

ORIGINAL ARTICLE

“A lot can happen in five years”: Women's attitudes to extending cervical screening intervals

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Funding information

The entire study was conducted without external funding.

Abstract

Objective: Evidence suggests that cervical screening intervals can be extended and lifetime cervical screening for human papillomavirus (HPV)-vaccinated women could be reduced. This study examines UK women's attitudes to extending screening intervals and assesses associations between knowledge, risk perception and HPV vaccination status, and acceptability of changes.

Methods: Using a convenience sampling strategy, an anonymous mixed-methods online survey was used and data recorded from 647 women (mean age = 28.63, SD = 8.69).

Results: Across the full sample, 46.1% of women indicated they would wait 5 years for their next cervical screening, while 60.2% of HPV-vaccinated women would be unwilling to have as few as three cervical screens in a lifetime. Multivariate analysis revealed those who are regular screened, those who intend to attend when invited, and those who perceive greater personal risk of cervical cancer are less likely to accept a 5-year screening interval. Qualitative findings relating to benefits of extending intervals included convenience of less tests, less physical discomfort, and psychological distress. Concerns identified included the likelihood of developing illness, increased psychological distress relating to what may be happening in the body, and worries about increased risk of cervical cancer.

Conclusion: Women need clear and specific information about HPV timelines, their relationship with cancer risk, and the rationale for extending screening intervals.

KEYWORDS

cancer screening, cervical cancer, human papilloma virus, human papilloma virus vaccination

1 | INTRODUCTION

Cervical cancer continues to be a major public health problem. Globally, approximately 570,000 cases of cervical cancer and 311,000 deaths from the disease occurred in 2018 (Arbyn et al., 2020). Persistent human papillomavirus (HPV) causes 99.7% of cervical cancer cases (Walboomers et al., 1999), and prophylactic HPV vaccines have been developed to prevent HPV infection (Athanasίου et al., 2020).

Since the introduction of HPV vaccinations for girls in 2008, 80% of women aged 15–25 years in the United Kingdom have been immunised (Letley, 2020). The UK HPV vaccination programme is showing significant reductions in Cervical Intraepithelial Neoplasia (CIN), HPV infections, and genital warts (Letley, 2020; Mesher et al., 2018; Palmer et al., 2019). A recent age-period-cohort model observed an 87% reduction in cervical cancer incidence in women in their 20s vaccinated at age 12–13 (Falcaro et al., 2021).

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At the time of the survey, women in the United Kingdom aged 25–49 were invited to take part in cervical screening every 3 years, and those aged 50–64 invited every 5 years (UK National Screening Committee, 2019a). Since late 2019, the National Health Service (NHS) Cervical Screening programme has instigated primary HPV testing for all who attend cervical screening. Primary HPV testing has higher sensitivity for high grade CIN than primary cytology (e.g., Kitchener et al., 2011). This means using primary HPV testing will identify more women at risk of developing cervical cancer (Castanon et al., 2017; Kitchener et al., 2011). Consequently, it has been suggested that screening intervals can be safely extended (e.g., Rebolj et al., 2019). The UK National Screening Committee (NSC) has recommended the extension of the cervical screening interval from three to 5 years for individuals aged 24.5 to 49 who test HPV negative as part of their routine screening (Public Health England, 2021). Moreover, mathematical modelling research suggests that screening frequency for HPV-vaccinated women can be extended to two or three screens in a lifetime using HPV testing (Kim et al., 2017). At the time of writing, the cervical screening interval for women aged 25–64 years has been extended to every 5 years in Scotland and Wales. England and Northern Ireland still offers screening for women 25–49 every 3 years, and those aged 50–64 are invited every 5 years (UK National Screening Committee, 2019b).

Reducing cervical screening frequency has been found to reduce overdiagnosis and overtreatment (Pienaar et al., 2019) and is associated with lower costs (Kim et al., 2017). However, participants of cancer screening programmes often react negatively to changes to cancer screening policy intervals and have limited awareness, or distrust of extended screening intervals (Ogden et al., 2020; Silver et al., 2015). For example, Gerend et al. (2017) found about 20% of women would not agree to less frequent screening even if recommended by their provider. International research suggests that women's unfavourable attitudes to increasing cervical screening intervals are due to perceived potential negative consequences, such as delayed diagnosis, increased risk of cervical cancer and death, and concerns about financial motives (Dodd, Nickel, et al., 2019; Dodd, Obermair, & McCaffery, 2019; Gerend et al., 2017; Hawkins et al., 2013; Obermair et al., 2018, 2020; Ogilvie et al., 2016). Furthermore, international studies have found that lower levels of knowledge and understanding of cervical screening is associated with lower levels of willingness to extend screening intervals (Cooper et al., 2015; Hawkins et al., 2013).

To date, little research has been done in the United Kingdom to explore women's perceptions of changes to the cervical screening programme. Measuring women's perceptions and preferences relating to cervical screening interval changes is important to provide insight into the acceptability of changes and highlight information needs to address concerns (Griffin-Mathieu et al., 2022). A recent study by Hill et al. (2021) focused on information provision and its impact on accepting a longer screening interval; however, it did not explore any psychosocial reasons for acceptance. Women were randomly assigned to one of three information conditions, with increasingly detailed information about HPV testing and the safety of extending screening intervals. The results showed that women who had been exposed to

the most detailed information, emphasising the long timeline between HPV infection and cervical cancer, had the most favourable attitudes to extending screening intervals, relative to women who received less information. Two recent studies lend further support to the importance of communications about screening interval changes, including indicating that women require information about the latency between HPV infection and cervical cancer (Nemec et al., 2021; Marlow et al., 2022). Taken together, the evidence suggests that knowledge and understanding are important considerations for acceptance.

None of the previous international studies have examined differences in attitudes to screening intervals between women who are HPV vaccinated and those who are not. There is concern that women who are HPV vaccinated may not attend screening (Brotherton & Mullins, 2012), although evidence from cohort studies in Sweden (Kreusch et al., 2018) and Denmark (Badre-Esfahani et al., 2019) has suggested HPV-vaccinated women are more likely to engage with cervical screening. Other sociodemographic factors may also be of relevance. For example, White British women are more likely to attend screening (e.g., Marlow et al., 2015), and more likely to initiate HPV vaccination (Fisher et al., 2014) than other ethnic groups. These differences may reflect differences in language, knowledge, perceived risk, and screening beliefs (Marlow et al., 2015), and differences in HPV-vaccination, virus awareness and vaccine attitudes (Sadry et al., 2013).

It is important to understand the extent to which women's attitudes to and perceptions of HPV and changes to the screening programme depend on a range of demographic and psychosocial variables. This knowledge can inform public health campaigns and health care communications with women and help to tailor advice. Using a cross-sectional survey design, the aim of the present study was to examine UK women's attitudes to extending screening intervals, and assess associations between knowledge, risk perceptions, and HPV vaccination status. Several open-ended questions about perceived benefits and harm of longer screening intervals have been included in this study.

2 | METHODS

2.1 | Design and participants

Between July 2018 and March 2019, we conducted a cross-sectional internet-based survey in the United Kingdom. Participant inclusion criteria included women aged between 18 and 45 years resident in the United Kingdom. A total of 801 participants took part in a study examining women's knowledge, attitudes and beliefs about HPV, HPV vaccine, and cervical screening (smear tests). Participants were recruited using a number of convenience sampling strategies, including survey description available through Jo's Cervical Cancer Trust, emails to university students, posters in public spaces (e.g., hairdressers, beauty parlours, and university social spaces), and social media posts outlining the study purpose, inclusion criteria, and survey link. The survey was hosted on Qualtrics. After providing

informed consent, participants completed an anonymous, self-administered 20-min online survey in self-selected locations. All procedures were reviewed and approved by the university's ethics committee. Following Bujang et al. (2018), we aimed for a minimum sample size of 500.

2.2 | Measures

2.2.1 | Demographic information

The background self-reported information included age, marital status, parity, ethnicity, education, employment status, and household income. In addition, respondents self-reported their previous cervical screening attendance, including if they have ever had an HPV vaccine, had ever attended cervical screening, the time since their last cervical screen, and whether they intended to attend screening when next invited.

2.2.2 | HPV Knowledge Questionnaire

General HPV knowledge and HPV testing knowledge was measured using the HPV Knowledge Questionnaire (Waller et al., 2013). It consists of 15 general HPV knowledge items (e.g., HPV is very rare), six items assessing HPV testing (e.g., an HPV test can tell you how long you have had an HPV infection), and seven items assessing HPV vaccination (e.g., someone who has had the HPV vaccine cannot develop cervical cancer). The scale uses a mixture of true and false items to minimise response bias, and the response format is true/false, with a "do not know" option, coded as incorrect. The scale is scored to obtain a total HPV knowledge score (possible range of scores 0–28), which can be broken down as total general HPV knowledge (possible range of scores 0–15), total HPV testing knowledge (possible range of scores 0–6), and total HPV vaccination scores (possible range of scores 0–7).

Acceptable reliability and validity have been established (Waller et al., 2013). In the present sample, Cronbach's alpha was 0.91 for the 28-item scale, 0.89 for the 15-item general HPV knowledge section, 0.69 for the 6-item HPV testing section, and 0.70 for the 7-item HPV vaccination section.

2.2.3 | Cervical cancer knowledge questionnaire

A measure of cervical cancer knowledge was constructed for this study. It consists of 13 items relating to symptoms of cervical cancer and 12 items relating to factors associated with developing cervical cancer (e.g., infection with HPV). The response options are true, false, do not know, with "do not know" coded as incorrect. The scale is scored to obtain a total cervical cancer knowledge score (possible range of scores 0–25), where a higher score indicates higher cervical cancer knowledge. The statements for this measure were derived

from information listed on NHS, Jo's Cervical Cancer Trust and BUPA websites relating to symptoms and prevention (Crawford & Rogers, 2021; Jo's Cervical Cancer Trust, 2021; NHS, 2020;). Cronbach's alpha for this scale was 0.84.

2.2.4 | Risk perceptions

Risk perceptions are important in understanding preventative health behaviours (Chan et al., 2015). To assess general risk perceptions (perception of the average woman's risk) and personal risk perceptions (perception of one's personal risk) of contracting HPV and getting cervical cancer, respondents completed four visual analogue scales each anchored *extremely low* (0) to *extremely high* (100). Numerical visual analogue scales of perceived risk have been shown to correlate with measures of actual risk and cancer screening behaviour and is invariant to socioeconomic differences (Levy et al., 2006).

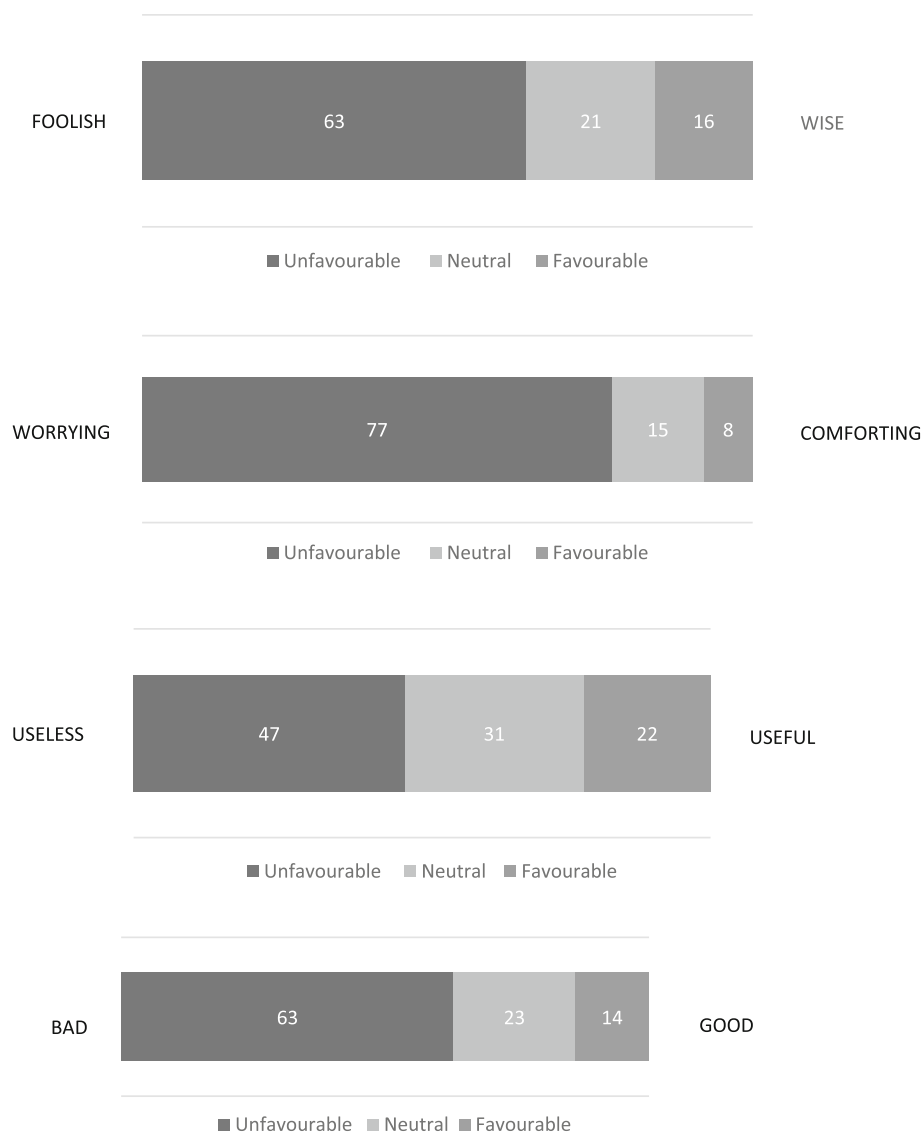
2.2.5 | Perceptions of increasing cervical screening interval

The following were adapted from Gerend et al. (2017). First, all respondents were provided with information about current screening guidelines and possible future screening guidelines. They were then asked "would you agree to have a cervical screening test (smear test) every five years if your doctor and the NHS recommended it?" This was followed by two 5-point Likert-scale rated items about perceptions of worry about cervical cancer and perceptions of increased risk of cervical cancer if they had to wait 5 years for their next cervical screen, rated strongly disagree to strongly agree. One item asked participants to rate how likely they were to wait 5 years for their next screen, from *very unlikely* to *very likely*. Participants were also asked to rate eight specific beliefs about extending the screening interval on a Likert scale from *strongly disagree* to *strongly agree* (see Figure 1). These beliefs were based on work by Hawkins et al. (2013).

Respondents who had been HPV-vaccinated were provided with additional information relating to scientific evidence about the possibility of having only three cervical screening tests in a lifetime. They were asked if they would be willing to have three screens in a lifetime and also asked the same questions as above about perceived worry of cervical cancer and perceived increased risk of cervical cancer.

2.2.6 | Open-ended items

To solicit qualitative responses, respondents were presented with two open-ended items relating to personal opinions of the benefits and risks of having a cervical screening test every 5 years instead of every 3 years ("For you personally, what would be the main

FIGURE 1 Waiting 5 years for my next cervical screen

benefits/risks [or good things/bad things] of getting a cervical screening test (smear test) every five years instead of every three years?”).

2.3 | Statistical analyses

Difference testing was conducted using one-way independent analyses of variance and independent *t*-tests for continuous variables. Associations were assessed with chi-square analysis for dichotomous variables. A logistic regression analysis was conducted to assess correlates of willingness to agree to a 5-year screening interval (excluding those who reported *do not know*).

The responses for marital status (married/living as married versus single), number of children (no children/have children), education (less than university level/university level), employment (student/employed), and ethnicity (minority/majority) were collapsed into dichotomous dummy variables to facilitate statistical analyses.

Analyses were conducted on nonmissing responses. All analyses were conducted using IBM SPSS V.26.

2.3.1 | Content analysis

The qualitative data was analysed using qualitative content analysis. Content analysis is a method for describing meaning from large qualitative data sets (Schreier, 2013). It enables the systematic reduction of large datasets by identifying patterns and developing inductive codes according to these patterns (Griffiths, 2016; Schreier, 2013). These codes are used to develop a coding frame, and then the whole dataset is coded to the coding frame (Elo & Kyngäs, 2008; Schreier, 2013). Coding frequency is then used to develop systematic written description of the content of the data. Initial coding was undertaken by three members of the research team, who worked separately from one another. Codes were then compared to check for inter-coder reliability and consistency. Discussions amongst the researchers enabled any disagreements in

TABLE 1 Descriptive statistics for sample ($N = 647$)

Variable	N (%)	Mean (SD)	Range min–max
Age		28.63 (8.69)	18–45
Marital status			
Single	325 (50)		
Married/living as married	285 (44)		
Separated/divorced	24 (4)		
Civil partnership	12 (2)		
No children	390 (60)		
Ethnicity			
White	578 (90)		
Black	8 (1)		
Asian	42 (7)		
Mixed	14 (2)		
Education			
Secondary school	21 (3)		
College	237 (37)		
University	389 (60)		
Household income			
<£18k	201 (34)		
£18k–£34,999	164 (28)		
>£35k	223 (38)		
Employment			
Employed	287 (48)		
Student	288 (48)		
Unemployed	4 (0.7)		
Homemaker	17 (3)		
Smoking status			
Current smoker	88 (14)		
Past smoker	112 (17)		
Nonsmoker	446 (69)		
Ever heard of cervical screening			
Yes	630 (97)		
No	15 (2)		
Do not know	2 (0.3)		
Ever had a cervical screen			
Yes	405 (63)		
No	236 (36)		
Do not know	6 (0.9)		
Last screen			
<3 years	356 (55)		
3–5 years	39 (6)		
>5 years	8 (1)		
Never	242 (38)		
Intend to screen			
Yes	555 (86)		
No	20 (3)		
Do not know	21 (3)		

(Continues)

TABLE 1 (Continued)

Variable	N (%)	Mean (SD)	Range min–max
Never thought about it	47 (7)		
HPV vaccine			
Yes	163 (27)		
No	352 (59)		
Do not know	80 (13)		
HPV knowledge		8.43 (4.63)	0–15
HPV testing knowledge		2.96 (1.74)	0–6
HPV vaccine knowledge		3.47 (1.83)	0–7
Cervical cancer symptom knowledge		7.81 (3.70)	0–13
Cervical cancer risk knowledge		6.96 (2.66)	0–12
HPV risk perception		41.29 (28.89)	0–100
Cervical cancer risk perception		37.72 (24.10)	0–100

coding to be resolved, and a final coding frame was developed, which the whole dataset was coded to. A descriptive report was then developed using coding-frequency. We aimed for descriptive validity (any reasonable person reading the same dataset would agree that our description was accurate), and interpretive validity (participants themselves would agree that our interpretations of their comments were accurate) (Maxwell, 1992). We checked for both types of validity by checking and rechecking codes against the data, both separately and as a research team, until we were confident that the final interpretation of meaning was valid.

3 | RESULTS

3.1 | Completion statistics

The online survey was accessed by 801 respondents, of which 65 (8%) did not complete any of the questionnaire. Of the 736 women who provided data, 647 completed the whole questionnaire (88.3% completion rate).

To ascertain there were no significant differences between those who completed the whole survey and those who only partially completed it, chi-square analyses for categorical variables and t-tests on continuous variables were conducted. There were no statistically significant differences between those who completed and those who partially completed the survey on any demographic measure, nor on cervical screening history or knowledge. The 86 respondents (13.7%) who had provided partial data were excluded from all further analyses. The mean age of respondents was 28.63 years (SD = 8.69), and the majority were up-to-date screeners (55%). Table 1 provides background information of the respondents who completed the survey and are included in the analyses.

There was a predicted significant difference in age between those who have had the HPV vaccine versus those who have not and those who do not know, $F(2, 609) = 133.25, p < 0.001$. Tukey HSD post hoc tests revealed that those who have not had the HPV vaccine

were significantly older ($M = 33.36, SD = 8.83$) than those who have ($M = 22.36, SD = 4.56$) and those who do not know ($M = 24.24, SD = 7.51$).

Chi-square analysis indicated no significant associations between HPV vaccine status and willingness to wait 5 years for the next cervical screen. Therefore, all respondents were included in the analyses that follow.

3.2 | Willingness to extend screening intervals

Across the full sample, 298 (46.1%) of women indicated they would be willing to wait 5 years for their next cervical screen if it was recommended, with 269 (41.6%) indicating they would be unwilling to wait 5 years, and 80 (12.4%) unsure. Table 2 shows differences in the perceived consequences of extending the screening interval and risk perceptions.

Of the women who had received the HPV vaccine, 47 (27.5%) indicated they would be willing to have three screens in a lifetime, 103 (60.2%) indicated they would be unwilling to have three screens in a lifetime, and 21 (12.3%) were unsure. Table 3 shows the perceived consequences of reducing the number of lifetime cervical screens to three from the current 12.

In order to assess women's beliefs about waiting for 5 years for their cervical screening, a visual analogue was utilised. When asked how they would feel about waiting 5 years for their next screen, 63% ($n = 405$) of the whole sample said it would feel "foolish," 77% ($n = 500$) said it would be "worrying," 47% ($n = 304$) reported it would be "useless," and 63% ($n = 407$) felt it would be "bad" (Figure 1).

3.2.1 | Logistic regression analysis

Direct logistic regression was performed to assess the impact of a number of factors on the likelihood of agreeing to a 5-year screen

TABLE 2 Perceived consequences of extending the screening interval and risk perceptions of UK women who were willing versus not willing to undergo less frequent cervical screening

Waiting 5 years for your next cervical screen would:	Not willing to extend interval (n = 269) mean (SD)	Willing to extend interval (n = 298) mean (SD)	t statistic (df)	p value
Cause you to worry about getting cervical cancer	4.36 (0.82)	3.04 (1.11)	15.99 (565)	<0.001
Increase your chances of getting cervical cancer	3.41 (1.13)	2.76 (1.05)	7.11 (563)	<0.001
How likely are you to wait 5 years for your next cervical screen?	1.94 (1.18)	3.64 (1.23)	16.79 (565)	<0.001
How would you rate the average woman's risk of getting HPV?	57.68 (20.93)	47.96 (21.98)	5.36 (560)	<0.001
How would you rate your personal risk of getting HPV?	46.92 (30.34)	35.93 (27.52)	4.45 (547)	<0.001
How would you rate the average woman's risk of getting cervical cancer?	44.07 (22.33)	37.50 (19.40)	3.74 (560)	<0.001
How would you rate your personal risk of getting cervical cancer?	44.15 (26.31)	32.91 (22.01)	5.48 (553)	<0.001

TABLE 3 Perceived consequences of extending the screening interval of UK women with the HPV vaccine who were willing versus not willing to undergo less frequent cervical screening

Having three cervical screens in a lifetime would:	Not willing to extend interval to three in a lifetime (n = 103) Mean (SD)	Willing to extend interval to three in a lifetime (n = 47) Mean (SD)	t statistic (df)	p value
Cause you to worry about getting cervical cancer	4.48 (0.91)	3.23 (1.15)	7.15 (148)	<0.001
Increase your chances of getting cervical cancer	3.25 (1.23)	2.53 (1.04)	3.48 (148)	0.001

interval. All variables that reached statistical significance of $p < 0.10$ were entered into the multiple logistic regression analysis.

The model contained 12 predictor variables (employment; parity; ethnicity; smoking status; ever had cervical screen; time since last cervical screen; intention to screen; HPV general knowledge; HPV testing knowledge; perceived personal risk HPV; perceived personal risk cervical cancer). The full model containing all predictors was statistically significant, $\chi^2(12) = 62.23$, $p < 0.001$, indicating the model was able to distinguish between respondents who were willing and those who were unwilling to wait 5 years for the next cervical screen. The model as a whole explained between 12% (Cox and Snell R^2) and 15% (Nagelkerke R^2) of the variance in willingness to accept a longer screening interval, and correctly identified 65% of cases. As shown in Table 4, three of the independent variables made a unique statistically significant contribution to the model. The strongest predictor of accepting a longer screening interval was *intention to attend next screen*, with respondents who did not know if they intended to attend next screen when invited more likely to be willing to wait than those who intended to attend next screen (odds ratio 3.72). This was followed by *time since last screen*, with those whose last screen was between 3 and 5 years ago more likely to be willing to wait than those who had had a screen in the last 3 years, (odds ratio 3.35). Finally, the higher the perceived personal risk of cervical cancer, the less likely a woman was to be willing to wait (odds ratio 0.98). Essentially, those

who were regular screeners, those who intended to attend when invited, and those who perceived greater personal risk of cervical cancer were less likely to accept a 5-year screening interval.

3.3 | Willingness to have three cervical screens in a lifetime

Only respondents who indicated that they had the HPV vaccine ($n = 171$ or 26% of the sample) were asked about perceptions of and attitudes to having three screens in a lifetime. In answer to the question "would you agree to have three cervical screening tests in your lifetime?" 28% ($n = 47$) said they would agree, 60% ($n = 103$) said they would not agree, and 12% ($n = 21$) said they did not know.

A number of *t*-test analyses were used to assess differences between those who indicated they would agree to having three screenings in a lifetime compared with those who would not. These yielded no statistically significant differences in personal perceived HPV risk or personal perceived cervical cancer risk, nor differences in any of the knowledge measures (subscales HPV and total score, nor on the cervical cancer knowledge). However, those who did not agree had higher worry scores and perceived higher risk of cervical cancer from only having three screens (see Table 4). We also conducted a logistic regression analysis to examine correlates of acceptance of

Variable	OR	95% CI	B	SE	p value
Employed	0.87	0.52/1.38	-0.14	0.24	0.55
Parity	0.64	0.41/1.02	-0.44	0.24	0.06
Ethnicity	0.86	0.41/1.78	-0.16	0.37	0.67
Smoking status	0.67	0.40/1.11	-0.40	0.26	0.12
Ever had smear test	0.98	0.57/1.68	-0.02	0.28	0.93
Screen <3 years ago vs.	1				
3–5 years ago	3.35	1.40/8.02	1.21	0.45	0.007
Intend to screen vs.	1				
Do not know	3.72	0.93/14.88	1.31	0.71	0.063
Never thought about it	2.75	1.07/7.09	1.01	0.48	0.036
HPV knowledge	1.02	0.96/1.07	0.02	0.03	0.57
HPV testing knowledge	0.99	0.99/1.00	-0.11	0.01	0.19
HPV risk	0.98	0.97/0.99	-0.01	0.01	0.19
Cervical cancer risk	0.98	0.97/0.99	-0.02	0.01	<0.001

Note: Statistically significant variables are shown in bold text.

TABLE 4 Summary logistic regression assessing correlates of willingness to accept a 5-year screening interval

three screens in a lifetime, but the model did not fit the data well and therefore we do not present the results here.

3.4 | Content analysis of qualitative responses

Out of the 647 respondents, 548 women (85%) provided qualitative responses to the question “for you personally, what would be the main benefits (or good things) of getting a cervical screening test every five years instead of every three years?” The perceptions of main benefits included convenience of fewer tests and appointments which would save time, and less physical discomfort and psychological distress. However, it should be pointed out that “no perceived benefit” had the highest frequency counts, suggesting that women did not perceive personal benefit in extending the screening interval. There were responses from 593 women (92%) to the question “for your personally, what would be the main risks (or bad things) of getting a cervical screening test every five years instead of every three years?” Respondents perceived a longer interval to be associated with increased risk of illness developing, increased psychological distress in terms of worry and anxiety around what is happening in the body, and increased risk of cancer. See Table 5. In response to the possible benefit to increasing the screening interval to 5 years 21% identified that they could not think of any, while only 0.01% ($n = 6$) said they could think of no risks.

Out of the 171 respondents who self-reported HPV vaccination and were asked the additional qualitative questions about three screens in a lifetime, 132 (77%) provided a response to the question “For your personally, what would be the main benefits (or good things) of getting three cervical screening tests in your lifetime?” The two most mentioned benefits of having three screens in a lifetime is convenience of having fewer appointments, which is perceived as time saving and less hassle, and less psychological distress, in terms of

less frequent anxiety, worry, and embarrassment about the screening. A lot of women also perceived no personal benefits with having three screens in a lifetime. See Table 6. The question “for you personally, what would be the main risks (or bad things) of getting three cervical screening tests in your lifetime?” 140 respondents (82%) answered. They reported an increased risk of cervical cancer and death due to late detection and being unaware of any changes, as well as increased psychological distress, with increased worry and anxiety about not knowing what is going on in the body. Only 20% reported that they could think of no possible benefits to having three screens in a lifetime, while 0.3% ($n = 4$) reported that they could think of no risks.

4 | DISCUSSION

Cervical screening has undergone rapid changes in recent years, and advances in screening technology and HPV vaccination will further change the UK cervical cancer screening programme. This study was designed to survey women's attitudes to extending the cervical screening interval from every three to every 5 years for women aged 24.5–49 years who test negative for high-risk HPV. A secondary aim was to investigate the attitudes of women who have been HPV vaccinated to having three cervical screens in their lifetime rather than 12. Finally, we compared women's attitudes to other factors including levels of knowledge of HPV and cervical cancer, and levels of risk perception relating to HPV and cervical cancer. To the best of our knowledge, this is the first survey of UK women's attitudes and perceptions of extending cervical screening intervals.

Our study found no significant difference in attitudes between HPV vaccinated and non-HPV vaccinated women overall. We also found no significant relationship between women's HPV and cervical cancer knowledge and their attitudes to screening frequency. Hill et al. (2021) found that knowledge of the length of time between

TABLE 5 Content analysis of respondents' perceptions of main benefit and risks of screen every 5 years rather than every three

	Major theme	Subthemes	Frequencies	
Benefits	No benefit	Increased risk	123/548	I cannot think of any. I do not think there are any, the more often you get smear tests the more up to date you are in terms of your health
	Convenience	Time saving Fewer tests and appointments Less planning/less hassle Fewer GP appointment difficulties Less pressure	106/548	I think it would be a lot more convenient for most women. Less time spent having to get tested. Less appointments to go to.
	Less physical discomfort	Less pain Less unpleasant experience Less frequent invasive procedure	76/548	An invasive procedure would occur less often. Do not have to go through it as much, as it is a bit unpleasant. Less intrusion.
	Less psychological distress	Less anxiety Less stress Less embarrassment Less trauma	75/548	Do not have to dread having it done as often. Reduced stress around awaiting test results that could have negative effects. Fewer times that would cause embarrassment. Less traumatic.
	Save NHS resources		41/548	Less pressure on the NHS as fewer appointments and tests. If every three years is really unnecessary then it will save money. Presume less burden on NHS staff.
	Reassurance	Peace of mind Identify health issues	38/548	I'd be reassured that I do not have high-risk HPV. Smear tests do not bother me and provide a peace of mind.
	Suggestions for different frequency	Would prefer every 3 years Would prefer screens more often than every 3 years	26/548	I would prefer every 3 years. It should remain every 3 years. I would rather have one annually.
	Refer to expert opinion or evidence		9/548	If it's not needed as often and that is a fact then I'm OK with that. Unsure of evidence. I am not bothered about the time frame as long as it is safe.
	Does not make a difference		6/548	3 years or 5 years, it's still an awful experience I dread! Does not make a difference to me.
	Better for cervical health	Less unnecessary screening	5/548	I suppose there's less chance of too much scraping of the cervix. Not having to go through screening more than is actually needed.
	Screening should be available to younger women		5/548	The minimum age lowered. I would want the age to be lower than 25 too.
	I do not know		2/548	Not sure, I've never had one done. I do not know.

(Continues)

TABLE 5 (Continued)

	Major theme	Subthemes	Frequencies	
Risks	Illness developing	Risk of HPV Risk of abnormal cells Lack of symptoms More time for problems to emerge	205/586	The risk of missing any abnormalities/not picking them up ASAP. An extra two years could cause early detection to be too late. Causing health problems for myself.
	Increased psychological distress	Increased worry Increased anxiety Reduced peace of mind	152/586	Possible worry of developing illness in the extra two years. Constant worrying, a diagnosis that turned out to be too late to treat. I think it would cause me more anxiety. I would worry about if I was developing cervical cancer.
	Increased risk of cancer	Risk of cancer Risk of death	150/586	A lot can happen in five years, especially if it's a fast growing cancer. I might get cervical cancer within the time I'm not being checked.
	5 years too long		23/586	5 years is too long, too much time between appointments. Every 3 years is long enough, I think 5 years is too long. It is a long time to wait.
	Frequency related to risk level	High personal risk Low personal risk	14/586	I've had dodgy smears so would not like to wait 5 years. My mum had cervical cancer so I may be more at risk if left 5 years instead of 3 years. None as I consider myself low risk.
	5 years make it seem less important	Less importance Reducing awareness	10/586	Easier to put it off more—if every five years then it cannot be that important? The test may not be taken as seriously if it is every 5 years instead of 3 we are already reducing the severity in people's minds. Lowering awareness.
	Refer to expert opinion or evidence		5/586	If doctor/NHS recommendations were every five year, I would trust their recommendations. I think if evidence proves that every five years is suitable and safe then I'm ok with that.
	Suggestions for different frequency	Screenings more frequent, not less Happy with 3-year intervals	9/586	More frequent tests to provide more up-to-date information. Prefer every 3 years.
	No risks		5/586	None. No risks.
	Not sure/do not know		5/586	I am not sure. I am not sure. I do not know why a cervical screening test is even necessary for me.
	Not attending	Forgetting Defaulting	5/586	Forgetting to go. People do not go after 3 so will not go after 5.

TABLE 5 (Continued)

Major theme	Subthemes	Frequencies	
			I think that changing it to every five years some women may forget and I believe that it will then cause an even lower uptake of the screening.
No concerns		2/586	I do not think there would be any bad things about getting the test every 5 years instead of 3. I would still approach the doctor if I had my own concerns.
Lowered perception of ability to go early if symptomatic		2/586	Not feeling able to go for one 'early' if you think there are any changes. As well as not wanting to go more than recommended out of fear of being a strain on the NHS.
Fewer tests		1/586	Not getting tested as often.

HPV infection and cervical cancer development made it more likely that women would accept decreased screening frequency. Our results suggest that this pattern does not extend to more general knowledge about HPV and cervical cancer.

Almost half of all respondents indicated they would be willing to wait 5 years for their next cervical screen if recommended. This still leaves most respondents either unwilling or unsure of whether to extend the screening interval by 2 years. Three out of five HPV vaccinated respondents reported they would be unwilling to have three screens in a lifetime if it was recommended. These results are consistent with that of Hill et al. (2021), whose UK study found that 50% respondents reported they would be pleased to be invited for a cervical screen every 5 years, while 43% of respondents reported they would be relieved to be invited for a cervical screen every 5 years. Similarly, Hawkins et al. (2013) found that over half of participants were resistant to increasing the length of time between screenings from 1 to 3 years in the United States. However, our results indicated a higher level of resistance to increased interval length compared with another US study (Gerend et al., 2017), which found that over two thirds would be willing to reduce screening frequency if recommended by a healthcare professional.

We found that women who were unwilling to extend the screening interval to 5 years perceived worse consequences of extending the interval and had significantly higher worry about cancer and a higher perception of both general and personal risk of contracting HPV and developing cervical cancer. Previous research has reported similar findings (Dodd, Obermair, & McCaffery, 2019; Dodd, Nickel, et al., 2019; Gerend et al., 2017), and our data extend these findings by identifying the importance of personal risk perceptions. HPV-vaccinated women unwilling to reduce screening to three times in a lifetime also perceived greater negative consequences relative to those willing to have three screens. Multivariate analysis revealed that women with higher perceived cervical cancer risk were significantly more likely to be opposed to increasing screening interval to 5 years. This has also been reported internationally. For example, a study of

perimenopausal women in the United State found that women who perceived themselves to be at medium or high risk of cervical cancer were less willing to accept an extended cervical screening interval (Silver et al., 2015). An Australian analysis of responses to an online petition opposing an increase in screening intervals changes to the cervical screening programme also found that personal risk perceptions due to family history of cervical abnormalities were used to explain opposition to these changes (Obermair et al., 2020).

Multivariate analyses also revealed that regular screeners and those who intend to attend when invited are less likely to accept a 5-year screening interval. This suggests that committed screeners who engage with the screening programme are more likely to oppose changes to the existing screening programme. This is in line with Hill et al. (2021), who found that women with more favourable attitudes to interval changes in screening were more likely to be irregular attenders, first-time attenders, nonattenders or those women who had never been invited for screening. We found that women who attend screening every 3–5 years (as opposed to the recommended 3 years) are more likely to accept five yearly screening. Further research is needed to understand whether those women who currently attend every 3–5 years despite the three-year recommendation would adhere more closely to a 5-year recommendation.

Qualitative content analysis found that perceived benefits of extending the interval between screens included convenience of having fewer tests and appointments, reduced physical discomfort and reduced psychological distress due to fewer cervical screens. Perceived harm of fewer cervical screens included increased risk of developing precancerous cell changes, increased psychological distress due to being unaware of what is going on in the body, and increased risk of developing cervical cancer. Around a fifth of participants explicitly reported that they could see no possible benefit to extending screening frequency, while less than 1% reported perceiving no possible risks. The most frequently cited concern was a perception that a longer interval between screenings may mean that there would be more time for disease to develop undetected. Taken in combination with

TABLE 6 Content analysis of respondents' perceptions of main benefit and risks of screening three times in a lifetime

	Major theme	Subthemes	Frequencies	
Benefits	Convenience	Less hassle	37/132	Having to go less.
		Save time		Less time consuming.
		Fewer appointments Less to think about		Less of a hassle as it would not happen as often.
	Psychological distress	Anxiety	28/132	The anxiety would not be as frequent.
		Stress		Less stressful as it happens less often.
		Embarrassment		Less embarrassing moments.
	No benefits		25/132	I cannot see any benefits of only having 3 smear tests.
				No benefits at all.
				Wouldn't be any.
	Physical discomfort	Less discomfort	8/132	Less times of discomfort.
Not having to go through the screening		Not going through the uncomfortable process as much.		
Any test better than none		8/132	It's still better than none at all.	
			The only positive is that at least I was still getting tested.	
Save NHS resources		3/132	Good use of resources.	
			Reduces resources and time of the NHS.	
Reassurance of low risk/less perceived risk of cancer		2/132	Less often means low risk.	
			Needing a test less frequently would make me think that I'm less likely to develop cervical cancer.	
Not sure		2/132	Not sure.	
More anxiety/worry		1/132	Having the tests far apart this may give more time for anxiety to build up about it.	
If evidence is there, it's all good		1/132	If it's proven that that is what is necessary then I would not see a problem with it.	
Not planning on getting screened		1/132	I still do not believe I would go to even 3 in my lifetime.	
Risks	Increased risk of cervical cancer and death	Late detection	51/140	3 smears is not enough as cancer would go undetected.
		Increased risk of cervical cancer		Failure to pick up cancer/cancerous cells quickly.
		Being unaware		Developing something and not knowing.
	Increased psychological distress	Increased anxiety	44/140	Anxiety around every cervical change.
		Increased worry		Would be worried/anxious.
				I would be concerned and worried. I might have cervical cancer and not know.
	Not enough screens		7/140	Not enough checks.
				Not enough tests.
	Prefer more screens		5/140	I want more, rather not get cancer so better to know and sort it out quick.
				I would want more just to be sure I did not have it.
None		4/140	None.	
			Nothing.	
Perceived less serious		1/140	I do not think there are any bad parts.	
			Downplays the seriousness.	

TABLE 6 (Continued)

Major theme	Subthemes	Frequencies	
Implied pressure to not ask for additional screens		1/140	Feeling like a hypochondriac if I wanted to go early due to symptoms or changes to anything down there.
Personal risk		1/140	I already know I've contracted a high risk strain of HPV despite having all the vaccines – So only 3 smears in a lifetime would be bad/useless for me.

the finding that women who attend regularly and intend to attend when invited are more likely to object to an increased interval between screening, this may suggest that women's attitudes to screening frequency are informed by a perception that more frequent screening leads to improved disease prevention. The second most frequently cited perceived harm was increased risk of cancer. In combination with the multivariate analysis finding that women who considered themselves to be at higher risk from cervical cancer were more likely to be against a decrease in screening frequency, this qualitative finding may suggest that a belief that more frequent cervical screening decreases risk of cervical cancer is a factor informing women's attitudes to screening frequency. Both of these findings support Hill et al.'s (2021) conclusion that understanding the HPV timeline (length of time between HPV infection and cervical cancer development) might increase acceptability of reduced screening frequency.

There are a number of strengths of this study to note: To the best of our knowledge, this is the first UK study exploring women's attitudes and perceptions of extending cervical screening intervals. A large sample size recruited from a variety of settings increases the likelihood of a good representation of women's perception of changes to the screening programme in the United Kingdom. Finally, a combination of survey tools and open-ended questions enriched this study by giving us an insight into women's perceptions outside of the items within the scales. Nevertheless, the study findings should be interpreted with the following limitations in mind: First, due to the participant recruitment methods it is not possible to calculate a response rate for the survey. This means we are unable to rule out selection bias. Consequently, there may be reduced generalisability to the general population of UK women. Also, the sample is highly educated and lacks ethnic diversity. It should be noted that in the United Kingdom, women from ethnic minority backgrounds are less likely to attend cervical screening (Marlow et al., 2015). The views of women from ethnic minority backgrounds are underrepresented, and additional research is required to assess the perceptions of screening interval changes in this group of women. Second, the data were self-reported, which may impact accuracy, reliability, and validity. However, the study was designed to mitigate against this, including anonymity and use of standardised, psychometrically sound measures which have been used in past research. Our findings also echo and extend previous knowledge on this topic. Third, it is worth noting that only women within the age range likely to be impacted by cervical screening interval changes

were included in this study. Consequently, the results may not generalise to younger or older women. Finally, our sample is weighted towards those who attend or are planning to attend cervical screening. As we have found that those who attend are *less* likely to accept decreased screening frequency, our finding that less than half overall would accept 5 yearly screening may not be generalisable. Further research is needed to understand the attitudes of those who do not currently attend as recommended and whether a change in recommended screening frequency would make those women more likely to attend screening as recommended. Given the intention-behaviour gap (Armitage & Conner, 2001) future research is also required, which assess behavioural outcomes, that is, screening behaviour.

4.1 | Study implications

Despite these acknowledged limitations, this study makes important contributions towards understanding women's perceptions of changes to the cervical screening programme in the United Kingdom. The insights from this study are internationally relevant and may be important and useful for other countries poised to make changes to their cervical screening programmes. Women's awareness of the clinical value of cervical screening could be improved through increased education to prevent negative perceptions that expanding the screening interval is based only on cost-saving. Any changes to cervical screening intervals must be carefully considered and communicated to women to ensure that they fully understand that the proposed changes are safe and evidence-based. Any changes to the screening intervals will cause concern, lead to suspicion of cost-saving and could reduce trust and attendance. Our qualitative findings indicated that women are concerned that, during a long wait between screens, cervical cancer could be developing undetected. Those who perceive themselves to be at higher risk of cancer are less likely to accept five yearly screening. Our study therefore supports Hill et al.'s (2021) recommendation that improving women's knowledge about the HPV timeline could improve acceptance of decreased screening frequency.

5 | CONCLUSION

Women's perceived risk of cervical cancer, and their current and intended screening attendance frequency, are significant factors in

attitudes to changes in cervical screening frequency. Women who perceive themselves to be at higher risk of cervical cancer, and those who currently attend as recommended and intend to attend their next screening on time, are less likely to accept extended screening intervals. Our qualitative findings indicate a perception of a relationship between increased time between screenings and likelihood of developing cervical cancer. This suggests that a possible mediating factor between women's attitudes to screening frequency and their perception of cancer risk is their perception of *time* as relevant to cancer risk. We found that general HPV and cervical cancer knowledge did not have a significant relationship with attitudes to screening frequency. The implication of this is that women need clear and specific information about HPV timelines, their relationship with cancer risk, and the rationale for extending screening intervals in order to make informed judgements about the risk of extended screening intervals.

ACKNOWLEDGEMENTS

The authors would like to thank the women who participated in this research study.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author, SKP, upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Kola-Palmer, S., Rogers, M., Halliday, A., & Rickford, R. (2022). "A lot can happen in five years": Women's attitudes to extending cervical screening intervals. *European Journal of Cancer Care*, 31(6), e13655. <https://doi.org/10.1111/ecc.13655>