.90. Similar to prior studies, participants who responded 'yes' to eight or more questions were considered as screening positive for CMD.[14]

Number of healthcare visits in the previous year was determined by participant self-report. Health status was assessed by using the first question from the SF-12 instrument: "*In general, would you say your health is"*; possible choices were (a) Excellent, (b) Very Good, (c) Good, (d) Fair, or (e) Poor. Expenditure of household income on healthcare was measured by asking participants, "What most closely estimates the portion of your yearly household income spent on healthcare?" with choices offered as (a) none, (b) less than ¼, (c) ¼ to less than ½, (d) ½ to ¾, or (e) more than ¾. Potential associations between CMD and healthcare utilization, self-reported health status, and expenditure on healthcare can be confounded by the presence of other diseases, age, marital status, income, and education level. Therefore, these factors were adjusted using multivariable methods. Disease burden was based on self-report of current conditions or past diagnoses of chronic diseases excluding any mental health disorders (see footnotes in Table 1 for more details). Disease burden was estimated as an aggregate grouped into four categories: no

disease, one disease, two diseases, and three or more diseases. Education of participants was categorized as < 7th grade, 7th grade- 12th grade, or > 12th grade. As described elsewhere,[15] monthly household income was transformed into income/person/day values to account for variation in the household size. Daily per capita income was subsequently converted to US dollars using the average currency exchange rate from 2011, the year the study was conducted and categorized into three levels (< $0.25, $0.25-$1.25, >$1.25).

Statistical Analyses: Descriptive data analyses were performed to assess the distribution of potential confounders with respect to CMD. Frequencies and percentages were calculated for categorical variables; associations with CMD were assessed using chi-square test for independence of attributes or Fischer's exact test. Bivariate association of age and number of visits to clinic in the previous year was assessed using a one-way analysis of variance test. Ordered logistic regression analyses were used to quantify the relationship of positive CMD screen with health status and household income spent on healthcare. Few participants reported poor health status; therefore, we grouped self-reported fair and poor health status. Similarly, few participants reported spending none or >3/4 of their household income on healthcare and therefore they were grouped with adjacent categories. Violation of parallel regression assumptions were ruled out using Brant test for health status (χ^2 = 29.76, df = 22; p = 0·67) and income spent on healthcare outcomes (χ^2 = 9·37, df = 22; p = 0·67). The association of CMD and number healthcare visits in the previous year was evaluated using negative binomial regression modeling. A negative binomial model was selected over Poisson to account for the over dispersion in the outcome (α=0·23; χ^2= 150.05, p < 0·001); improvement of model fit using zero inflated negative binomial regression was tested and ruled out using vuong test (z = 0·42, p = 0·34). Unadjusted and adjusted incidence rate ratios (IRR) were calculated and interpreted as a

count multiplier for the number of healthcare visits in the previous year. All three models adjusted for number of co-morbid conditions, age, income, education, and marital status.

RESULTS

Using the SRQ-20 to assess presence of CMD, 155 (22.8%) participants screened positive having answered yes to at least eight of 20 questions. On average, participants visited a healthcare provider more than three times in the previous year. The majority of the respondents considered their health status less than very good (i.e.; good or fair/poor), and over 60% reported spending less than a quarter of their yearly income on healthcare.

Table 1 presents characteristics of participants who screened positive for CMD compared with participants screening negative. Increased levels of education and household income were associated with decreased likelihood of screening positive for CMD. More than four out of every five (81·3%) respondents who screened positive for CMD did not report a diagnosis of depression or other mental health disorder even though all but four of these women reported visiting a healthcare provider at least once in the past year (results not shown).

Table 1: Sociodemographic and health characteristics of 658 reproductive-aged women from rural western India stratified by Common Mental Disorder screening status.

	Total	CMD Screening (col %)		
	N	Positive	Negative	p
Participants (N)	658	155	503	
# Clinic Visits[a] (mean(sd))	3.6 (2.8)	3.2(2.5)	4.6(3.5)	0.001[#]
Health Status				
Excellent	166	1.3	32.6	<0.001[*]
Very Good	95	3.9	17.7	
Good	249	34.8	38.8	
Fair/Poor	148	60.0	10.9	
HHI Spent on Healthcare[b]				
Less than 1/4	403	36.8	68.9	<0.001
1/4 to 1/2	184	38.0	24.9	
More than 1/2	70	25.2	6.2	
# Diseases or Conditions[c]				
Zero	221	3.9	42.2	<0.001[*]
One	155	17.4	25.8	
Two	148	28.4	20.9	
Three or more	134	50.3	11.1	
Current Depression				
Yes	34	18.7	1.0	N/A
Age (years)				
18-25	226	28.6	36.3	0.18
26-35	249	39.6	37.5	
36-45	181	31.8	26.3	
Education				
< 7th Grade	162	34.8	21.6	<0.001
7th - 12th Grade	356	55.5	53.9	
> 12th Grade	138	9.7	24.5	
Marital Status				
Single	97	8.4	16.7	0.03[*]
Married	541	88.3	80.5	
Divorced or Widowed	19	3.3	2.8	
Daily Income Per Person				
< $0.25	49	13.5	5.9	0.01
$0.25-1.25	369	56.1	58.6	
>$1.25	218	30.4	35.5	

a: Number of clinic visits in the previous year based on self-report

b: Portion of yearly household-income spent on healthcare expenditure
c: Participants were asked to identify using a list of 33 non-psychiatric conditions and diseases. 22 conditions and diseases reported at least once by any participant; these were reviewed by trained clinicians to identify chronic conditions. Based on the review, an aggregate variable to represent chronic disease burden was generated; it comprised of cardiovascular problems (coronary heart disease, hypertension, positive history of heart attack or related condition), pulmonary problems (difficulty breathing, chronic allergies, asthma, or chronic bronchitis), musculoskeletal pain (chronic back problems, arthritis, difficulty opening mouth, or limited mobility due to pain), toothaches, anemia, and diabetes.
* Fischer's Exact Test; #ANOVA

The adjusted association between CMD status and health status as well as portion of household income spent on healthcare is presented in Table 2. After controlling for confounders, screening positive for CMD was associated with more than an eight-fold increase in the cumulative odds of reporting a worse health status (cumulative OR (cumOR)= 9.39; 95% CI: 5.97-14.76) and a two-fold increase in the cumulative odds of reporting a higher category of income expenditure on healthcare (cumOR = 2.31; 95% CL: 1·38-3·06). Increasing number of comorbid non-psychiatric conditions were associated with self-report of lower health-status and greater portion of income spent on healthcare. In comparison to participants with no comorbid non-psychiatric conditions, participants who reported 3 or more had more than twice the cumulative odds of reporting a poorer health status (cumOR = 2·61; 95% CL: 1·60-4.24) and more than three times greater cumulative odds of spending a higher portion of their yearly income on healthcare (OR = 3.46; 95% CL 2.05 – 5.84).

Table 2: Ordinal Logistic Regression Models for the Association between Common Mental Disorder (CMD) and a) Self-Reported Health Status and b) Yearly Income Spent on Healthcare		
	Self-Reported Health Status[a]	**Yearly Income spent on healthcare**[b]
	CumOR (95% CL)*	CumOR (95% CL)*
CMD Screen: Negative (ref)		
Positive (SRQ-20 ≥ 8)	9.39 (5.97-14.76)	2.31 (1.52-3.52)
Disease or Conditions: Zero (ref)		
One	1.19 (0.80-1.77)	1.26 (0.76-2.07)
Two	1.64 (1.08-2.47)	3.07 (1.90-4.96)
Three or More	2.61 (1.60-4.24)	3.46 (2.05-5.84)
Ordered categories: a= Excellent, Very Good, Good, Fair/Poor; b = <1/4 , 1/4-1/2, > 1/2 *CumOR: Cumulative odds ratio also adjusted for age, income, education, and marital status.		

Results from negative binomial regression models are reported in Table 3. Before adjusting for confounding, CMD status was associated with a 40% increase in the number of clinical visits in the previous year (IRR = 1·42; 95% CI: 1·25-1·61). Participants who reported experiencing multiple non-psychiatric comorbidities were also more likely to have greater number of clinic visits in the previous year (two diseases: IRR = 1·27 [1·07-1·50]; three or more diseases: IRR = 1·44 [1·25-1·65]).

Table 3: Multivariable negative binomial regression model estimates of count multiplier (IRR [a]) for number of clinical visits in the previous year.

	unadjusted	adjusted* (n=632)
	IRR (95% CL)	IRR (95% CL)
CMD: Negative (ref)		
Positive	1.41 (1.24-1.60)	1.24 (1.07-1.44)
Comorbid Conidtions: None (ref)		
1	1.10 (0.94-1.28)	1.11 (0.95-1.29)
2	1.25 (1.07-1.46)	1.18 (1.00-1.39)
3 or more	1.47 (1.26-1.72)	1.27 (1.06-1.52)

a: IRR = incidence rate ratio is calculated by exponentiating beta co-efficients of count models. IRR can be interpreted as count multipliers. For example, screening positive for CMD is associated with a 42% increase in the number of clinical visits in the previous in comparison to those who do not screen positive (unadjusted estimates)
*Also adjusted for education, age, income, and marital status

DISCUSSION

In this sample of reproductive-aged women from rural western India, approximately one out of every four participants screened positive for CMD. Despite visiting a healthcare provider at least once in the previous year, the majority did not report a diagnosis of depression or other mental health disorder. Positive CMD status was associated with an increased number of healthcare visits, worse self-reported health status, and higher portion of household income expended on healthcare. Together, these findings underscore significant negative outcomes associated with CMD experienced by women of reproductive age from rural western India.

Our high prevalence of undiagnosed CMD (81·3%) is similar to the 79.0% depression prevalence reported by Kohli et al for primary care attendees from another rural region in India.[16] The high rates are likely to be driven by two main factors. First, compared to western societies, people in India are more likely to attribute mental illness to personally controllable factors and thus mental health in rural India is associated with a tremendous amount of stigma

and social disadvantage.[9,17] Consequently, Indians may be less willing to disclose psychological symptoms. Indeed, studies have shown that most Indian patients suffering from mental disease present with somatic symptoms, which may increase the likelihood that CMD goes undetected.[18–20] Second, there is a scarcity of mental healthcare providers in India and other healthcare providers do not receive adequate mental health training.[21] Thus, in primary care settings mental illness may not be considered in the differential diagnoses, especially in the context of an atypical presentation, leading to inadequate identification of mental diseases.[22]

In addition to documenting a high prevalence of undiagnosed CMD, we also found that CMD was associated with worse self-reported health. The association of CMD with worse self-reported health was more than three times the magnitude of the association of CMD with two or more non-psychiatric co-morbidities. By comparison, Moussavi et al found that depression produced equal health decrement as having two non-psychiatric conditions concurrently.[23] This disparity reveals suggests that CMD may have a greater impact on the health of an individual than to non-psychiatric conditions among women in this community. Poor appraisal of personal health could lead to a greater healthcare utilization which can increase healthcare expenditure in India where the majority of the healthcare costs are out of pocket.[15,24]

Our findings suggest that women with CMD visited their providers more frequently and were more likely to spend a larger portion of their household income on healthcare. The association between CMD and healthcare cost also could be self-perpetuating. Women may present to primary clinics with somatic rather than psychological symptoms, which may lead to under-diagnosis and treatment of CMD. Patients and their medical providers may continue to search

for a physical cause, incurring healthcare costs and a greater number of healthcare visits, while the underlying mental illness remains undiagnosed and unaddressed.[22,25]

Due to healthcare related costs, 63 million people in India fall below the poverty line every year.[26] This is expected to rise given the inevitable increase in the prevalence of chronic, non-communicable diseases in India, which carry a greater financial burden than communicable diseases.[27,28] Treating CMD with pharmacological and psychological therapies has been shown to reduce the economic burden of healthcare among adults. Thus, treatment of mental illness could break this vicious cycle of poverty and CMD. The Indian government recently proposed to revamp its mental health services through the National Mental Health Policy of India (NMHPI). NMHPI proposes to increase the number of mental healthcare providers and expand coverage from 182 to 648 districts and support 11 centers of excellence in mental health to train the next generation's mental healthcare providers.[29] Despite the laudable NMHPI proposal, the urgent needs of rural Indian women may continue to go unaddressed because the proposal may be difficult to implement due to lack of funding and a cohesive implementation plan.[30]

Integration of mental healthcare into primary care could provide a solution because women suffering from mental illness most often present to primary care settings.[31,32] Depression screening needs to be done in conjunction with a systematic approach to ensuring adequate access to mental health assessment and care.[33] It is well-established that integrated care models, such as collaborative care, effectively integrate depression and primary care and improve clinical outcomes.[34] Such approaches have also been tested in India; Patel and colleagues tested a collaborative stepped care (CSC) model that included four levels of referral before a clinical specialist became involved in care.[35] The CSC model begins with CMD screening for adult

patients that present to clinic with a village health worker, and progresses through therapeutic steps of increasing intensity including Yoga, behavioral, and pharmacologic interventions. Patients who do not respond to a less intense treatment are stepped up to a higher intensity therapeutic option. The CSC model improves in mental illness over a 6-month period and holds promise as an effective mechanism to improve mental health in rural India.[36] However, the wide implementation of the CSC model in India is lacking and has been limited to Goa and South India, two regions in India that face a comparatively lower burden of mental diseases.[37,38] Despite treatment success, many collaborative care models depend on care management facets that are not reliably reimbursed and therefore their broad implementation, dissemination, and associated treatment improvement are not realized.[39] The term "voltage drop" has been used to describe the less robust results found when collaborative care approaches are implemented in low resource real-world settings.[40] Thus, there is need for cost-effective treatment plans that leverage primary care providers and staff already working in the primary care setting.

The findings from our study must be interpreted in the context of its limitations. We identified CMD status using a validated questionnaire instead of a structured clinical interview. Our data was collected through a cross-sectional survey and thus we cannot comment on the causal relationship of our findings. Presence of comorbidities among our participants was captured through self-report and therefore is vulnerable to differential recall with CMD positive women potentially over-reporting their conditions. However, such misclassification would likely bias our estimates toward the null hypotheses. Our estimates of household expenditure on healthcare was based on a single question and had broad categories and therefore may lack precision; however,

in the context of rural Gujarat, this instrument provides information about healthcare costs that is difficult to capture and not available in other databases.[32]

In conclusion, we found a high burden of CMD among women in rural India that is undiagnosed and is associated with adverse impacts on overall health and economic well-being. Our findings suggest that there is need to screen, assess, and manage CMD in primary healthcare and community-based settings in India. This could, in turn, improve overall health status and reduce healthcare related economic burden.

Contributors' Statement:

Apurv Soni: Soni conceptualized, designed, and implemented the study in India. Soni carried out the initial analyses, drafted the initial manuscript, and approved the final manuscript as submitted.

Nisha Fahey: Fahey conceptualized, designed, and implemented the study in India. Fahey provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Nancy Byatt: Byatt provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Anusha Prabhakaran: Prabhakaran provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Tiffany Moore Simas: Moore Simas provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Jagdish Vankar: Vankar provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Ajay Phatak: Phatak conceptualized, designed, and implemented the study in India. Phatak provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Eileen O'Keefe: O'Keefe conceptualized and designed the study. O'Keefe provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Jeroan Allison: Allison provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Somashekhar Nimbalkar: Nimbalkar conceptualized, designed, and implemented the study in India. Nimbalkar provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Competing Interests: I have read and understood the BMJ Group policy on declaration of interests and declare the following interests: None

Data sharing statement: No additional data are available

References

1 Whiteford HA, Degenhardt L, Rehm J, *et al.* Global burden of disease attributable to mental and substance use disorders: Findings from the Global Burden of Disease Study 2010. *Lancet* 2013;**382**:1575–86. doi:10.1016/S0140-6736(13)61611-6

2 Murray CJL, Lopez A. A comprehensive assessment of mortality and disability from disease, injures and risk factors in 1990 and projected to 2020. In: *The Global Burden of Disease*. 1996. 1–51. doi:10.1186/1471-2458-13-863

3 Druss BG, Walker ER. Mental disorders and medical comorbidity. *Synth Proj Res Synth Rep* 2011;:1–26.

4 Egede LE. Major depression in individuals with chronic medical disorders: prevalence, correlates and association with health resource utilization, lost productivity and functional disability. *Gen Hosp Psychiatry* 2007;**29**:409–16. doi:10.1016/j.genhosppsych.2007.06.002

5 Chan M. Mental Health and Development: Targeting People with Mental Health Conditions as a Vulnerable Group. 2010.

6 Ganguli HC. Epidemiological findings on prevalence of mental disorders in India. *Indian J Psychiatry* 2000;**42**:14–

7 Shidhaye R, Patel V. Association of socio-economic, gender and health factors with common mental disorders in women: a population-based study of 5703 married rural women in India. *Int J Epidemiol* 2010;**39**:1510–21. doi:10.1093/ije/dyq179

8 Patel V, Ramasundarahettige C, Vijayakumar L, *et al.* Suicide mortality in India : a nationally representative survey. *Lancet* 2012;**379**:2343–51. doi:10.1016/S0140-6736(12)60606-0

9 Liu MC, Tirth S, Appasani R, *et al.* Knowledge and Attitudes Toward Depression Among Community Members in Rural Gujarat, India. *J Nerv Ment Dis* 2014;**202**:813–21. doi:10.1097/NMD.0000000000000199

10 Amin G, Shah S, Vankar GK. The prevelance and recognition of depression in primary care. *Indian J Psychiatry* 1998;**40**:364–9.

11 Saddichha S, Vibha P, Saxena MK, *et al.* Behavioral emergencies in India: A population based epidemiological study. *Soc Psychiatry Psychiatr Epidemiol* 2010;**45**:589–93. doi:10.1007/s00127-009-0103-8

12 Almanzar S, Shah N, Vithalani S, *et al.* Knowledge of and attitudes toward clinical depression among health providers in gujarat, India. *Ann Glob Heal* 2014;**80**:89–95. doi:10.1016/j.aogh.2014.04.001

13 World Health Organization. A user's guide to the Self Reporting Questionnaire. *Geneva World Heal Organ* Published Online First: 1994.http://www.missions-acf.org/kitemergency/EN/5. ACF-Paris Toolbox/5.8 MHCP/04 - Other Tools/01 - Mental Health Scales/04 - SRQ_WHO.pdf (accessed 28 May2014).

14 Harpham T, Reichenheim M, Oser R, *et al.* Measuring mental health in a cost-effective manner. *Health Policy Plan* 2003;**18**:344–9. doi:10.1093/heapol/czg041

15 Soni A, Fahey N, Phatak AG, *et al.* Differential in healthcare seeking behavior of mothers for themselves versus their children in rural India: Results of a cross sectional survey. *Int Public Heal J* 2014;**6**:57–66.

16 Kohli C, Kishore J, Agarwal P, *et al.* Prevalence of unrecognised depression among outpatient department attendees of a rural hospital in delhi, India. *J Clin Diagn Res* 2013;**7**:1921–5. doi:10.7860/JCDR/2013/6449.3358

17 Nieuwsma JA, Pepper CM, Maack DJ, *et al.* Indigenous perspectives on depression in rural regions of India and the United States. Transcult. Psychiatry. 2011;**48**:539–68. doi:10.1177/1363461511419274

18 Pereira B, Andrew G, Pednekar S, *et al.* The explanatory models of depression in low income countries: listening to women in India. *J Affect Disord* 2007;**102**:209–18. doi:10.1016/j.jad.2006.09.025

19 Andrew G, Cohen A, Salgaonkar S, *et al.* The explanatory models of depression and anxiety in primary care: a qualitative study from India. BMC Res. Notes. 2012;**5**:499. doi:10.1186/1756-0500-5-499

20 Nambi SK, Prasad J, Singh D, *et al.* Explanatory models and common mental disorders among patients with unexplained somatic symptoms attending a primary care facility in Tamil Nadu. *Natl Med J India* 2002;**15**:331–5.http://www.ncbi.nlm.nih.gov/pubmed/12540066

21 WHO-AIMS report on Mental Health System in Gujarat, India. 2006. https://www.mindbank.info/item/4531 (accessed 31 May2015).

22 Paykel ES, Priest RG. Recognition and management of depression in general practice: consensus statement. *BMJ Br Med J* 1992;**305**:1198–202.

23 Moussavi S, Chatterji S, Verdes E, *et al.* Depression, chronic diseases, and decrements in health: results from the World Health Surveys. *Lancet* 2007;**370**:851–8. doi:10.1016/S0140-6736(07)61415-9

24 Roy K, Howard DH. Equity in out-of-pocket payments for hospital care: Evidence from India. *Health Policy (New York)* 2007;**80**:297–307. doi:10.1016/j.healthpol.2006.03.012

25 Linden M, Lecrubier Y, Bellantuono C, *et al.* The prescribing of psychotropic drugs by primary care physicians: an international collaborative study. *J Clin Psychopharmacol*

1999;**19**:132–40.http://www.ncbi.nlm.nih.gov/pubmed/10211914

26 National Health Policy 2015 :: Ministry of Health and Family Welfare. http://www.mohfw.nic.in/showfile.php?lid=3014 (accessed 22 Oct2015).

27 Berman P, Ahuja R, Bhandari L. The Impoverishing Effect of Healthcare Payments in India: New Methodology and Findings. *Econ Polit Wkly* 2010;**xlv**:65–71.

28 Binnendijk E, Koren R, Dror DM. Can the rural poor in India afford to treat non-communicable diseases. *Trop Med Int Health* 2012;**17**:1376–85. doi:10.1111/j.1365-3156.2012.03070.x

29 Sinha S, Kaur J. National mental health programme: Manpower development scheme of eleventh five-year plan. Indian J. Psychiatry. 2011;**53**:261. doi:10.4103/0019-5545.86821

30 Sharma DC. India's new policy aims to close gaps in mental health care. Lancet. 2014;**384**:1564.http://www.scopus.com/inward/record.url?eid=2-s2.0-84924954548&partnerID=tZOtx3y1

31 Das J, Do Q-T, Friedman J, *et al.* Mental Health Patterns and Consequences: Results from Survey Data in Five Developing Countries. *World Bank Econ Rev* 2008;**23**:31–55. doi:10.1093/wber/lhn010

32 Patel V, Chisholm D, Kirkwood BR, *et al.* Prioritizing health problems in women in developing countries: comparing the financial burden of reproductive tract infections, anaemia and depressive disorders in a community survey in India. *Trop Med Int Health* 2007;**12**:130–9. doi:10.1111/j.1365-3156.2006.01756.x

33 Kagee A, Tsai AC, Lund C, *et al.* Screening for common mental disorders in low resource settings: reasons for caution and a way forward. *Int Health* 2013;**5**:11–4. doi:10.1093/inthealth/ihs004

34 Woltmann E, Grogan-Kaylor A, Perron B, *et al.* Comparative effectiveness of collaborative chronic care models for mental health conditions across primary, specialty, and behavioral health care settings: systematic review and meta-analysis. *Am J Psychiatry* 2012;:790–804.

35 Patel VH, Kirkwood BR, Pednekar S, *et al.* Improving the outcomes of primary care attenders with common mental disorders in developing countries: a cluster randomized controlled trial of a collaborative stepped care intervention in Goa, India. *Trials* 2008;**9**:4. doi:10.1186/1745-6215-9-4

36 Patel V, Weiss H a., Chowdhary N, *et al.* Effectiveness of an intervention led by lay health counsellors for depressive and anxiety disorders in primary care in Goa, India (MANAS): A cluster randomised controlled trial. *Lancet* 2010;**376**:2086–95. doi:10.1016/S0140-6736(10)61508-5

37 Singla D, Lazarus A, Atif N, *et al.* 'Someone like us': delivering maternal mental health through peers in two South Asian contexts. *J Affect Disord* 2014;**168**:452–8. doi:10.1016/j.jad.2014.07.017

38 Patel V, Kirkwood BR, Pednekar S, *et al.* Gender disadvantage and reproductive health risk factors for common mental disorders in women: a community survey in India. *Arch Gen Psychiatry* 2006;**63**:404–13. doi:10.1001/archpsyc.63.4.404

39 Bachman J, Pincus H, Houtsinger J, *et al.* Funding mechanisms for depression care management: opportunities and challenges. *Gen Hosp Psychiatry* 2006;:278–88.

40 Eisenberg J, Power E. Transforming insurance coverage into quality health care: voltage drops from potential to delivered quality. *JAMA* 2000;:210.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional 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 2: ABSTRACT (Methods)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found Page 2: ABSTRACT (Methods and Results)
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Page 3: INTRODUCTION (1st and 2nd Paragraph)
Objectives	3	State specific objectives, including any prespecified hypotheses Page 3: INTRODUCTION (3rd Paragraph)
Methods		
Study design	4	Present key elements of study design early in the paper Page 4: METHODS (Setting and Study Design)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection Page 4: METHODS (Setting and Study Design)
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants Pages 4 and 5 : METHODS (Setting and Study Design, Data collection)
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable Pages 5 and 6 : METHODS (Data Variables)
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 Pages 5 and 6 : METHODS (Data Variables)
Bias	9	Describe any efforts to address potential sources of bias Pages 5 and 6 : METHODS (Data Variables)
Study size	10	Explain how the study size was arrived at We did not provide calculations for sample size for this study in the manuscript because the sample size for data collection was
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why Pages 5 and 6 : METHODS (Data Variables)
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding Pages 6: METHODS (Statistical Analyses)
		(*b*) Describe any methods used to examine subgroups and interactions Pages 6: METHODS (Statistical Analyses)
		(*c*) Explain how missing data were addressed Pages 6: METHODS (Statistical Analyses)
		(*d*) If applicable, describe analytical methods taking account of sampling strategy We did not use sample survey weights in our study
		(*e*) Describe any sensitivity analyses
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
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram 13:a-c) All participants were interviewed once when their eligibility was examined prior to interview. Details regarding participant participation is provided on pages 4 and 5 : METHODS (Setting and Study Design, Data collection)
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders Pages 7 and 8: RESULTS (1st and 2nd paragraph; Table 1)
		(b) Indicate number of participants with missing data for each variable of interest Page 8: RESULTS (Table 1)
Outcome data	15*	Report numbers of outcome events or summary measures Page 8: RESULTS (Table 1)
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 Pages 9 and 10: RESULTS (3rd and 4th paragraph; Tables 2 and 3)
		(*b*) Report category boundaries when continuous variables were categorized Page 8: RESULTS (Table 1)
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period Not relevant for analyses provided
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses Not applicable
Discussion		
Key results	18	Summarise key results with reference to study objectives Page 11: DISCUSSION (1st paragraph)
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 14: DISCUSSION (6th Paragraph)
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence Pages 11-13: DISCUSSION (2nd – 5th Paragraphs)
Generalisability	21	Discuss the generalisability (external validity) of the study results Pages 11-13: DISCUSSION (2nd – 5th Paragraphs)
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 The present study was conducted with in-kind support from investigators and co-authors. The original data collection was based on support from an Institutional travel grant.

*Give information separately for exposed and unexposed groups.

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

Association of Common Mental Disorders with Health and Healthcare Factors among Women in Rural Western India: results of a cross-sectional survey.

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010834.R1
Article Type:	Research
Date Submitted by the Author:	19-Feb-2016
Complete List of Authors:	Soni, Apurv; University of Massachusetts Medical School, Quantitative Health Sciences / School of Medicine Fahey, Nisha; Des Moines University, College of Osteopathic Medicine Byatt, Nancy; University of Massachusetts Medical School Prabhakaran, Anusha; Pramukhsawmi Medical College Moore Simas, Tiffany; University of Massachusetts Medical School Vankar, Jagdish; Pramukhsawmi Medical College Phatak, Ajay; Pramukhsawmi Medical College O'Keefe, Eileen; Boston University Allison, Jeroan; University of Massachusetts Medical School Nimbalkar, Somashekhar; Pramukhsawmi Medical College
Primary Subject Heading:	Global health
Secondary Subject Heading:	Mental health, Public health, Health policy, Epidemiology
Keywords:	MENTAL HEALTH, PUBLIC HEALTH, EPIDEMIOLOGY

Association of Common Mental Disorders with Health and Healthcare Factors among Women in Rural Western India: results of a cross-sectional survey.

Apurv Soni [a], Nisha Fahey [b], Nancy Byatt [a], Anusha Prabhakaran[c], Tiffany A. Moore Simas [a], Jagdish Vankar[c], Ajay Phatak[c], Eileen O'Keefe [d], Jeroan Allison [a], Somashekhar Nimbalkar[c]

Affiliations: [a] University of Massachusetts Medical School, Worcester, Massachusetts; [b] Des Moines University, Des Moines, Iowa; [c] Pramukhswami Medical College, Gujarat, India; [d] Boston University, Boston, Massachusetts.

Address Correspondence: Apurv Soni, Clinical and Population Health Research, AS7.1064, 55 Lake Avenue N, Worcester, Massachusetts, 01605, Apurv.Soni@umassmed.edu, 508-856-8956

Keywords: Common Mental Disorders, Health Status, Healthcare Expenditure Healthcare Behavior, Rural India, Reproductive-aged Women.

Word Count: 3,328

References: 43

ABSTRACT

Objectives
Information about common mental disorders (CMD) is needed to guide policy and clinical interventions in lower and middle-income countries. The purpose of this study was to characterize the association of CMD with three inter-related consequences of mental disorders: health status, healthcare utilization, and healthcare expenditure among women from rural western India based on a representative, cross-sectional survey.

Setting
Surveys were conducted in the waiting area of various outpatient clinics at a tertiary care hospital and in 16 rural villages in the Anand district of Gujarat, India.

Participants
700 Gujarat-speaking women between the ages of 18-45 years who resided in the Anand district of Gujarat, India were surveyed in a quasi-randomized manner. Data from 658 were used in this analysis; 19 surveys were excluded due to incompleteness, 18 participants were excluded because they were visiting hospitalized patients, and five surveys were classified as outliers.

Primary and secondary outcomes measures
Association of CMD, ascertained using WHO's Self-Reporting Questionnaire-20 (SRQ-20) tool, with self-reported 1) number of healthcare visits in the prior year; 2) health status; and 3) portion of yearly income expended on healthcare.

Results
Overall, 155 (22·8%) participants screened positive for CMD with most (81.9%) not previously diagnosed despite contact with healthcare provider in the prior year. On adjusted analyses, positive screening for CMD was associated with worse category in self-reported health status (cumulative OR= 9.39; 95% CI: 5·97-14·76), higher portion of household income expended on healthcare (cumulative OR = 2·31; 95% CL: 1·52-3.52), and increased healthcare visits in the prior year (Incidence Rate Ratio = 1·24; 95% CI: 1·07-1·44).

Conclusions
The high prevalence of potential CMD among rural women in India that is unrecognized and associated with adverse health and financial indicators highlights the individual and public health burden of CMD.

Keywords: Common Mental Disorders, Health Status, Healthcare Expenditure Healthcare Behavior, Rural India, Reproductive-aged Women.

Strengths and limitations of this study

- Our novel dataset contains information about health status and healthcare of reproductive-aged women in rural Indian, an underserved and understudied population.
- This is the first study to report the association of screening positive for common mental disorders (CMD) with self-reported health status, healthcare expenditure, and healthcare utilization among women in rural India.
- The multivariable negative binomial and ordinal logistic regression allowed robust estimation of disease-adjusted association, which preserved the data structure of self-reported measures.
- We are limited by our cross-section study design that limits causal interpretation. However, identification of the associations between women screening positive for CMD and healthcare related expenditure holds significance in the context of a system where the majority of healthcare costs are out of pocket and women face barriers in accessing healthcare.

INTRODUCTION

Depression is the leading cause of total years lived with disability globally. [1,2] In developed countries, depression has been associated with lower health status, increased ambulatory and emergency hospital visits, loss in productivity, and greater healthcare costs.[3,4] Despite recent estimates suggesting that low and middle-income countries (LMIC) experience over 80% of the worldwide burden attributed to depression,[1,5] there is disproportionately limited data regarding consequences from these countries. Within LMIC, further disparities exist such that regions with a relatively greater burden of common mental disorders (CMD) remain understudied.

The majority of mental health studies in India are conducted in the progressive states of Goa or Kerala, which have high levels of female empowerment and education, important predictors of mental health.[6–8] By contrast, reproductive aged women from the state of Gujarat are three times less likely to have 10 or more years of education as those from Goa and Kerala and roughly four times more likely to be married before 18 years of age.[9] Nevertheless, mental health in Gujarat is comparatively understudied and there are reports of tremendous stigma against mental disorders among community members as well as healthcare providers, further limiting access to mental health.[10–13] Because healthcare priorities are often dictated by disease burden and its impact on individuals and their communities, information about CMD and its associated healthcare outcomes is necessary to guide prioritization of mental health programs.

The goal of this study was to determine the prevalence of CMD and characterize its association with three inter-related health factors i.e. 1) self-reported health status, 2) portion of yearly household income spent on healthcare, and 3) healthcare utilization in the previous year among

an understudied population of women from rural western India based on a representative, cross-sectional survey.

METHODS

Setting and Study Design: Data was collected through a cross-sectional survey among women currently living in rural settings in the Anand district of Gujarat, India. Trained interviewers conducted face-to-face surveys in Gujarati, the local language. Participants were recruited from two different settings: 1) Shree Krishna Hospital, a tertiary care center serving the local rural population; and 2) 16 villages within a 20-kilometer radius from the hospital. In the hospital clinic waiting areas, participants were quasi-randomly selected with interviewers by approaching every third woman in the outpatient waiting area. Interviews were conducted in the waiting area but away from participants' family members and other patients in the clinic. Prior to recruitment in the villages, the layout of each village was obtained. Every third household in each of the village's colonies was approached and the first female who encountered the interviewer was asked to participate in the study. Community interviews were conducted at participants' residences. In both settings, two research supervisors, a male and a female, ensured privacy of all participants.

Participants: Seven-hundred eligible women between the ages of 18-45 years, that could comprehend and speak Gujarati, and had a rural residence within the Anand district, consented and participated in the study. Of the 700 participants interviewed for the study, data from 658 were used in this analysis; 19 surveys were excluded due to incompleteness, 18 participants were excluded because they were visiting hospitalized relatives, and five surveys were classified as outliers due to their healthcare behavior (these participants had more than 20 clinical visits in the

previous year due to serious health conditions) yielding an analytic sample size of 658. A study of this nature with more than 642 participants would have a priori power of 90% (α error = 0.01) to detect a difference in proportions of 50% vs 35% for two groups. Based on our understanding before we conducted the study, these proportions would be reasonable to postulate for women with and without CMD who spent a substantial part of their income on health.

Funding and Ethical Approval: The data collection was funded by an institutional travel grant by Boston University. Boston University Institutional Review Board and the Human Research Ethics Committee of HM Patel Center for Medical Care and Education reviewed the study independently and approved it.

Data Collection: The study survey was drafted in English and underwent two iterations of translation back and forth between Gujarati and English. The survey was comprised of five modules: a) health status, b) current and past medical history, c) lifestyle choices, d) healthcare seeking behavior, and e) affordability of healthcare. Five trained female interviewers piloted the survey with one volunteer, each, and conducted all interviews from October 1 – October 13, 2011. An average survey lasted 20-30 minutes.

Data Variables:

Exposure variable: Symptoms of Common Mental Disorders were s assessed using the World Health Organization (WHO) Self-Reporting Questionnaire (SRQ-20).[14] Due to the absence of validation studies for SRQ-20 use in Gujarati population, we used the threshold for a positive test from a previous study conducted in a nearby location. Participants who responded 'yes' to eight or more questions were considered to have screened positive for CMD.[15] SRQ-20

demonstrated excellent internal reliability in our population as measured by the Kuder Richardson 20 score of 0.90.

Outcome variables:

1) Health status was assessed by using the first question from the SF-12 instrument: "*In general, would you say your health is"*; possible choices were (a) Excellent, (b) Very Good, (c) Good, (d) Fair, or (e) Poor. Few participants (n=14, 2.13%) reported poor health status; therefore, we grouped self-reported fair and poor health status.
2) Expenditure of household income on healthcare was measured by asking participants, "What most closely estimates the portion of your yearly household income spent on healthcare?" with choices offered as (a) none, (b) less than ¼, (c) ¼ to less than ½, (d) ½ to ¾, or (e) more than ¾. Six participants (0.9%) reported none and 17 (2.6%) reported more than ¾ and thus were grouped into less than ¼ and more than ½ categories, respectively.
3) Number of healthcare visits in the previous year was determined by participant self-report. Participants were asked to report the number of times they visited a village, public, private, ayurvedic, or homeopathic clinic/hospital in the previous year. Only twelve participants reported seeing a non-allopathic medical provider and among them, all but four, also saw an allopathic provider. Therefore, the number of healthcare visits was based on aggregate visits reported, regardless of the provider.

Confounders: Potential associations between CMD and healthcare utilization, self-reported health status, and expenditure on healthcare can be confounded by the presence of other diseases, age, marital status, income, education level, and reproductive factors (total number of

pregnancies, number of living children). Therefore, these factors were adjusted using multivariable methods. Disease burden was based on self-report of current conditions or past diagnoses of chronic diseases excluding any mental health disorders (see footnotes in Table 1 for more details). Disease burden was estimated as an aggregate grouped into four categories: no disease, one disease, two diseases, and three or more diseases. Marital status, education level, and reproductive history were based on self-report. As described elsewhere,[16] monthly household income was transformed into income/person/day values to account for variation in the household size. Daily per capita income was subsequently converted to US dollars using the average currency exchange rate from 2011, the year the study was conducted and categorized into three levels (< $0.25, $0.25-$1.25, >$1.25).

Statistical Analyses: Descriptive data analyses were performed to assess the distribution of potential confounders with respect to CMD screening status. Frequencies and percentages were calculated for categorical variables; associations with CMD screening status were assessed using chi-square test for independence of attributes or Fischer's exact test. Bivariate associations of CMD screening status with number of visits to clinic in the previous year, total number of pregnancies, and number of live births were assessed using a one-way analysis of variance test. Ordered logistic regression analyses were used to quantify the relationship of positive CMD screen with health status and household income spent on healthcare. Violations of the parallel regression assumptions were ruled out using Brant test for health status (χ^2 = 29.76, df = 22; p = 0·67) and income spent on healthcare outcomes (χ^2 = 9·37, df = 22; p = 0·67). The association of positive CMD screen and number healthcare visits in the previous year was evaluated using negative binomial regression modeling. A negative binomial model was selected over Poisson to account for the over dispersion in the outcome (α=0·23; χ^2= 150.05, p < 0·001); improvement of

model fit using zero inflated negative binomial regression was tested and ruled out using vuong test (z = 0·42, p = 0·34). Unadjusted and adjusted incidence rate ratios (IRR) were calculated and interpreted as a count multiplier for the number of healthcare visits in the previous year. All three models adjusted for number of co-morbid conditions, age, income, education, marital status, and reproductive history. Subgroup analyses to investigate differences between the hospital and community-based sample, and sensitivity analyses to examine changes in the findings based on varying thresholds (6+ to 12+) for determining whether participants had positive CMD screen were performed to check for potential sources of biases. Multiple imputation using chained equations (5 imputations, 25 burn-in iterations) was performed to impute missing values for missing covariates; the one instance of a missing outcome was not imputed. The adequacy burn-in period was assessed by examining stationarity of each chain by the end of burn-in periods from 1 to 30.

RESULTS

Table 1 presents characteristics of participants who screened positive for CMD compared with participants screening negative. Using the SRQ-20 to assess symptoms suggestive of CMD, 155 (22.8%) participants screened positive having answered yes to at least eight of 20 questions. No considerable differences were found between women recruited from the clinic or village. On average, participants reported visiting a healthcare provider more than three times in the previous year. The majority of the respondents considered their health status less than very good (i.e.; good or fair/poor), and over 60% reported spending less than a quarter of their yearly income on healthcare.

Socio-economic and reproductive factors were associated with CMD screening outcome. Increased levels of education and household income were associated with decreased likelihood

of screening positive for CMD. More than four out of every five (81·3%) respondents who screened positive for CMD reported they had not been diagnosed with depression or another mental health disorder by their health care provider even though all but four of these women reported visiting a healthcare provider at least once in the past year (results not shown).

Table 1: Sociodemographic and health characteristics of 658 reproductive-aged women from rural western India stratified by Common Mental Disorder screening status.

	Total	CMD Screening (col %)		
	N	Positive	Negative	p
Participants (N)	658	155	503	
Location: Clinic	311	43.9	48.3	0.33
# Clinic Visits[a] (mean(sd))	3.6 (2.8)	3.2(2.5)	4.6(3.5)	0.001[#]
Health Status				
Excellent	166	1.3	32.6	<0.001[*]
Very Good	95	3.9	17.7	
Good	249	34.8	38.8	
Fair/Poor	148	60.0	10.9	
HHI Spent on Healthcare[b]	*1 missing*			
Less than 1/4	403	36.8	68.9	<0.001
1/4 to 1/2	184	38.0	24.9	
More than 1/2	70	25.2	6.2	
# Diseases or Conditions[c]				
Zero	221	3.9	42.2	<0.001[*]
One	155	17.4	25.8	
Two	148	28.4	20.9	
Three or more	134	50.3	11.1	
Current Depression				
Yes	34	18.7	1.0	N/A
Age (years)	*2 missing*			
18-25	226	28.6	36.3	0.18
26-35	249	39.6	37.5	
36-45	181	31.8	26.3	
Education	*2 missing*			
< 7th Grade	162	34.8	21.6	<0.001
7th - 12th Grade	356	55.5	53.9	
> 12th Grade	138	9.7	24.5	
Marital Status	*1 missing*			
Single	97	8.4	16.7	0.03[*]
Married	541	88.3	80.5	

Divorced or Widowed	19	3.3	2.8	
Daily Income Per Person	*22 missing*			
< $0.25	49	13.5	5.9	0.01
$0.25-1.25	369	56.1	58.6	
>$1.25	218	30.4	35.5	
# Pregnancies (mean(sd))	2.13(1.78)	2.55(1.92)	2.00(1.71)	<0.001[#]
# Living children (mean(sd))	1.60(1.35)	1.85(1.34)	1.52(1.34)	0.001[#]

a: Number of clinic visits in the previous year based on self-report
b: Portion of yearly household-income spent on healthcare expenditure
c: Participants were asked to identify using a list of 33 non-psychiatric conditions and diseases. 22 conditions and diseases reported at least once by any participant; these were reviewed by trained clinicians to identify chronic conditions. Based on the review, an aggregate variable to represent chronic disease burden was generated; it comprised of cardiovascular problems (coronary heart disease, hypertension, positive history of heart attack or related condition), pulmonary problems (difficulty breathing, chronic allergies, asthma, or chronic bronchitis), musculoskeletal pain (chronic back problems, arthritis, difficulty opening mouth, or limited mobility due to pain), toothaches, anemia, and diabetes.
[*] Fischer's Exact Test; [#]ANOVA

The adjusted association between CMD screening status and health status as well as portion of household income spent on healthcare is presented in Table 2. After controlling for confounders, screening positive for CMD was associated with more than an nine-fold increase in the cumulative odds of reporting a worse health status (cumulative OR (cumOR)= 9.34; 95% CI: 5.93-14.70) and a two-fold increase in the cumulative odds of reporting a higher category of income expenditure on healthcare (cumOR = 2.25; 95% CL: 1.48-3.44).

Results from negative binomial regression models are reported in Table 3. Before adjusting for confounding, screening positive for CMD was associated with a 40% increase in the number of clinical visits in the previous year (IRR = 1·41; 95% CI: 1·24-1·60). After adjusting for potential confounders, the association was attenuated but remained statistically significant (IRR = 1.22; 95%CI: 1.05-1.42)

Table 2: Ordinal Logistic Regression Models for the Association between Common Mental Disorder (CMD) and a) Self-Reported Health Status and b) Yearly Income Spent on

Healthcare		
	Self-Reported Health Status[a] (n = 633)	**Yearly Income spent on healthcare**[b] (n = 632)
	CumOR (95% CL)*	CumOR (95% CL)*
CMD Screen: Negative (ref)		
Positive (SRQ-20 ≥ 8)	9.34 (5.93-14.70)	2.25 (1.48-3.44)
Ordered categories: a= Excellent, Very Good, Good, Fair/Poor; b = <1/4 , 1/4-1/2, > 1/2 *CumOR: Cumulative odds ratio adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.		

Table 3: Multivariable negative binomial regression model estimates of count multiplier (IRR [a]) for number of clinical visits in the previous year.

	unadjusted	**adjusted* (n=633)**
	IRR (95% CL)	IRR (95% CL)
CMD: Negative (ref)		
Positive (SRQ-20 ≥ 8)	1.41 (1.24-1.60)	1.22 (1.05-1.42)
a: IRR = incidence rate ratio is calculated by exponentiating beta co-efficients of count models. IRR can be interpreted as count multipliers. For example, screening positive for CMD is associated with a 42% increase in the number of clinical visits in the previous in comparison to those who do not screen positive (unadjusted estimates) * adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.		

Sensitivity analyses based on site of enrollment (clinic vs. village), threshold values for positive CMD screening and missing data did not reveal any changes in direction or statistical significance for the association of CMD screening status with health status, percentage of income spent on healthcare expenditure, or number of clinical visits in the previous year. (Table 4).

Table 4: Results of Subgroup Analyses by Location of Survey, Sensitivity Analyses using Stricter Threshold Value for Positive CMD screening, and Imputed Dataset to Account for Missing Values

	Self-Reported Health Status[a] (n = 633)	**Yearly Income spent on healthcare**[b] (n = 632)	**Number of clinical visits in previous year** (n=633)
	CumOR (95% CL)*	CumOR (95% CL)*	IRR (95% CL)
Original	9.34 (5.93-14.70)	2.25 (1.48-3.44)	1.22 (1.05-1.42)
By Location			

Clinic	11.79 (5.94-23.40)	2.77 (1.46-5.24)	1.21 (0.98 – 1.51)
Village	7.72 (4.14-14.37)	2.04 (1.14-3.65)	1.25 (1.03 – 1.52)
Threshold Value			
SRQ-20 ≥ 12	6.82 (3.72-12.51)	3.37 (1.98-5.75)	1.37 (1.14-1.64)
Missing Data			
Imputed Dataset	8.42 (5.44-13.05)	2.23 (1.48-3.36)	1.23 (1.06-1.42)

Ordered categories: a= Excellent, Very Good, Good, Fair/Poor; b = <1/4 , 1/4-1/2, > ½
Adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.

DISCUSSION

In this sample of reproductive-aged women from rural western India, approximately one out of every four participants screened positive for CMD. Despite visiting a healthcare provider at least once in the previous year, the majority reported that they had not been diagnosed with depression or other mental health disorder by their health care provider. Screening positive for CMD was associated with worse self-reported health status, a higher portion of household income expended on healthcare, and an increased number of healthcare visits. The associations found in our study were robust to subgroup, sensitivity, and missing data analysis with the exception of a stronger association between health status and CMD screening status among women interviewed in clinic in comparison to those in the village. Together, these findings underscore significant negative outcomes experienced by women of reproductive age from rural western India with symptoms suggestive of CMD.

Our findings of potentially unrecognized CMD (81·3%) is similar to the 79.0% depression prevalence reported by Kohli et al for primary care attendees from another rural region in India.[17] The high rates are likely to be driven by two main factors. First, compared to western societies, people in India are more likely to attribute mental illness to personally controllable

factors and thus mental health in rural India is associated with a tremendous amount of stigma and social disadvantage.[10,18] Consequently, Indians may be less willing to disclose psychological symptoms. Indeed, studies have shown that most Indian patients suffering from mental disease present with somatic symptoms, which may increase the likelihood that CMD goes undetected.[19–21] Second, there is a scarcity of mental healthcare providers in India and other healthcare providers do not receive adequate mental health training.[22] Thus, in primary care settings mental illness may not be considered in the differential diagnoses, especially in the context of an atypical presentation, leading to inadequate identification of mental diseases.[23]

Our findings suggest that women screening positive for CMD had visited their providers more frequently and were more likely to spend a larger portion of their household income on healthcare. The association between CMD and healthcare cost also could be self-perpetuating. Women screening positive have considerably lower appraisal of their personal health than those who screen negative, which probably explained their seeking healthcare more often. Indian women who are suffering from mental illness are known to present to primary clinics with somatic rather than psychological symptoms, which may lead to under-diagnosis and treatment of their CMD.[24] Patients and their medical providers may continue to search for a physical cause, incurring healthcare costs and a greater number of healthcare visits, while the underlying mental illness remains unrecognized and unaddressed.[23,25]

Alternatively, it is also possible that providers may have suspected mental illness but not directly addressed it with the patient; providers may have attributed possible mental illnesses to female suppression and poverty. In such instances, providers may find themselves ill-positioned to assist

with underlying risk factors for mental health problems. Given the study design and the data collected, it is impossible to rule out this scenario; nevertheless, it is striking that majority of women screening positive for CMD report they never received a diagnosis from a health care provider despite having reporting seen a provider at least once in the previous year.

The high prevalence of poverty in India create important barriers for recognition and treatment of CMD. Due to healthcare related costs, 63 million people in India fall below the poverty line every year.[26] This is expected to rise given the inevitable increase in the prevalence of chronic, non-communicable diseases in India, which carry a greater financial burden than communicable diseases.[27,28] Treating CMD with pharmacological and psychological therapies has been shown to reduce the economic burden of healthcare among adults.[29,30] Thus, treatment of mental illness could break this vicious cycle of poverty and CMD.[29,30] The Indian government recently proposed to revamp its mental health services through the National Mental Health Policy of India (NMHPI). NMHPI proposes to increase the number of mental healthcare providers and expand coverage from 182 to 648 districts and support 11 centers of excellence in mental health to train the next generation's mental healthcare providers.[31] Despite the laudable NMHPI proposal, the urgent needs of rural Indian women may continue to go unaddressed because the proposal may be difficult to implement due to lack of funding and a cohesive implementation plan.[32]

Integration of mental healthcare into primary care could provide a solution because women suffering from mental illness most often present to primary care settings.[33,34] The increased frequency of healthcare visits among women screening positive for CMD in our study potentially

highlights missed opportunity for intervention. Depression screening needs to be done in conjunction with a systematic approach to ensuring adequate access to mental health assessment and care.[35] It is well-established that integrated care models, such as collaborative care, effectively integrate depression and primary care, can improve clinical outcomes, and can also be carried out by non-specialist health workers.[36,37] Such approaches have also been tested in India; Patel and colleagues tested a collaborative stepped care (CSC) model that included four levels of referral before a clinical specialist became involved in care.[38] The CSC model begins with CMD screening for adult patients that present to clinic with a village health worker, and progresses through therapeutic steps of increasing intensity including Yoga, behavioral, and pharmacologic interventions. Patients who do not respond to a less intense treatment are stepped up to a higher intensity therapeutic option. The CSC model improves in mental illness over a 6-month period and holds promise as an effective mechanism to improve mental health in rural India.[39] However, the wide implementation of the CSC model in India is lacking and has been limited to Goa and South India, two regions in India that face a comparatively lower burden of mental diseases.[40,41] Despite treatment success, many collaborative care models depend on care management facets that are not reliably reimbursed and therefore their broad implementation, dissemination, and associated treatment improvement are not realized.[42] The term “voltage drop” has been used to describe the less robust results found when collaborative care approaches are implemented in low resource real-world settings.[43] Thus, there is need for cost-effective treatment plans that leverage primary care providers and staff already working in the primary care setting.

The findings from our study must be interpreted in the context of its limitations. We identified CMD status using a validated screening questionnaire, SRQ-20, instead of a diagnostic structured clinical interview. It is possible that women who screen positive for CMD may have had sub-syndromal symptoms. However, our decision to use SRQ-20 for this study was based on sound principles: 1) The SRQ-20 was developed specifically for use in global health research conducted low-resource setting. It is validated, well-accepted, and has been described as a cost-effective way of measuring mental health.[15] 2) The purpose of this study was not to investigate psychiatric practice or clinical management of CMD in India but rather to understand the characteristics of women who might be suffering from mental illness, and 3) In the context of India, where mental health literacy is limited, administration of a high face-validity instrument such as SRQ-20 with yes and no responses lowers the interview-burden on participants.[14] Our data was collected through a cross-sectional survey and thus we cannot comment on the causal relationship of our findings, it is possible that women with poor appraisal of their personal health develop CMD. Presence of comorbidities among our participants was captured through self-report and therefore is vulnerable to differential recall with CMD screen positive women potentially over-reporting their conditions. However, such misclassification would likely bias our estimates toward the null hypotheses. Our estimates of household expenditure on healthcare was based on a single question and had broad categories and therefore may lack precision; however, in the context of rural Gujarat, this instrument provides information about healthcare costs that is difficult to capture and not available in other databases.[34] Additionally, we used trained local interviewers and piloted the questionnaire to enhance cultural relevancy of the questionnaire.

In conclusion, we found a high number of rural Indian women screening positive for CMD that was unrecognized and associated with adverse impacts on overall health and economic well-being. Our findings suggest that there is a need to screen, assess, and manage CMD in primary healthcare and community-based settings in India. This could, in turn, improve overall health status and reduce healthcare related economic burden.

Contributors' Statement:

Apurv Soni: Soni conceptualized, designed, and implemented the study in India. Soni carried out the initial analyses, drafted the initial manuscript, and approved the final manuscript as submitted.

Nisha Fahey: Fahey conceptualized, designed, and implemented the study in India. Fahey provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Nancy Byatt: Byatt provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Anusha Prabhakaran: Prabhakaran provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Tiffany A. Moore Simas: Moore Simas provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Jagdish Vankar: Vankar provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Ajay Phatak: Phatak conceptualized, designed, and implemented the study in India. Phatak provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Eileen O'Keefe: O'Keefe conceptualized and designed the study. O'Keefe provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Jeroan Allison: Allison provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Somashekhar Nimbalkar: Nimbalkar conceptualized, designed, and implemented the study in India. Nimbalkar provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Competing Interests: I have read and understood the BMJ Group policy on declaration of interests and declare the following interests: None

Data sharing statement: No additional data are available

References

1 Whiteford HA, Degenhardt L, Rehm J, *et al.* Global burden of disease attributable to mental and substance use disorders: Findings from the Global Burden of Disease Study 2010. *Lancet* 2013;**382**:1575–86. doi:10.1016/S0140-6736(13)61611-6

2 Murray CJL, Lopez A. A comprehensive assessment of mortality and disability from disease, injures and risk factors in 1990 and projected to 2020. In: *The Global Burden of Disease*. 1996. 1–51. doi:10.1186/1471-2458-13-863

3 Druss BG, Walker ER. Mental disorders and medical comorbidity. *Synth Proj Res Synth Rep* 2011;:1–26.

4 Egede LE. Major depression in individuals with chronic medical disorders: prevalence, correlates and association with health resource utilization, lost productivity and functional disability. *Gen Hosp Psychiatry* 2007;**29**:409–16. doi:10.1016/j.genhosppsych.2007.06.002

5 Chan M. Mental Health and Development: Targeting People with Mental Health Conditions as a Vulnerable Group. 2010.

6 Ganguli HC. Epidemiological findings on prevalence of mental disorders in India. *Indian J Psychiatry* 2000;**42**:14–20.http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2956997&tool=pmcentrez&rendertype=abstract (accessed 19 Apr2015).

7 Shidhaye R, Patel V. Association of socio-economic, gender and health factors with common mental disorders in women: a population-based study of 5703 married rural women in India. *Int J Epidemiol* 2010;**39**:1510–21. doi:10.1093/ije/dyq179

8 Patel V, Lund C, Hatherill S, *et al.* Mental disorders: equity and social determinants. *Equity, Soc Determ public Heal Program* 2010;:115–35.http://www.who.int/entity/social_determinants/tools/EquitySDandPH_eng.pdf#page=125 (accessed 28 May2014).

9 Kishor S, Gupta K. Gender Equality and Women's Empowerment in India. Mumbai:

2009. http://rchiips.org/nfhs/a_subject_report_gender_for_website.pdf

10 Liu MC, Tirth S, Appasani R, *et al.* Knowledge and Attitudes Toward Depression Among Community Members in Rural Gujarat, India. *J Nerv Ment Dis* 2014;**202**:813–21. doi:10.1097/NMD.0000000000000199

11 Amin G, Shah S, Vankar GK. The prevelance and recognition of depression in primary care. *Indian J Psychiatry* 1998;**40**:364–9.

12 Saddichha S, Vibha P, Saxena MK, *et al.* Behavioral emergencies in India: A population based epidemiological study. *Soc Psychiatry Psychiatr Epidemiol* 2010;**45**:589–93. doi:10.1007/s00127-009-0103-8

13 Almanzar S, Shah N, Vithalani S, *et al.* Knowledge of and attitudes toward clinical depression among health providers in gujarat, India. *Ann Glob Heal* 2014;**80**:89–95. doi:10.1016/j.aogh.2014.04.001

14 World Health Organization. A user's guide to the Self Reporting Questionnaire. *Geneva World Heal Organ* Published Online First: 1994.http://www.missions-acf.org/kitemergency/EN/5. ACF-Paris Toolbox/5.8 MHCP/04 - Other Tools/01 - Mental Health Scales/04 - SRQ_WHO.pdf (accessed 28 May2014).

15 Harpham T, Reichenheim M, Oser R, *et al.* Measuring mental health in a cost-effective manner. *Health Policy Plan* 2003;**18**:344–9. doi:10.1093/heapol/czg041

16 Soni A, Fahey N, Phatak AG, *et al.* Differential in healthcare seeking behavior of mothers for themselves versus their children in rural India: Results of a cross sectional survey. *Int Public Heal J* 2014;**6**:57–66.

17 Kohli C, Kishore J, Agarwal P, *et al.* Prevalence of unrecognised depression among outpatient department attendees of a rural hospital in delhi, India. *J Clin Diagn Res* 2013;**7**:1921–5. doi:10.7860/JCDR/2013/6449.3358

18 Nieuwsma JA, Pepper CM, Maack DJ, *et al.* Indigenous perspectives on depression in rural regions of India and the United States. Transcult. Psychiatry. 2011;**48**:539–68. doi:10.1177/1363461511419274

19 Pereira B, Andrew G, Pednekar S, *et al.* The explanatory models of depression in low income countries: listening to women in India. *J Affect Disord* 2007;**102**:209–18. doi:10.1016/j.jad.2006.09.025

20 Andrew G, Cohen A, Salgaonkar S, *et al.* The explanatory models of depression and anxiety in primary care: a qualitative study from India. BMC Res. Notes. 2012;**5**:499. doi:10.1186/1756-0500-5-499

21 Nambi SK, Prasad J, Singh D, *et al.* Explanatory models and common mental disorders among patients with unexplained somatic symptoms attending a primary care facility in Tamil Nadu. *Natl Med J India* 2002;**15**:331–5.http://www.ncbi.nlm.nih.gov/pubmed/12540066

22 WHO-AIMS report on Mental Health System in Gujarat, India. 2006. https://www.mindbank.info/item/4531 (accessed 31 May2015).

23 Paykel ES, Priest RG. Recognition and management of depression in general practice: consensus statement. *BMJ Br Med J* 1992;**305**:1198–202.

24 Grover S, Dutt A, Avasthi A. An overview of Indian research in depression. *Indian J Psychiatry* 2010;**52**:S178–88. doi:10.4103/0019-5545.69231

25 Linden M, Lecrubier Y, Bellantuono C, *et al.* The prescribing of psychotropic drugs by primary care physicians: an international collaborative study. *J Clin Psychopharmacol* 1999;**19**:132–40.http://www.ncbi.nlm.nih.gov/pubmed/10211914

26 National Health Policy 2015 :: Ministry of Health and Family Welfare. http://www.mohfw.nic.in/showfile.php?lid=3014 (accessed 22 Oct2015).

27 Berman P, Ahuja R, Bhandari L. The Impoverishing Effect of Healthcare Payments in India: New Methodology and Findings. *Econ Polit Wkly* 2010;**xlv**:65–71.

28 Binnendijk E, Koren R, Dror DM. Can the rural poor in India afford to treat non-communicable diseases. *Trop Med Int Health* 2012;**17**:1376–85. doi:10.1111/j.1365-3156.2012.03070.x

29 Patel V, Weobong B, Nadkarni A, *et al.* The effectiveness and cost-effectiveness of lay counsellor-delivered psychological treatments for harmful and dependent drinking and moderate to severe depression in primary care in India: PREMIUM study protocol for randomized controlled trials. *Trials* 2014;**15**:101. doi:10.1186/1745-6215-15-101

30 Patel V, Chisholm D, Rabe-Hesketh S, *et al.* Efficacy and cost-effectiveness of drug and psychological treatments for common mental disorders in general health care in Goa, India: A randomised, controlled trial. *Lancet* 2003;**361**:33–9. doi:10.1016/S0140-6736(03)12119-8

31 Sinha S, Kaur J. National mental health programme: Manpower development scheme of eleventh five-year plan. Indian J. Psychiatry. 2011;**53**:261. doi:10.4103/0019-5545.86821

32 Sharma DC. India's new policy aims to close gaps in mental health care. Lancet. 2014;**384**:1564.http://www.scopus.com/inward/record.url?eid=2-s2.0-84924954548&partnerID=tZOtx3y1

33 Das J, Do Q-T, Friedman J, *et al.* Mental Health Patterns and Consequences: Results from Survey Data in Five Developing Countries. *World Bank Econ Rev* 2008;**23**:31–55. doi:10.1093/wber/lhn010

34 Patel V, Chisholm D, Kirkwood BR, *et al.* Prioritizing health problems in women in developing countries: comparing the financial burden of reproductive tract infections, anaemia and depressive disorders in a community survey in India. *Trop Med Int Health* 2007;**12**:130–9. doi:10.1111/j.1365-3156.2006.01756.x

35 Kagee A, Tsai AC, Lund C, *et al.* Screening for common mental disorders in low resource settings: reasons for caution and a way forward. *Int Health* 2013;**5**:11–4. doi:10.1093/inthealth/ihs004

36 Woltmann E, Grogan-Kaylor A, Perron B, *et al.* Comparative effectiveness of collaborative chronic care models for mental health conditions across primary, specialty, and behavioral health care settings: systematic review and meta-analysis. *Am J Psychiatry*

2012;:790–804.

37 van Ginneken N, Tharyan P, Lewin S, *et al.* Non-specialist health worker interventions for the care of mental, neurological and substance-abuse disorders in low- and middle-income countries. Cochrane database Syst. Rev. 2013;**11**.http://www.scopus.com/inward/record.url?eid=2-s2.0-84900775760&partnerID=tZOtx3y1

38 Patel VH, Kirkwood BR, Pednekar S, *et al.* Improving the outcomes of primary care attenders with common mental disorders in developing countries: a cluster randomized controlled trial of a collaborative stepped care intervention in Goa, India. *Trials* 2008;**9**:4. doi:10.1186/1745-6215-9-4

39 Patel V, Weiss H a., Chowdhary N, *et al.* Effectiveness of an intervention led by lay health counsellors for depressive and anxiety disorders in primary care in Goa, India (MANAS): A cluster randomised controlled trial. *Lancet* 2010;**376**:2086–95. doi:10.1016/S0140-6736(10)61508-5

40 Singla D, Lazarus A, Atif N, *et al.* 'Someone like us': delivering maternal mental health through peers in two South Asian contexts. *J Affect Disord* 2014;**168**:452–8. doi:10.1016/j.jad.2014.07.017

41 Patel V, Kirkwood BR, Pednekar S, *et al.* Gender disadvantage and reproductive health risk factors for common mental disorders in women: a community survey in India. *Arch Gen Psychiatry* 2006;**63**:404–13. doi:10.1001/archpsyc.63.4.404

42 Bachman J, Pincus H, Houtsinger J, *et al.* Funding mechanisms for depression care management: opportunities and challenges. *Gen Hosp Psychiatry* 2006;:278–88.

43 Eisenberg J, Power E. Transforming insurance coverage into quality health care: voltage drops from potential to delivered quality. *JAMA* 2000;:210.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional 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 2: ABSTRACT (Methods)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found Page 2: ABSTRACT (Methods and Results)
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Page 3: INTRODUCTION (1st and 2nd Paragraph)
Objectives	3	State specific objectives, including any prespecified hypotheses Page 3: INTRODUCTION (3rd Paragraph)
Methods		
Study design	4	Present key elements of study design early in the paper Page 5: METHODS (Setting and Study Design)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection Page 5: METHODS (Setting and Study Design)
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants Pages 6 : METHODS (Participants)
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable Pages 7-9 : METHODS (Data Variables)
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 Pages7-9: METHODS (Data Variables)
Bias	9	Describe any efforts to address potential sources of bias Pages 8-10: METHODS (Data Variables *confounders*, Statistical Analysis)
Study size	10	Explain how the study size was arrived at Page 6: METHODS (Participants)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why Pages 7-10 : METHODS (Data Variables *confounders*, Statistical Analysis)
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding Pages 9-10: METHODS (Statistical Analyses)
		(*b*) Describe any methods used to examine subgroups and interactions Pages 10: METHODS (Statistical Analyses)
		(*c*) Explain how missing data were addressed Pages 10: METHODS (Statistical Analyses)
		(*d*) If applicable, describe analytical methods taking account of sampling strategy We did not use sample survey weights in our study
		(*e*) Describe any sensitivity analyses Pages 10: METHODS (Statistical Analyses)

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
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram 13:a-c) All participants were interviewed once when their eligibility was examined prior to interview. Details regarding participant participation is provided on pages 5 and 6 : METHODS (Setting and Study Design, Data collection)
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders Pages 10-11: RESULTS (1st and 2nd paragraph; Table 1)
		(b) Indicate number of participants with missing data for each variable of interest Page 12: RESULTS (Table 1)
Outcome data	15*	Report numbers of outcome events or summary measures Page 12: RESULTS (Table 1)
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 Pages 13-14: RESULTS (3rd and 4th paragraph; Tables 2 and 3)
		(*b*) Report category boundaries when continuous variables were categorized Page 12: RESULTS (Table 1)
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period Not relevant for analyses provided
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses Pages 15-16: RESULTS
Discussion		
Key results	18	Summarise key results with reference to study objectives Page 16-17: DISCUSSION
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 20-21: DISCUSSION
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence Pages 17-20: DISCUSSION
Generalisability	21	Discuss the generalisability (external validity) of the study results Pages 17-20: DISCUSSION
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 Pages 6: METHODS (Funding and Ethical Approval)

BMJ Open

Association of Common Mental Disorder Symptoms with Health and Healthcare Factors among Women in Rural Western India: results of a cross-sectional survey.

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010834.R2
Article Type:	Research
Date Submitted by the Author:	11-May-2016
Complete List of Authors:	Soni, Apurv; University of Massachusetts Medical School, Quantitative Health Sciences / School of Medicine Fahey, Nisha; Des Moines University, College of Osteopathic Medicine Byatt, Nancy; University of Massachusetts Medical School Prabhakaran, Anusha; Pramukhsawmi Medical College Moore Simas, Tiffany; University of Massachusetts Medical School Vankar, Jagdish; Pramukhsawmi Medical College Phatak, Ajay; Pramukhsawmi Medical College O'Keefe, Eileen; Boston University Allison, Jeroan; University of Massachusetts Medical School Nimbalkar, Somashekhar; Pramukhsawmi Medical College
Primary Subject Heading:	Global health
Secondary Subject Heading:	Mental health, Public health, Health policy, Epidemiology
Keywords:	MENTAL HEALTH, PUBLIC HEALTH, EPIDEMIOLOGY

Association of Common Mental Disorder Symptoms with Health and Healthcare Factors among Women in Rural Western India: results of a cross-sectional survey.

Apurv Soni [a], Nisha Fahey [b], Nancy Byatt [a], Anusha Prabhakaran[c], Tiffany A. Moore Simas [a], Jagdish Vankar[c], Ajay Phatak[c], Eileen O'Keefe [d], Jeroan Allison [a], Somashekhar Nimbalkar[c]

Affiliations: [a] University of Massachusetts Medical School, Worcester, Massachusetts; [b] Des Moines University, Des Moines, Iowa; [c] Pramukhswami Medical College, Gujarat, India; [d] Boston University, Boston, Massachusetts.

Address Correspondence: Apurv Soni, Clinical and Population Health Research, AS7.1064, 55 Lake Avenue N, Worcester, Massachusetts, 01605, Apurv.Soni@umassmed.edu, 508-856-8956

Keywords: Common Mental Disorders, Health Status, Healthcare Expenditure Healthcare Behavior, Rural India, Reproductive-aged Women.

Word Count: 3,631

References: 42

Funding: Data collection for the study was supported by Boston University Dudley Allen Sargent travel grant. Contribution by co-authors was partially supported by TL1-TR001454 (to A.S.) and KL2TR000160 (to N.B.) from National Center for Advancing Translational Sciences, P60-MD006912-05 (to J.A.) from National Institute on Minority Health and Disparities, and Joy McCann Endowment (to T.M.S.). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

ABSTRACT

Objectives
Information about common mental disorders (CMD) is needed to guide policy and clinical interventions in low and middle-income countries. The purpose of this study was to characterize the association of CMD symptoms with three inter-related health and healthcare factors among women from rural western India based on a representative, cross-sectional survey.

Setting
Surveys were conducted in the waiting area of various outpatient clinics at a tertiary care hospital and in 16 rural villages in the Anand district of Gujarat, India.

Participants
700 Gujarati-speaking women between the ages of 18-45 years who resided in the Anand district of Gujarat, India were recruited in a quasi-randomized manner.

Primary and secondary outcomes measures
CMD symptoms, ascertained using WHO's Self-Reporting Questionnaire-20 (SRQ-20) tool, were associated with self-reported 1) number of healthcare visits in the prior year; 2) health status; and 3) portion of yearly income expended on healthcare.

Results
Data from 658 were used in this analysis; 19 surveys were excluded due to incompleteness, 18 participants were excluded because they were visiting hospitalized patients, and five surveys were classified as outliers. Overall, 155 (22·8%) participants screened positive for CMD symptoms (SRQ-20 score ≥ 8) with most (81.9%) not previously diagnosed despite contact with healthcare provider in the prior year. On adjusted analyses, screening positive for CMD symptoms was associated with worse category in self-reported health status (cumulative OR= 9.39; 95% CI: 5·97-14·76), higher portion of household income expended on healthcare (cumulative OR = 2·31; 95% CL: 1·52-3.52), and increased healthcare visits in the prior year (Incidence Rate Ratio = 1·24; 95% CI: 1·07-1·44).

Conclusions
The high prevalence of potential CMD among rural women in India, which is unrecognized and associated with adverse health and financial indicators highlights the individual and public health burden of CMD.

Keywords: Common Mental Disorders, Health Status, Healthcare Expenditure Healthcare Behavior, Rural India, Reproductive-aged Women.

Strengths and limitations of this study

- Our novel dataset contains information about health status and healthcare of reproductive-aged women in rural Indian, an underserved and understudied population.
- This is the first study to report the association of screening positive for symptoms of common mental disorders (CMD) with self-reported health status, healthcare expenditure, and healthcare utilization among women in rural India.
- The multivariable negative binomial and ordinal logistic regression allowed robust estimation of disease-adjusted association, which preserved the data structure of self-reported measures.
- We are limited by our cross-section study design that limits causal interpretation. However, identification of the associations between women screening positive for CMD symptoms and healthcare expenditure holds significance in the context of a system where the majority of healthcare costs are out of pocket and women face barriers in accessing healthcare.

INTRODUCTION

Depression is the leading cause of total years lived with disability globally. [1,2] In developed countries, depression has been associated with lower health status and productivity, increased ambulatory and emergency hospital visits, and greater healthcare costs.[3,4] Despite recent estimates suggesting that low and middle-income countries (LMIC) experience over 80% of the worldwide burden attributed to depression,[1,5] there is disproportionately limited data about mental health and its related factors from these countries. Within LMIC, further disparities exist such that regions with a relatively greater burden of common mental disorders (CMD) remain understudied.

The majority of mental health studies in India are conducted in the progressive states of Goa or Kerala, which have high levels of female empowerment and education, important predictors of mental health.[6–8] By contrast, reproductive-aged women from the state of Gujarat are three times less likely to have 10 or more years of education as those from Goa and Kerala and roughly four times more likely to be married before 18 years of age.[9] Nevertheless, mental health in Gujarat is comparatively understudied and there are reports of tremendous stigma against mental disorders among community members as well as healthcare providers, further limiting access to mental health.[10–13] Because healthcare priorities are often dictated by disease burden and its impact on individuals and their communities, information about CMD and its associated healthcare outcomes is necessary to guide prioritization of mental health programs.

The goal of this study was to determine the prevalence of CMD symptoms and characterize its association with three inter-related health factors i.e. 1) self-reported health status, 2) portion of yearly household income spent on healthcare, and 3) healthcare utilization in the previous year

among an understudied population of women from rural western India based on a representative, cross-sectional survey.

METHODS

Setting and Study Design: Data were collected through a cross-sectional survey among women living in rural settings in the Anand district of Gujarat, India. Trained interviewers conducted face-to-face surveys in Gujarati, the local language. Participants were recruited in a quasi-randomized manner from two different settings: 1) Shree Krishna Hospital, a tertiary care center serving the local rural population; and 2) 16 villages within a 20-kilometer radius of the hospital. In the hospital clinic waiting areas, interviewers approached every third woman seated in the outpatient waiting area. Interviews were conducted in the waiting area but away from participants' family members and other patients in the clinic. Prior to recruitment in the villages, the layout of each village was obtained. Every third household in each of the village's colonies was approached and the first female who encountered the interviewer was asked to participate in the study. Community interviews were conducted at participants' residences. In both settings, two research supervisors, a male and a female, ensured privacy of all participants.

Participants: Seven hundred eligible women between the ages of 18-45 years who could comprehend and speak Gujarati and had a rural residence within the Anand district, consented and participated in the study. For the purpose of this study, we excluded participants who were hospitalized or visiting in-patient relatives because they might experience acute emotional distress and have unique life circumstances that are different from participants identified in the outpatient area or in the community. A study of this nature with more than 642 participants would have a priori power of 90% (α error = 0.01) to detect a difference in proportions of 50%

vs 35% for two groups. Based on our understanding before we conducted the study, these proportions would be reasonable to postulate for women with and without CMD who spend a substantial part of their income on health.

Ethics: Consent of the participants was obtained by the trained interviewers prior to survey. Interviewers read the consent to participants in Gujarati and shared a single-page fact sheet about the study with them. Willing participants were asked to sign or initial a separate consent form that was never linked to the survey to preserve the anonymous nature of the survey. Boston University Institutional Review Board and the Human Research Ethics Committee of HM Patel Center for Medical Care and Education reviewed the study independently and approved it.

Data Sources: The data used in the study were collected as part of a broader survey comprised of five modules: a) health status, b) current and past medical history, c) lifestyle choices, d) healthcare seeking behavior, and e) affordability of healthcare. The survey was drafted in English and underwent two iterations of translation back and forth between Gujarati and English. Five trained female interviewers piloted the survey with one volunteer each and conducted all interviews from October 1 – October 13, 2011. An average survey lasted 20-30 minutes. The following variables were extracted for this study:

Exposure: CMD symptoms were assessed using the World Health Organization (WHO) Self-Reporting Questionnaire (SRQ-20).[14] Due to the absence of validation studies for SRQ-20 use in Gujarati population, we used the threshold for a positive test from a previous study conducted in a nearby location. Participants who responded 'yes' to eight or more questions were

considered to have screened positive for CMD symptoms.[15] SRQ-20 demonstrated excellent internal reliability in our population as measured by the Kuder Richardson 20 score of 0.90.

Outcomes:

1) Health status was assessed by using the first question from the SF-12 instrument: "*In general, would you say your health is"* with possible choices of (a) Excellent, (b) Very Good, (c) Good, (d) Fair, or (e) Poor.
2) Expenditure of household income on healthcare was measured by asking participants, "What most closely estimates the portion of your yearly household income spent on healthcare?" with choices offered as (a) none, (b) less than ¼, (c) ¼ to less than ½, (d) ½ to ¾, or (e) more than ¾.
3) Number of healthcare visits in the previous year was determined by participant self-report. Participants were asked to report the number of times they visited a village, public, private, ayurvedic, or homeopathic clinic/hospital in the previous year.

Confounders: Potential associations between CMD symptoms and healthcare utilization, self-reported health status, and expenditure on healthcare can be confounded by the presence of other diseases, age, marital status, income, education level, and reproductive factors (total number of pregnancies, number of living children). Therefore, these factors were adjusted for using multivariable methods. Disease burden was based on self-report of current conditions or past diagnoses of chronic diseases excluding any mental health disorders (see footnotes in Table 1 for more details). Disease burden was estimated as an aggregate grouped into four categories: no disease, one disease, two diseases, and three or more diseases. Marital status, education level, and reproductive history were based on self-report. As described elsewhere,[16] monthly

household income was transformed into income/person/day values to account for variation in the household size. Daily per capita income was subsequently converted to US dollars using the average currency exchange rate from 2011, the year the study was conducted and categorized into three levels (< $0.25, $0.25-$1.25, >$1.25).

All items, with the exception of SRQ-20 and SF-12, were study-specific and developed based on input from care providers and community members of these settings.

Data Management and Analyses: The paper-form surveys were entered into a database using Epi-Info software. All data entry was verified for errors by a team member different than the one performing the original data entry.

Descriptive data analyses were performed to assess the distribution of potential confounders with respect to CMD symptom screening status. Frequencies and percentages were calculated for categorical variables; associations with CMD symptom screening status were assessed using chi-square test for independence of attributes or Fischer's exact test. Bivariate associations of CMD symptom screening status with number of visits to clinic in the previous year, total number of pregnancies, and number of live births were assessed using a one-way analysis of variance test. Ordered logistic regression analyses were used to quantify the relationship of positive CMD symptom screen with health status and household income spent on healthcare. The association of positive CMD screen and number of healthcare visits in the previous year was evaluated using negative binomial regression modeling. Unadjusted and adjusted incidence rate ratios (IRR) were calculated and interpreted as a count multiplier for the number of healthcare visits in the previous year. All three models adjusted for number of co-morbid conditions, age, income, education, marital status, and reproductive history. Subgroup analyses to investigate differences between

the hospital and community-based sample and sensitivity analyses to examine changes in the findings based on varying thresholds (6+ to 12+) for determining whether participants had positive CMD symptoms screen were performed to check for potential sources of biases. Multiple imputation using chained equations (5 imputations, 25 burn-in iterations) was performed to impute missing values for missing covariates; the one instance of a missing outcome was not imputed. The adequacy of burn-in period was assessed by examining stationarity of each chain by the end of burn-in periods from 1 to 30. All statistical analyses were performed in STATA v13.

RESULTS

Of the 700 participants interviewed for the study, 19 surveys were excluded due to incompleteness, 18 participants were excluded because they were visiting hospitalized relatives, and five surveys were classified as outliers due to their healthcare behavior (these participants had more than 20 clinical visits in the previous year due to serious health conditions) yielding an analytic sample of 658 women. Using the SRQ-20 to assess symptoms suggestive of CMD, 155 (22.8%) participants screened positive having answered yes to at least eight of 20 questions (Table 1). Only twelve participants reported seeing a non-allopathic medical provider and among them, all but four, also saw an allopathic provider. Therefore, the number of healthcare visits was based on aggregate visits reported, regardless of the provider. On average, participants reported visiting a healthcare provider more than three times in the previous year. Few participants (n=14, 2.13%) reported poor health status; therefore, we grouped participants who self-reported fair or poor health status into one category. The majority of the respondents considered their health status less than very good (i.e.; good or fair/poor). Over 60% of participants reported spending less than a quarter of their yearly income on healthcare; six participants (0.9%) reported

spending none, and 17 (2.6%) reported spending more than ¾ of their yearly income, and thus responses were categorized into 2 groups (i.e. spending less than ¼, and more than ½ of yearly income). Increased levels of education and household income were associated with decreased likelihood of screening positive for CMD symptoms.

More than four out of every five (81·3%) respondents who screened positive for CMD symptoms reported they had not been diagnosed with depression or another mental health disorder by their healthcare provider even though all but four of these women reported visiting a healthcare provider at least once in the past year (results not shown).

Table 1: Sociodemographic and Health Characteristics of 658 Reproductive-Aged Women from Rural India Stratified by Screening Status For Common Mental Disorders (CMD) Symptoms.

	Total	CMD Symptoms (col %)		
	N	Positive	Negative	p
Participants (N)	658	155	503	
Location: Clinic	311	43.9	48.3	0.33
# Clinic Visits[a] (mean(sd))	3.6 (2.8)	3.2(2.5)	4.6(3.5)	0.001[#]
Health Status				
Excellent	166	1.3	32.6	<0.001[*]
Very Good	95	3.9	17.7	
Good	249	34.8	38.8	
Fair/Poor	148	60.0	10.9	
HHI Spent on Healthcare[b]	*1 missing*			
Less than 1/4	403	36.8	68.9	<0.001
1/4 to 1/2	184	38.0	24.9	
More than 1/2	70	25.2	6.2	
# Diseases or Conditions[c]				
Zero	221	3.9	42.2	<0.001[*]
One	155	17.4	25.8	
Two	148	28.4	20.9	
Three or more	134	50.3	11.1	
Current Depression				
Yes	34	18.7	1.0	N/A
Age (years)	*2 missing*			
18-25	226	28.6	36.3	0.18

26-35	249	39.6	37.5	
36-45	181	31.8	26.3	
Education	*2 missing*			
< 7th Grade	162	34.8	21.6	<0.001
7th - 12th Grade	356	55.5	53.9	
> 12th Grade	138	9.7	24.5	
Marital Status	*1 missing*			
Single	97	8.4	16.7	0.03*
Married	541	88.3	80.5	
Divorced or Widowed	19	3.3	2.8	
Daily Income Per Person	*22 missing*			
< $0.25	49	13.5	5.9	0.01
$0.25-1.25	369	56.1	58.6	
>$1.25	218	30.4	35.5	
# Pregnancies (mean(sd))	2.13(1.78)	2.55(1.92)	2.00(1.71)	<0.001#
# Living children (mean(sd))	1.60(1.35)	1.85(1.34)	1.52(1.34)	0.001#

a: Number of clinic visits in the previous year based on self-report
b: Portion of yearly household-income spent on healthcare expenditure
c: Participants were asked to identify using a list of 33 non-psychiatric conditions and diseases. 22 conditions and diseases reported at least once by any participant; these were reviewed by trained clinicians to identify chronic conditions. Based on the review, an aggregate variable to represent chronic disease burden was generated; it comprised of cardiovascular problems (coronary heart disease, hypertension, positive history of heart attack or related condition), pulmonary problems (difficulty breathing, chronic allergies, asthma, or chronic bronchitis), musculoskeletal pain (chronic back problems, arthritis, difficulty opening mouth, or limited mobility due to pain), toothaches, anemia, and diabetes.
* Fischer's Exact Test; #ANOVA

After controlling for confounders, screening positive for CMD symptoms was associated with more than an nine-fold increase in the cumulative odds of reporting a worse health status (cumulative OR (cumOR)= 9.34; 95% CI: 5.93-14.70) and a two-fold increase in the cumulative odds of reporting a higher category of income expenditure on healthcare (cumOR = 2.25; 95% CL: 1.48-3.44) (Table 2). Increasing number of comorbid non-psychiatric conditions were associated with self-report of lower health status and greater portion of income spent on healthcare (Supplementary Table 1). In comparison to participants with no comorbid non-psychiatric conditions, participants who reported three or more had more than twice the

cumulative odds of reporting a poorer health status (cumOR = 2.61; 95% CL: 1.60-4.24) and more than three times greater cumulative odds of spending a higher portion of their yearly income on healthcare (OR = 3.46; 95% CL 2.05 – 5.84). Violations of the parallel regression assumptions for ordered logistic regression were ruled out using Brant test for health status (χ^2 = 29.76, df = 22; p = 0.67) and income spent on healthcare outcomes (χ^2 = 9.37, df = 22; p = 0.67).

Table 2: Ordinal Logistic Regression Models for the Association between Common Mental Disorders (CMD) symptoms and a) Self-Reported Health Status and b) Yearly Income Spent on Healthcare

	Self-Reported Health Status[a] (n = 633)	**Yearly Income Spent on Healthcare**[b] (n = 632)
	CumOR (95% CL)*	CumOR (95% CL)*
CMD Symptoms: Negative (ref)		
Positive (SRQ-20 ≥ 8)	9.34 (5.93-14.70)	2.25 (1.48-3.44)

Ordered categories: a= Excellent, Very Good, Good, Fair/Poor; b = <1/4 , 1/4-1/2, > 1/2
*CumOR: Cumulative odds ratio adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.

Results from negative binomial regression models are reported in Table 3. A negative binomial model was selected over Poisson to account for the over dispersion in the outcome (α=0.23; χ^2= 150.05, p < 0.001); improvement of model fit using zero inflated negative binomial regression was tested and ruled out using Vuong Test (z = 0.42, p = 0.34). Before adjusting for confounding, screening positive for CMD symptoms was associated with a 40% increase in the number of clinical visits in the previous year (IRR = 1.41; 95% CI: 1.24-1.60). After adjusting for potential confounders, the association was attenuated but remained statistically significant (IRR = 1.22; 95% CI: 1.05-1.42). Adjusted analyses revealed that in comparison to participants with no comorbidities, women who reported experiencing multiple non-psychiatric comorbidities

were more likely to have greater number of clinic visits in the previous year (two diseases: IRR = 1.18 [1.00 -1.39]; three or more diseases: IRR = 1.27 [1.06-1.52]) (Supplementary Table 2).

Table 3: Multivariable Negative Binomial Regression Model Estimates of Count Multiplier (IRR [A]) for Clinical Visits in the Previous Year Based on Screening Status for CMD Symptoms

	unadjusted	**adjusted* (n=633)**
	IRR (95% CL)	IRR (95% CL)
CMD Symptoms: Negative (ref)		
Positive (SRQ-20 ≥ 8)	1.41 (1.24-1.60)	1.22 (1.05-1.42)

a: IRR = incidence rate ratio is calculated by exponentiating beta co-efficients of count models. IRR can be interpreted as count multipliers. For example, screening positive for CMD symptoms is associated with a 42% increase in the number of clinical visits in the previous in comparison to those who do not screen positive (unadjusted estimates)
* adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.

Sensitivity analyses based on site of enrollment (clinic vs. village), threshold values for positive screening for CMD symptoms and missing data did not reveal any changes in direction or statistical significance for the association of CMD symptoms with health status, percentage of income spent on healthcare expenditure, or number of clinical visits in the previous year (Table 4).

Table 4: Results of Subgroup Analyses by Location of Survey, Sensitivity Analyses using Stricter Threshold Value for Positive Screening for CMD Symptoms, and Imputed Dataset to Account for Missing Values

	Self-Reported Health Status[a] (n = 633)	**Yearly Income spent on healthcare**[b] (n = 632)	**Number of clinical visits in previous year** (n=633)
	CumOR (95% CL)*	CumOR (95% CL)*	IRR (95% CL)
Original	9.34 (5.93-14.70)	2.25 (1.48-3.44)	1.22 (1.05-1.42)
By Location			
Clinic	11.79 (5.94-23.40)	2.77 (1.46-5.24)	1.21 (0.98 – 1.51)
Village	7.72 (4.14-14.37)	2.04 (1.14-3.65)	1.25 (1.03 – 1.52)
Threshold Value			
SRQ-20 ≥ 12	6.82 (3.72-12.51)	3.37 (1.98-5.75)	1.37 (1.14-1.64)
Missing Data			
Imputed Dataset	8.42 (5.44-13.05)	2.23 (1.48-3.36)	1.23 (1.06-1.42)

Ordered categories: a= Excellent, Very Good, Good, Fair/Poor; b = <1/4 , 1/4-1/2, > ½
Adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.

DISCUSSION

In this sample of reproductive-aged women from rural western India, approximately one out of every four participants screened positive for CMD symptoms. High mental distress in this population may be attributed to overall circumstances of women's lives in this setting. We have previously reported that CMD symptoms in this setting are closely associated with poor socioeconomic status, food insecurity, and exposure to traumatic events.[17] Despite visiting a healthcare provider at least once in the previous year, the majority of participants reported that they had not been diagnosed with depression or other mental health disorder by their healthcare provider. Screening positive for CMD symptoms was associated with worse self-reported health status, a higher portion of household income expended on healthcare, and an increased number of healthcare visits. The associations found in our study were robust to subgroup, sensitivity, and missing data analysis with the exception of a stronger association between health status and CMD symptoms among women interviewed in clinic compared to those interviewed in the village.

Our finding of potentially unrecognized CMD (81·3%) is similar to the 79.0% depression prevalence reported by Kohli et al for primary care attendees from another rural region in India.[18] The high rates are likely to be driven by two main factors. First, compared to western societies, people in India are more likely to attribute mental illness to personally controllable factors and thus mental health in rural India is associated with a tremendous amount of stigma and social disadvantage.[10,19] Consequently, Indians may be less willing to disclose

psychological symptoms. Indeed, studies have shown that most Indian patients suffering from mental disease present with somatic symptoms, which may increase the likelihood that CMD goes undetected.[20–23] Second, there is a scarcity of mental healthcare providers in India and other healthcare providers do not receive adequate mental health training.[24] Thus, in primary care settings mental illness may not be considered in the differential diagnoses, especially in the context of an atypical presentation, leading to inadequate identification of mental diseases.[25]

Our findings suggest that women screening positive for CMD symptoms had visited their providers more frequently and were more likely to spend a larger portion of their household income on healthcare. The association between CMD symptoms and healthcare cost also could be self-perpetuating. Women screening positive have considerably lower appraisal of their personal health than those who screen negative, which probably explained their seeking healthcare more often. Indian women who are suffering from mental illness are known to present to primary clinics with somatic rather than psychological symptoms, which may lead to under-diagnosis and treatment of their CMD.[23] Patients and their medical providers may continue to search for a physical cause, incurring healthcare costs and a greater number of healthcare visits, while the underlying mental illness remains unrecognized and unaddressed.[25,26]

Alternatively, it is also possible that providers may have suspected mental illness but not directly addressed it with the patient; providers may have attributed possible mental illnesses to female suppression and poverty. In such instances, providers may find themselves ill-positioned to assist with underlying risk factors for mental health problems. Given the study design and the data collected, it is impossible to rule out this scenario; nevertheless, it is striking that the majority of

women screening positive for CMD symptoms report they never received a diagnosis from a healthcare provider despite having reported seeing a provider at least once in the previous year. This represents a missed opportunity to screen and assess women for CMD. Identification of women who may have CMD or be at risk of developing CMD could facilitate detection, assessment and treatment.

The high prevalence of poverty in India creates important barriers for recognition and treatment of CMD. Due to healthcare related costs, 63 million people in India fall below the poverty line every year.[27] This number is expected to rise given the inevitable increase in the prevalence of chronic, non-communicable diseases in India, which carry a greater financial burden than communicable diseases.[28,29] Treating CMD with pharmacological and psychological therapies has been shown to reduce the economic burden of healthcare among adults.[30,31] Thus, treatment of mental illness could break this vicious cycle of poverty and CMD.[30,31] The Indian government recently proposed to revamp its mental health services through the National Mental Health Policy of India (NMHPI). NMHPI proposes to increase the number of mental healthcare providers and expand coverage from 182 to 648 districts and support 11 centers of excellence in mental health to train the next generation's mental healthcare providers.[32] Despite the laudable NMHPI proposal, the urgent needs of rural Indian women may continue to go unaddressed because the proposal may be difficult to implement due to lack of funding and a cohesive implementation plan.[33]

Integration of mental healthcare into primary care could provide a solution because women suffering from mental illness most often present to primary care settings.[34,35] The increased

frequency of healthcare visits among women screening positive for CMD symptoms in our study potentially highlights missed opportunity for intervention. Depression screening needs to be done in conjunction with a systematic approach to ensuring adequate access to mental health assessment and care.[36] It is well-established that integrated care models, such as collaborative care, effectively integrate depression and primary care, can improve clinical outcomes, and can also be carried out by non-specialist health workers.[37,38] Such approaches have also been tested in India; Patel and colleagues tested a collaborative stepped care (CSC) model that included four levels of referral before a clinical specialist became involved in care.[39] The CSC model begins with CMD screening for adult patients that present to clinic with a village health worker, and progresses through therapeutic steps of increasing intensity including yoga, behavioral, and pharmacologic interventions. Patients who do not respond to a less intense treatment are stepped up to a higher intensity therapeutic option. The CSC model improves mental illness over a six month period and holds promise as an effective mechanism to improve mental health in rural India.[40] However, the wide implementation of the CSC model in India is lacking and has been limited to Goa and South India, two regions in India that face a comparatively lower burden of mental diseases.[41,42] Thus, there is need for cost-effective treatment plans that leverage primary care providers and staff already working in the primary care setting.

The findings from our study must be interpreted in the context of its limitations. We identified CMD symptoms using a validated screening questionnaire, SRQ-20, instead of a diagnostic structured clinical interview. It is possible that women who screen positive for CMD symptoms may have had sub-syndromal symptoms. However, our decision to use SRQ-20 for this study

was based on sound principles: 1) The SRQ-20 was developed specifically for use in global health research conducted low-resource setting. It is validated, well-accepted, and has been described as a cost-effective way of measuring mental health, [15] 2) The purpose of this study was not to investigate psychiatric practice or clinical management of CMD in India but rather to understand the characteristics of women who might be suffering from mental illness, and 3) In the context of India, where mental health literacy is limited, administration of a high face-validity instrument such as SRQ-20 with yes and no responses lowers the interview-burden on participants.[14] Our data were collected through a cross-sectional survey and thus we cannot comment on the causal relationship of our findings, it is possible that women with poor appraisal of their personal health develop CMD symptoms. Presence of comorbidities among our participants was captured through self-report and therefore is vulnerable to differential recall where women with positive screen for CMD symptoms potentially over-report their conditions. However, such misclassification would likely bias our estimates toward the null hypotheses. Our estimates of household expenditure on healthcare were based on a single question and had broad categories and therefore may lack precision. However, we used trained local interviewers to pilot the question. Moreover, in the context of rural Gujarat, this instrument provides information about healthcare costs that is difficult to capture and not available in other databases.[35] Lastly, our finding of increased cumulative odds of reporting a higher portion of household expenditure on healthcare with increasing number of comorbidities suggests that our instrument performed as expected.

In conclusion, we found a high number of Indian women screening positive for CMD symptoms that was unrecognized and associated with adverse impacts on overall health and economic well-

being. Our findings suggest that there is a need to screen, assess, and manage CMD in primary healthcare and community-based settings in India. This could, in turn, improve overall health status and reduce healthcare related economic burden.

Contributors' Statement:

Apurv Soni: Soni conceptualized, designed, and implemented the study in India. Soni carried out the initial analyses, drafted the initial manuscript, and approved the final manuscript as submitted.

Nisha Fahey: Fahey conceptualized, designed, and implemented the study in India. Fahey provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Nancy Byatt: Byatt provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Anusha Prabhakaran: Prabhakaran provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Tiffany A. Moore Simas: Moore Simas provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Jagdish Vankar: Vankar provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Ajay Phatak: Phatak conceptualized, designed, and implemented the study in India. Phatak provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Eileen O'Keefe: O'Keefe conceptualized and designed the study. O'Keefe provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Jeroan Allison: Allison provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Somashekhar Nimbalkar: Nimbalkar conceptualized, designed, and implemented the study in India. Nimbalkar provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Competing Interests: I have read and understood the BMJ Group policy on declaration of interests and declare the following interests: None

Data sharing statement: No additional data are available

References

1 Whiteford HA, Degenhardt L, Rehm J, *et al.* Global burden of disease attributable to mental and substance use disorders: Findings from the Global Burden of Disease Study 2010. *Lancet* 2013;**382**:1575–86. doi:10.1016/S0140-6736(13)61611-6

2 Murray CJL, Lopez A. A comprehensive assessment of mortality and disability from disease, injures and risk factors in 1990 and projected to 2020. In: *The Global Burden of Disease*. 1996. 1–51. doi:10.1186/1471-2458-13-863

3 Druss BG, Walker ER. Mental disorders and medical comorbidity. *Synth Proj Res Synth Rep* 2011;:1–26.

4 Egede LE. Major depression in individuals with chronic medical disorders: prevalence, correlates and association with health resource utilization, lost productivity and functional disability. *Gen Hosp Psychiatry* 2007;**29**:409–16. doi:10.1016/j.genhosppsych.2007.06.002

5 Chan M. Mental Health and Development: Targeting People with Mental Health Conditions as a Vulnerable Group. 2010.

6 Ganguli HC. Epidemiological findings on prevalence of mental disorders in India. *Indian J Psychiatry* 2000;**42**:14–20.

7 Shidhaye R, Patel V. Association of socio-economic, gender and health factors with common mental disorders in women: a population-based study of 5703 married rural women in India. *Int J Epidemiol* 2010;**39**:1510–21. doi:10.1093/ije/dyq179

8 Patel V, Lund C, Hatherill S, *et al.* Mental disorders: equity and social determinants. In: *Equity, social determinants and public health programmes*. 2010. 115–35.

9 Kishor S, Gupta K. Gender Equality and Women's Empowerment in India. Mumbai: 2009. http://rchiips.org/nfhs/a_subject_report_gender_for_website.pdf

10 Liu MC, Tirth S, Appasani R, *et al.* Knowledge and Attitudes Toward Depression Among Community Members in Rural Gujarat, India. *J Nerv Ment Dis* 2014;**202**:813–21. doi:10.1097/NMD.0000000000000199

11 Amin G, Shah S, Vankar GK. The prevelance and recognition of depression in primary care. *Indian J Psychiatry* 1998;**40**:364–9.

12 Saddichha S, Vibha P, Saxena MK, *et al.* Behavioral emergencies in India: A population based epidemiological study. *Soc Psychiatry Psychiatr Epidemiol* 2010;**45**:589–93.

doi:10.1007/s00127-009-0103-8

13 Almanzar S, Shah N, Vithalani S, *et al.* Knowledge of and attitudes toward clinical depression among health providers in gujarat, India. *Ann Glob Heal* 2014;**80**:89–95. doi:10.1016/j.aogh.2014.04.001

14 World Health Organization. A user's guide to the Self Reporting Questionnaire. *Geneva World Heal Organ* 1994.

15 Harpham T, Reichenheim M, Oser R, *et al.* Measuring mental health in a cost-effective manner. *Health Policy Plan* 2003;**18**:344–9. doi:10.1093/heapol/czg041

16 Soni A, Fahey N, Phatak AG, *et al.* Differential in healthcare seeking behavior of mothers for themselves versus their children in rural India: Results of a cross sectional survey. *Int Public Heal J* 2014;**6**:57–66.

17 Fahey N, Soni A, Allison J, *et al.* Higher Levels of Education Mitigate the Relationship between Perceived Stress and Positive Screening for Common Mental Disorders among Women in Rural India: Results of a Cross-Sectional Study. *Ann Glob Heal* 2016;**In Press**.

18 Kohli C, Kishore J, Agarwal P, *et al.* Prevalence of unrecognised depression among outpatient department attendees of a rural hospital in delhi, India. *J Clin Diagn Res* 2013;**7**:1921–5. doi:10.7860/JCDR/2013/6449.3358

19 Nieuwsma JA, Pepper CM, Maack DJ, *et al.* Indigenous perspectives on depression in rural regions of India and the United States. Transcult. Psychiatry. 2011;**48**:539–68. doi:10.1177/1363461511419274

20 Pereira B, Andrew G, Pednekar S, *et al.* The explanatory models of depression in low income countries: listening to women in India. *J Affect Disord* 2007;**102**:209–18. doi:10.1016/j.jad.2006.09.025

21 Andrew G, Cohen A, Salgaonkar S, *et al.* The explanatory models of depression and anxiety in primary care: a qualitative study from India. BMC Res. Notes. 2012;**5**:499. doi:10.1186/1756-0500-5-499

22 Nambi SK, Prasad J, Singh D, *et al.* Explanatory models and common mental disorders among patients with unexplained somatic symptoms attending a primary care facility in Tamil Nadu. *Natl Med J India* 2002;**15**:331–5.

23 Grover S, Dutt A, Avasthi A. An overview of Indian research in depression. *Indian J Psychiatry* 2010;**52**:S178–88. doi:10.4103/0019-5545.69231

24 WHO-AIMS report on Mental Health System in Gujarat, India. 2006. https://www.mindbank.info/item/4531 (accessed 31 May2015).

25 Paykel ES, Priest RG. Recognition and management of depression in general practice: consensus statement. *BMJ Br Med J* 1992;**305**:1198–202.

26 Linden M, Lecrubier Y, Bellantuono C, *et al.* The prescribing of psychotropic drugs by primary care physicians: an international collaborative study. *J Clin Psychopharmacol* 1999;**19**:132–40.

27 National Health Policy 2015 :: Ministry of Health and Family Welfare.

http://www.mohfw.nic.in/showfile.php?lid=3014 (accessed 22 Oct2015).

28 Berman P, Ahuja R, Bhandari L. The Impoverishing Effect of Healthcare Payments in India: New Methodology and Findings. *Econ Polit Wkly* 2010;**xlv**:65–71.

29 Binnendijk E, Koren R, Dror DM. Can the rural poor in India afford to treat non-communicable diseases. *Trop Med Int Health* 2012;**17**:1376–85. doi:10.1111/j.1365-3156.2012.03070.x

30 Patel V, Weobong B, Nadkarni A, *et al.* The effectiveness and cost-effectiveness of lay counsellor-delivered psychological treatments for harmful and dependent drinking and moderate to severe depression in primary care in India: PREMIUM study protocol for randomized controlled trials. *Trials* 2014;**15**:101. doi:10.1186/1745-6215-15-101

31 Patel V, Chisholm D, Rabe-Hesketh S, *et al.* Efficacy and cost-effectiveness of drug and psychological treatments for common mental disorders in general health care in Goa, India: a randomised, controlled trial. *Lancet* 2003;**361**:33–9. doi:10.1016/S0140-6736(03)12119-8

32 Sinha S, Kaur J. National mental health programme: Manpower development scheme of eleventh five-year plan. Indian J. Psychiatry. 2011;**53**:261. doi:10.4103/0019-5545.86821

33 Sharma DC. India's new policy aims to close gaps in mental health care. Lancet. 2014;**384**:1564.

34 Das J, Do Q-T, Friedman J, *et al.* Mental Health Patterns and Consequences: Results from Survey Data in Five Developing Countries. *World Bank Econ Rev* 2008;**23**:31–55. doi:10.1093/wber/lhn010

35 Patel V, Chisholm D, Kirkwood BR, *et al.* Prioritizing health problems in women in developing countries: comparing the financial burden of reproductive tract infections, anaemia and depressive disorders in a community survey in India. *Trop Med Int Health* 2007;**12**:130–9. doi:10.1111/j.1365-3156.2006.01756.x

36 Kagee A, Tsai AC, Lund C, *et al.* Screening for common mental disorders in low resource settings: reasons for caution and a way forward. *Int Health* 2013;**5**:11–4. doi:10.1093/inthealth/ihs004

37 Woltmann E, Grogan-Kaylor A, Perron B, *et al.* Comparative effectiveness of collaborative chronic care models for mental health conditions across primary, specialty, and behavioral health care settings: systematic review and meta-analysis. *Am J Psychiatry* 2012;:790–804.

38 van Ginneken N, Tharyan P, Lewin S, *et al.* Non-specialist health worker interventions for the care of mental, neurological and substance-abuse disorders in low- and middle-income countries. Cochrane database Syst. Rev. 2013;**11**.

39 Patel VH, Kirkwood BR, Pednekar S, *et al.* Improving the outcomes of primary care attenders with common mental disorders in developing countries: a cluster randomized controlled trial of a collaborative stepped care intervention in Goa, India. *Trials* 2008;**9**:4. doi:10.1186/1745-6215-9-4

40 Patel V, Weiss H a., Chowdhary N, *et al.* Effectiveness of an intervention led by lay

health counsellors for depressive and anxiety disorders in primary care in Goa, India (MANAS): A cluster randomised controlled trial. *Lancet* 2010;**376**:2086–95. doi:10.1016/S0140-6736(10)61508-5

41 Singla D, Lazarus A, Atif N, *et al.* 'Someone like us': delivering maternal mental health through peers in two South Asian contexts. *J Affect Disord* 2014;**168**:452–8. doi:10.1016/j.jad.2014.07.017

42 Patel V, Kirkwood BR, Pednekar S, *et al.* Gender disadvantage and reproductive health risk factors for common mental disorders in women: a community survey in India. *Arch Gen Psychiatry* 2006;**63**:404–13. doi:10.1001/archpsyc.63.4.404

Supplementary Table 1: Ordinal Logistic Regression Models for the Association between Chronic Co-morbid Conditions and a) Self-Reported Health Status and b) Yearly Income Spent on Healthcare		
	Self-Reported Health Status[a] (n = 633)	**Yearly Income Spent on Healthcare**[b] (n = 632)
	CumOR (95% CL)*	CumOR (95% CL)*
Disease or Conditions: Zero (ref)		
One	1.19 (0.80-1.77)	1.26 (0.76-2.07)
Two	1.64 (1.08-2.47)	3.07 (1.90-4.96)
Three or More	2.61 (1.60-4.24)	3.46 (2.05-5.84)
Ordered categories: a= Excellent, Very Good, Good, Fair/Poor; b = <1/4 , 1/4-1/2, > 1/2 *CumOR: Cumulative odds ratio adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.		

Supplementary Table 2: Multivariable Negative Binomial Regression Model Estimates of Count Multiplier (IRR [A]) for Clinical Visits in the Previous Year Based on Number of Chronic Co-morbid Conditions		
	unadjusted	**adjusted* (n=633)**
	IRR (95% CL)	IRR (95% CL)
Comorbid Conidtions: None (ref)		
1	1.10 (0.94-1.28)	1.11 (0.95-1.29)
2	1.25 (1.07-1.46)	1.18 (1.00-1.39)
3 or more	1.47 (1.26-1.72)	1.27 (1.06-1.52)
a: IRR = incidence rate ratio is calculated by exponentiating beta co-efficients of count models. IRR can be interpreted as count multipliers. For example, screening positive for CMD symptoms is associated with a 42% increase in the number of clinical visits in the previous in comparison to those who do not screen positive (unadjusted estimates) * adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.		

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional 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 2: ABSTRACT (Methods)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found Page 2: ABSTRACT (Methods and Results)
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Page 3: INTRODUCTION (1st and 2nd Paragraph)
Objectives	3	State specific objectives, including any prespecified hypotheses Page 3: INTRODUCTION (3rd Paragraph)
Methods		
Study design	4	Present key elements of study design early in the paper Page 5: METHODS (Setting and Study Design)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection Page 5: METHODS (Setting and Study Design)
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants Pages 6 : METHODS (Participants)
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable Pages 7-9 : METHODS (Data Variables)
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 Pages7-9: METHODS (Data Variables)
Bias	9	Describe any efforts to address potential sources of bias Pages 8-10: METHODS (Data Variables *confounders*, Statistical Analysis)
Study size	10	Explain how the study size was arrived at Page 6: METHODS (Participants)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why Pages 7-10 : METHODS (Data Variables *confounders*, Statistical Analysis)
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding Pages 9-10: METHODS (Statistical Analyses)
		(*b*) Describe any methods used to examine subgroups and interactions Pages 10: METHODS (Statistical Analyses)
		(*c*) Explain how missing data were addressed Pages 10: METHODS (Statistical Analyses)
		(*d*) If applicable, describe analytical methods taking account of sampling strategy We did not use sample survey weights in our study
		(*e*) Describe any sensitivity analyses Pages 10: METHODS (Statistical Analyses)

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
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram 13:a-c) All participants were interviewed once when their eligibility was examined prior to interview. Details regarding participant participation is provided on pages 5 and 6 : METHODS (Setting and Study Design, Data collection)
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders Pages 10-11: RESULTS (1st and 2nd paragraph; Table 1)
		(b) Indicate number of participants with missing data for each variable of interest Page 12: RESULTS (Table 1)
Outcome data	15*	Report numbers of outcome events or summary measures Page 12: RESULTS (Table 1)
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 Pages 13-14: RESULTS (3rd and 4th paragraph; Tables 2 and 3)
		(*b*) Report category boundaries when continuous variables were categorized Page 12: RESULTS (Table 1)
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period Not relevant for analyses provided
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses Pages 15-16: RESULTS
Discussion		
Key results	18	Summarise key results with reference to study objectives Page 16-17: DISCUSSION
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 20-21: DISCUSSION
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence Pages 17-20: DISCUSSION
Generalisability	21	Discuss the generalisability (external validity) of the study results Pages 17-20: DISCUSSION
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 Pages 6: METHODS (Funding and Ethical Approval)

BMJ Open

Association of Common Mental Disorder Symptoms with Health and Healthcare Factors among Women in Rural Western India: results of a cross-sectional survey.

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010834.R3
Article Type:	Research
Date Submitted by the Author:	07-Jun-2016
Complete List of Authors:	Soni, Apurv; University of Massachusetts Medical School, Quantitative Health Sciences / School of Medicine Fahey, Nisha; Des Moines University, College of Osteopathic Medicine Byatt, Nancy; University of Massachusetts Medical School Prabhakaran, Anusha; Pramukhsawmi Medical College Moore Simas, Tiffany; University of Massachusetts Medical School Vankar, Jagdish; Pramukhsawmi Medical College Phatak, Ajay; Pramukhsawmi Medical College O'Keefe, Eileen; Boston University Allison, Jeroan; University of Massachusetts Medical School Nimbalkar, Somashekhar; Pramukhsawmi Medical College
Primary Subject Heading:	Global health
Secondary Subject Heading:	Mental health, Public health, Health policy, Epidemiology
Keywords:	MENTAL HEALTH, PUBLIC HEALTH, EPIDEMIOLOGY

Association of Common Mental Disorder Symptoms with Health and Healthcare Factors among Women in Rural Western India: results of a cross-sectional survey.

Apurv Soni [a], Nisha Fahey [b], Nancy Byatt [a], Anusha Prabhakaran[c], Tiffany A. Moore Simas [a], Jagdish Vankar[c], Ajay Phatak[c], Eileen O'Keefe [d], Jeroan Allison [a], Somashekhar Nimbalkar[c]

Affiliations: [a] University of Massachusetts Medical School, Worcester, Massachusetts; [b] Des Moines University, Des Moines, Iowa; [c] Pramukhswami Medical College, Gujarat, India; [d] Boston University, Boston, Massachusetts.

Address Correspondence: Apurv Soni, Clinical and Population Health Research, AS7.1064, 55 Lake Avenue N, Worcester, Massachusetts, 01605, Apurv.Soni@umassmed.edu, 508-856-8956

Keywords: Common Mental Disorders, Health Status, Healthcare Expenditure, Healthcare Behavior, Rural India, Reproductive-aged Women.

Word Count: 3,631

References: 42

Funding: This study was supported by Boston University Dudley Allen Sargent Research Grant. Contribution by co-authors was partially supported by TL1-TR001454 (to A.S.) and KL2TR000160 (to N.B.) from National Center for Advancing Translational Sciences, P60-MD006912-05 (to J.A.) from National Institute on Minority Health and Disparities, and Joy McCann Endowment (to T.M.S.). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

ABSTRACT

Objectives
Information about common mental disorders (CMD) is needed to guide policy and clinical interventions in low and middle-income countries. This study's purpose was to characterize the association of CMD symptoms with three inter-related health and healthcare factors among women from rural western India based on a representative, cross-sectional survey.

Setting
Surveys were conducted in the waiting area of various outpatient clinics at a tertiary care hospital and in 16 rural villages in the Anand district of Gujarat, India.

Participants
700 Gujarati-speaking women between the ages of 18-45 years who resided in the Anand district of Gujarat, India were recruited in a quasi-randomized manner.

Primary and secondary outcomes measures
CMD symptoms, ascertained using WHO's Self-Reporting Questionnaire-20 (SRQ-20), were associated with self-reported 1) number of healthcare visits in the prior year; 2) health status; and 3) portion of yearly income expended on healthcare.

Results
Data from 658 participants were used in this analysis; 19 surveys were excluded due to incompleteness, 18 surveys were excluded because the participants were visiting hospitalized patients, and five surveys were classified as outliers. Overall, 155 (22·8%) participants screened positive for CMD symptoms (SRQ-20 score ≥ 8) with most (81.9%) not previously diagnosed despite contact with healthcare provider in the prior year. On adjusted analyses, screening positive for CMD symptoms was associated with worse category in self-reported health status (cumulative OR= 9.39; 95% CI: 5·97-14·76), higher portion of household income expended on healthcare (cumulative OR = 2·31; 95% CL: 1·52-3.52), and increased healthcare visits in the prior year (Incidence Rate Ratio = 1·24; 95% CI: 1·07-1·44).

Conclusions
The high prevalence of potential CMD among women in rural India that is unrecognized and associated with adverse health and financial indicators highlights the individual and public health burden of CMD.

Keywords: Common Mental Disorders, Health Status, Healthcare Expenditure, Healthcare Behavior, Rural India, Reproductive-aged Women.

Strengths and limitations of this study

- Our novel dataset contains information about health status and healthcare utilization of reproductive-aged women in rural India, an underserved and understudied population.
- This is the first study to report the association of screening positive for symptoms of common mental disorders (CMD) with self-reported health status, healthcare expenditure, and healthcare utilization among women in rural India.
- The multivariable negative binomial and ordinal logistic regression allowed robust estimation of disease-adjusted association, which preserved the data structure of self-reported measures.
- We are limited by our cross-sectional study design that limits causal interpretation. However, identification of the associations between women screening positive for CMD symptoms and healthcare expenditure holds significance in the context of a system where the majority of healthcare costs are out of pocket and women face barriers in accessing healthcare.

INTRODUCTION

Depression is the leading cause of total years lived with disability globally. [1,2] In developed countries, depression has been associated with lower health status and productivity, increased ambulatory and emergency hospital visits, and greater healthcare costs.[3,4] Despite recent estimates suggesting that low and middle-income countries (LMIC) experience over 80% of the worldwide burden attributed to depression,[1,5] there is disproportionately limited data about mental health and its related factors from these countries. Within LMIC, further disparities exist such that regions with a relatively greater burden of common mental disorders (CMD) remain understudied.

The majority of mental health studies in India are conducted in the progressive states of Goa and Kerala, which have high levels of female empowerment and education, important predictors of mental health.[6–8] By contrast, reproductive-aged women from the state of Gujarat are three times less likely to have 10 or more years of education compared to those from Goa and Kerala and roughly four times more likely to be married before 18 years of age.[9] Nevertheless, mental health in Gujarat is comparatively understudied and there are reports of tremendous stigma against mental disorders among community members as well as healthcare providers, which further limits access to mental health care.[10–13] Because healthcare priorities are often dictated by disease burden and its impact on individuals and their communities, information about CMD and its associated healthcare outcomes is necessary to guide prioritization of mental health programs.

The goal of this study was to determine the prevalence of CMD symptoms and characterize its association with three inter-related health factors i.e. 1) self-reported health status, 2) portion of

yearly household income spent on healthcare, and 3) healthcare utilization in the previous year among an understudied population of women from rural western India based on a representative, cross-sectional survey.

METHODS

Setting and Study Design: Data were collected through a cross-sectional survey among women living in rural settings in the Anand district of Gujarat, India. Trained interviewers conducted face-to-face surveys in Gujarati, the local language. Participants were recruited in a quasi-randomized manner from two different settings: 1) Shree Krishna Hospital, a tertiary care center serving the local rural population; and 2) 16 villages within a 20-kilometer radius of the hospital. In the hospital clinic waiting areas, interviewers approached every third woman seated in the outpatient waiting area. Interviews were conducted in the waiting area but away from participants' family members and other patients in the clinic. Prior to recruitment in the villages, the layout of each village was obtained. Every third household in each of the village's colonies was approached and the first female who encountered the interviewer was asked to participate in the study. Community interviews were conducted at participants' residences. In both settings, two research supervisors, a male and a female, ensured privacy of all participants.

Participants: Seven hundred eligible women between the ages of 18-45 years who could comprehend and speak Gujarati and had a rural residence within the Anand district consented and participated in the study. For the purpose of this study, we excluded participants who were hospitalized or visiting in-patient relatives because they might experience acute emotional distress and have unique life circumstances that are different from participants identified in the outpatient area or in the community. A study of this nature with more than 642 participants

would have a priori power of 90% (α error = 0.01) to detect a difference in proportions of 50% vs 35% for two groups. Based on our understanding before we conducted the study, these proportions would be reasonable to postulate for women with and without CMD who spend a substantial part of their income on health.

Ethics: Consent of the participants was obtained by trained interviewers prior to survey. Interviewers read the consent to participants in Gujarati and shared a single-page fact sheet about the study with them. Willing participants were asked to sign or initial a separate consent form that was never linked to the survey to preserve the anonymous nature of the survey. Boston University Institutional Review Board and the Human Research Ethics Committee of HM Patel Center for Medical Care and Education reviewed the study independently and approved it.

Data Sources: The data used in the study were collected as part of a broader survey comprised of five modules: a) health status, b) current and past medical history, c) lifestyle choices, d) healthcare seeking behavior, and e) affordability of healthcare. The survey was drafted in English and underwent two iterations of translation back and forth between Gujarati and English. Five trained female interviewers piloted the survey with one volunteer each and then conducted all interviews from October 1 – October 13, 2011. An average survey lasted 20-30 minutes. The following variables were extracted for this study:

Exposure: CMD symptoms were assessed using the World Health Organization (WHO) Self-Reporting Questionnaire (SRQ-20).[14] Due to the absence of validation studies for SRQ-20 use in Gujarati population, we used the threshold for a positive test from a previous study conducted in a nearby location. Participants who responded 'yes' to eight or more questions were

considered to have screened positive for CMD symptoms.[15] SRQ-20 demonstrated excellent internal reliability in our population as measured by the Kuder Richardson 20 score of 0.90.

Outcomes:

1) Health status was assessed by using the first question from the SF-12 instrument: "*In general, would you say your health is"* with possible choices of (a) Excellent, (b) Very Good, (c) Good, (d) Fair, or (e) Poor.
2) Expenditure of household income on healthcare was measured by asking participants, "What most closely estimates the portion of your yearly household income spent on healthcare?" with choices offered as (a) None, (b) Less than ¼, (c) ¼ to less than ½, (d) ½ to ¾, or (e) More than ¾.
3) Number of healthcare visits in the previous year was determined by participant self-report. Participants were asked to report the number of times they visited a village, public, private, ayurvedic, or homeopathic clinic/hospital in the previous year.

Confounders: Potential associations between CMD symptoms and healthcare utilization, self-reported health status, and expenditure on healthcare can be confounded by the presence of other diseases, age, marital status, income, education level, and reproductive factors (total number of pregnancies, number of living children). Therefore, these factors were adjusted for using multivariable methods. Disease burden was based on self-report of current conditions or past diagnoses of chronic diseases excluding any mental health disorders (see footnotes in Table 1 for more details). Disease burden was estimated as an aggregate grouped into four categories: no disease, one disease, two diseases, and three or more diseases. Marital status, education level, and reproductive history were based on self-report. As described elsewhere,[16] monthly

household income was transformed into income/person/day values to account for variation in the household size. Daily per capita income was subsequently converted to US dollars using the average currency exchange rate from 2011, the year the study was conducted and categorized into three levels (< $0.25, $0.25-$1.25, >$1.25).

All items, with the exception of SRQ-20 and SF-12, were study-specific and developed based on input from care providers and community members of these settings.

Data Management and Analyses: The paper-form surveys were entered into a database using Epi-Info software. All data entry was verified for errors by a team member different than the one performing the original data entry.

Descriptive data analyses were performed to assess the distribution of potential confounders with respect to CMD symptom screening status. Frequencies and percentages were calculated for categorical variables; associations with CMD symptom screening status were assessed using chi-square test for independence of attributes or Fischer's exact test. Bivariate associations of CMD symptom screening status with number of visits to clinic in the previous year, total number of pregnancies, and number of live births were assessed using a one-way analysis of variance test. Ordered logistic regression analyses were used to quantify the relationship of positive CMD symptom screen with health status and household income spent on healthcare. The association of positive CMD screen and number of healthcare visits in the previous year was evaluated using negative binomial regression modeling. Unadjusted and adjusted incidence rate ratios (IRR) were calculated and interpreted as a count multiplier for the number of healthcare visits in the previous year. All three models adjusted for number of co-morbid conditions, age, income, education, marital status, and reproductive history. Subgroup analyses to investigate differences between

the hospital and community-based sample and sensitivity analyses to examine changes in the findings based on varying thresholds (6+ to 12+) for determining whether participants had positive CMD symptoms screen were performed to check for potential sources of biases. Multiple imputation using chained equations (5 imputations, 25 burn-in iterations) was performed to impute missing values for missing covariates; the one instance of a missing outcome was not imputed. The adequacy of burn-in period was assessed by examining stationarity of each chain by the end of burn-in periods from 1 to 30. All statistical analyses were performed in STATA v13.

RESULTS

Of the 700 participants interviewed for the study, 19 surveys were excluded due to incompleteness, 18 participants were excluded because they were visiting hospitalized relatives, and five surveys were classified as outliers due to their healthcare behavior (these participants were identified using univariate distribution of healthcare visits because they had more than 20 clinical visits in the previous year due to serious health conditions) yielding an analytic sample of 658 women. Using the SRQ-20 to assess symptoms suggestive of CMD, 155 (22.8%) participants screened positive having answered yes to at least eight of 20 questions (Table 1). Only twelve participants reported seeing a non-allopathic medical provider and among them, all but four also saw an allopathic provider. Therefore, the number of healthcare visits was based on aggregate visits reported, regardless of the provider. On average, participants reported visiting a healthcare provider more than three times in the previous year. Few participants (n=14, 2.13%) reported poor health status; therefore, we grouped participants who self-reported fair or poor health status into one category. The majority of the respondents considered their health status less than very good (i.e.; good or fair/poor). Over 60% of participants reported spending less than

a quarter of their yearly income on healthcare; six participants (0.9%) reported spending none, and 17 (2.6%) reported spending more than ¾ of their yearly income, and thus responses were categorized into 2 groups (i.e. spending less than ¼ and more than ½ of yearly income). Increased levels of education and household income were associated with decreased likelihood of screening positive for CMD symptoms.

More than four out of every five (81·3%) respondents who screened positive for CMD symptoms reported they had not been diagnosed with depression or another mental health disorder by their healthcare provider even though all but four of these women reported visiting a healthcare provider at least once in the past year (results not shown).

Table 1: Sociodemographic and Health Characteristics of 658 Reproductive-Aged Women from Rural India Stratified by Screening Status For Common Mental Disorders (CMD) Symptoms.

	Total	CMD Symptoms (col %)		
	N	Positive	Negative	p
Participants (N)	658	155	503	
Location: Clinic	311	43.9	48.3	0.33
# Clinic Visits[a] (mean(sd))	3.6 (2.8)	3.2(2.5)	4.6(3.5)	0.001[#]
Health Status				
Excellent	166	1.3	32.6	<0.001[*]
Very Good	95	3.9	17.7	
Good	249	34.8	38.8	
Fair/Poor	148	60.0	10.9	
HHI Spent on Healthcare[b]	*1 missing*			
Less than 1/4	403	36.8	68.9	<0.001
1/4 to 1/2	184	38.0	24.9	
More than 1/2	70	25.2	6.2	
# Diseases or Conditions[c]				
Zero	221	3.9	42.2	<0.001[*]
One	155	17.4	25.8	
Two	148	28.4	20.9	
Three or more	134	50.3	11.1	
Current Depression				
Yes	34	18.7	1.0	N/A
Age (years)	*2 missing*			

18-25	226	28.6	36.3	0.18
26-35	249	39.6	37.5	
36-45	181	31.8	26.3	
Education	*2 missing*			
< 7th Grade	162	34.8	21.6	<0.001
7th - 12th Grade	356	55.5	53.9	
> 12th Grade	138	9.7	24.5	
Marital Status	*1 missing*			
Single	97	8.4	16.7	0.03*
Married	541	88.3	80.5	
Divorced or Widowed	19	3.3	2.8	
Daily Income Per Person	*22 missing*			
< $0.25	49	13.5	5.9	0.01
$0.25-1.25	369	56.1	58.6	
>$1.25	218	30.4	35.5	
# Pregnancies (mean(sd))	2.13(1.78)	2.55(1.92)	2.00(1.71)	<0.001#
# Living children (mean(sd))	1.60(1.35)	1.85(1.34)	1.52(1.34)	0.001#

a: Number of clinic visits in the previous year based on self-report
b: Portion of yearly household-income spent on healthcare expenditure
c: Participants were asked to identify using a list of 33 non-psychiatric conditions and diseases. 22 conditions and diseases reported at least once by any participant; these were reviewed by trained clinicians to identify chronic conditions. Based on the review, an aggregate variable to represent chronic disease burden was generated; it comprised of cardiovascular problems (coronary heart disease, hypertension, positive history of heart attack or related condition), pulmonary problems (difficulty breathing, chronic allergies, asthma, or chronic bronchitis), musculoskeletal pain (chronic back problems, arthritis, difficulty opening mouth, or limited mobility due to pain), toothaches, anemia, and diabetes.
* Fischer's Exact Test; # ANOVA

After controlling for confounders, screening positive for CMD symptoms was associated with more than an nine-fold increase in the cumulative odds of reporting a worse health status (cumulative OR (cumOR)= 9.34; 95% CI: 5.93-14.70) and a two-fold increase in the cumulative odds of reporting a higher category of income expenditure on healthcare (cumOR = 2.25; 95% CL: 1.48-3.44) (Table 2). Increasing number of comorbid non-psychiatric conditions were associated with self-report of lower health status and greater portion of income spent on healthcare (Supplementary Table 1). In comparison to participants with no comorbid non-

psychiatric conditions, participants who reported three or more had more than twice the cumulative odds of reporting a poorer health status (cumOR = 2.61; 95% CL: 1.60-4.24) and more than three times greater cumulative odds of spending a higher portion of their yearly income on healthcare (OR = 3.46; 95% CL 2.05 – 5.84). Violations of the parallel regression assumptions for ordered logistic regression were ruled out using Brant test for health status (χ^2 = 29.76, df = 22; p = 0.67) and income spent on healthcare outcomes (χ^2 = 9.37, df = 22; p = 0.67).

Table 2: Ordinal Logistic Regression Models for the Association between Common Mental Disorders (CMD) Symptoms and a) Self-Reported Health Status and b) Yearly Income Spent on Healthcare

	Self-Reported Health Status[a] (n = 633)	**Yearly Income Spent on Healthcare**[b] (n = 632)
	CumOR (95% CL)*	CumOR (95% CL)*
CMD Symptoms: Negative (ref)		
Positive (SRQ-20 ≥ 8)	9.34 (5.93-14.70)	2.25 (1.48-3.44)

Ordered categories: a= Excellent, Very Good, Good, Fair/Poor; b = <1/4 , 1/4-1/2, > 1/2
*CumOR: Cumulative odds ratio adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.

Results from negative binomial regression models are reported in Table 3. A negative binomial model was selected over Poisson to account for the over dispersion in the outcome (α=0.23; χ^2= 150.05, p < 0.001); improvement of model fit using zero inflated negative binomial regression was tested and ruled out using Vuong Test (z = 0.42, p = 0.34). Before adjusting for confounding, screening positive for CMD symptoms was associated with a 40% increase in the number of clinical visits in the previous year (IRR = 1.41; 95% CI: 1.24-1.60). After adjusting for potential confounders, the association was attenuated but remained statistically significant (IRR = 1.22; 95% CI: 1.05-1.42). Adjusted analyses revealed that in comparison to participants with no comorbidities, women who reported experiencing multiple non-psychiatric comorbidities

were more likely to have greater number of clinic visits in the previous year (two diseases: IRR = 1.18 [1.00 -1.39]; three or more diseases: IRR = 1.27 [1.06-1.52]) (Supplementary Table 2).

Table 3: Multivariable Negative Binomial Regression Model Estimates of Count Multiplier (IRR [A]) for Clinical Visits in the Previous Year Based on Screening Status for CMD Symptoms

	unadjusted	**adjusted* (n=633)**
	IRR (95% CL)	IRR (95% CL)
CMD Symptoms: Negative (ref)		
Positive (SRQ-20 ≥ 8)	1.41 (1.24-1.60)	1.22 (1.05-1.42)

a: IRR = incidence rate ratio is calculated by exponentiating beta co-efficients of count models. IRR can be interpreted as count multipliers. For example, screening positive for CMD symptoms is associated with a 42% increase in the number of clinical visits in the previous in comparison to those who do not screen positive (unadjusted estimates)
* adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.

Sensitivity analyses based on site of enrollment (clinic vs. village), threshold values for positive screening for CMD symptoms and missing data did not reveal any changes in direction or statistical significance for the association of CMD symptoms with health status, percentage of income spent on healthcare expenditure, or number of clinical visits in the previous year (Table 4).

Table 4: Results of Subgroup Analyses by Location of Survey, Sensitivity Analyses using Stricter Threshold Value for Positive Screening for CMD Symptoms, and Imputed Dataset to Account for Missing Values

	Self-Reported Health Status[a] (n = 633)	**Yearly Income spent on Healthcare**[b] (n = 632)	**Number of Clinical Visits in Previous Year** (n=633)
	CumOR (95% CL)*	CumOR (95% CL)*	IRR (95% CL)
Original	9.34 (5.93-14.70)	2.25 (1.48-3.44)	1.22 (1.05-1.42)
By Location			
Clinic	11.79 (5.94-23.40)	2.77 (1.46-5.24)	1.21 (0.98 – 1.51)
Village	7.72 (4.14-14.37)	2.04 (1.14-3.65)	1.25 (1.03 – 1.52)
Threshold Value			
SRQ-20 ≥ 12	6.82 (3.72-12.51)	3.37 (1.98-5.75)	1.37 (1.14-1.64)
Missing Data			
Imputed Dataset	8.42 (5.44-13.05)	2.23 (1.48-3.36)	1.23 (1.06-1.42)

Ordered categories: a= Excellent, Very Good, Good, Fair/Poor; b = <1/4 , 1/4-1/2, > ½
Adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.

DISCUSSION

In this sample of reproductive-aged women from rural western India, approximately one out of every four participants screened positive for CMD symptoms. High mental distress in this population may be attributed to overall circumstances of women's lives in this setting. We have previously reported that CMD symptoms in this setting are closely associated with poor socioeconomic status, food insecurity, and exposure to traumatic events.[17] Despite visiting a healthcare provider at least once in the previous year, the majority of participants reported that they had not been diagnosed with depression or other mental health disorder by their healthcare provider. Screening positive for CMD symptoms was associated with worse self-reported health status, a higher portion of household income expended on healthcare, and an increased number of healthcare visits. The associations found in our study were robust to subgroup, sensitivity, and missing data analysis with the exception of a stronger association between health status and CMD symptoms among women interviewed in clinic compared to those interviewed in the village.

Our finding of potentially unrecognized CMD (81·3%) is similar to the 79.0% depression prevalence reported by Kohli et al for primary care attendees from another rural region in India.[18] The high rates are likely to be driven by two main factors. First, compared to western societies, people in India are more likely to attribute mental illness to personally controllable factors and thus mental health in rural India is associated with a tremendous amount of stigma and social disadvantage.[10,19] Consequently, Indians may be less willing to disclose

psychological symptoms. Indeed, studies have shown that most Indian patients suffering from mental disease present with somatic symptoms, which may increase the likelihood that CMD goes undetected.[20–23] Second, there is a scarcity of mental healthcare providers in India and other healthcare providers do not receive adequate mental health training.[24] Thus, in primary care settings mental illness may not be considered in the differential diagnoses, especially in the context of an atypical presentation, leading to inadequate identification of mental diseases.[25]

Our findings suggest that women screening positive for CMD symptoms had visited their providers more frequently and were more likely to spend a larger portion of their household income on healthcare. The association between CMD symptoms and healthcare cost also could be self-perpetuating. Women screening positive have considerably lower appraisal of their personal health than those who screen negative, which probably explained their seeking healthcare more often. Indian women who are suffering from mental illness are known to present to primary clinics with somatic rather than psychological symptoms, which may lead to under-diagnosis and treatment of their CMD.[23] Patients and their medical providers may continue to search for a physical cause, incurring healthcare costs and a greater number of healthcare visits, while the underlying mental illness remains unrecognized and unaddressed.[25,26]

Alternatively, it is also possible that providers may have suspected mental illness but not directly addressed it with the patient; providers may have attributed possible mental illnesses to female suppression and poverty. In such instances, providers may find themselves ill-positioned to assist with underlying risk factors for mental health problems. Given the study design and the data collected, it is impossible to rule out this scenario; nevertheless, it is striking that the majority of

women screening positive for CMD symptoms report they never received a diagnosis from a healthcare provider despite having reported seeing a provider at least once in the previous year. This represents a missed opportunity to screen and assess women for CMD. Identification of women who may have CMD or be at risk of developing CMD could facilitate detection, assessment, and treatment.

The high prevalence of poverty in India creates important barriers for recognition and treatment of CMD. Due to healthcare related costs, 63 million people in India fall below the poverty line every year.[27] This number is expected to rise given the inevitable increase in the prevalence of chronic, non-communicable diseases in India, which carry a greater financial burden than communicable diseases.[28,29] Treating CMD with pharmacological and psychological therapies has been shown to reduce the economic burden of healthcare among adults.[30,31] Thus, treatment of mental illness could break this vicious cycle of poverty and CMD.[30,31] The Indian government recently proposed to revamp its mental health services through the National Mental Health Policy of India (NMHPI). NMHPI proposes to increase the number of mental healthcare providers and expand coverage from 182 to 648 districts and support 11 centers of excellence in mental health to train the next generation's mental healthcare providers.[32] Despite the laudable NMHPI proposal, the urgent needs of rural Indian women may continue to go unaddressed because the proposal may be difficult to implement due to lack of funding and a cohesive implementation plan.[33]

Integration of mental healthcare into primary care could provide a solution because women suffering from mental illness most often present to primary care settings.[34,35] The increased

frequency of healthcare visits among women screening positive for CMD symptoms in our study potentially highlights missed opportunity for intervention. Depression screening needs to be done in conjunction with a systematic approach to ensuring adequate access to mental health assessment and care.[36] It is well-established that integrated care models, such as collaborative care, effectively integrate depression and primary care, can improve clinical outcomes, and can also be carried out by non-specialist health workers.[37,38] Such approaches have also been tested in India; Patel and colleagues tested a collaborative stepped care (CSC) model that included four levels of referral before a clinical specialist became involved in care.[39] The CSC model begins with CMD screening for adult patients that present to clinic with a village health worker, and progresses through therapeutic steps of increasing intensity including yoga, behavioral, and pharmacologic interventions. Patients who do not respond to a less intense treatment are stepped up to a higher intensity therapeutic option. The CSC model improves mental illness over a six month period and holds promise as an effective mechanism to improve mental health in rural India.[40] However, the wide implementation of the CSC model in India is lacking and has been limited to Goa and South India, two regions in India that face a comparatively lower burden of mental diseases.[41,42] Thus, there is need for cost-effective treatment plans that leverage primary care providers and staff already working in the primary care setting.

The findings from our study must be interpreted in the context of its limitations. We identified CMD symptoms using a validated screening questionnaire, SRQ-20, instead of a diagnostic structured clinical interview. It is possible that women who screen positive for CMD symptoms may have had sub-syndromal symptoms. However, our decision to use SRQ-20 for this study

was based on sound principles: 1) The SRQ-20 was developed specifically for use in global health research conducted in low-resource setting. It is validated, well-accepted, and has been described as a cost-effective way of measuring mental health, [15] 2) The purpose of this study was not to investigate psychiatric practice or clinical management of CMD in India but rather to understand the characteristics of women who might be suffering from mental illness, and 3) In the context of India, where mental health literacy is limited, administration of a high face-validity instrument such as SRQ-20 with yes and no responses lowers the interview-burden on participants.[14] Our data were collected through a cross-sectional survey and thus we cannot comment on the causal relationship of our findings, it is possible that women with poor appraisal of their personal health develop CMD symptoms. Presence of comorbidities among our participants was captured through self-report and therefore is vulnerable to differential recall where women with positive screen for CMD symptoms potentially over-report their conditions. However, such misclassification would likely bias our estimates toward the null hypotheses. Our estimates of household expenditure on healthcare were based on a single question and had broad categories and therefore may lack precision. However, we used trained local interviewers to pilot the question. Moreover, in the context of rural Gujarat, this instrument provides information about healthcare costs that is difficult to capture and not available in other databases.[35] Lastly, our finding of increased cumulative odds of reporting a higher portion of household expenditure on healthcare with increasing number of comorbidities suggests that our instrument performed as expected.

In conclusion, we found a high number of Indian women screening positive for CMD symptoms that were unrecognized and associated with adverse impacts on overall health and economic

well-being. Our findings suggest that there is a need to screen, assess, and manage CMD in primary healthcare and community-based settings in India. This could, in turn, improve overall health status and reduce healthcare related economic burden.

Contributors' Statement:

Apurv Soni: Soni conceptualized, designed, and implemented the study in India. Soni carried out the initial analyses, drafted the initial manuscript, and approved the final manuscript as submitted.

Nisha Fahey: Fahey conceptualized, designed, and implemented the study in India. Fahey provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Nancy Byatt: Byatt provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Anusha Prabhakaran: Prabhakaran provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Tiffany A. Moore Simas: Moore Simas provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Jagdish Vankar: Vankar provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Ajay Phatak: Phatak conceptualized, designed, and implemented the study in India. Phatak provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Eileen O'Keefe: O'Keefe conceptualized and designed the study. O'Keefe provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Jeroan Allison: Allison provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Somashekhar Nimbalkar: Nimbalkar conceptualized, designed, and implemented the study in India. Nimbalkar provided input to the analyses, contributed to the drafting of the manuscript, and approved the final manuscript as submitted.

Competing Interests: I have read and understood the BMJ Group policy on declaration of interests and declare the following interests: None

Data sharing statement: No additional data are available

References

1 Whiteford HA, Degenhardt L, Rehm J, *et al.* Global burden of disease attributable to mental and substance use disorders: Findings from the Global Burden of Disease Study 2010. *Lancet* 2013;**382**:1575–86. doi:10.1016/S0140-6736(13)61611-6

2 Murray CJL, Lopez A. A comprehensive assessment of mortality and disability from disease, injures and risk factors in 1990 and projected to 2020. In: *The Global Burden of Disease*. 1996. 1–51. doi:10.1186/1471-2458-13-863

3 Druss BG, Walker ER. Mental disorders and medical comorbidity. *Synth Proj Res Synth Rep* 2011;:1–26.

4 Egede LE. Major depression in individuals with chronic medical disorders: prevalence, correlates and association with health resource utilization, lost productivity and functional disability. *Gen Hosp Psychiatry* 2007;**29**:409–16. doi:10.1016/j.genhosppsych.2007.06.002

5 Chan M. Mental Health and Development: Targeting People with Mental Health Conditions as a Vulnerable Group. 2010.

6 Ganguli HC. Epidemiological findings on prevalence of mental disorders in India. *Indian J Psychiatry* 2000;**42**:14–20.

7 Shidhaye R, Patel V. Association of socio-economic, gender and health factors with common mental disorders in women: a population-based study of 5703 married rural women in India. *Int J Epidemiol* 2010;**39**:1510–21. doi:10.1093/ije/dyq179

8 Patel V, Lund C, Hatherill S, *et al.* Mental disorders: equity and social determinants. In: *Equity, social determinants and public health programmes*. 2010. 115–35.

9 Kishor S, Gupta K. Gender Equality and Women's Empowerment in India. Mumbai: 2009. http://rchiips.org/nfhs/a_subject_report_gender_for_website.pdf

10 Liu MC, Tirth S, Appasani R, *et al.* Knowledge and Attitudes Toward Depression Among Community Members in Rural Gujarat, India. *J Nerv Ment Dis* 2014;**202**:813–21. doi:10.1097/NMD.0000000000000199

11 Amin G, Shah S, Vankar GK. The prevelance and recognition of depression in primary care. *Indian J Psychiatry* 1998;**40**:364–9.

12 Saddichha S, Vibha P, Saxena MK, *et al.* Behavioral emergencies in India: A population based epidemiological study. *Soc Psychiatry Psychiatr Epidemiol* 2010;**45**:589–93.

doi:10.1007/s00127-009-0103-8

13 Almanzar S, Shah N, Vithalani S, *et al.* Knowledge of and attitudes toward clinical depression among health providers in gujarat, India. *Ann Glob Heal* 2014;**80**:89–95. doi:10.1016/j.aogh.2014.04.001

14 World Health Organization. A user's guide to the Self Reporting Questionnaire. *Geneva World Heal Organ* 1994.

15 Harpham T, Reichenheim M, Oser R, *et al.* Measuring mental health in a cost-effective manner. *Health Policy Plan* 2003;**18**:344–9. doi:10.1093/heapol/czg041

16 Soni A, Fahey N, Phatak AG, *et al.* Differential in healthcare seeking behavior of mothers for themselves versus their children in rural India: Results of a cross sectional survey. *Int Public Heal J* 2014;**6**:57–66.

17 Fahey N, Soni A, Allison J, *et al.* Higher Levels of Education Mitigate the Relationship between Perceived Stress and Positive Screening for Common Mental Disorders among Women in Rural India: Results of a Cross-Sectional Study. *Ann Glob Heal* 2016;**In Press**.

18 Kohli C, Kishore J, Agarwal P, *et al.* Prevalence of unrecognised depression among outpatient department attendees of a rural hospital in delhi, India. *J Clin Diagn Res* 2013;**7**:1921–5. doi:10.7860/JCDR/2013/6449.3358

19 Nieuwsma JA, Pepper CM, Maack DJ, *et al.* Indigenous perspectives on depression in rural regions of India and the United States. Transcult. Psychiatry. 2011;**48**:539–68. doi:10.1177/1363461511419274

20 Pereira B, Andrew G, Pednekar S, *et al.* The explanatory models of depression in low income countries: listening to women in India. *J Affect Disord* 2007;**102**:209–18. doi:10.1016/j.jad.2006.09.025

21 Andrew G, Cohen A, Salgaonkar S, *et al.* The explanatory models of depression and anxiety in primary care: a qualitative study from India. BMC Res. Notes. 2012;**5**:499. doi:10.1186/1756-0500-5-499

22 Nambi SK, Prasad J, Singh D, *et al.* Explanatory models and common mental disorders among patients with unexplained somatic symptoms attending a primary care facility in Tamil Nadu. *Natl Med J India* 2002;**15**:331–5.

23 Grover S, Dutt A, Avasthi A. An overview of Indian research in depression. *Indian J Psychiatry* 2010;**52**:S178–88. doi:10.4103/0019-5545.69231

24 WHO-AIMS report on Mental Health System in Gujarat, India. 2006. https://www.mindbank.info/item/4531 (accessed 31 May2015).

25 Paykel ES, Priest RG. Recognition and management of depression in general practice: consensus statement. *BMJ Br Med J* 1992;**305**:1198–202.

26 Linden M, Lecrubier Y, Bellantuono C, *et al.* The prescribing of psychotropic drugs by primary care physicians: an international collaborative study. *J Clin Psychopharmacol* 1999;**19**:132–40.

27 National Health Policy 2015 :: Ministry of Health and Family Welfare.

http://www.mohfw.nic.in/showfile.php?lid=3014 (accessed 22 Oct2015).

28 Berman P, Ahuja R, Bhandari L. The Impoverishing Effect of Healthcare Payments in India: New Methodology and Findings. *Econ Polit Wkly* 2010;**xlv**:65–71.

29 Binnendijk E, Koren R, Dror DM. Can the rural poor in India afford to treat non-communicable diseases. *Trop Med Int Health* 2012;**17**:1376–85. doi:10.1111/j.1365-3156.2012.03070.x

30 Patel V, Weobong B, Nadkarni A, *et al.* The effectiveness and cost-effectiveness of lay counsellor-delivered psychological treatments for harmful and dependent drinking and moderate to severe depression in primary care in India: PREMIUM study protocol for randomized controlled trials. *Trials* 2014;**15**:101. doi:10.1186/1745-6215-15-101

31 Patel V, Chisholm D, Rabe-Hesketh S, *et al.* Efficacy and cost-effectiveness of drug and psychological treatments for common mental disorders in general health care in Goa, India: a randomised, controlled trial. *Lancet* 2003;**361**:33–9. doi:10.1016/S0140-6736(03)12119-8

32 Sinha S, Kaur J. National mental health programme: Manpower development scheme of eleventh five-year plan. Indian J. Psychiatry. 2011;**53**:261. doi:10.4103/0019-5545.86821

33 Sharma DC. India's new policy aims to close gaps in mental health care. Lancet. 2014;**384**:1564.

34 Das J, Do Q-T, Friedman J, *et al.* Mental Health Patterns and Consequences: Results from Survey Data in Five Developing Countries. *World Bank Econ Rev* 2008;**23**:31–55. doi:10.1093/wber/lhn010

35 Patel V, Chisholm D, Kirkwood BR, *et al.* Prioritizing health problems in women in developing countries: comparing the financial burden of reproductive tract infections, anaemia and depressive disorders in a community survey in India. *Trop Med Int Health* 2007;**12**:130–9. doi:10.1111/j.1365-3156.2006.01756.x

36 Kagee A, Tsai AC, Lund C, *et al.* Screening for common mental disorders in low resource settings: reasons for caution and a way forward. *Int Health* 2013;**5**:11–4. doi:10.1093/inthealth/ihs004

37 Woltmann E, Grogan-Kaylor A, Perron B, *et al.* Comparative effectiveness of collaborative chronic care models for mental health conditions across primary, specialty, and behavioral health care settings: systematic review and meta-analysis. *Am J Psychiatry* 2012;:790–804.

38 van Ginneken N, Tharyan P, Lewin S, *et al.* Non-specialist health worker interventions for the care of mental, neurological and substance-abuse disorders in low- and middle-income countries. Cochrane database Syst. Rev. 2013;**11**.

39 Patel VH, Kirkwood BR, Pednekar S, *et al.* Improving the outcomes of primary care attenders with common mental disorders in developing countries: a cluster randomized controlled trial of a collaborative stepped care intervention in Goa, India. *Trials* 2008;**9**:4. doi:10.1186/1745-6215-9-4

40 Patel V, Weiss H a., Chowdhary N, *et al.* Effectiveness of an intervention led by lay

health counsellors for depressive and anxiety disorders in primary care in Goa, India (MANAS): A cluster randomised controlled trial. *Lancet* 2010;**376**:2086–95. doi:10.1016/S0140-6736(10)61508-5

41 Singla D, Lazarus A, Atif N, *et al.* 'Someone like us': delivering maternal mental health through peers in two South Asian contexts. *J Affect Disord* 2014;**168**:452–8. doi:10.1016/j.jad.2014.07.017

42 Patel V, Kirkwood BR, Pednekar S, *et al.* Gender disadvantage and reproductive health risk factors for common mental disorders in women: a community survey in India. *Arch Gen Psychiatry* 2006;**63**:404–13. doi:10.1001/archpsyc.63.4.404

Supplementary Table 1: Ordinal Logistic Regression Models for the Association between Chronic Co-morbid Conditions and a) Self-Reported Health Status and b) Yearly Income Spent on Healthcare		
	Self-Reported Health Status[a] (n = 633)	**Yearly Income Spent on Healthcare**[b] (n = 632)
	CumOR (95% CL)*	CumOR (95% CL)*
Disease or Conditions: Zero (ref)		
One	1.19 (0.80-1.77)	1.26 (0.76-2.07)
Two	1.64 (1.08-2.47)	3.07 (1.90-4.96)
Three or More	2.61 (1.60-4.24)	3.46 (2.05-5.84)
Ordered categories: a= Excellent, Very Good, Good, Fair/Poor; b = <1/4 , 1/4-1/2, > 1/2 *CumOR: Cumulative odds ratio adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.		

Supplementary Table 2: Multivariable Negative Binomial Regression Model Estimates of Count Multiplier (IRR [A]) for Clinical Visits in the Previous Year Based on Number of Chronic Co-morbid Conditions		
	unadjusted	**adjusted* (n=633)**
	IRR (95% CL)	IRR (95% CL)
Comorbid Conidtions: None (ref)		
1	1.10 (0.94-1.28)	1.11 (0.95-1.29)
2	1.25 (1.07-1.46)	1.18 (1.00-1.39)
3 or more	1.47 (1.26-1.72)	1.27 (1.06-1.52)
a: IRR = incidence rate ratio is calculated by exponentiating beta co-efficients of count models. IRR can be interpreted as count multipliers. For example, screening positive for CMD symptoms is associated with a 42% increase in the number of clinical visits in the previous in comparison to those who do not screen positive (unadjusted estimates) * adjusted for non-psychiatric comorbidities, age, income, education, marital status, total number of pregnancies, and number of living children.		

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional 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 2: ABSTRACT (Methods)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found Page 2: ABSTRACT (Methods and Results)
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Page 3: INTRODUCTION (1st and 2nd Paragraph)
Objectives	3	State specific objectives, including any prespecified hypotheses Page 3: INTRODUCTION (3rd Paragraph)
Methods		
Study design	4	Present key elements of study design early in the paper Page 5: METHODS (Setting and Study Design)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection Page 5: METHODS (Setting and Study Design)
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants Pages 6 : METHODS (Participants)
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable Pages 7-9 : METHODS (Data Variables)
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 Pages7-9: METHODS (Data Variables)
Bias	9	Describe any efforts to address potential sources of bias Pages 8-10: METHODS (Data Variables *confounders*, Statistical Analysis)
Study size	10	Explain how the study size was arrived at Page 6: METHODS (Participants)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why Pages 7-10 : METHODS (Data Variables *confounders*, Statistical Analysis)
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding Pages 9-10: METHODS (Statistical Analyses)
		(*b*) Describe any methods used to examine subgroups and interactions Pages 10: METHODS (Statistical Analyses)
		(*c*) Explain how missing data were addressed Pages 10: METHODS (Statistical Analyses)
		(*d*) If applicable, describe analytical methods taking account of sampling strategy We did not use sample survey weights in our study
		(*e*) Describe any sensitivity analyses Pages 10: METHODS (Statistical Analyses)

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
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram 13:a-c) All participants were interviewed once when their eligibility was examined prior to interview. Details regarding participant participation is provided on pages 5 and 6 : METHODS (Setting and Study Design, Data collection)
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders Pages 10-11: RESULTS (1st and 2nd paragraph; Table 1)
		(b) Indicate number of participants with missing data for each variable of interest Page 12: RESULTS (Table 1)
Outcome data	15*	Report numbers of outcome events or summary measures Page 12: RESULTS (Table 1)
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 Pages 13-14: RESULTS (3rd and 4th paragraph; Tables 2 and 3)
		(*b*) Report category boundaries when continuous variables were categorized Page 12: RESULTS (Table 1)
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period Not relevant for analyses provided
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses Pages 15-16: RESULTS
Discussion		
Key results	18	Summarise key results with reference to study objectives Page 16-17: DISCUSSION
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 20-21: DISCUSSION
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence Pages 17-20: DISCUSSION
Generalisability	21	Discuss the generalisability (external validity) of the study results Pages 17-20: DISCUSSION
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 Pages 6: METHODS (Funding and Ethical Approval)