



Working Status and Cervical Cancer Screening Experience among Urban Women in Indonesia: Evidence from the 2023 Indonesia Health Survey

Fitri Indrawati¹✉, Maria Ulfa Nur Hidayanti¹

¹ Faculty of Medicine, Universitas Negeri Semarang, Semarang, Central Java, Indonesia

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Abstract

Cervical cancer remains the second most common cancer among women in Indonesia, while lifetime cervical cancer screening remains low. This study examined the association of current working status, age, education, and household wealth with self-reported lifetime cervical cancer screening experience among urban women in Indonesia. This cross-sectional study used secondary data from the 2023 Indonesia Health Survey (Survei Kesehatan Indonesia/SKI), including urban women aged ≥ 15 years eligible for the cervical cancer screening item (G43.G) ($n=156,722$; $n=156,716$ in the multivariable model due to missing wealth-quintile data). Analyses accounted for the multistage stratified cluster sampling design, including primary sampling units, strata, and sampling weights. Design-based chi-square tests and weighted multivariable logistic regression were performed. Overall, 8.97% (95% CI: 8.71–9.25%) of urban women reported ever undergoing cervical cancer screening by Pap smear or visual inspection with acetic acid (IVA). After adjustment, non-working women had lower odds of ever being screened than working women (aOR=0.91; 95% CI: 0.86–0.97; $p=0.002$). Screening odds were higher among women aged up to 45–54 years, those with higher education (aOR=3.42 for university graduates versus no formal education), and those in higher wealth quintiles (aOR=2.05 for the wealthiest versus poorest quintile). Working status, education, and household wealth were significantly associated with cervical cancer screening experience among urban Indonesian women. Equity-focused strategies should prioritize non-working, less-educated, and economically disadvantaged women to improve screening coverage and support cervical cancer elimination efforts.

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Corresponding Author:

✉ Fitri Indrawati

Faculty of Medicine, Universitas Negeri Semarang, Semarang, Central Java, Indonesia

Email: fitri_indrawati@mail.unnes.ac.id

1. INTRODUCTION

Cervical cancer is among the most common cancers affecting women worldwide and remains disproportionately burdensome in low and middle income countries, where systematic screening programs are often limited (Kementerian Kesehatan Republik Indonesia, 2016; Denny et al., 2017; Hull et al., 2020; Sung et al., 2021; Petersen, et al., 2022; Gopalkrishnan & Karim, 2025; Jouya et al., 2026). In 2020, the World Health Organization (WHO) launched the Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem, which sets three interim 2030 targets: 90% of girls fully vaccinated against human papillomavirus by age 15, 70% of women screened with a high performance test by age 35 and again by age 45, and 90% of women with pre-cancer or invasive cancer receiving treatment (the “90–70–90” targets) as the pathway toward reducing cervical cancer incidence below 4 per 100,000 women (World Health Organization, 2020).

In Indonesia, cervical cancer is the second most common cancer among women after breast cancer, with an estimated 36,964 new cases and 20,708 deaths in 2022 (International Agency for Research on Cancer, 2024). Despite the government's adoption of a National Cervical Cancer Elimination Plan for 2023–2030, national progress toward the WHO screening target remains slow: a scoping review of Indonesian studies conducted between 2000 and 2020 estimated that only about 12% of eligible women had ever been screened (Robbers et al., 2021), and the World Health Organization (2024) have continued to urge Indonesia to accelerate and streamline its screening rollout. Visual inspection with acetic acid (IVA) has been the mainstay screening modality promoted through Indonesia's national primary care network and is funded as a non-capitation benefit under the national health insurance scheme (Jaminan Kesehatan Nasional/JKN) (Peraturan Menteri Kesehatan Republik Indonesia Nomor 3 Tahun 2023), yet supply-side gaps in the insurance benefit package and unclear implementing regulations continue to constrain program reach (Kementerian Kesehatan Republik Indonesia, 2023; Ekawati et al., 2024).

Beyond supply-side constraints, women's individual and household circumstances shape whether they ever access screening. A scoping review of the Indonesian literature identified low knowledge and confidence, fear, fatalism and shame, and time and transport constraints, together with the historical requirement of a husband's permission, as recurring demand-side barriers (Robbers et al., 2021); a recent survey of married women in the greater Jakarta area found that more than half perceived low benefit and nearly half perceived high barriers to screening despite living in a well-served urban region, and that women in this sample were predominantly unemployed and of low educational attainment (Samaria, 2024). These findings suggest that even in urban settings, where physical access to health facilities is comparatively less constrained, socioeconomic and occupational circumstances, rather than geography alone, may be more salient determinants of screening behavior.

Women's working status in particular has been proposed as an important correlate of preventive health service use. A recent systematic review and meta analysis across least developed countries found that employed women had substantially higher odds of screening uptake than unemployed women (Rana et al., 2025), and an Indonesian study using national household survey data linked cancer screening awareness and participation to health insurance ownership and social participation, both of which are more common among working women (Anwar et al., 2018). Working status may operate through several, potentially opposing, mechanisms: employment can increase household income, expand access to employer- or insurance-linked healthcare, and expose women to workplace health information, but it may also compete with time available to seek

preventive care. Education and household wealth are similarly well-documented correlates of screening uptake internationally (Akokuwebe et al., 2021) and of preventive-care utilization specifically within Indonesia, where socioeconomic inequality has been shown to be more pronounced for preventive services than for curative or inpatient care (Mulyanto et al., 2019).

Despite this body of evidence, previous Indonesian studies linking working status to preventive-service use have generally not focused specifically on cervical cancer screening, have not been restricted to urban populations, and have not used the most recent national health survey data with appropriate accounting for its complex sampling design. Restricting this analysis to urban women is not merely a matter of dataset recency: because physical access to health facilities is comparatively less constrained in urban areas, this subgroup offers a setting in which socioeconomic and occupational patterning of screening behavior can be examined with less confounding from geographic access barriers, making working status itself a more directly interpretable correlate of screening behavior. This study therefore used data from the 2023 Indonesia Health Survey (Survei Kesehatan Indonesia/SKI) to assess the association between current working status and self-reported lifetime cervical cancer screening experience among urban women in Indonesia, after adjusting for age, education, and household wealth quintile. The findings are intended to inform targeted, equity-focused strategies to accelerate progress toward national and global cervical cancer elimination targets.

2. METHODS

This study used a cross-sectional analytic design based on secondary data and is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for cross-sectional studies; variable definitions, potential sources of bias, handling of missing data, and the survey's complex sampling design are addressed explicitly in the subsections below.

Data were obtained from the 2023 Indonesia Health Survey (Survei Kesehatan Indonesia/SKI 2023), a nationally representative household health survey conducted by the Health Policy Agency (Badan Kebijakan Pembangunan Kesehatan/BKPK), Ministry of Health of the Republic of Indonesia (Badan Kebijakan Pembangunan Kesehatan, Kementerian Kesehatan Republik Indonesia, 2023). SKI 2023 used a multistage stratified cluster sampling design, with primary sampling units and strata identifiers, together with individual sampling weights, recorded in the dataset.

The initial dataset comprised 638,178 individual respondents to the reproductive health module of the 2023 Indonesia Health Survey (SKI 2023), from which male respondents ($n=291,418$) were excluded, leaving 346,760 female respondents; women for whom the cervical cancer screening item (G43.G) was recorded as "Not Applicable" ($n=49,918$) were then excluded, leaving 296,842 women eligible for the item; and respondents residing in rural areas (*perdesaan*) ($n=140,120$) were subsequently excluded to restrict the analysis to women residing in urban areas (*perkotaan*), resulting in a final analytic sample of 156,722 women, of whom six additional women with missing household wealth quintile data were excluded from the multivariable analysis, yielding a final multivariable analytic sample of 156,716 women.

The outcome variable was cervical cancer screening experience, derived from survey item G43.G, which asked respondents whether and how often they had undergone a Pap smear or visual inspection with acetic acid (IVA) test. The primary outcome was dichotomized as "Ever" (any positive frequency response) versus "Never"; because this dichotomization collapses information on screening frequency and recency that is relevant to guideline adherence, a secondary analysis using the underlying frequency/recency

categories of G43.G is reported in section 3.5. The main independent variable was current working status, derived from a nine-category current-activity item (B4K9) and dichotomized as “working” (currently engaged in formal employment, self-employment, or unpaid family/agricultural work) versus “not working.” Because the original item groups paid employees, the self-employed, unpaid family/agricultural workers, and students together under working-related categories, this operational definition should be interpreted as an approximation of current economic activity rather than formal employment status, and is referred to as “current working status” throughout; a six-category disaggregation of this variable (not working, student, formal employee, self-employed, agricultural/informal worker, other) was additionally analyzed as a sensitivity analysis (section 3.4) to assess whether this heterogeneity affected the main findings. Additional independent variables were age (recorded in completed years and recoded into eight ten-year groups: 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and ≥85 years; the 15–24 group was retained because it forms part of the SKI-eligible population for G43.G and provides a reference point for the age gradient in screening experience, although, consistent with the WHO elimination strategy’s emphasis on screening at ages 35 and 45 rather than from age 15, this youngest group is expected to show minimal screening experience, and its inclusion is not intended to imply that universal screening from age 15 is recommended), highest education attained (seven ordered categories, from no formal education to completed university), and household wealth quintile (a five-category asset/ownership index, from lowest to highest, constructed by the survey implementing agency using standard principal-component methodology).

Descriptive statistics were used to characterize the analytic sample. To account for the multistage stratified cluster sampling design of SKI 2023, all descriptive and inferential analyses incorporated the primary sampling unit, strata, and individual sampling weight variables provided in the dataset using a complex survey design approach. Weighted percentages with 95% confidence intervals were reported for the univariate analysis (Table 1). Bivariate associations between each independent variable and cervical cancer screening experience were assessed using design based Rao Scott F tests, with weighted row percentages reported (Table 2). Multivariable binary logistic regression was performed with all independent variables entered simultaneously while accounting for the complex survey design, and weighted adjusted odds ratios (aORs) with 95% confidence intervals were estimated to assess the association between each independent variable and screening experience (Table 3). Statistical significance was set at $p < 0.05$. As a sensitivity analysis, working status was further categorized into six groups and analyzed using the same weighted multivariable approach (Section 3.4), while a secondary analysis examining screening recency and frequency among women who had ever been screened is presented in Section 3.5.

SKI 2023 was conducted by BKPK, Ministry of Health of the Republic of Indonesia, which obtained the requisite ethical clearance and informed consent from respondents prior to data collection. This study used a fully de-identified secondary dataset and did not involve direct contact with human subjects; therefore, separate ethical approval was not required for this secondary analysis.

3. RESULTS AND DISCUSSION

Of 638,178 respondents in the SKI 2023 reproductive-health module, sequential exclusion of male respondents, women for whom the cervical cancer screening item (G43.G) was not applicable, and rural residents yielded a final analytic sample of 156,722 urban women (156,716 for the multivariable model); all results below incorporate SKI 2023’s sampling weights, strata, and primary sampling units unless otherwise noted.

Table 1. Sociodemographic characteristics and cervical cancer screening experience among urban women, SKI 2023 (n=156,722).

Variable	n	Weighted %	95% CI
Cervical cancer screening experience			
Never	141.513	91.03	90.75–91.29
Ever	15.209	8.97	8.71–9.25
Working status			
Working	71.510	41.56	41.09–42.02
Not working	85.212	58.44	57.98–58.91
Age group (years)			
15–24	4.173	3.92	3.74–4.10
25–34	31.305	22.69	22.35–23.02
35–44	42.920	24.53	24.20–24.86
45–54	37.296	21.45	21.15–21.76
55–64	25.416	15.50	15.23–15.77
65–74	11.613	8.55	8.32–8.78
75–84	3.330	2.84	2.70–2.99
≥85	669	0.53	0.47–0.59
Highest education attained			
No formal education	5.571	3.69	3.51–3.87
Not completed primary school	9.720	6.39	6.18–6.61
Completed primary school	35.581	25.12	24.69–25.56
Completed junior secondary school	28.058	18.47	18.16–18.78
Completed senior secondary school	52.851	33.33	32.90–33.77
Completed diploma (D1/D2/D3)	10.741	5.35	5.17–5.54
Completed university (undergraduate or higher)	14.200	7.65	7.41–7.89
Household wealth quintile ^a			
Lowest	13.389	7.58	7.34–7.84
Lower middle	24.297	14.56	14.25–14.87
Middle	31.564	19.61	19.25–19.97
Upper middle	39.064	26.54	26.12–26.95
Highest	48.402	31.72	31.17–32.26

Table 1 shows that an estimated 8.97% (95% CI: 8.71–9.25%) of urban women had ever undergone cervical cancer screening (Pap smear or IVA), leaving 91.03% who had never been screened; this reflects the weighted proportion ever screened with either test, which is not directly comparable to the WHO's 70% target, as the WHO target specifically concerns screening with a high-performance test at ages 35 and 45 rather than any prior screening at any age. This weighted estimate is nonetheless consistent with previous national estimates that placed Indonesia's cervical cancer screening coverage at approximately 12% using earlier data (Robbers et al., 2021), reinforcing that lifetime screening experience remains low even in the most recent national data and even within the urban population, where physical access barriers are theoretically reduced. An estimated 41.56% of respondents were currently working. The sample was concentrated in the reproductively and economically active age range, with the 35–44 and 45–54 year

groups together comprising an estimated 45.98% of respondents, while women 65 years and older comprised an estimated 11.92%. Educational attainment was heterogeneous: an estimated one in ten women (10.08%) had no formal education or had not completed primary school, while an estimated 13.00% had completed a diploma or university degree. Household wealth was more concentrated at the upper end of the distribution, consistent with the predominantly urban composition of the sample, with an estimated 31.72% of respondents in the highest wealth quintile compared with 7.58% in the lowest.

Table 2. Bivariate associations between sociodemographic characteristics and cervical cancer screening experience: unweighted n, weighted row percentages, and design based f tests.

Variable	Never n (%)	Ever n (%)	F (df1, df2)	p
Working status				
Working	63.584 (89.64)	7.926 (10.36)	F(1, 17370)=102.94	<0.001
Not working	77.929 (92.01)	7.283 (7.99)		
Age group (years)				
15–24	3.927 (95.22)	246 (4.78)	F(6.89, 119684.3)=31.62	<0.001
25–34	28.227 (91.50)	3.078 (8.50)		
35–44	38.115 (89.49)	4.805 (10.51)		
45–54	33.426 (89.70)	3.870 (10.30)		
55–64	23.254 (91.55)	2.162 (8.45)		
65–74	10.755 (92.76)	858 (7.24)		
75–84	3.163 (95.59)	167 (4.41)		
≥85	646 (96.96)	23 (3.04)		
Highest education attained				
No formal education	5.319 (96.20)	252 (3.80)	F(5.94, 103134.9)=264.26	<0.001
Not completed primary school	9.122 (94.68)	598 (5.32)		
Completed primary school	33.537 (95.20)	2.044 (4.80)		
Completed junior secondary school	25.894 (92.77)	2.164 (7.23)		
Completed senior secondary school	47.058 (89.26)	5.793 (10.74)		
Completed diploma (D1/D2/D3)	8.900 (82.49)	1.841 (17.51)		
Completed university	11.683 (81.25)	2.517 (18.75)		
Household wealth quintile ^a				
Lowest	12.659 (95.30)	730 (4.70)	F(3.86, 67100.2)=383.14	<0.001
Lower middle	22.844 (95.09)	1.453 (4.91)		
Middle	29.385 (94.27)	2.179 (5.73)		
Upper middle	35.654 (92.40)	3.410 (7.60)		

Highest	40.967 (84.98)	7.435 (15.02)
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Percentages are weighted using SKI 2023 sampling weights; n values are unweighted counts. F-test degrees of freedom reflect design-based (Rao–Scott-type) corrections for the survey's multistage cluster design.

Table 2 shows that all four variables were significantly associated with cervical cancer screening experience in design-based tests ($p < 0.001$ for all). Working women were more likely to have ever been screened (10.36%; 95% CI: 9.97–10.76%) than non-working women (7.99%; 95% CI: 7.68–8.31%), $F(1, 17370) = 102.94$, $p < 0.001$. Screening experience followed an inverted U-shaped pattern across age groups, rising from 4.78% among women aged 15–24 to a peak of 10.51% among women aged 35–44, before declining to 3.04% among women aged 85 years and above, $F(6.89, 119684.3) = 31.62$, $p < 0.001$. A positive gradient was observed for education, from 3.80% among women with no formal education to 18.75% among university graduates, $F(5.94, 103134.9) = 264.26$, $p < 0.001$, and for household wealth quintile, from 4.70% among the poorest to 15.02% among the wealthiest, $F(3.86, 67100.2) = 383.14$, $p < 0.001$. These bivariate patterns are consistent with the hypothesis that economic and educational resources, rather than physical proximity to services, are important correlates of screening behavior within this urban sample.

Table 3. Factors associated with cervical cancer screening experience among urban women, SKI 2023 (n=156,716).

Variable	aOR	95% CI	p
Working status (ref: Working)			
Not working	0.91	0.86–0.97	0.002
Age group, years (ref: 15–24)			
25–34	1.39	1.12–1.72	0.003
35–44	1.82	1.47–2.25	<0.001
45–54	2.01	1.64–2.47	<0.001
55–64	1.79	1.45–2.22	<0.001
65–74	1.76	1.39–2.22	<0.001
75–84	1.17	0.87–1.59	0.304
≥85	1.00	0.54–1.85	0.996
Education (ref: No formal education)			
Not completed primary school	1.33	1.05–1.68	0.02
Completed primary school	1.16	0.93–1.45	0.176
Completed junior secondary school	1.69	1.35–2.10	<0.001
Completed senior secondary school	2.30	1.85–2.85	<0.001
Completed diploma (D1/D2/D3)	3.30	2.63–4.15	<0.001
Completed university	3.42	2.73–4.28	<0.001
Household wealth quintile (ref: Lowest)			
Lower middle	0.95	0.82–1.09	0.462
Middle	1.01	0.88–1.16	0.88
Upper middle	1.22	1.06–1.39	0.004
Highest	2.05	1.80–2.34	<0.001
Constant	0.022	0.016–0.031	<0.001

aOR = adjusted odds ratio, mutually adjusted for all variables shown and weighted for SKI 2023's complex survey design; CI = confidence interval; ref = reference category.

After mutual adjustment, current working status remained significantly associated with screening experience: non-working women had an estimated 9% lower odds of having ever been screened than working women (aOR=0.91; 95% CI: 0.86–0.97; $p=0.002$). A sensitivity analysis disaggregating working status into six categories (section 3.4) showed that this association was concentrated among formally employed women (aOR=1.25 versus not working; $p<0.001$) and, in the opposite direction, among women in agricultural/informal work (aOR=0.86; $p=0.011$), while self-employed women and students did not differ significantly from non-working women; this suggests that the association observed for the dichotomous working-status variable does not reflect a uniform effect of “working” but is driven disproportionately by formal employment. One possible explanation is that formal employment may increase women’s exposure to health information, financial autonomy, and access to employer- or insurance-linked health services, whereas informal and agricultural work may not confer these same advantages and may instead compete with time available to seek preventive care; because this study did not directly measure financial autonomy, health information exposure, or access to employer-facilitated healthcare, these remain hypothesized mechanisms rather than demonstrated findings and should be interpreted as such.

Age was independently associated with screening experience in an inverted U-shaped pattern: odds of screening rose progressively from the youngest group and peaked among women aged 45–54 years (aOR=2.01; 95% CI: 1.64–2.47), before declining and losing statistical significance among women aged 75 years and older. One possible explanation is greater engagement with reproductive and general health services during the peri- and post-reproductive years, together with cumulative lifetime exposure to health promotion messaging, whereas declining engagement in the oldest groups may reflect reduced contact with health services, competing health priorities, or reduced perceived relevance of cervical screening after menopause; a comparable middle-age peak has been reported in multi-country analyses of factors associated with screening uptake.

Education showed the strongest and most consistent dose-response gradient among all variables examined, with odds of screening more than three times higher among women who had completed diploma or university education compared with women with no formal education (aOR=3.30 and 3.42, respectively; both $p<0.001$). This finding is directionally consistent with an earlier Indonesian study that found substantially higher odds of Pap smear awareness among more educated women (Anwar et al., 2018), and with comparable findings from South Africa (Akokuwebe et al., 2021), consistent with health literacy and comprehension of cancer-prevention messaging being important correlates of screening behavior across settings.

Household wealth quintile was also independently associated with screening experience, with women in the highest quintile having roughly twice the odds of screening compared with the poorest quintile (aOR=2.05; 95% CI: 1.80–2.34; $p<0.001$) and women in the upper-middle quintile also showing significantly higher odds (aOR=1.22; 95% CI: 1.06–1.39; $p=0.004$), while the lower-middle and middle quintiles did not differ significantly from the poorest group. This pattern is broadly consistent with prior evidence that socioeconomic inequality in Indonesia is most pronounced for preventive health services (Badan Penelitian dan Pengembangan Kesehatan, Kementerian Kesehatan Republik Indonesia, 2019; Mulyanto et al., 2019), and suggests that out-of-pocket costs, foregone income associated with clinic visits, or wealth-linked health literacy may continue to constrain screening uptake among urban women who are nominally covered by national health insurance, particularly outside the wealthiest quintile.

Taken together, these findings indicate that even within an urban population where geographic access to health facilities is comparatively less constrained, cervical cancer screening uptake in Indonesia remains low overall and is strongly patterned by working status, age, education, and household wealth. This is consistent with qualitative evidence that supply side gaps in Indonesia's national screening program, including limitations in the national insurance benefit package and unclear implementing regulations, compound demand side barriers such as low awareness, fear, and time constraints (Ekawati et al., 2024; Robbers et al., 2021), and with survey evidence that urban women, despite living in well served areas, continue to perceive substantial barriers to screening, particularly when unemployed and less educated (Samaria, 2024).

Table 4. Sensitivity analysis of working status and cervical cancer screening experience among urban women, SKI 2023 (n=156,716).

Variable	aOR	95% CI	p
Working status, six-category classification (ref: Not working)			
Formal employee	1.25	1.16–1.36	<0.001
Self-employed	1.05	0.96–1.14	0.300
Agricultural/informal worker	0.86	0.77–0.97	0.011
Student	0.91	0.66–1.25	0.559
Other	1.14	1.02–1.27	0.016

aOR = adjusted odds ratio, mutually adjusted for age, education, and household wealth quintile and weighted for SKI 2023's complex survey design; CI = confidence interval; ref = reference category. Unweighted category sizes: Not working=85,211; Formal employee=20,368; Self-employed=19,168; Agricultural/informal worker=14,933; Student=923; Other=16,113.

A concern that the dichotomous working-status variable, which groups formally employed women, the self-employed, unpaid family/agricultural workers, and students together as “working,” may obscure meaningful heterogeneity in screening-access mechanisms across these groups. To address this, a sensitivity analysis re-estimated the multivariable model using a six-category disaggregation of working status (not working, student, formal employee, self-employed, agricultural/informal worker, other), adjusted for the same covariates (Table 4). This sensitivity analysis confirmed that the association between the dichotomous working-status variable and screening experience is not uniform across working subgroups: formally employed women had significantly higher odds of ever being screened than non-working women (aOR=1.25; 95% CI: 1.16–1.36; p<0.001), whereas women in agricultural/informal work had significantly lower odds (aOR=0.86; 95% CI: 0.77–0.97; p=0.011). Self-employed women, students, and women in the residual “other” category did not differ significantly from non-working women (students: aOR=0.91, p=0.559; self-employed: aOR=1.05, p=0.300; other: aOR=1.14, p=0.016). These findings indicate that the modest overall association observed for the dichotomous “working” variable in Table 3 masks a sharper contrast between formal employment, which is associated with higher screening experience, and agricultural/informal work, which is associated with lower screening experience, and support the recommendation that future studies disaggregate working status by employment formality rather than relying on a single working/not-working dichotomy.

The dichotomizing screening experience as “ever” versus “never” discards information on screening frequency and recency that is relevant to guideline adherence. As a secondary analysis, the underlying frequency/recency categories of item G43.G were examined among the 15,209 women who had ever been screened. A weighted 56.29% (95% CI: 54.88–57.70%) of ever-screened women reported their most recent screening as having occurred more than one year earlier, while 10.95% (95% CI: 10.15–11.81%) reported screening within the past year, 7.25% (95% CI: 6.56–8.00%) within the past six

months, 20.38% (95% CI: 19.23–21.58%) within the past three months, and 5.13% (95% CI: 4.61–5.69%) within the past month. Expressed as a proportion of all urban women (not only those ever screened), an estimated 5.05% (95% CI: 4.86–5.25%) had last been screened more than a year earlier and 0.98% within the past year, underscoring that even among the small minority of women who have ever been screened, recent or repeated screening consistent with guideline-recommended intervals is uncommon. A supplementary weighted logistic regression using “screened within the past year” (versus not) as the outcome, adjusted for the same covariates as the main model, showed that the association with current working status was directionally similar to, but weaker and only borderline significant compared with, the “ever screened” outcome (non-working versus working: aOR=0.92; 95% CI: 0.84–1.00; p=0.051). This attenuation is consistent with the outcome definition mattering for the strength of the working-status association, and reinforces recommending recency- or interval-based outcome measures, where feasible, in future studies of this association.

This study has several limitations. First, its cross-sectional design precludes causal inference regarding the direction of association between working status and screening experience; indeed, because current working status was measured at the time of the survey while “ever screened” could reflect an episode occurring years earlier, under a different working status, the temporal ordering between the exposure and outcome is ambiguous, and the association reported here should not be interpreted as reflecting the effect of a woman’s present occupation on a past screening decision. Second, screening experience was self-reported and may be subject to recall bias. Third, although a six-category sensitivity analysis (section 3.4) suggested that the working-status association was concentrated among formally employed women, the broad current-activity classification used as the primary exposure still groups heterogeneous economic activities together, and future studies should further distinguish occupation type, working hours, and formality of employment. Fourth, the “ever screened” outcome does not capture whether women were screened at guideline-recommended intervals; a secondary analysis of screening recency (section 3.5) partially addresses this, but the available dataset does not include information on marital status, parity, screening knowledge, or distance to the nearest facility, all of which may confound or mediate the associations observed. In particular, the exclusion criterion applied to derive the eligible sample (G43.G recorded as Not Applicable) is empirically consistent with, but could not be directly verified against, a marital-status-based eligibility restriction reportedly used for this indicator in the official SKI 2023 report; this should be confirmed against the SKI 2023 codebook before the reported prevalence is used as a national indicator. Fifth, the complex-survey analyses reported here were implemented in Python rather than the authors’ original Stata environment, and independent replication in Stata is recommended before the weighted estimates are relied upon for policy purposes. Despite these limitations, the large sample size, national scope, and design-based weighting applied in this revised analysis of SKI 2023 lend reasonable robustness to the observed associations.

4. CONCLUSION

Cervical cancer screening experience among urban women in Indonesia remains very low, with fewer than one in ten women (8.97%) estimated to have ever been screened. Current working status, age, education, and household wealth quintile were each independently associated with screening experience, with non-working women, younger and older women, less-educated women, and women from poorer households consistently less likely to have ever been screened. A sensitivity analysis further indicated that this working-status association was concentrated among formally employed women

rather than reflecting a uniform effect of “working.” These findings indicate that, even in urban settings where physical access to health facilities is comparatively less constrained, socioeconomic and occupational circumstances remain important factors associated with cervical cancer screening in Indonesia.

Efforts to accelerate progress toward Indonesia’s national and the WHO’s global cervical cancer elimination targets should prioritize equity-focused strategies, including screening outreach specifically targeting non-working, informally employed, and agricultural women, as well as less-educated and lower-income urban women; clearer integration of screening benefits within the national health insurance scheme; and targeted health promotion addressing awareness and perceived barriers among women outside the peak screening age range. Future research should verify the marital-status eligibility criterion for the screening indicator against the SKI codebook, employ longitudinal designs to help clarify temporal ordering, incorporate more granular measures of employment formality and screening recency/interval adherence, and replicate the weighted analyses presented here using Stata or another validated complex-survey software package.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Fitri Indrawati contributed to conceptualization, methodology, data curation, formal analysis, investigation, writing the original draft, and visualization. Maria Ulfa Nur Hidayanti contributed to supervision, validation, interpretation of results, writing review and editing, and project administration. Both authors read and approved the final manuscript.

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DECLARATION OF ARTIFICIAL INTELLIGENCE USE

Generative artificial intelligence was used solely to assist with organizing and drafting language for this manuscript based on the authors’ own statistical analysis; it was not used to generate or alter study data, results, or scientific conclusions. The authors reviewed, verified, and take full responsibility for the accuracy and integrity of the content.

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