

Mental distress modifies the association between cost-related barriers and cervical cancer screening adherence: interaction and stratified analyses of BRFSS 2024

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Abstract

Background: Cost-related barriers and mental distress may jointly influence preventive service use, but their combined association with cervical cancer screening adherence is not well characterized in recent U.S. surveillance data.

Methods: We analyzed 2024 Behavioral Risk Factor Surveillance System (BRFSS) data among female respondents. The primary outcome was Pap-related cervical cancer screening adherence (_RFPAP37); a sensitivity outcome used Pap+HPV adherence (_PAPHPV1). Mental distress was categorized as low, moderate, or high using _MENT14D, and cost-related barriers were defined by MEDCOST1. We fitted unadjusted and adjusted logistic regression models including an interaction term, adjusting for age group, education, income, marital status, race/ethnicity, insurance coverage, personal doctor status, and routine checkup. We also estimated stratified effects, adjusted predicted probabilities, and absolute risk differences.

Results: The primary analytic sample included 101,580 women; 66,417 were included in complete-case adjusted models. Overall Pap adherence was 66.6% and was lower among women reporting cost-related barriers (54.5% vs 68.6%). Cost-related barriers were associated with lower Pap adherence in unadjusted (OR 0.52, 95% CI 0.49–0.56) and adjusted models (OR 0.83, 95% CI 0.76–0.90). Mental distress showed a graded inverse association with adherence (adjusted trend OR 0.96, 95% CI 0.94–0.99). Adjusted predicted probabilities showed lower adherence across distress strata among women with cost-related barriers, with absolute differences of about 3.3–3.8 percentage points. Findings were directionally consistent for the Pap+HPV outcome.

Conclusions: In BRFSS 2024, cost-related barriers and mental distress were independently associated with lower cervical cancer screening adherence. Financial navigation and mental health–informed outreach may help improve screening uptake.

Introduction

Cervical cancer is one of the most preventable malignancies in women, yet it continues to impose avoidable morbidity and mortality when screening and timely follow-up are missed. Screening programs have historically driven major reductions in incidence and deaths by detecting precancerous lesions before invasion, and U.S. clinical guidance now offers several evidence-based pathways for average-risk individuals with a cervix. The U.S. Preventive Services Task Force (USPSTF) recommends cytology every 3 years for ages 21–29 and, for ages 30–65, cytology every 3 years, primary high-risk HPV testing every 5 years, or co-testing every 5 years¹. The American Cancer Society (ACS) further updated its guideline to emphasize primary HPV testing where available and to refine initiation and intervals, reflecting the central etiologic role of HPV and the performance of HPV-based testing². In practice—particularly within nursing-led preventive care and community outreach—these recommendations translate into routine

opportunities to promote screening completion, address barriers, and ensure appropriate follow-up when results are abnormal, consistent with modern risk-based management approaches³.

Despite clear recommendations, screening uptake remains uneven, and recent evidence suggests that underscreening has not been eliminated and may be worsening in specific populations. A large, repeated cross-sectional assessment of guideline-concordant screening from 2005–2019 documented declines and highlighted persistent reasons for underscreening across sociodemographic groups⁴. More recent national evidence also underscores geographic inequities, with rural populations experiencing lower screening levels in contemporary years, reinforcing the need for targeted prevention strategies⁵. At the same time, improvements in screening questions and surveillance measurement remain an active area of public health work—important for interpreting trends and comparing estimates across survey years⁶.

From a nursing and health services perspective, access-to-care barriers remain central. Among these, cost-related barriers are particularly actionable because they often represent modifiable friction points—transportation, copays, scheduling constraints, or uncertainty about coverage—that can be addressed through financial navigation, care coordination, and referral support. In a broader preventive care context, unmet need due to cost has been tracked over time and remains consequential for receipt of recommended services⁷. Importantly, even when individuals have nominal insurance coverage, out-of-pocket costs or “unexpected” cost-sharing can occur and may discourage preventive service use, suggesting that insurance alone does not guarantee affordability⁸.

In parallel, psychosocial vulnerability may shape whether a woman completes screening and follow-up. Emotional barriers—fear, embarrassment, worry, and anticipatory discomfort—have been identified as potent deterrents to cervical screening attendance, particularly around first-time screening and at earlier points in the screening life course⁹. Psychological distress is also clinically relevant after abnormal screening results: systematic reviews demonstrate that screening procedures and positive results can be associated with measurable distress and anxiety, which may influence future adherence and follow-up behaviors¹⁰. These psychosocial pathways intersect directly with nursing practice, where counseling, health education, and supportive communication can reduce distress and facilitate adherence to recommended care.

The “double burden” of structural and psychosocial barriers is therefore plausible: cost-related barriers may reduce screening completion, and mental distress may further weaken motivation, self-efficacy, and follow-through. This intersection may be particularly salient in populations experiencing cumulative disadvantage, including immigrants and culturally or linguistically diverse groups. A comprehensive review of barriers and facilitators among U.S. immigrant populations highlights the interplay of financial constraints, access limitations, and system-level barriers such as interpreter availability and culturally responsive care¹¹. Health literacy represents another critical mediator; a systematic review has emphasized plausible pathways linking limited health literacy to lower cervical cancer screening through knowledge gaps, communication barriers, and reduced self-management capacity¹².

Nursing interventions have a strong evidence base for addressing these intertwined barriers. Patient navigation—often delivered or coordinated by nurses—has been evaluated across trials and synthesized in recent meta-analytic work, showing meaningful improvements in breast and cervical cancer screening completion and follow-up, particularly among underserved populations¹³. Such findings underscore a pragmatic implication: interventions that combine barrier assessment, education, navigation, and follow-up tracking are likely to be more effective than education-only approaches.

The BRFSS provides a timely surveillance platform to examine screening adherence alongside access barriers and mental health indicators at scale. It includes measures that map to nursing-relevant intervention targets—cost-related barriers to care, access to a personal doctor, routine checkups, and mental health days—allowing researchers to quantify both relative and absolute differences in screening adherence across population strata. Additionally, because screening strategies are evolving (including increasing emphasis on HPV-based approaches and the emergence of self-sampling options), assessing robustness across alternative adherence definitions remains valuable for interpreting prevention gaps and translating findings into practice¹⁴⁻¹⁶.

Against this background, we used BRFSS 2024 to examine how cost-related barriers and mental distress—operationalized using BRFSS indicators—relate to cervical cancer screening adherence. We specifically tested whether mental distress modifies the association between cost-related barriers and adherence using interaction and stratified analyses, and we translated results into clinically interpretable absolute metrics using adjusted predicted probabilities and risk differences. By focusing on nursing-actionable determinants (financial barriers, psychosocial distress, and access-to-care pathways), the present study aims to inform integrated outreach and navigation strategies to improve screening adherence.

Results

Study sample

The BRFSS 2024 dataset included 457,670 respondents, of whom 240,183 were female. After restricting to female respondents with the Pap-related adherence outcome available, the primary analytic sample comprised 101,580 women; complete-case analyses for the adjusted primary model included 66,417 women. For the sensitivity outcome based on Pap+HPV adherence, 90,706 women were eligible and 58,999 remained in complete-case adjusted models. The participant selection process is shown in Fig. 1.

Participant characteristics

Overall Pap-related adherence in the primary analytic sample was 66.6%. Adherence differed by cost-related barriers and by mental distress level. Women reporting cost-related barriers had a markedly lower observed adherence proportion than those without such barriers (54.5% vs 68.6%). Across mental distress strata, observed adherence ranged from 61.5%–69.1%, with the lowest adherence in the high

distress group. Participant characteristics by Pap-related cervical cancer screening adherence are summarized in Table 1.

Table 1. Participant characteristics according to Pap-related cervical cancer screening adherence (BRFSS 2024).

Characteristic	Non-adherent, n (%)	Adherent, n (%)
Mental distress		
Low	15333 (45.2)	30777 (45.5)
Moderate	11207 (33.0)	25046 (37.0)
High	7389 (21.8)	11828 (17.5)
Cost-related barrier to care		
No	27225 (80.2)	59613 (88.1)
Yes	6704 (19.8)	8038 (11.9)
Age group, years		
21–29	6527 (19.2)	9064 (13.4)
30–39	6677 (19.7)	15270 (22.6)
40–49	6834 (20.1)	16288 (24.1)
50–59	7696 (22.7)	16082 (23.8)
60–65	6195 (18.3)	10947 (16.2)
Education		
Less than high school	2950 (8.7)	2633 (3.9)
High school/GED	8618 (25.4)	11415 (16.9)
Some college/technical school	9028 (26.6)	16478 (24.4)
College graduate	13174 (38.8)	36946 (54.6)
Unknown	159 (0.5)	179 (0.3)
Household income		
<\$25,000	6107 (18.0)	7069 (10.4)
\$25,000–\$49,999	7517 (22.2)	11734 (17.3)
\$50,000–\$99,999	7913 (23.3)	17579 (26.0)
≥\$100,000	7002 (20.6)	23561 (34.8)
Unknown/refused	5390 (15.9)	7708 (11.4)
Marital status		
Married	14806 (43.6)	36833 (54.4)
Divorced	4297 (12.7)	8308 (12.3)

Widowed	1456 (4.3)	2077 (3.1)
Separated	1302 (3.8)	1850 (2.7)
Never married	9237 (27.2)	13512 (20.0)
Unmarried couple	2550 (7.5)	4684 (6.9)
Unknown/refused	281 (0.8)	385 (0.6)
Race		
White	21005 (61.9)	46828 (69.2)
Black	3051 (9.0)	6191 (9.2)
Asian	1622 (4.8)	1666 (2.5)
American Indian/Alaska Native	718 (2.1)	967 (1.4)
Other race	5966 (17.6)	9443 (14.0)
Multiracial	1567 (4.6)	2556 (3.8)
Hispanic ethnicity		
Hispanic	5940 (17.5)	9402 (13.9)
Non-Hispanic	27635 (81.4)	57784 (85.4)
Unknown/refused	354 (1.0)	465 (0.7)
Primary insurance status		
Private/employer-based	16926 (49.9)	45110 (66.7)
Medicare	3136 (9.2)	4076 (6.0)
Medicaid	4915 (14.5)	7358 (10.9)
Military/VA/IHS/other public	3326 (9.8)	6190 (9.1)
Other	46 (0.1)	61 (0.1)
Uninsured	4144 (12.2)	3391 (5.0)
Unknown/refused	1436 (4.2)	1465 (2.2)
Personal doctor		
Yes, only one	16789 (49.5)	34906 (51.6)
More than one	9349 (27.6)	26566 (39.3)
No	7436 (21.9)	5843 (8.6)
Unknown/refused	355 (1.0)	336 (0.5)

Time since routine checkup		
Within past year	22426 (66.1)	57480 (85.0)
Within past 2 years	4414 (13.0)	6766 (10.0)
Within past 5 years	3413 (10.1)	2137 (3.2)
≥5 years ago	2799 (8.2)	759 (1.1)
Never	382 (1.1)	146 (0.2)
Unknown/refused	495 (1.5)	363 (0.5)

Notes: Group percentages are column percentages. “Non-adherent” and “Adherent” refer to Pap-related cervical cancer screening adherence defined by _RFPAP37. Categories were relabeled for readability based on BRFSS coding.

Primary outcome: Pap-related adherence (_RFPAP37)

Unadjusted associations and stratified effects

Observed cervical cancer screening adherence across mental distress levels and cost-related barrier strata is presented in Fig. 2. In unadjusted analyses, cost-related barriers were strongly associated with lower odds of Pap adherence. Stratified estimates indicated consistently reduced adherence associated with cost-related barriers across mental distress levels. Unadjusted and adjusted logistic regression results are summarized in Table 2.

Table 2. Associations of cost-related barriers and mental distress with cervical cancer screening adherence: unadjusted and adjusted logistic regression results (BRFSS 2024).

Outcome	Term	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Pap adherence	Moderate vs low mental distress	1.15 (1.11–1.19)	1.01 (0.97–1.06)
Pap adherence	High vs low mental distress	0.87 (0.84–0.91)	0.94 (0.89–0.99)
Pap adherence	Cost barrier (yes vs no)	0.52 (0.49–0.56)	0.83 (0.76–0.90)
Pap adherence	Moderate distress × cost barrier	1.07 (0.98–1.17)	1.01 (0.90–1.13)
Pap adherence	High distress × cost barrier	1.16 (1.06–1.27)	1.03 (0.91–1.16)
Pap adherence	Cost barrier within low distress	0.52 (0.49–0.56)	0.83 (0.76–0.90)
Pap adherence	Cost barrier within moderate distress	0.56 (0.53–0.59)	0.83 (0.77–0.90)
Pap adherence	Cost barrier within high distress	0.60 (0.57–0.64)	0.85 (0.78–0.93)
Pap adherence	Mental distress trend per level	0.92 (0.91–0.94)	0.96 (0.94–0.99)
Pap+HPV adherence	Moderate vs low mental distress	1.40 (1.34–1.45)	1.05 (0.99–1.10)
Pap+HPV adherence	High vs low mental distress	1.00 (0.95–1.05)	0.96 (0.90–1.03)
Pap+HPV adherence	Cost barrier (yes vs no)	0.54 (0.50–0.58)	0.87 (0.79–0.96)
Pap+HPV adherence	Moderate distress × cost barrier	1.06 (0.95–1.17)	0.98 (0.85–1.12)
Pap+HPV adherence	High distress × cost barrier	1.18 (1.06–1.31)	0.94 (0.82–1.08)
Pap+HPV adherence	Cost barrier within low distress	—	0.87 (0.79–0.96)
Pap+HPV adherence	Cost barrier within moderate distress	—	0.85 (0.76–0.94)
Pap+HPV adherence	Cost barrier within high distress	—	0.82 (0.74–0.91)
Pap+HPV adherence	Mental distress trend per level	—	0.97 (0.94–1.00)

Notes: Adjusted models included age group, education, household income, marital status, race, Hispanic ethnicity, primary insurance status, personal doctor status, and time since routine checkup. Stratified cost-barrier effects represent the association between cost-related barriers and screening adherence within each mental distress stratum. Trend estimates represent the odds ratio per one-level increase in

mental distress (low → moderate → high). Dashes indicate estimates not reported in the current analytic output.

Adjusted model (complete cases)

After adjustment for age group, education, income, marital status, race/ethnicity, insurance coverage, having a personal doctor, and routine checkup, cost-related barriers remained independently associated with lower Pap adherence. Compared with low mental distress, high distress was associated with lower adherence, while moderate vs low distress was not clearly associated with adherence after adjustment. In adjusted stratified analyses, cost-related barriers were associated with lower adherence across low, moderate, and high distress strata.

Trend across mental distress levels

Treating mental distress as an ordinal exposure, there was evidence of a graded association with adherence. Each increment in distress level was associated with lower odds of adherence in unadjusted analyses, and the association remained after multivariable adjustment. Key model estimates from the unadjusted and adjusted logistic regression analyses are visually summarized in Fig. 3.

Adjusted predicted probabilities and absolute differences

Adjusted predicted probabilities of screening adherence across combinations of mental distress level and cost-related barriers are shown in Fig. 4. Adjusted predicted probabilities (holding covariates at typical levels) showed lower adherence for women with cost-related barriers across all mental distress strata. Corresponding absolute differences (no barrier minus barrier) were on the order of several percentage points across distress levels. The adjusted predicted probabilities and corresponding absolute risk differences are summarized in Table 3.

Table 3. Adjusted predicted probabilities and absolute risk differences in cervical cancer screening adherence by mental distress level and cost-related barriers (BRFSS 2024).

Outcome	Mental distress	No cost barrier, predicted adherence (%)	Cost barrier, predicted adherence (%)	Absolute risk difference (percentage points)
Pap adherence	Low	73.8	70.1	3.8
Pap adherence	Moderate	74.1	70.4	3.6
Pap adherence	High	72.6	69.3	3.3
Pap+HPV adherence	Low	80.3	77.9	2.3
Pap+HPV adherence	Moderate	81	78.3	2.7
Pap+HPV adherence	High	79.7	76.2	3.5

Notes: Predicted probabilities were derived from adjusted logistic regression models at typical covariate values. Absolute risk difference was calculated as predicted adherence in the no-cost-barrier group minus predicted adherence in the cost-barrier group within each mental distress stratum.

Sensitivity outcome: Pap+HPV adherence (_PAPHPV1)

Findings were broadly consistent when adherence was defined using the Pap+HPV outcome. Cost-related barriers remained associated with lower adherence in adjusted models, and a modest ordinal trend across distress levels persisted. Adjusted stratified estimates again demonstrated reduced adherence associated with cost-related barriers across distress strata, and adjusted predicted probabilities showed corresponding absolute differences across strata. The absolute risk differences stratified by mental distress level are shown in Fig. 5.

Discussion

In this analysis of BRFSS 2024, we found that cost-related barriers to care were consistently associated with lower cervical cancer screening adherence, whether adherence was defined using the Pap-related measure (_RFPAP37) or the Pap+HPV measure (_PAPHPV1). These findings are clinically and programmatically important because cervical cancer screening remains a cornerstone of prevention, with multiple recommended pathways that are effective when implemented at scale¹⁷.

Interpretation of the main findings

Three results merit emphasis.

First, the association between cost-related barriers and screening adherence was robust. Even after multivariable adjustment for sociodemographic factors and healthcare access proxies (insurance, personal doctor, and routine checkup), cost barriers remained independently associated with lower odds of adherence for both outcomes. This pattern supports a structural interpretation: cost-related constraints likely reflect more than a single momentary obstacle and may serve as a marker of broader financial strain and access friction that can interrupt preventive care routines.

Second, mental distress showed a graded relationship with adherence when modeled as an ordinal exposure. The adjusted trend estimate suggested that, as distress increased from low to moderate to high, adherence declined modestly but measurably. From a clinical perspective, this aligns with how distress can affect follow-through on preventive care—through diminished energy, competing priorities, avoidance behaviors, or difficulty coordinating appointments and transportation. While the magnitude of the trend was not large, it persisted after controlling for multiple confounders, which suggests it is not simply a byproduct of socioeconomic status.

Third, the combined patterns of cost-related barriers and distress were more compelling when expressed in absolute terms. The adjusted predicted probabilities and risk differences indicated that cost barriers translated into several percentage points lower predicted adherence across distress strata. At the individual level this may appear modest; at the population level, however, even a 2–4 percentage point gap in adherence corresponds to a very large number of missed screenings when scaled to the U.S. population represented by BRFSS. Presenting both relative and absolute metrics is therefore not merely a statistical preference—it is clinically meaningful and facilitates interpretation by nurses, clinicians, and health system leaders who design outreach and navigation programs.

Effect modification and scale considerations

A key analytic question was whether mental distress modifies the association between cost barriers and adherence. In unadjusted models and stratified displays, the cost-barrier association appeared to differ across distress categories. After adjustment, interaction terms were attenuated on the odds-ratio scale, while stratified adjusted estimates continued to show a consistent adverse association of cost barriers across all distress strata. This pattern is not uncommon: (i) adjustment can remove confounding that is unevenly distributed across strata; and (ii) interaction can look different on relative vs absolute scales. In practice, the absolute differences derived from predicted probabilities may be more relevant for planning nursing interventions than interaction terms in a multiplicative logistic model, because program leaders often act on “how many more people will be reached” rather than on changes in odds ratios.

Nursing implications

These findings point toward pragmatic, nursing-relevant strategies.

1. Financial navigation integrated into routine prevention workflows. Cost-related barriers remained important even after adjusting for insurance and other access indicators, suggesting that “insured”

does not equate to “affordable.” Nursing-led navigation can address practical gaps: clarifying coverage, connecting patients to low- or no-cost screening programs, arranging referrals, and reducing logistical burdens.

2. Mental health–informed preventive outreach. Mental distress was associated with lower adherence and a graded trend. Integrating brief distress screening (or mental well-being check-ins) into outreach calls, reminder systems, and clinic visits may help nurses tailor motivational interviewing, address avoidance, and coordinate follow-up.
3. Dual-outcome robustness aligns with evolving screening pathways. The consistency across Pap and Pap+HPV adherence outcomes supports that the core access and psychosocial barriers operate across guideline-concordant screening approaches. This matters as screening modalities diversify and guidelines incorporate HPV-based strategies¹.

Strengths

This study leverages a large, contemporary surveillance dataset with standardized measures and wide geographic coverage, allowing us to evaluate clinically interpretable outcomes using both relative (odds ratios) and absolute (predicted probabilities and risk differences) metrics. The use of two adherence definitions (Pap-related and Pap+HPV) strengthens robustness.

Limitations

Several limitations should be considered.

1. Cross-sectional design: Exposure and outcome are measured at the same time, so causality and directionality cannot be established. For example, distress may reduce adherence, but missed preventive care could also contribute to distress.
2. Self-reported measures: Screening history and access barriers are self-reported and may be subject to recall or social desirability bias.
3. Module eligibility and missingness: The screening measures apply to eligible subgroups, and item nonresponse can introduce selection effects. We addressed this through clearly defined analytic samples and complete-case adjusted models, but residual selection bias may remain.
4. Complex survey design: The BRFSS employs complex sampling and weighting. If the primary analyses are not survey-weighted, effect estimates may not perfectly generalize to population parameters. (If you later add weighted analyses, this becomes a strength rather than a limitation.)
5. Outcome definition nuance: Calculated variables summarize adherence based on recommended intervals but may not capture clinical nuance (e.g., screening after hysterectomy, high-risk histories) with perfect specificity; this is inherent to surveillance measures and underscores the importance of using BRFSS documentation for variable construction.

Conclusion

In BRFSS 2024, cost-related barriers and mental distress were independently associated with lower cervical cancer screening adherence, and these relationships were consistent across Pap-related and Pap+HPV adherence definitions. The absolute adherence gaps associated with cost barriers were clinically meaningful at the population level. Nursing-led interventions that combine financial navigation with mental health–informed outreach may help reduce avoidable gaps in cervical cancer screening uptake.

Methods

We conducted a cross-sectional analysis using the 2024 Behavioral Risk Factor Surveillance System (BRFSS) public-use dataset (LLCP2024), an annual state-based survey of non-institutionalized U.S. adults. Because the data are de-identified and publicly available, no additional institutional ethics approval or informed consent was required.

Analyses were restricted to female respondents identified by SEXVAR (coded as 2). The primary analytic sample included women with non-missing Pap-related cervical cancer screening adherence outcome (_RFPAP37), and the sensitivity analytic sample included women with non-missing Pap+HPV adherence outcome (_PAPHPV1). Respondents not administered screening items or with missing outcome data were excluded from analyses requiring that outcome.

The primary outcome was Pap-related cervical cancer screening adherence, defined as adherent (_RFPAP37=1) versus non-adherent (_RFPAP37=2). The sensitivity outcome was Pap+HPV screening adherence, defined as adherent (_PAPHPV1=1) versus non-adherent (_PAPHPV1=2). Cost-related barriers to care were defined using MEDCOST1 (yes=1, no=2). Mental distress was defined using _MENT14D and categorized as low (1), moderate (2), or high (3). Responses coded as “don’t know/refused” were treated as missing. Adjusted models included age group (_AGE80), education (EDUCA), household income (INCOME3), marital status (MARITAL), race (_IMPRACE), Hispanic ethnicity (_HISPANC), primary insurance status (PRIMINS2), personal doctor status (PERSDOC3), and time since routine checkup (CHECKUP1).

We summarized participant characteristics and observed adherence proportions overall and across exposure strata. For each outcome, we fitted unadjusted and adjusted logistic regression models including mental distress, cost-related barriers, and their interaction term. Odds ratios (ORs) and 95% confidence intervals (CIs) were reported. We also estimated stratified cost-barrier effects within each mental distress level and conducted a trend analysis by modeling mental distress as an ordinal variable (low=1, moderate=2, high=3). From adjusted models, we generated predicted adherence probabilities by combinations of mental distress and cost-barrier status while holding covariates at typical values, and calculated absolute risk differences as the predicted adherence in the no-cost-barrier group minus that in the cost-barrier group within each distress stratum. Adjusted analyses were based on complete-case data. All analyses were conducted in R.

Declarations

Conflict of Interest statement

The authors declare that they have no conflicts of interest.

Author Statement

Chenglin Zhang was responsible for the conceptual design, Haijuan Chen provided research guidance, Xin Du and Yangdan Zhao conducted data collection and analysis, Li Liu and Xin Du authored the manuscript, and Chenglin Zhang and Yangdan Zhao performed data analysis and manuscript review.

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Ethics Approval and Consent to Participate

This study was a secondary analysis of de-identified, publicly available Behavioral Risk Factor Surveillance System (BRFSS) data. BRFSS data are publicly released in de-identified form; therefore, no additional institutional ethics approval or informed consent was required for this secondary analysis. Clinical trial number: not applicable.

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Data Availability Statement

The data analyzed in this study are publicly available from the U.S. Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS) 2024 public-use dataset. All datasets are de-identified and can be downloaded from the BRFSS website. The analytic code used to generate the results is available from the corresponding author upon reasonable request.

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Figures

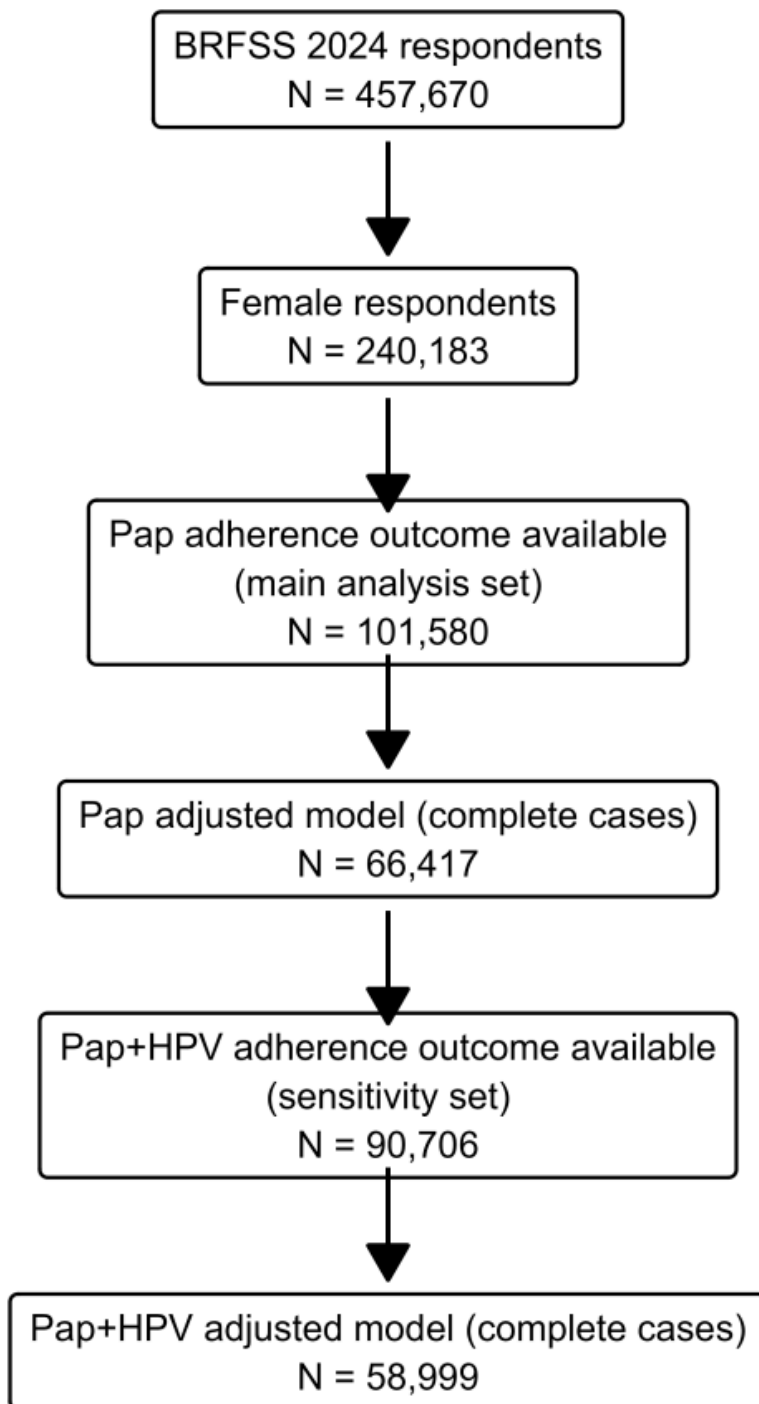


Figure 1

Study flow diagram. Flow chart of sample derivation from BRFSS 2024. The diagram summarizes restrictions to female respondents and analytic samples for the primary Pap-related adherence outcome and the sensitivity Pap+HPV adherence outcome, as well as complete-case samples used for adjusted models.

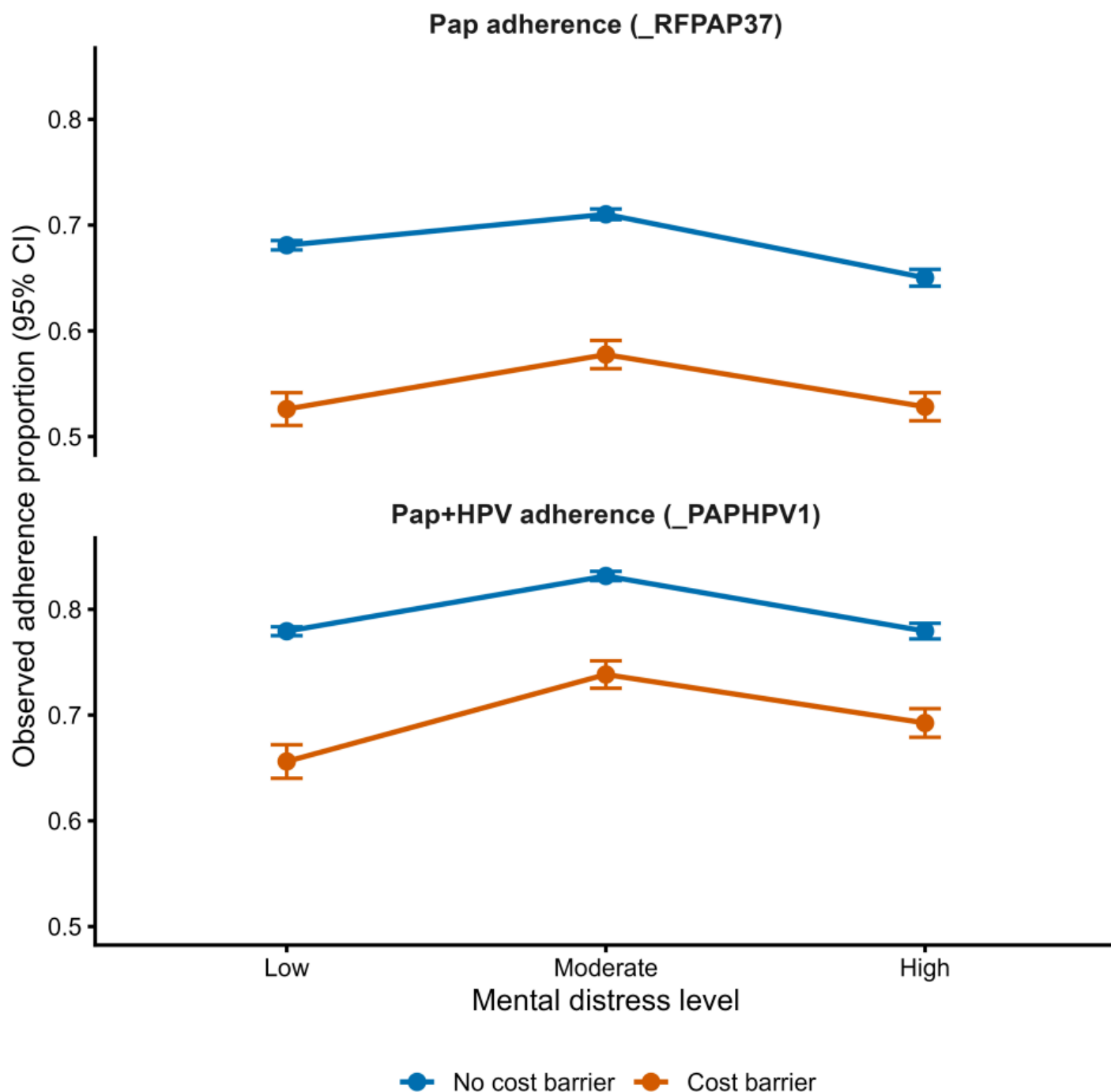


Figure 2

Observed cervical cancer screening adherence by mental distress level and cost-related barriers. Unadjusted adherence proportions (with 95% confidence intervals) are shown across mental distress levels (Low/Moderate/High) and cost-related barriers to care (No cost barrier vs Cost barrier). Panels display results for the primary outcome (Pap adherence, _RFPAP37) and the sensitivity outcome (Pap+HPV adherence, _PAPHPV1).

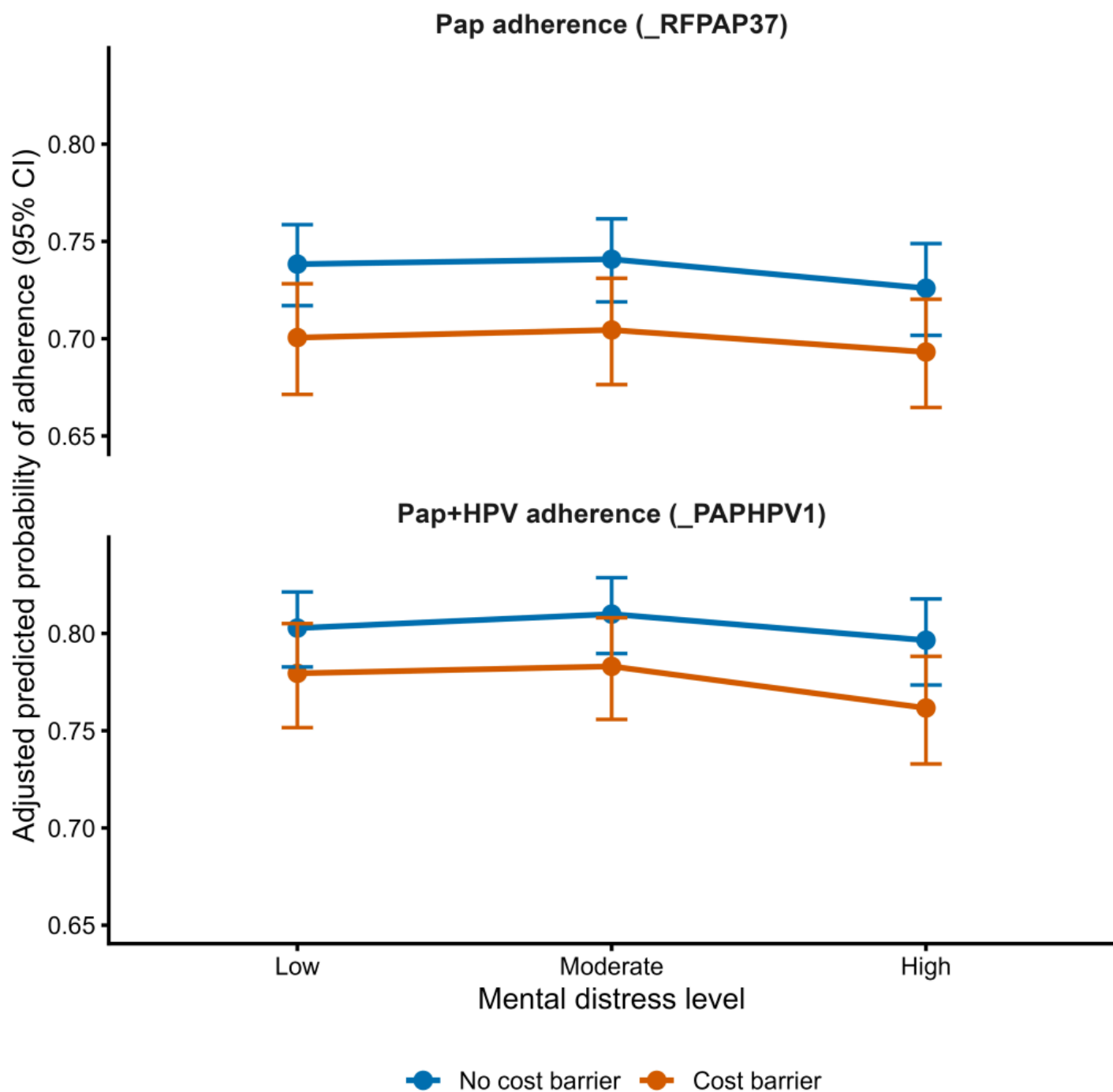


Figure 3

Forest plot of key model terms for cervical cancer screening adherence. Odds ratios (log scale) and 95% confidence intervals for key predictors (cost-related barriers, mental distress level, and interaction terms) are shown for unadjusted and adjusted logistic regression models. Results are presented separately for the primary outcome (Pap adherence, _RFPAP37) and the sensitivity outcome (Pap+HPV adherence, _PAPHPV1).

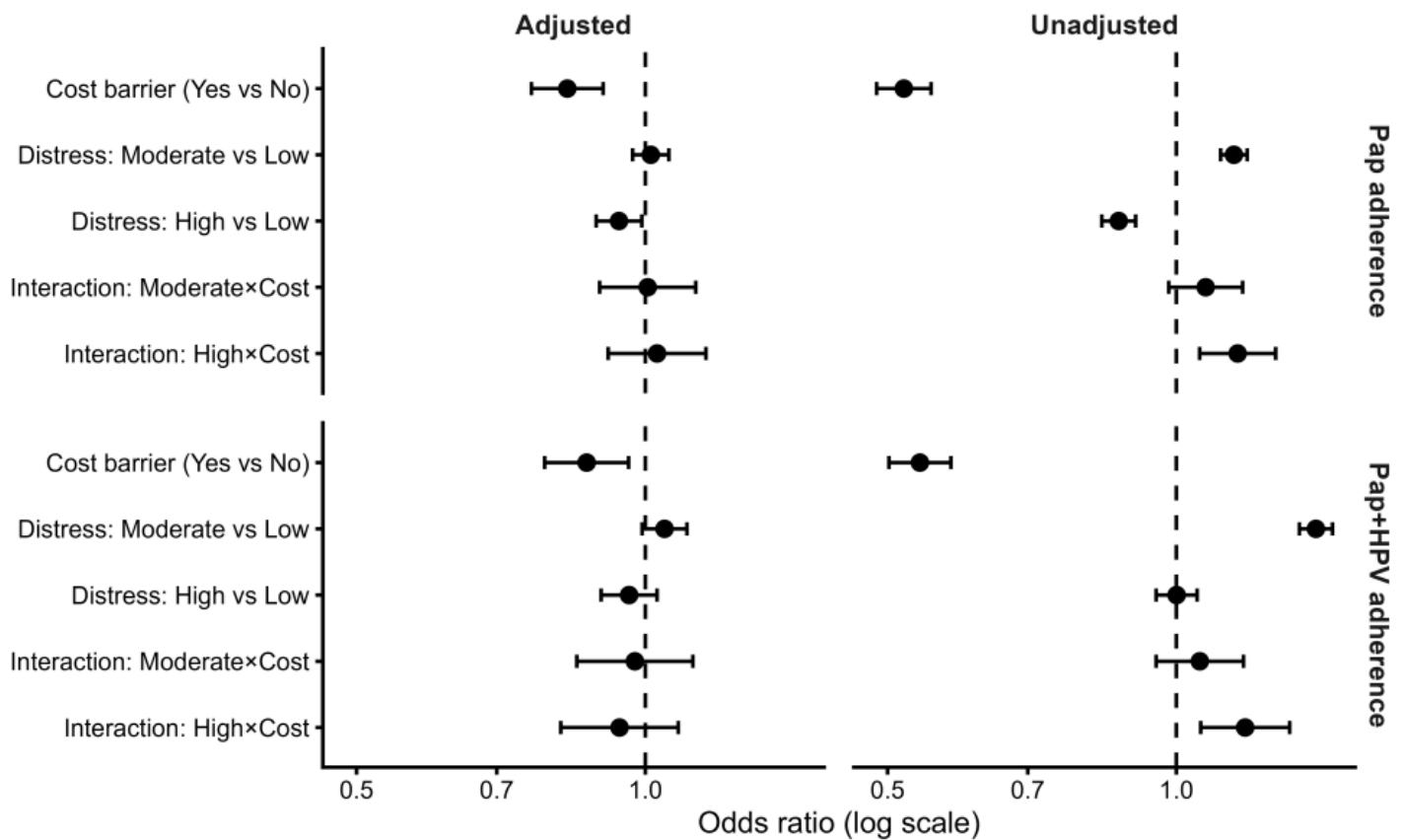


Figure 4

Adjusted predicted probabilities of cervical cancer screening adherence by mental distress level and cost-related barriers. Adjusted predicted probabilities (with 95% confidence intervals) of screening adherence are shown across mental distress levels and cost-related barriers. Estimates are derived from multivariable logistic regression models and presented for the primary outcome (Pap adherence, _RFPAP37) and the sensitivity outcome (Pap+HPV adherence, _PAPHPV1). Predicted probabilities are calculated at typical covariate values from the analytic sample.

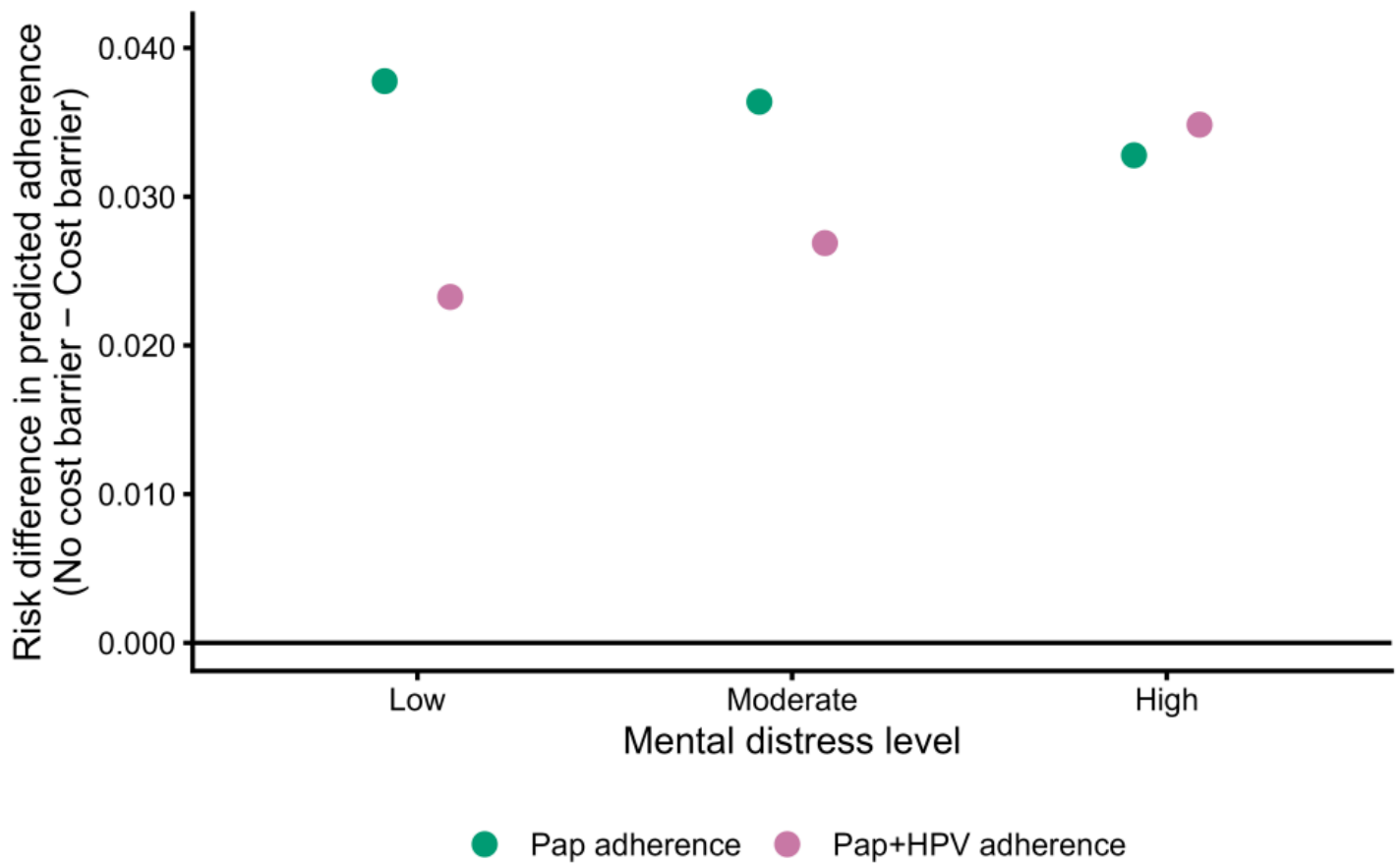


Figure 5

Absolute differences in adjusted predicted adherence associated with cost-related barriers, stratified by mental distress.

Risk differences are shown as the difference in adjusted predicted adherence between participants with no cost barrier and those with a cost barrier (No cost barrier – Cost barrier), stratified by mental distress level. Panels/series correspond to the primary outcome (Pap adherence, _RFPAP37) and the sensitivity outcome (Pap+HPV adherence, _PAPHPV1).