



# Socio-demographic correlates of cervical cancer risk factor knowledge among screening non-participants in Great Britain<sup>☆</sup>

Mairead Ryan, Laura Marlow, Jo Waller<sup>\*</sup>

UCL, Research Department of Behavioural Science and Health, Institute of Epidemiology & Health Care, London, WC1E 6BT, United Kingdom

## ARTICLE INFO

### Keywords:

Sexual health  
Cervical cancer screening  
HPV  
Informed choice  
Knowledge

## ABSTRACT

This study explored knowledge of cervical cancer risk factors among cervical screening non-participants in Great Britain. The aim was to identify knowledge gaps that could be targeted in screening information materials or public education campaigns. We used a cross-sectional design to survey women aged 25 to 64 years living in Great Britain, identified as cervical screening non-participants through self-report questions. Data were collected via a household survey. Survey questions measured awareness of risk factors for cervical cancer and socio-demographic factors. Screening non-participants were included in the study ( $n = 793$ ) and classified into non-participant groups based on the Precaution Adoption Process Model. Across the sample, 57% of participants identified 'not going for regular smear tests' as a risk factor for cervical cancer. Women who intended to be screened were more likely to identify this risk factor than other non-participant groups (OR = 2.13, 95% CI: 1.51–2.99). Women age 55–64 years (OR = 0.60, 95% CI: 0.39–0.93) and women from non-white ethnic backgrounds (OR = 0.70, 95% CI: 0.52–0.94) were less likely to recognise this risk factor. Recognition was lower for 'infection with human papillomavirus' (41%). Just over half the sample were aware that screening non-attendance is associated with increased cervical cancer risk, suggesting that non-attendance at screening is not always based on an accurate understanding of the offer. Overall, non-participants are poorly informed about cervical cancer risk factors and further work is needed to ensure that women are making informed choices about (non-) participation.

## 1. Introduction

In England, approximately 2500 women are diagnosed with cervical cancer each year and 680 die of the disease (CRUK, 2016). Cervical screening reduces the incidence of and mortality from cervical cancer by detecting abnormal cells on the cervix before they become cancerous. However, coverage is sub-optimal and continues to fall year-on-year across all age groups (NHS, 2018). Most countries that offer cervical screening encourage women to make an informed choice about participating. In England, the risks and benefits of screening are outlined in an information leaflet which is posted to women with an invitation letter, to facilitate informed choice. Similar leaflets are sent in Scotland and Wales. The leaflets describe the risk factors for cervical cancer, including the role of the human papillomavirus (HPV) and the risk of not attending regularly for screening.

Despite such efforts, awareness of risk factors for cervical cancer, and particularly the role of HPV, has historically been low in the general population (Hendry et al., 2012; Klug et al., 2008; Low et al.,

2012). Research has also found that at-risk groups, such as cigarette smokers, are unaware of their increased risk of cervical cancer (Marteau et al., 2002). These findings are a cause for concern and suggest that non-participants may not be making informed choices about screening.

Population cervical screening programmes are increasingly adopting HPV-based screening (e.g. Ronco et al., 2014). Primary HPV testing has been introduced in Australia, the Netherlands and New Zealand (Brotherton et al., 2016), and will be rolled out across England in 2019 (NSC, 2016). Such policy changes require information materials to be updated. To optimise informed choice, educational materials should address key knowledge gaps.

This study used data from our previously reported survey (Marlow et al., 2017) to assess knowledge of cervical cancer risk factors among screening non-participants. Women were classified into a stage of screening uptake based on the Precaution Adoption Process Model (PAPM; Weinstein, 1988). Using the model, screening non-participants were divided into: 'unaware' of screening, 'unengaged', 'undecided' about screening, 'decided not' to be screened and 'intending to be

<sup>☆</sup> This work was supported by Cancer Research UK [grant reference: C7492/A17219].

<sup>\*</sup> Corresponding author.

E-mail address: [j.waller@ucl.ac.uk](mailto:j.waller@ucl.ac.uk) (J. Waller).

**Table 1**  
Knowledge of risk factors for cervical cancer ( $n = 761$ , weighted data).

	Aware		Unaware	
	Strongly agree/agree	Strongly disagree/disagree	Neither agree nor disagree	Don't know
	N (%)	N (%)	N (%)	N (%)
Not going for regular smear (Pap) tests	431 (56.5)	111 (14.6)	131 (17.2)	82 (10.8)
Having many sexual partners	362 (47.5)	135 (17.7)	150 (19.6)	104 (13.7)
Having a weakened immune system	340 (44.7)	127 (16.6)	170 (22.3)	121 (16.0)
Smoking any cigarettes at all	329 (43.2)	184 (24.2)	162 (21.3)	84 (11.1)
Infection with chlamydia	324 (42.5)	106 (13.9)	188 (24.6)	139 (18.3)
Infection with HPV (human papillomavirus)	309 (40.5)	81 (10.6)	162 (21.2)	205 (26.9)
Starting to have sex at a young age	267 (35.1)	179 (23.5)	187 (24.6)	116 (15.2)
Long term use of the contraceptive pill	220 (28.8)	164 (21.5)	241 (31.6)	130 (17.1)

Note. Missing data due to participants who responded 'Refused'.

screened' (but currently overdue). Associations between risk factor knowledge, PAPM stage and socio-demographic variables were explored.

## 2. Methods

### 2.1. Design

A cross-sectional design was employed. Data collection was outsourced to Kantar TNS, a market research company, who conduct weekly population-based surveys. All data were collected via a household survey conducted in January and February 2016. No incentives were offered for participation.

### 2.2. Participants

All screening-eligible women (aged 25 to 64) living in Great Britain were invited to participate in the survey. Women who had been diagnosed with cervical cancer, had a hysterectomy, or who provided insufficient data to determine their screening status were excluded. Here we report analyses of a sub-sample of participants who were either overdue for screening (women aged 25 to 49 who had not been screened in the last 3 years and women aged 50 to 64 who had not been screened in the last 5 years) or did not intend to go when next invited.

### 2.3. Procedure

Ethical approval was granted by UCL Research Ethics Committee (ref: 7585/001). Data collection is described in detail elsewhere (Marlow et al., 2017). Briefly, women were asked questions regarding their screening history and future intentions to attend, to determine eligibility (see Appendix A). Their responses determined their stage of adoption for screening based on the PAPM (Weinstein, 1988), before they were asked a series of questions about their knowledge of risk factors for cervical cancer using items derived from the validated Cervical Cancer Awareness Measure (Simon et al., 2012). Eight established risk factors for cervical cancer were presented. Participants were asked to state their agreement that each factor may increase a woman's chance of developing cervical cancer using a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Participants could also respond 'don't know'. Socio-demographic factors previously linked with screening attendance including age, social grade and ethnicity were also assessed.

### 2.4. Analyses

All analyses were carried out using IBM SPSS (version 22). The proportion and distribution of missing data was explored. Participants who did not respond to any of the eight risk factor items were excluded

from all analyses. Kantar TNS provide sampling weights which can be applied to ensure the data are population-representative in relation to age, social grade and region. All analyses were weighted using the complex samples function in SPSS. Knowledge of each risk factor was recoded into 'aware' (for *strongly agree* or *agree* responses) vs. 'unaware' (for *neither agree nor disagree*, *disagree*, *strongly disagree* or *don't know* responses). A series of logistic regressions were conducted to determine predictors of knowledge (aware vs. unaware) of each risk factor for cervical cancer. Adjusted logistic regression models are presented as Appendix A.

## 3. Results

### 3.1. Participant characteristics

Of 793 screening non-participants in the survey, 761 responded to at least one risk factor item and were included in the current analyses. The majority of participants were White British/Irish (62%) and had positive intentions to be screened (52%). There was good representation of women from all occupational social grades; sample characteristics (weighted and unweighted) are presented in Appendix A.

### 3.2. Knowledge of risk factors for cervical cancer

Knowledge of each risk factor is shown in Table 1. The most widely recognised was 'not going for regular smear (Pap) tests' (57% awareness), followed by 'having many sexual partners' (48%). Participants were least aware of the following risk factors: 'infection with HPV' (41%), 'starting to have sex at a young age' (35%) and 'long term use of the contraceptive pill' (29%).

### 3.3. Predictors of risk factor knowledge

Predictors of risk factor knowledge (aware vs. unaware) were assessed (see Table 2). Women who intended to be screened were more likely to identify 'not going for regular smear tests' as a risk factor than the other non-participant groups. Women who were undecided, had decided not to be screened, or intended to be screened were also more aware of the risk of having many sexual partners than women who were unengaged or unaware of screening; knowledge of all other risk factors was similar across PAPM groups. Women aged 45–54 were less likely to identify 'smoking any cigarettes at all' and 'having a weakened immune system' as risk factors than women in the 25–34 age group. These associations remained in adjusted analyses (see Appendix A). Women aged 55–64 were less likely to identify 'not going for regular smear tests' compared to women aged 25–34 years. This association was attenuated in adjusted analyses. Women in social grades C2 and E were less likely to identify 'infection with HPV' and 'having many sexual partners' as risk factors than women in the highest social grade (A/B).

**Table 2**  
Unadjusted logistic regression models of predictors of risk factor knowledge (n = 761, weighted data).

	HPV		Sex at young age		Many partners		Smoking	
	% aware	OR (95% CI)	% aware	OR (95% CI)	% aware	OR (95% CI)	% aware	OR (95% CI)
Age group								
25–34	40.2	1.00	34.0	1.00	45.1	1.00	47.0	1.00
35–44	48.4	1.39 (0.98–1.99)	36.6	1.12 (0.78–1.62)	49.5	1.20 (0.84–1.70)	41.6	0.80 (0.56–1.14)
45–54	35.2	0.81 (0.53–1.23)	37.1	1.15 (0.76–1.74)	51.4	1.29 (0.86–1.93)	37.1	0.66 (0.44–1.00)
55–64	35.1	0.80 (0.51–1.27)	32.1	0.92 (0.58–1.46)	43.8	0.95 (0.61–1.47)	46.7	0.99 (0.64–1.52)
PAPM stage								
Unaware	35.3	1.00	31.8	1.00	39.3	1.00	42.7	1.00
Unengaged	34.1	0.95 (0.45–2.02)	35.9	1.20 (0.57–2.56)	40.0	1.03 (0.50–2.14)	42.6	1.00 (0.49–2.05)
Undecided	40.3	1.24 (0.41–3.71)	35.8	1.20 (0.40–3.61)	68.9	3.41 (1.12–10.41)	43.3	1.03 (0.36–2.97)
Decided not	47.4	1.65 (1.03–2.65)	37.7	1.30 (0.80–2.11)	54.3	1.83 (1.15–2.93)	37.4	0.80 (0.50–1.29)
Intender	41.8	1.32 (0.93–1.86)	36.0	1.21 (0.85–1.72)	49.6	1.52 (1.08–2.13)	45.3	1.11 (0.79–1.56)
Social grade								
AB (highest)	48.6	1.00	35.0	1.00	56.4	1.00	46.2	1.00
C1	46.3	0.91 (0.57–1.45)	39.5	1.21 (0.75–1.97)	47.6	0.70 (0.44–1.12)	43.6	0.90 (0.56–1.44)
C2	32.1	0.50 (0.30–0.84)	29.8	0.79 (0.46–1.34)	42.5	0.57 (0.35–0.95)	36.6	0.67 (0.40–1.11)
D	37.3	0.63 (0.39–1.03)	34.7	0.99 (0.59–1.64)	46.6	0.68 (0.41–1.10)	47.3	1.05 (0.64–1.70)
E (lowest)	33.7	0.54 (0.32–0.89)	34.2	0.96 (0.57–1.62)	43.4	0.59 (0.36–0.98)	42.1	0.85 (0.52–1.39)
Ethnic group								
White British/Irish	42.2	1.00	37.3	1.00	49.5	1.00	44.3	1.00
Other	38.4	0.86 (0.63–1.15)	32.1	0.79 (0.58–1.08)	45.1	0.84 (0.63–1.12)	42.2	0.92 (0.68–1.23)
	Contraceptive pill		Chlamydia		Regular screening		Weakened immune system	
	% aware	OR (95% CI)	% aware	OR (95% CI)	% aware	OR (95% CI)	% aware	OR (95% CI)
Age group								
25–34	31.9	1.00	42.3	1.00	56.6	1.00	53.4	1.00
35–44	32.6	1.03 (0.71–1.50)	46.5	1.18 (0.83–1.69)	63.6	1.34 (0.93–1.91)	42.5	0.64 (0.45–0.92)
45–54	22.7	0.63 (0.40–1.00)	42.4	1.00 (0.67–1.51)	56.6	1.00 (0.67–1.50)	38.0	0.53 (0.35–0.80)
55–64	24.4	0.69 (0.42–1.13)	36.4	0.78 (0.50–1.23)	44.1	0.60 (0.39–0.93)	38.9	0.56 (0.36–0.86)
PAPM stage								
Unaware	32.6	1.00	38.3	1.00	48.5	1.00	46.5	1.00
Unengaged	26.6	0.75 (0.35–1.62)	41.9	1.16 (0.55–2.44)	48.7	1.01 (0.50–2.06)	50.6	1.18 (0.58–2.40)
Undecided	18.8	0.48 (0.13–1.79)	35.0	0.87 (0.28–2.72)	32.8	0.52 (0.18–1.52)	52.6	1.27 (0.45–3.64)
Decided not	28.4	0.82 (0.49–1.36)	45.9	1.37 (0.85–2.19)	41.1	0.74 (0.47–1.19)	46.7	1.01 (0.63–1.61)
Intender	27.7	0.79 (0.55–1.13)	44.1	1.27 (0.90–1.79)	66.7	2.13 (1.51–2.99)	42.3	0.84 (0.60–1.18)
Social grade								
AB (highest)	25.3	1.00	48.2	1.00	53.9	1.00	38.7	1.00
C1	31.4	1.36 (0.81–2.28)	47.6	0.98 (0.61–1.56)	58.8	1.22 (0.76–1.95)	49.6	1.56 (0.97–2.50)
C2	23.5	0.91 (0.51–1.61)	39.0	0.69 (0.42–1.14)	57.7	1.17 (0.71–1.92)	38.7	1.00 (0.60–1.66)
D	34.1	1.53 (0.90–2.62)	36.4	0.61 (0.38–1.00)	59.5	1.25 (0.77–2.05)	46.6	1.38 (0.85–2.25)
E (lowest)	29.2	1.22 (0.70–2.13)	37.4	0.64 (0.39–1.06)	50.5	0.87 (0.53–1.43)	48.5	1.49 (0.91–2.46)
Ethnic group								
White British/Irish	27.5	1.00	41.5	1.00	60.1	1.00	41.7	1.00
Other	31.4	1.21 (0.88–1.66)	44.4	1.12 (0.83–1.51)	51.2	0.70 (0.52–0.94)	49.7	1.38 (1.03–1.85)

Note. OR = unadjusted odds ratio; CI = confidence interval; ‘Social grade’ is determined by the occupation of the Chief Income Earner in the household and is classified as follows: AB managerial/professional; C1 supervisory; C2 skilled manual; D semi-skilled/unskilled manual; E casual workers/unemployed.

Compared with White British/Irish women, women from other ethnic groups were less likely to identify ‘not going for regular smear tests’ as a risk factor and this association remained in adjusted analyses (see Appendix A).

**4. Discussion**

This study measured awareness of risk factors for cervical cancer among screening non-participants in Britain. Adequate knowledge, particularly regarding the increased risk associated with screening non-participation, is a key aspect of informed choice (Marteau et al., 2001).

The most widely recognised risk factor was screening non-attendance; however only just over half the sample agreed that this may increase a woman's chance of developing cervical cancer. Given that participants were asked to identify risk factors from a list provided, rather than recall them from memory, it is likely that unprompted risk

factor knowledge would be considerably lower than the results from this survey indicate (Waller et al., 2004). The proportion of women who identified risk factors in this study was notably lower than in a previous study of adult women in Britain recruited using similar methods, but not selected on the basis of their screening status (Low et al., 2012). Low et al. (2012) reported higher proportions of women recognising all risk factors (e.g. not going to regular smear tests; 75%), suggesting that risk factor knowledge is probably lower in women who are screening non-participants. In our study, all participants should previously have been sent information regarding the screening programme and its aims, but in line with previous work in the colorectal screening context (Kobayashi et al., 2016), our findings suggest that many women may not read or remember this information. These findings suggest that i) many women are not making an informed decision about non-participation and ii) the screening information materials, in their current format, may not be sufficient to educate all screening-eligible women

about risk factors for cervical cancer. Awareness of the role of HPV was notably low, which has implications for the introduction of primary HPV testing in the UK.

The ‘intender’ group was more aware of the increased risk of screening non-attendance than other PAPM groups. The PAPM (Weinstein, 1988) proposes that individuals move through a series of stages before intending to engage in, and then adopting, a health-protective behaviour. Educating women about the risk of screening non-attendance may help to shift non-participants through these stages closer to the ‘intender’ stage. Women aged 50–64 were less aware of the risk of not attending regularly for screening than younger women. Although older women have received multiple screening invitations, they may no longer read posted materials, having received similar information previously. Being regularly screened between the ages of 50–64 years can significantly reduce a woman's chance of being diagnosed with cervical cancer in older age (Landy et al., 2016), so effective methods of educating this age-group should be explored.

This survey also found that women from non-white ethnic backgrounds are less informed about the risk of screening non-participation than women who identified as white. Engagement with English-language written materials may be lower among ethnic minority groups (Abdullahi et al., 2009). In addition, this survey was conducted in English so certain ethnic minority groups were not represented. Thus, it is likely that awareness of the increased risk associated with screening non-attendance among ethnic minority women is lower than we have reported (Jackowska et al., 2012). These findings add to the body of literature suggesting that women from non-white ethnic backgrounds and those whose first language is not English face many barriers to screening and need further support in deciding whether to attend (Marlow et al., 2015).

Although stratified random location sampling was employed to reduce the risk of bias, the number and details of women who elected not to participate in the survey was not recorded, so neither the response rate nor differences between responders and non-responders could be determined. Further, the current study did not assess knowledge of HPV vaccine or vaccine receipt. Finally, due to resource constraints, we were unable to measure risk factor awareness among women who were up-to-date with screening so direct comparisons between attenders and non-attenders could not be made.

It is unlikely that solely increasing risk factor knowledge in this cohort would increase screening attendance, as personalised risk information rarely leads to behaviour change without targeting other psychological factors (French et al., 2017) and previous research has found that many non-participants do not always engage with educational leaflets (Kobayashi et al., 2016). Nevertheless, our findings indicate that further public health action is needed to ensure that the aims of the screening programme regarding informed choice are achieved. The imminent change to primary HPV screening presents an opportunity to increase awareness of the role of HPV. Future research may determine the most effective methods of communicating with the screening-eligible population, including non-leaflet approaches, to improve informed choice for HPV-based cervical screening.

#### Declaration of Competing Interest

None to declare.

#### Acknowledgments

This work was supported by a Cancer Research UK career

development fellowship awarded to Jo Waller (grant reference: C7492/A17219).

#### Appendix A. Supplementary material

Supplementary material to this article can be found online at <https://doi.org/10.1016/j.jypmed.2019.04.026>.

#### References

- Abdullahi, A., Copping, J., Kessel, A., Luck, M., Bonell, C., 2009. Cervical screening: perceptions and barriers to uptake among Somali women in Camden. *Public Health* 123 (10), 680–685. <https://doi.org/10.1016/j.puhe.2009.09.011>.
- Brotherton, J.M., Jit, M., Gravitt, P.E., Brisson, M., Kreimer, A.R., Pai, S.I., ... Franceschi, S., 2016. Eurogin roadmap 2015: how has HPV knowledge changed our practice: vaccines. *Int. J. Cancer* 139 (3), 510–517.
- CRUK, 2016. Cervical cancer mortality by UK country. Retrieved from. <https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/cervical-cancer/mortality#heading=Zero>.
- French, D.P., Cameron, E., Benton, J.S., Deaton, C., Harvie, M., 2017. Can communicating personalised disease risk promote healthy behaviour change? A systematic review of systematic reviews. *Ann. Behav. Med.* 51 (5), 718–729. <https://doi.org/10.1007/s12160-017-9895-z>.
- Hendry, M., Pasterfield, D., Lewis, R., Clements, A., Damery, S., Neal, R.D., ... Wilkinson, C., 2012. Are women ready for the new cervical screening protocol in England? A systematic review and qualitative synthesis of views about human papillomavirus testing. *Br. J. Cancer* 107 (2), 243–254. <https://doi.org/10.1038/bjc.2012.256>.
- Jackowska, M., von Wagner, C., Wardle, J., Juszczyk, D., Luszczynska, A., Waller, J., 2012. Cervical screening among migrant women: a qualitative study of polish, Slovak and Romanian women in London, UK. *J. Fam. Plann. Reprod. Health Care* 38 (4), 229–238. <https://doi.org/10.1136/jfprhc-2011-100144>.
- Klug, S.J., Hukelmann, M., Blettner, M., 2008. Knowledge about infection with human papillomavirus: a systematic review. *Prev. Med.* 46 (2), 87–98. <https://doi.org/10.1016/j.jypmed.2007.09.003>.
- Kobayashi, L.C., Waller, J., von Wagner, C., Wardle, J., 2016. A lack of information engagement among colorectal cancer screening non-attenders: cross-sectional survey. *BMC Public Health* 16 (1), 659. <https://doi.org/10.1186/s12889-016-3374-5>.
- Landy, R., Pesola, F., Castanon, A., Sasiemi, P., 2016. Impact of cervical screening on cervical cancer mortality: estimation using stage-specific results from a nested case-control study. *Br. J. Cancer* 115 (9), 1140–1146. <https://doi.org/10.1038/bjc.2016.290>.
- Low, E. L., Simon, A. E., Lyons, J., Romney-Alexander, D., & Waller, J. (2012). What do British women know about cervical cancer symptoms and risk factors? *Eur. J. Cancer*, 48(16), 3001–3008. doi:doi:10.1016/j.ejca.2012.05.004.
- Marlow, L.A., Wardle, J., Waller, J., 2015. Understanding cervical screening non-attendance among ethnic minority women in England. *Br. J. Cancer* 113 (5), 833–839. <https://doi.org/10.1038/bjc.2015.248>.
- Marlow, L.A.V., Chorley, A.J., Haddrell, J., Ferrer, R., Waller, J., 2017. Understanding the heterogeneity of cervical cancer screening non-participants: data from a national sample of British women. *Eur. J. Cancer* 80, 30–38. <https://doi.org/10.1016/j.ejca.2017.04.017>.
- Marteau, T.M., Dormandy, E., Michie, S., 2001. A measure of informed choice. *Health Expect.* 4 (2), 99–108.
- Marteau, T.M., Hankins, M., Collins, B., 2002. Perceptions of risk of cervical cancer and attitudes towards cervical screening: a comparison of smokers and non-smokers. *Fam. Pract.* 19 (1), 18–22.
- NHS, 2018. Cervical screening Programme, England 2017–18. Retrieved from National Statistics <https://files.digital.nhs.uk/B1/66FF72/nhs-cerv-scre-prog-eng-2017-18-report.pdf>.
- NSC, U, 2016. UK NSC HPV recommendation. Retrieved from. [https://legacyscreening.phe.org.uk/policydb\\_download.php?doc=594](https://legacyscreening.phe.org.uk/policydb_download.php?doc=594).
- Ronco, G., Dillner, J., Elfstrom, K.M., Tunesi, S., Snijders, P.J., Arbyn, M., ... Meijer, C.J., 2014. Efficacy of HPV-based screening for prevention of invasive cervical cancer: follow-up of four European randomised controlled trials. *Lancet* 383 (9916), 524–532. [https://doi.org/10.1016/s0140-6736\(13\)62218-7](https://doi.org/10.1016/s0140-6736(13)62218-7).
- Simon, A.E., Wardle, J., Grimmer, C., Power, E., Corker, E., Menon, U., ... Waller, J., 2012. Ovarian and cervical cancer awareness: development of two validated measurement tools. *J. Fam. Plann. Reprod. Health Care* 38 (3), 167–174. <https://doi.org/10.1136/jfprhc-2011-100118>.
- Waller, J., McCaffery, K., Wardle, J., 2004. Measuring cancer knowledge: comparing prompted and unprompted recall. *Br. J. Psychol.* 95 (Pt 2), 219–234. <https://doi.org/10.1348/000712604773952430>.
- Weinstein, N.D., 1988. The precaution adoption process. *Health Psychol.* 7 (4), 355–386.