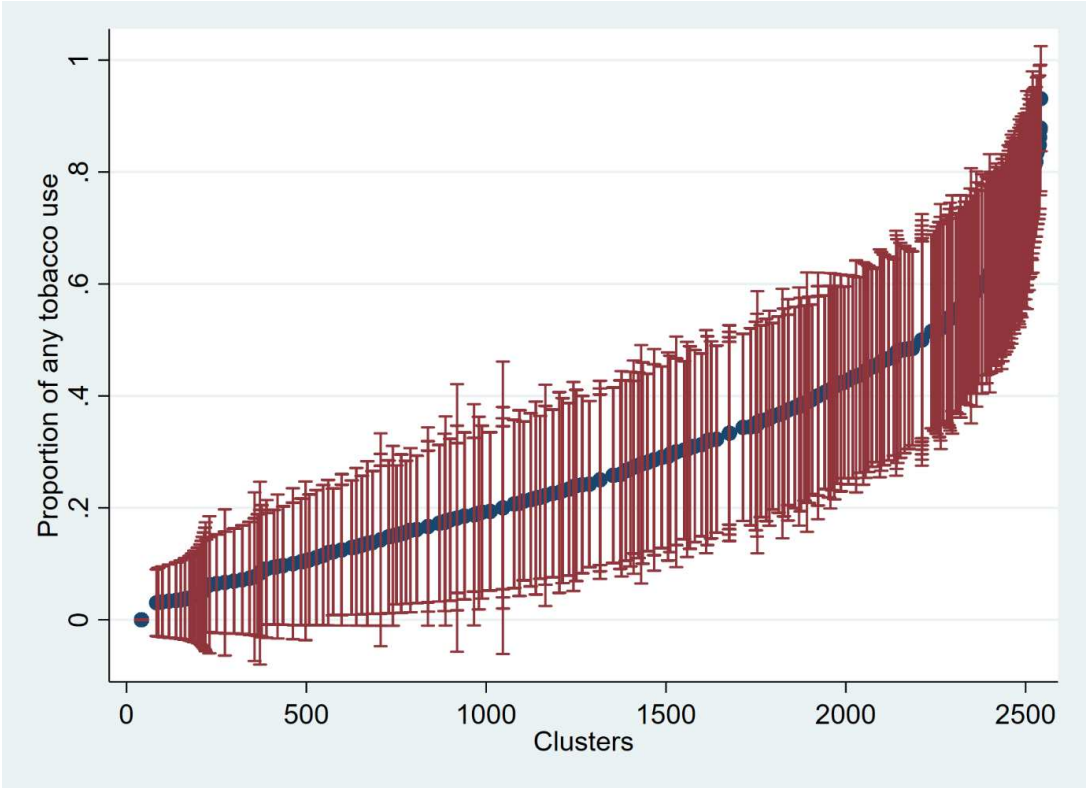
Supplementary Appendix

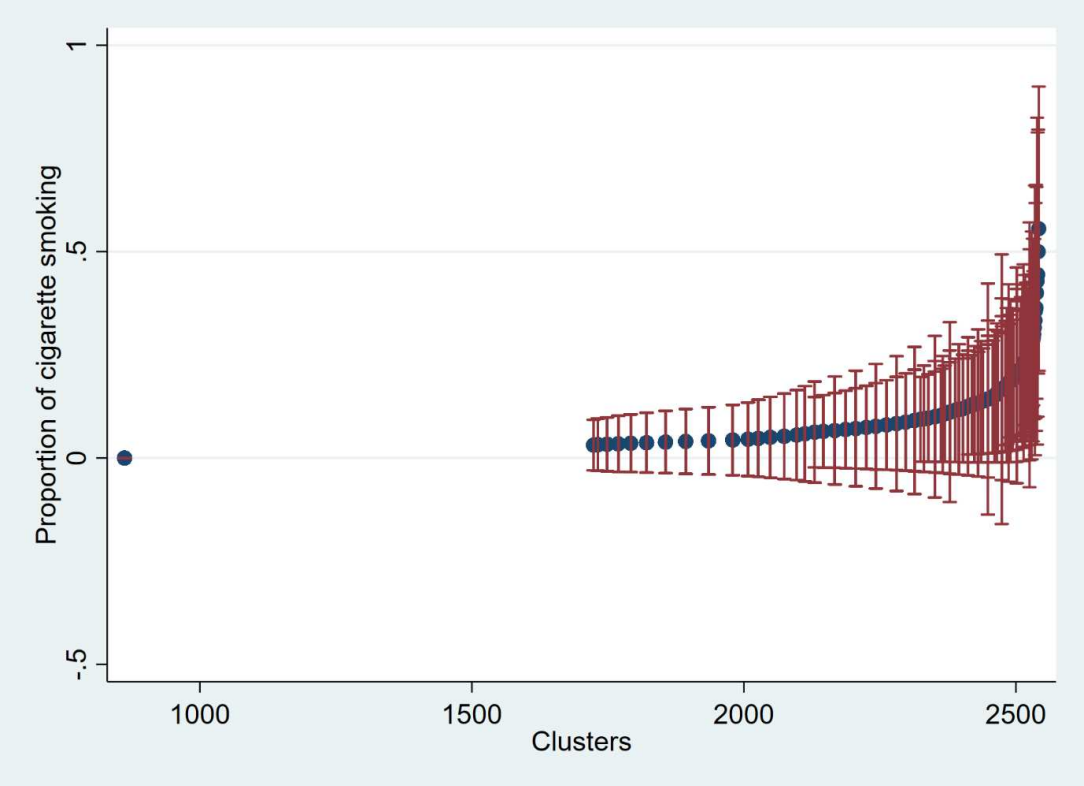
Contents

Prevalence and 95% confidence intervals of any tobacco use by local areas

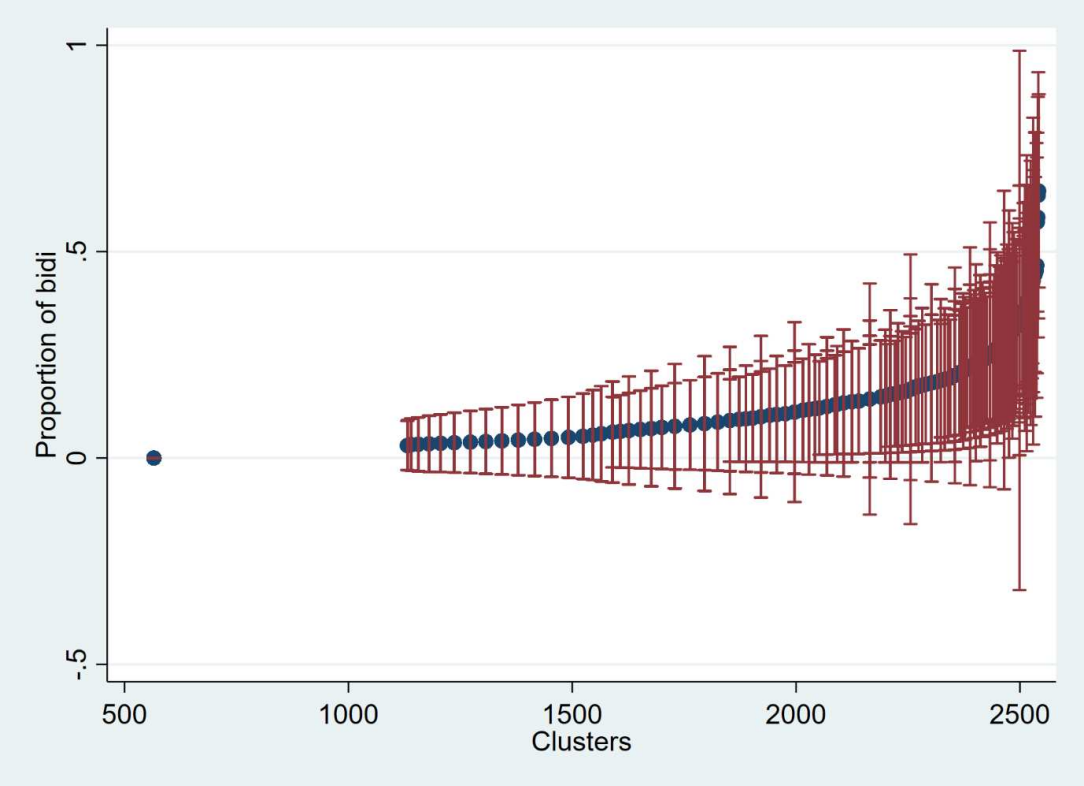


Singh A, *et al. BMJ Open* 2020; 10:e033178. doi: 10.1136/bmjopen-2019-033178

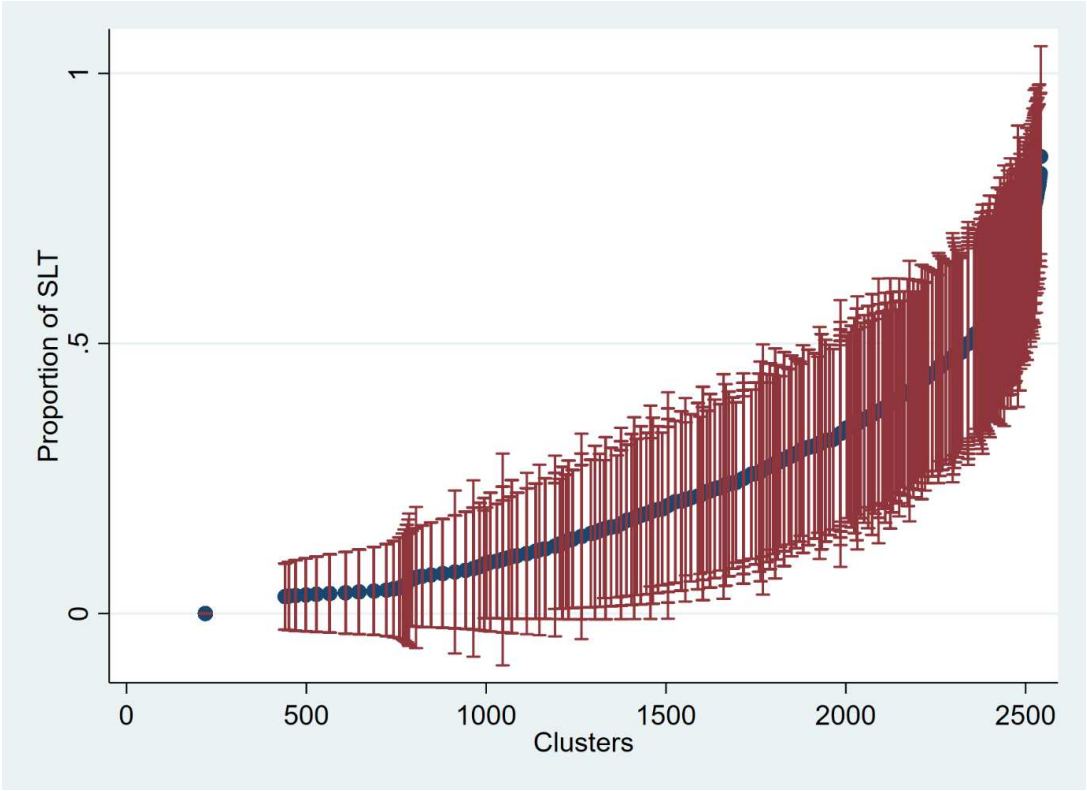
Prevalence and 95% confidence intervals of cigarette smoking by local areas



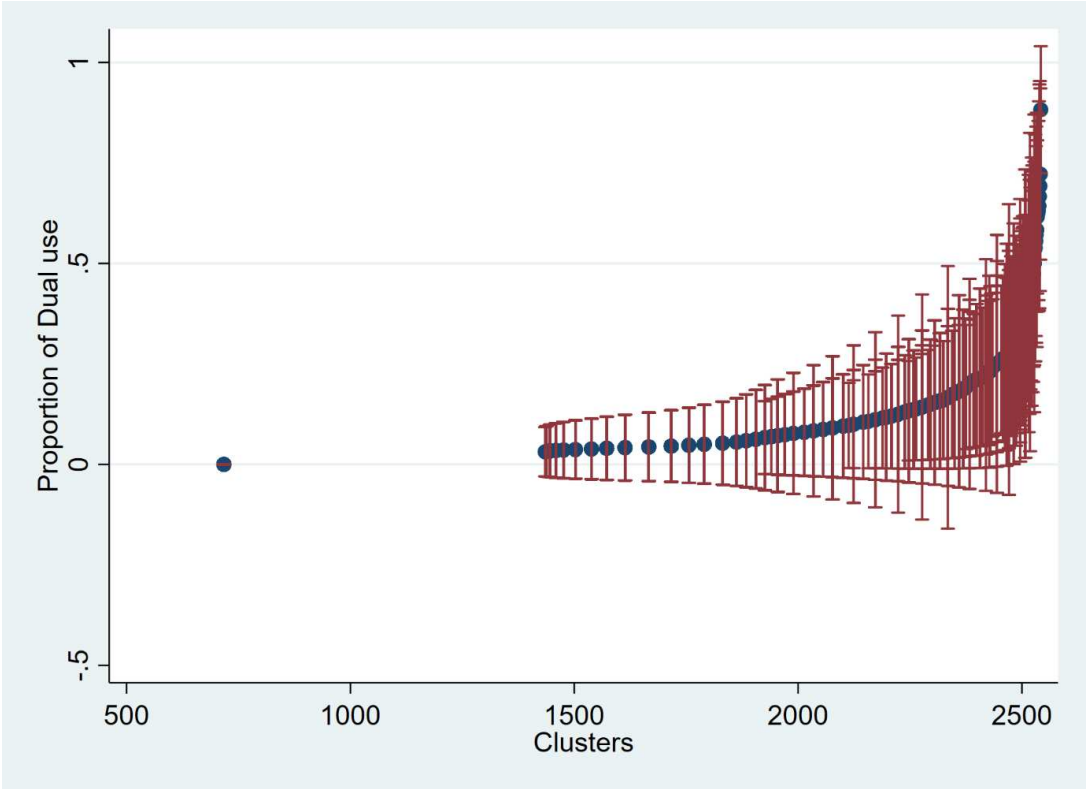
Prevalence and 95% confidence intervals of bidi smoking by local areas



Prevalence and 95% confidence intervals of SLT use by local areas



Prevalence and 95% confidence intervals of Dual use by local areas



Odds ratios for any tobacco use obtained from multilevel multivariable logistic regression models

Covariates	Categories	Odds Ratio	95% CI	
Age		1.02	1.02	1.03
Sex	Male			
	Female	0.23	0.21	0.24
Wealth	Poorer			
	Poor	0.85	0.81	0.90
	Middle	0.74	0.69	0.80
	Rich	0.58	0.53	0.63
	Richer	0.43	0.40	0.48
Education	No formal education			
	Less than primary	0.86	0.80	0.92
	Primary less than secondary	0.68	0.64	0.73
	Secondary and above	0.37	0.35	0.40
Occupation	Unemployed			
	Labourer	1.92	1.74	2.12
	Housewife/ Retired/ Student	0.66	0.60	0.73
	Self	1.54	1.40	1.70
	Private	1.53	1.37	1.72
	Government	1.14	1.00	1.30
Area of residence	Urban			
	Rural	1.11	1.04	1.19
States	Jammu & Kashmir			
	Himachal Pradesh	0.81	0.64	1.03
	Punjab	0.71	0.55	0.90
	Chandigarh	0.73	0.56	0.94
	Uttarakhand	1.44	1.15	1.81
	Haryana	1.20	0.95	1.52
	Delhi	1.18	0.92	1.51
	Rajasthan	1.06	0.85	1.32
	Uttar Pradesh	2.34	1.90	2.88
	Chhattisgarh	3.06	2.43	3.86
	Madhya Pradesh	1.78	1.44	2.21
	West Bengal	1.92	1.55	2.39
	Jharkhand	2.48	1.96	3.13
	Odisha	3.87	3.06	4.90
	Bihar	1.16	0.94	1.45
	Sikkim	0.86	0.66	1.12
	Arunachal Pradesh	3.74	2.90	4.82
	Nagaland	5.06	3.94	6.48
	Manipur	9.46	7.37	12.14
	Mizoram	4.64	3.61	5.95
	Tripura	11.87	9.21	15.29
	Meghalaya	3.06	2.38	3.92
	Assam	4.36	3.52	5.41
	Gujarat	1.26	1.01	1.58
	Maharashtra	1.39	1.12	1.72

	Goa	0.44	0.34	0.58
	Andhra Pradesh	0.50	0.39	0.63
	Telangana	0.68	0.53	0.87
	Karnataka	1.04	0.84	1.30
	Kerala	0.57	0.44	0.73
	Tamil Nadu	0.80	0.64	1.00
	Puducherry	0.53	0.41	0.68

Odds ratios for cigarette smoking obtained from multilevel multivariable logistic regression models

Covariates	Categories	Odds Ratio	95% CI	
Age		1.01	1.00	1.01
Sex	Male	0.03	0.02	0.04
	Female			
Wealth	Poorer			
	Poor	1.31	1.03	1.68
	Middle	1.80	1.38	2.35
	Rich	1.86	1.40	2.46
	Richer	1.80	1.36	2.40
Education	No formal education			
	Less than primary	1.14	0.86	1.51
	Primary less than secondary	1.24	0.98	1.56
	Secondary and above	1.02	0.81	1.30
Occupation	Unemployed			
	Labourer	1.70	1.24	2.34
	Housewife/ Retired/ Student	0.51	0.37	0.72
	Self	1.51	1.12	2.05
	Private	1.54	1.11	2.14
	Government	1.32	0.94	1.87
Area of residence	Urban			
	Rural	0.66	0.56	0.77
States	Jammu & Kashmir			
	Himachal Pradesh	0.13	0.08	0.21
	Punjab	0.08	0.04	0.13
	Chandigarh	0.10	0.06	0.16
	Uttarakhand	0.16	0.10	0.26
	Haryana	0.06	0.03	0.10
	Delhi	0.13	0.09	0.21
	Rajasthan	0.05	0.03	0.09
	Uttar Pradesh	0.05	0.03	0.10
	Chhattisgarh	0.03	0.01	0.09
	Madhya Pradesh	0.04	0.02	0.08
	West Bengal	0.19	0.12	0.30
	Jharkhand	0.21	0.12	0.37
	Odisha	0.09	0.04	0.19
	Bihar	0.02	0.01	0.06
	Sikkim	0.46	0.30	0.70
	Arunachal Pradesh	0.59	0.37	0.96
	Nagaland	0.07	0.03	0.16
	Manipur	1.05	0.69	1.60
	Mizoram	0.58	0.39	0.86
	Tripura	0.99	0.63	1.58
	Meghalaya	0.58	0.38	0.90
	Assam	0.22	0.13	0.35
	Gujarat	0.03	0.02	0.06

	Maharashtra	0.07	0.04	0.11
	Goa	0.06	0.03	0.11
	Andhra Pradesh	0.21	0.14	0.32
	Telangana	0.27	0.18	0.42
	Karnataka	0.16	0.10	0.24
	Kerala	0.26	0.17	0.39
	Tamil Nadu	0.27	0.19	0.38
	Puducherry	0.29	0.20	0.42

Odds ratios for bidi smoking obtained from multilevel multivariable logistic regression models

Covariates	Categories	Odds Ratio	95% CI	
Age		1.04	1.03	1.04
Sex	Male	0.04	0.04	0.05
	Female			
Wealth	Poorer			
	Poor	0.82	0.73	0.92
	Middle	0.67	0.57	0.78
	Rich	0.45	0.37	0.54
	Richer	0.28	0.23	0.35
Education	No formal education			
	Less than primary	0.79	0.69	0.91
	Primary less than secondary	0.48	0.43	0.55
	Secondary and above	0.18	0.15	0.21
Occupation	Unemployed			
	Labourer	2.45	2.02	2.96
	Housewife/ Retired/ Student	0.73	0.59	0.90
	Self	1.87	1.55	2.26
	Private	1.34	1.06	1.70
	Government	1.47	1.10	1.95
Area of residence	Urban			
	Rural	1.63	1.41	1.89
States	Jammu & Kashmir			
	Himachal Pradesh	3.24	2.19	4.78
	Punjab	1.18	0.77	1.82
	Chandigarh	2.49	1.59	3.90
	Uttarakhand	3.71	2.51	5.49
	Haryana	4.69	3.18	6.92
	Delhi	2.38	1.51	3.75
	Rajasthan	1.40	0.96	2.03
	Uttar Pradesh	1.32	0.90	1.94
	Chhattisgarh	0.53	0.32	0.86
	Madhya Pradesh	0.83	0.56	1.24
	West Bengal	1.98	1.36	2.89
	Jharkhand	0.27	0.15	0.50
	Odisha	0.37	0.22	0.63
	Bihar	0.32	0.21	0.50
	Sikkim	0.15	0.08	0.29
	Arunachal Pradesh	0.50	0.28	0.89
	Nagaland	1.26	0.77	2.07
	Manipur	0.26	0.13	0.53
	Mizoram	0.11	0.05	0.25
	Tripura	4.73	3.02	7.42
	Meghalaya	2.29	1.49	3.52
	Assam	0.83	0.54	1.26

	Gujarat	0.93	0.62	1.39
	Maharashtra	0.25	0.16	0.41
	Goa	0.27	0.14	0.50
	Andhra Pradesh	0.51	0.33	0.78
	Telangana	0.52	0.33	0.81
	Karnataka	0.61	0.40	0.91
	Kerala	0.42	0.25	0.69
	Tamil Nadu	0.62	0.41	0.93
	Puducherry	0.23	0.13	0.41

Odds ratios for smokeless tobacco use obtained from multilevel multivariable logistic regression models

Covariates	Categories	Odds Ratio	95% CI	
Age		1.02	1.02	1.02
Sex	Male			
	Female	0.44	0.41	0.46
Wealth	Poorer			
	Poor	0.88	0.83	0.94
	Middle	0.75	0.69	0.82
	Rich	0.56	0.50	0.62
	Richer	0.38	0.34	0.43
Education	No formal education			
	Less than primary	0.90	0.83	0.97
	Primary less than secondary	0.74	0.69	0.79
	Secondary and above	0.43	0.39	0.46
Occupation	Unemployed			
	Labourer	1.81	1.61	2.04
	Housewife/ Retired/ Student	0.67	0.60	0.76
	Self	1.46	1.30	1.64
	Private	1.56	1.36	1.79
	Government	0.99	0.84	1.17
Area of residence	Urban			
	Rural	1.09	1.01	1.19
States	Jammu & Kashmir			
	Himachal Pradesh	0.49	0.31	0.76
	Punjab	1.97	1.37	2.82
	Chandigarh	1.23	0.82	1.84
	Uttarakhand	2.35	1.66	3.34
	Haryana	1.39	0.95	2.03
	Delhi	2.64	1.83	3.82
	Rajasthan	3.03	2.19	4.19
	Uttar Pradesh	8.56	6.27	11.67
	Chhattisgarh	14.66	10.56	20.35
	Madhya Pradesh	7.32	5.34	10.04
	West Bengal	5.72	4.15	7.87
	Jharkhand	10.67	7.66	14.85
	Odisha	17.56	12.62	24.42
	Bihar	5.49	4.01	7.53
	Sikkim	2.21	1.51	3.23
	Arunachal Pradesh	11.81	8.29	16.82
	Nagaland	18.80	13.30	26.57
	Manipur	36.81	26.07	51.99
	Mizoram	17.94	12.69	25.36
	Tripura	40.00	28.21	56.70

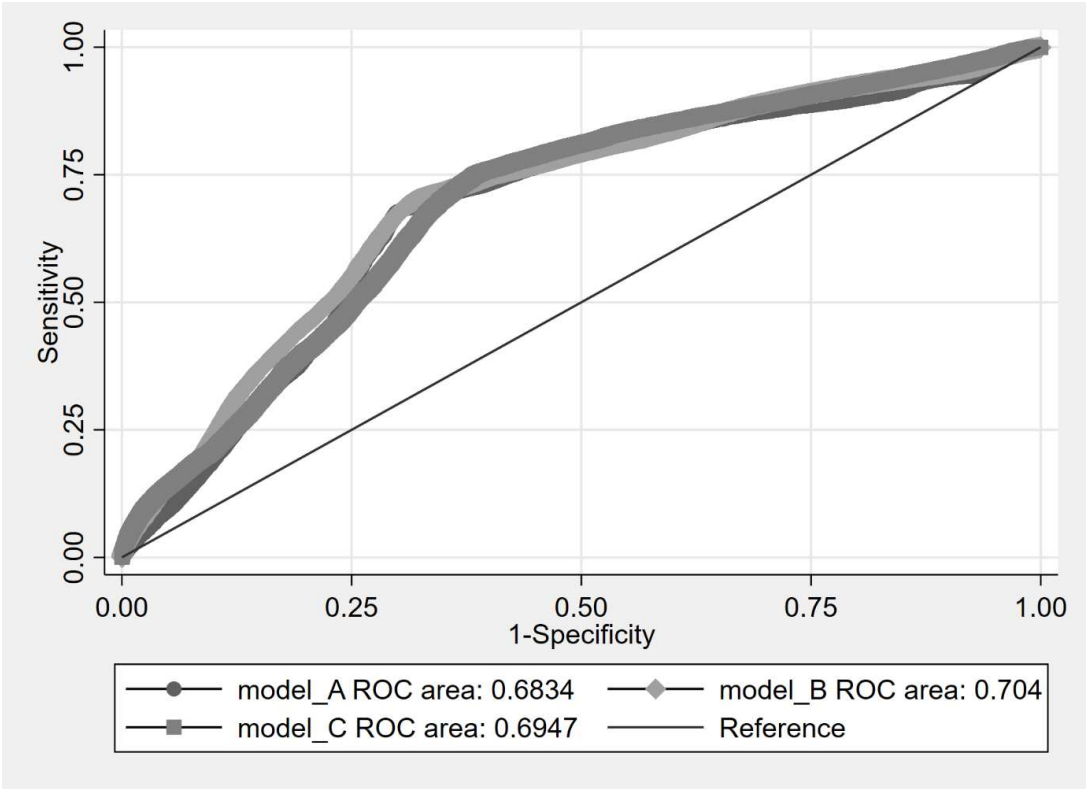
	Meghalaya	7.70	5.40	10.98
	Assam	17.68	12.92	24.20
	Gujarat	5.31	3.85	7.32
	Maharashtra	6.81	4.98	9.31
	Goa	1.76	1.21	2.56
	Andhra Pradesh	1.14	0.79	1.65
	Telangana	2.05	1.44	2.92
	Karnataka	3.63	2.62	5.02
	Kerala	1.12	0.76	1.65
	Tamil Nadu	2.15	1.54	3.00
	Puducherry	1.18	0.81	1.72

Odds ratios for dual use obtained from multilevel multivariable logistic regression models

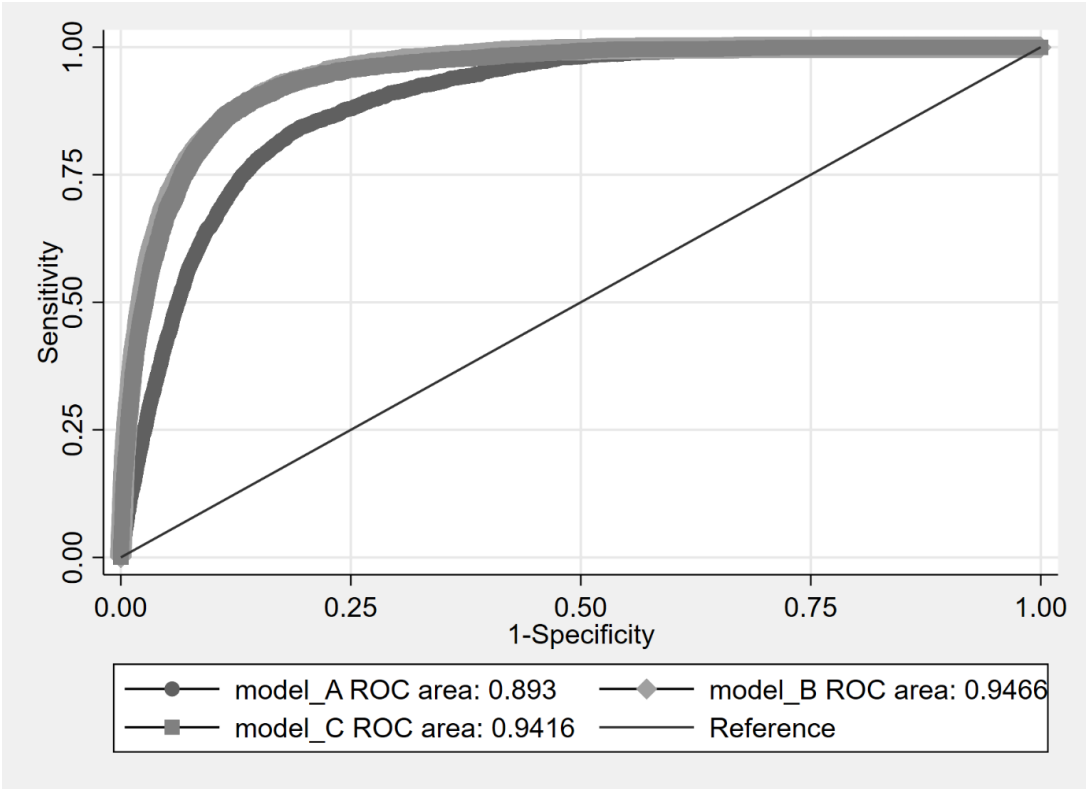
Covariates	Categories	Odds Ratio	95% CI	
Age		1.01	1.01	1.01
Sex	Male			
	Female	0.05	0.04	0.05
Wealth	Poorer			
	Poor	0.85	0.74	0.98
	Middle	0.74	0.61	0.89
	Rich	0.64	0.51	0.80
	Richer	0.45	0.35	0.58
Education	No formal education			
	Less than primary	0.82	0.69	0.98
	Primary less than secondary	0.62	0.54	0.73
	Secondary and above	0.26	0.22	0.31
Occupation	Unemployed			
	Labourer	2.18	1.72	2.77
	Housewife/ Retired/ Student	0.37	0.28	0.49
	Self	1.41	1.11	1.78
	Private	1.58	1.20	2.08
	Government	1.12	0.81	1.56
Area of residence	Urban			
	Rural	1.09	0.92	1.29
States	Jammu & Kashmir			
	Himachal Pradesh	1.00	0.49	2.04
	Punjab	1.37	0.70	2.68
	Chandigarh	1.34	0.65	2.74
	Uttarakhand	5.60	3.07	10.19
	Haryana	2.03	1.06	3.89
	Delhi	2.77	1.43	5.36
	Rajasthan	1.45	0.79	2.65
	Uttar Pradesh	7.29	4.17	12.74
	Chhattisgarh	2.06	1.06	3.99
	Madhya Pradesh	2.88	1.61	5.16
	West Bengal	3.06	1.70	5.52
	Jharkhand	7.41	4.04	13.57
	Odisha	4.55	2.44	8.48
	Bihar	1.73	0.95	3.14
	Sikkim	2.06	1.05	4.06
	Arunachal Pradesh	18.94	10.26	34.97
	Nagaland	17.87	9.68	33.00
	Manipur	28.55	15.51	52.53
	Mizoram	2.81	1.44	5.49
	Tripura	22.80	12.21	42.58
	Meghalaya	2.09	1.07	4.08
	Assam	7.16	4.04	12.69
	Gujarat	1.23	0.66	2.30

	Maharashtra	0.59	0.30	1.17
	Goa	0.30	0.11	0.81
	Andhra Pradesh	0.23	0.10	0.53
	Telangana	0.21	0.08	0.52
	Karnataka	1.33	0.72	2.46
	Kerala	1.19	0.59	2.37
	Tamil Nadu	0.65	0.34	1.27
	Puducherry	0.40	0.18	0.89

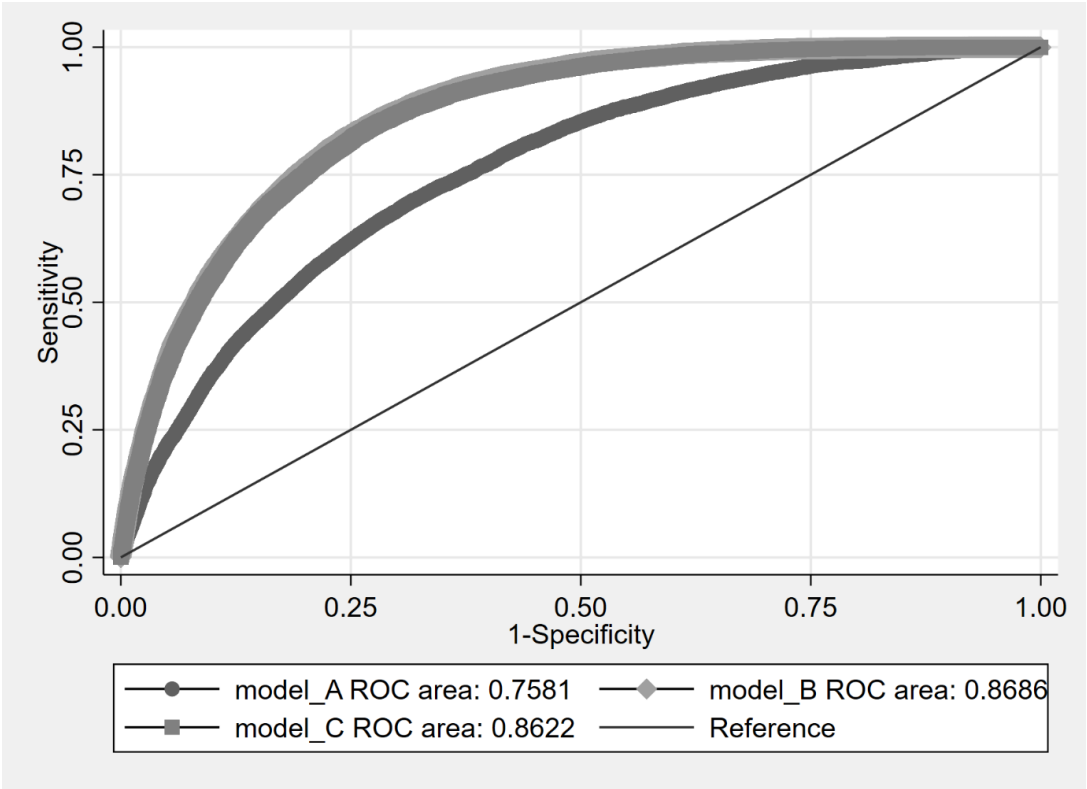
Area under the receiver operating characteristic (AU-ROC) curve for *cigarette smoking* plotted separately for single and multilevel logistic regression models



Area under the receiver operating characteristic (AU-ROC) curve for *bidi smoking* plotted separately for single and multilevel logistic regression models



Area under the receiver operating characteristic (AU-ROC) curve for *SLT use* plotted separately for single and multilevel logistic regression models



Area under the receiver operating characteristic (AU-ROC) curve for *dual use* plotted separately for single and multilevel logistic regression models

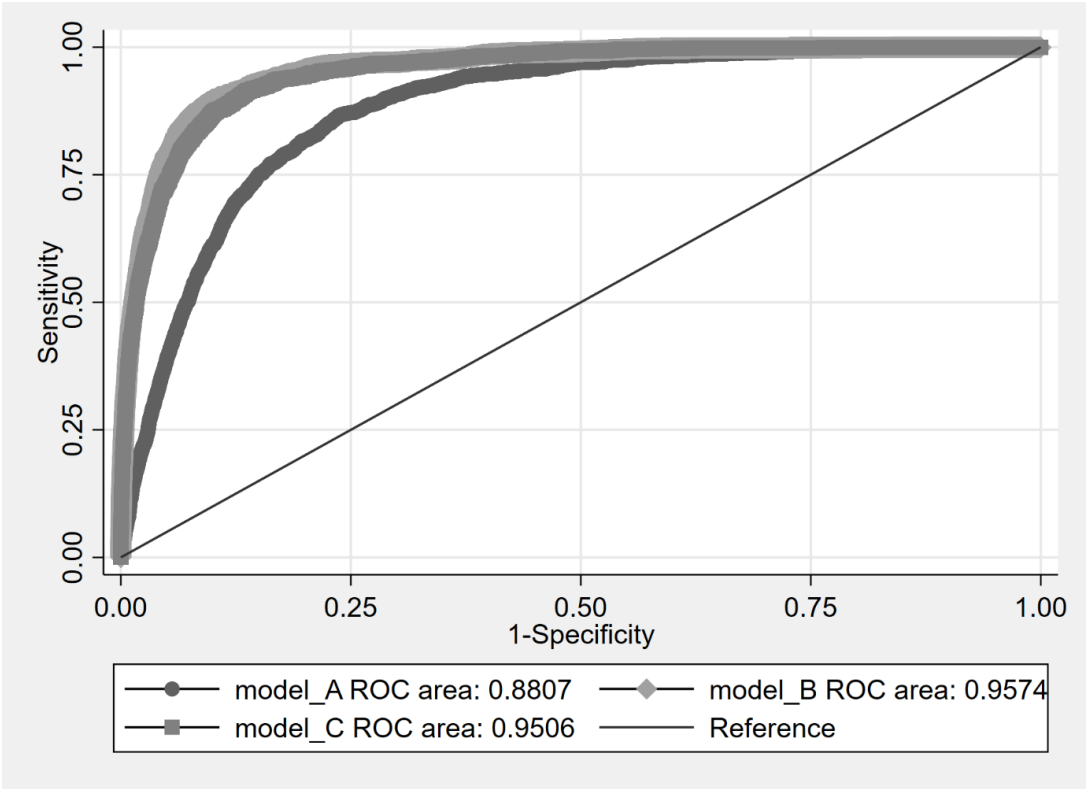


Table showing intraclass correlation coefficients obtained from three level hierarchical models with individual nested within city-wards/villages nested within states

		Null Model ICC 95% CI	Full model ICC 95% CI
Any tobacco use	State	17% (11%, 25%)	17% (11%, 25%)
	City ward/ village within state	23% (17%, 30%)	23% (17%, 30%)
Cigarette smoking	State	23% (15%, 34%)	22% (14%, 32%)
	City ward/ village within state	33% (25%, 42%)	33% (26%, 42%)
Bidi smoking	State	16% (11%, 25%)	19% (13%, 29%)
	City ward/ village within state	30% (24%, 36%)	33% (26%, 40%)
SLT use	State	28% (20%, 40%)	26% (18%, 36%)
	City ward/ village within state	36% (28%, 46%)	33% (25%, 42%)
Dual use	State	27% (18%, 38%)	26% (18%, 37%)
	City ward/ village within state	39% (31%, 48%)	43% (36%, 51%)

ICC: Intra-class correlation
Null model: Intercept only
Full model: Age, sex, education, occupation, wealth and area of residence

Interpretation

Example any tobacco use: Conditioned on covariates (age, sex, education, occupation, wealth and area of residence) any tobacco use is highly correlated within states (ICC: 17%). Within the same cityward/ village and state, this correlation was even higher (ICC: 23%).