SUPPLEMENTARY FILE

Additional Analysis

The interaction effects presented in Supplementary Table 1 offer additional insights into how self-rated health influences depression across gender and regional contexts among older adults in India. The analysis showed that the association between poor self-rated health and depression was more pronounced among women, with female older adults experiencing significantly higher odds of depression compared to their male counterparts when reporting average or poor health. This finding reflects gender-specific vulnerabilities likely linked to both biological factors and social challenges faced by older women.

Furthermore, regional differences in the relationship between self-rated health and depression were evident. Older adults from Central India with poor self-rated health exhibited higher odds of depression compared to those from North India, while those from the Northeast showed comparatively lower odds under similar health conditions. These variations suggest that the social and healthcare environments across regions play a moderating role in how perceived health status translates into mental health outcomes.

In summary, these interaction effects reinforce the need for gender- and region-specific approaches in addressing depression among India's older population, recognizing that the impact of self-rated health on mental well-being is not uniform across all groups.

Supplementary Table 1: Multivariate Logistic Regression Results Including Interaction Terms

Variables	AOR	95% Confidence Interval	p-value
Self-Rated Health			
Average	1.46	1.42–1.50	<0.001
Poor	2.47	2.36–2.59	<0.001
Education Level			
Up to Primary	0.84	0.80–0.88	0.024
Up to Secondary	0.56	0.50–0.64	<0.001
Higher	0.8	0.68–0.95	0.091
Current Living Arrangements			
Living with Spouse/Children/Others	0.92	0.84–1.01	0.058
Wealth Status			
Poor	0.93	0.87–1.00	0.068
Age (Continuous)	1.01	1.00–1.03	0.022
Sex			
Female	1.07	1.01–1.13	0.043
Marital Status			
Unmarried/Widowed/Divorced/Separated/Others	1.46	1.32–1.61	<0.001
Religion			
Hindu	0.88	0.78–1.00	0.082
Caste			
Forward Caste	1.16	1.03–1.31	0.034
Satisfaction with Current Living Arrangement			
Neutral	2.02	1.83–2.24	<0.001
Not satisfied	2.83	2.42–3.31	<0.001
Place of Residence			
Urban	1.09	0.99–1.20	0.064
Region			
Central	1.51	1.31–1.74	<0.001
East	1.02	0.91–1.14	0.822
Northeast	0.41	0.36–0.47	<0.001
West	0.94	0.82–1.08	0.346
South	1.2	1.00–1.43	0.048
Sleep Time (Continuous)	0.88	0.83–0.94	0.003
Morbidity			
One	1.03	0.98–1.09	0.171
More than one	1.77	1.54–2.03	<0.001
Functional Limitation Score (Continuous)	1.39	1.31–1.47	<0.001
Self-Rated Health × Sex Interaction			
Average × Female	1.08	1.01–1.16	0.03
Poor × Female	1.15	1.04–1.28	0.008
Self-Rated Health × Region Interaction			
Poor × Central	1.23	1.06–1.42	0.006
Poor × Northeast	0.72	0.58–0.89	0.003
_cons	0.49	0.41–0.59	<0.001
Wald Chi2(27)	545.3		
Log pseudolikelihood	−35,755,327		

Note: (1) AOR indicates Adjusted odd ratio, (2) Reference categories: Self-Rated Health – Good; Education – No Education; Current Living Arrangements – Living Alone; Wealth Status – Non-Poor; Sex – Male; Marital Status – Currently Married or in a Living Relationship; Religion – Minorities; Caste – Backward Castes; Satisfaction with Current Living Arrangement – Satisfied; Place of Residence – Rural; Region – North; Morbidity – None; Source: Estimated by the authors

Sensitivity Analysis: Depression Prevalence Across Alternative CES-D Cut-Off Points

To assess the robustness of the study's findings, a sensitivity analysis was conducted using alternative CES-D cut-off points of ≥3 and ≥5, alongside the primary threshold of ≥4 and the results are presented in Supplementary File 2. It revealed notable variations in depression prevalence across states depending on the cut-off applied. For instance, with the lower threshold of ≥3, the prevalence of depressive symptoms was markedly higher across all regions rising to as much as 81.3% in Uttar Pradesh and 79.1% in West Bengal. Conversely, applying a stricter threshold of ≥5 led to reduced prevalence rates; for example, Karnataka, which reported 45.5% prevalence at the ≥4 cut-off, showed 26.2% at ≥5, and Nagaland dropped from 7.9% (≥4 cut-off) to just 4.3% (≥5 cut-off).

These patterns suggest that while absolute prevalence estimates vary with different thresholds, the relative distribution across regions remains broadly consistent. States such as Jammu and Kashmir, Karnataka, and Uttar Pradesh consistently showed higher levels of depressive symptoms regardless of the cut-off applied, while northeastern states like Nagaland and Meghalaya maintained comparatively lower prevalence rates. This consistency across varying cut-offs reinforces the robustness of the study's core findings.

The sensitivity analysis underscores the importance of selecting an appropriate threshold when using brief depression screening tools like the CES-D 10-item scale. While a lower threshold (≥3) may capture a wider range of subclinical symptoms, a higher threshold (≥5) identifies more severe cases, balancing sensitivity and specificity. These results align with recommendations from prior studies emphasizing context-specific cut-off calibration to accurately reflect mental health patterns in diverse populations.

Supplementary File 2: Sensitivity Analysis with Different Depression Cutoffs

State	Cutoff>=4	Cutoff>=3	Cutoff>=5
Andaman and Nicobar	45.59	73.4	33.78
Andhra Pradesh	28.19	73.82	14.1
Arunachal Pradesh	17.11	63.66	10.78
Assam	12.72	45.71	5.55
Bihar	22.06	64.57	9.98
Chandigarh	18.95	50.63	6.88
Chhattisgarh	24.17	61.23	11.23
Dadra and Nagar Ha	28.73	64.16	12.41
Daman and Diu	28.51	71.7	11.82
Delhi	37.44	64.4	22.81
Goa	22.74	75.66	11.39
Gujarat	24.86	70.08	9.71
Haryana	33.75	72.96	15.2
Himachal Pradesh	20.78	58.76	8.87
Jammu and Kashmir	46.67	72.35	31.68
Jharkhand	27.01	68.86	13.31
Karnataka	45.5	79.05	26.15
Kerala	30.3	77.87	18.62
Lakshadweep	15.88	66.91	8.67
Madhya Pradesh	35.8	71.92	23.7
Maharashtra	24.14	57.64	9.96
Manipur	14.44	39.44	5.3
Meghalaya	8.04	47.8	2.75
Mizoram	17.1	63.45	10.64
Nagaland	7.9	31.71	4.34
Odisha	20.48	63.45	7.45
Puducherry	31.98	65.7	19.48
Punjab	20.67	57.21	8.25
Rajasthan	24.95	78.04	12.53
Sikkim	24.23	61.46	15.98
Tamil Nadu	26.72	55.07	14.71
Telangana	31.3	72.22	18.82
Tripura	18.49	70.27	6.31
Uttar Pradesh	34.13	81.26	19.95
Uttarakhand	30.08	67.27	17.08
West Bengal	39.81	79.09	20.33

Source: Estimated by authors

Sample Size Adequacy and Power Calculation

The sample size of 64,695 individuals aged 45 years and above included in this analysis exceeds the minimum required sample size to detect meaningful associations with adequate statistical power. A post hoc power calculation was conducted for detecting an odds ratio of at least 1.20 with 95% confidence and 80% power, assuming a depression prevalence of approximately 27% (based on observed data). Using standard logistic regression power calculation formulas (Hsieh et al., 1998), the minimum required sample size was estimated at approximately 5,000 participants. Therefore, the present sample size provides sufficient power to detect statistically significant associations in both univariate and multivariate analyses.