

## Impact of GP reminders on follow-up of abnormal cervical cytology:

a before–after study in Danish general practice

### Abstract

#### Background

Dysplasia may progress because of a loss to follow-up after an abnormal cervical cytology. Approximately 18% of Danish women postpone the recommended follow-up, which depends on the cytology results.

#### Aim

To investigate if a reminder to the GP about missed follow-up could reduce the proportion of women who fail to act on a recommended follow-up, and to analyse the effect on sociodemographic and general practice variations.

#### Design and setting

A national electronic GP reminder system was launched in Denmark in 2012 to target missed follow-up after screening, opportunistic testing, or surveillance indication. The authors compared follow-up proportions in a national observational before–after study.

#### Method

From national registries, 1.5 million cervical cytologies (from 2009 to 2013) were eligible for inclusion. Approximately 10% had a recommendation for follow-up. The proportion of cervical cytologies without follow-up was calculated at different time points. Results were stratified by follow-up recommendations and sociodemographic characteristics, and changes in practice variation for follow-up were analysed.

#### Results

Fewer women with a recommendation for follow-up missed follow-up 6 months after a GP reminder. Follow-up improved in all investigated sociodemographic groups (age, ethnicity, education, and cohabitation status). Interaction was found for age and cohabitation status. Variation between practices in loss to follow-up was significantly reduced.

#### Conclusion

An electronic GP reminder system showed potential to improve the quality of cervical cancer screening through reduced loss to follow-up.

#### Keywords

early detection of cancer; general practice; mass screening; quality of health care; uterine cervical neoplasms.

### INTRODUCTION

Successful prevention of cervical cancer depends on follow-up of abnormalities after cervical cytology testing.<sup>1,2</sup> Nevertheless, women without follow-up are a persisting problem in many Western countries.<sup>3–5</sup> Lack of follow-up has been associated with both patient<sup>6–8</sup> and system-related barriers.<sup>3,9,10</sup> In Denmark, a GP is usually involved in securing follow-up.<sup>5,11</sup> Consequently, since 2012, GPs have received an electronic reminder if appropriate follow-up was not duly registered.<sup>11</sup>

Four other studies have addressed the effect of a GP reminder as a single intervention in cervical cancer screening follow-up. However, two of the studies lacked a control group,<sup>12,13</sup> and a before–after study did not find more women with follow-up when comparing before and after in an unadjusted analysis, though the study may have been underpowered.<sup>14</sup> A Dutch intervention study improved follow-up. However, in this setting it was necessary to generate a GP reminder for 45% of all women in need of follow-up and, despite this, 19% of intervention women missed follow-up 1 year after cervical cytology requisition.<sup>15</sup> In Denmark, 18% of women with a cervical cytology and a recommendation for follow-up are without follow-up 12 weeks after recommended follow-up.<sup>5,11</sup> This number is relatively low compared with studies in other countries.<sup>3</sup> Therefore, evidence about the

effects of a GP reminder in a clinical setting with better follow-up is needed. It could be expected that the remaining 18% of women without follow-up may face more complex barriers and could thus be more reluctant to attend follow-up.<sup>16</sup> Additionally, no studies have described the effect of GP reminders on social inequality<sup>17</sup> or variation among GP practices.

The authors aimed to evaluate the effect of GP reminders on women without follow-up, on sociodemographic differences, and on variation between GP practices.

### METHOD

In a large observational study, the authors compared the proportions of follow-up before and after the implementation of a national electronic reminder system for GPs.

### Setting

All Danish women aged 23–50 years are invited to cervical cancer screening every third year, and women aged 50–64 years are invited every fifth year. The women are identified through national databases and are encouraged to book an appointment free of charge with their general practice. All samples are sent to a pathology department for diagnosis. If necessary, a recommendation for follow-up is also applied — that is, either within 3 months (referral to a gynaecologist) or in 3, 6, or 12 months, depending on the

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## How this fits in

A review found that up to 12% of cancers arise due to failure in follow-up, and is the third most common reason for cancer development. Strategies to improve follow-up are thus crucial. As the sample taker, the GP plays a pivotal role in securing follow-up. This study found that a GP reminder almost halved the proportion of women without follow-up, had effect across sociodemographic groups, and decreased the variation in loss to follow-up among GPs.

current and former cervical cytology results. Results and follow-up recommendation are transferred to the electronic patient record in the general practice. GPs convey results to women either face-to-face, or by phone, or by e-mail.<sup>11</sup> Before the implementation of GP reminders, no other national system initiatives were performed in Denmark to support women or GPs in remembering follow-up.<sup>11</sup> Approximately 99% of all Danish women are listed with a specific GP practice.<sup>18</sup>

## Intervention

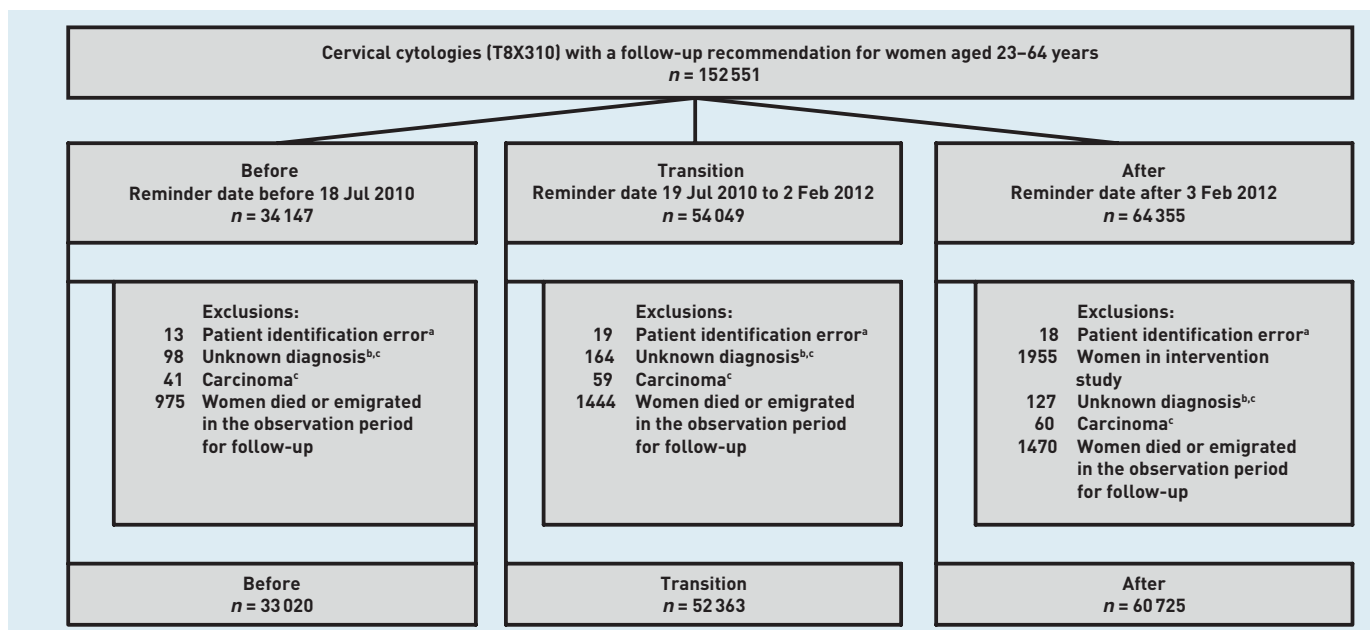
The reminder system was launched nationwide in Denmark on 18 January 2011 under the auspices of the Danish Pathology Data Bank (DPDB). The reminder system was fully operational on 2 February 2012 after a run-in period.<sup>4</sup> Cervical cytologies with a recommendation of follow-up within 3 months (referral to gynaecologist) generated a GP reminder if no new cervical

cytology or histology was registered in the DPDB 1 month after the follow-up was due. Cytology results with a recommendation of follow-up in 3, 6, or 12 months generated a reminder 3 months after recommended date of follow-up. It was anticipated that, after receiving the electronic reminder from the DPDB, GPs would initiate contact with the woman, and encourage her to return for the required follow-up. However, there was no protocol for how or when GPs should act on reminders and no additional resources were given to the GPs.

## Study participants

All cervical cytology samples (Systematized Nomenclature of Medicine [SNOMED code: T8X310]) performed during 1 January 2009 to 5 August 2013 for women with a follow-up recommendation were identified, regardless of test indication (screening, opportunistic testing, or surveillance for earlier abnormality). The authors aimed to study follow-up adherence 6 months after the reminder (that is, 7 months after a recommendation for follow-up within 3 months, and 9 months after recommendations for follow-up in 3, 6, or 12 months), as the reminder was generated 1 or 3 months after the date of recommended follow-up. Data regarding follow-up were retrieved on 30 May 2014. Therefore, the authors only included cervical cytologies with a recommended follow-up date 7 or 9 months earlier than 30 May 2014. The authors excluded cytologies of women with unknown diagnosis or carcinoma, women who died or emigrated from Denmark in

**Figure 1. Flow chart of number of cervical cytologies.**  
<sup>a</sup>Women without a unique Danish civil registration number. <sup>b</sup>Unknown diagnosis or potential uncertainty about follow-up recommendations. <sup>c</sup>Diagnosis formed according to information available from the authors upon request.



**Table 1. Characteristics of the 146 108 cervical cytologies and the 124 244 women before, in the transition period, and after implementation of GP reminders**

	Before, n(%)	Transition, n(%)	After, n(%)
Total number of cervical cytologies	33 020	52 363	60 725
Total number of general practices	2093	2174	2176
10 <sup>th</sup> –90 <sup>th</sup> centile in number of cytologies per practice	2–36	3–56	3–68
Number of general practices with >4 cytologies	1692		1943
<b>Total number of women</b>	29 978 (100)	44 285 (100)	49 981 (100)
Number of women with 1 cytology	27 044 (90)	36 779 (83)	40 098 (80)
Number of women with 2 cytologies	2828 (9)	6964 (16)	9085 (18)
Number of women with ≥3 cytologies	106 (0)	542 (1)	798 (2)
<b>Diagnosis<sup>a</sup></b>			
Normal	4237 (13)	16 248 (31)	17 182 (28)
Inadequate	10 308 (31)	11 240 (21)	11 440 (19)
ASC-US, ASC-H, AGC	8034 (24)	10 840 (21)	12 367 (20)
LSIL	6399 (19)	9720 (19)	14 730 (24)
HSIL, AIS	4042 (12)	4315 (8)	5006 (8)
<b>Follow-up recommendation<sup>a</sup></b>			
Before 3 months (reminder after 4 months)	11 957 (36)	13 887 (27)	17 673 (29)
3 months (reminder after 6 months)	10 222 (31)	10 817 (21)	10 854 (18)
6 months (reminder after 9 months)	6986 (21)	8890 (17)	9683 (16)
12 months (reminder after 15 months)	3855 (12)	18 769 (36)	22 515 (37)
<b>Region<sup>a</sup></b>			
Capital Region of Denmark	6297 (19)	8532 (16)	10 868 (18)
Region Zealand	7134 (22)	11 872 (22)	13 048 (21)
Central Denmark Region	9527 (29)	15 247 (29)	16 848 (28)
North Denmark Region	3462 (10)	6837 (13)	8656 (14)
Region of Southern Denmark	6598 (20)	9875 (19)	11 305 (19)
Missing	2	0	0
<b>Median age of women (25<sup>th</sup>–75<sup>th</sup> centile)<sup>b</sup></b>	36 (29–44)	36 (29–44)	36 (29–45)
<b>Ethnicity<sup>b</sup></b>			
Danish	27 493 (93)	40 764 (93)	45 891 (93)
Western immigrants/descendants	684 (2)	991 (2)	1289 (3)
Non-Western immigrants/descendants	1266 (4)	1892 (4)	2139 (4)
Missing	535	638	662
<b>Cohabitation status<sup>b</sup></b>			
Married/cohabiting	18 308 (62)	27 058 (62)	29 601 (60)
Living alone	11 140 (38)	16 596 (38)	19 724 (40)
Missing	530	631	656
<b>Education (years)<sup>b</sup></b>			
≤10	5689 (20)	8349 (19)	9219 (19)
>10 to <15	15 624 (54)	22 888 (53)	25 318 (53)
>15	7663 (26)	11 658 (27)	13 656 (28)
Missing	1002	1390	1788

<sup>a</sup>Numbers per cervical cytology; <sup>b</sup>Numbers per women at time of first cervical cytology. AGC = atypical glandular cells. AIS = adenocarcinoma in situ. ASC-H = atypical squamous cells of undetermined significance. ASC-US = atypical cells of undetermined significance. HSIL = high-grade squamous intraepithelial lesion. LSIL = low-grade squamous intraepithelial lesion.

the study period, women with identification errors, and women who participated in the intervention arm of a randomised study targeted to improve follow-up.

#### Before–after exposure groups

The authors calculated a GP reminder date for all included cervical cytologies. They divided

the study population into a before group (with a simulated reminder date before activation of the reminder system) and an after group (with an actual reminder date after activation). The before group consisted of women with a simulated reminder date before 18 July 2010 (that is, 6 months before the system was launched on 18 January 2011). The after group consisted of women with a reminder date after 2 February 2012 (when the system was fully operational). The transition group consisted of women with a GP reminder date generated during the run-in period (between 19 July 2010 and 2 February 2012). This period ensured a fully functioning reminder system in the after group and gave the GPs time to adapt to the new procedures.

#### Data

Data regarding cervical cytology and histology were retrieved from the nationwide DPDB. This register contains records on diagnosis and dates of all pathological material evaluated in Denmark since 1997, from all settings and regardless of indication. All cytologies are assigned codes from the Danish version of the SNOMED.<sup>19</sup> National standards from 2007 prescribe classification of results in accordance with the Bethesda Classification for Cervical Cytology 2001 and encourage inclusion of follow-up recommendation (specific SNOMED codes).<sup>20,21</sup>

Information on sociodemographic characteristics was obtained through Statistics Denmark (on 1 January in the year preceding the cytology), and all data were linked using the unique Danish civil registration number of each woman. Educational level was categorised, according to the UNESCO classification, as low (≤10 years), middle (11–15 years), or higher education (>15 years).<sup>22</sup> Cohabitation was categorised as married/cohabiting or living alone. Ethnicity was categorised according to the definition applied by Statistics Denmark as:

- Danish;
- immigrant or descendant from Western countries; or
- immigrant or descendant from non-Western countries.<sup>23</sup>

Age was calculated by subtracting the woman's date of birth from the cytology requisition date.

#### Statistical analysis

Follow-up proportions were calculated for each follow-up recommendation (that is, within 3, or in 3, 6, or 12 months) with

**Table 2. Associations (odds ratios)<sup>a</sup> of cervical cytologies without follow-up, stratified by follow-up recommendation**

	Before % without follow-up	After % without follow-up	After versus before (ref) OR (95% CI)
<b>Recommended follow-up in 12 months, <i>n</i></b>	3855	22 515	
At recommended follow-up date	78.0	72.8	0.87 (0.83 to 0.91)
3 months after recommended follow-up <sup>b</sup>	48.8	48.0	1.00 (0.96 to 1.06)
6 months after recommended follow-up	36.0	18.6	0.54 (0.50 to 0.58)
9 months after recommended follow-up	28.4	11.7	0.44 (0.39 to 0.50)
<b>Recommended follow-up in 6 months, <i>n</i></b>	6986	9683	
At recommended follow-up date	64.8	62.0	0.94 (0.90 to 0.97)
3 months after recommended follow-up <sup>b</sup>	28.4	28.0	0.99 (0.96 to 1.03)
6 months after recommended follow-up	18.5	10.9	0.73 (0.69 to 0.76)
9 months after recommended follow-up	14.8	7.0	0.62 (0.56 to 0.69)
<b>Recommended follow-up in 3 months, <i>n</i></b>	10 222	10 854	
At recommended follow-up date	62.6	60.1	0.94 (0.90 to 0.97)
3 months after recommended follow-up <sup>b</sup>	34.3	32.4	0.94 (0.91 to 0.98)
6 months after recommended follow-up	25.5	15.0	0.64 (0.59 to 0.70)
9 months after recommended follow-up	21.5	10.6	0.60 (0.55 to 0.67)
<b>Recommended follow-up within 3 months, <i>n</i></b>	11 957	17 673	
At recommended follow-up date	16.3	16.2	0.99 (0.95 to 1.02)
1 month after recommended follow-up <sup>b</sup>	9.7	10.4	1.04 (0.99 to 1.08)
4 months after recommended follow-up	4.4	3.9	0.93 (0.88 to 0.99)
7 months after recommended follow-up	3.3	2.5	0.87 (0.81 to 0.94)

<sup>a</sup>Multilevel mixed-effect logistic regression, with correction for random-effect clusters at the level of GPs and women. <sup>b</sup>The date a GP reminder was generated for the after group. CI = confidence interval. OR = odds ratio. Ref = reference.

all women needing follow-up as the denominator at four time points. Follow-up proportions in before-and-after groups were compared through odds ratios (OR) for the likelihood of not having a follow-up, and stratified according to type of follow-up recommendation.

The unit of analysis was the individual cervical cytology. The authors calculated ORs using multilevel mixed-effects logistic regression with random effects to correct for clustering of measurements within each woman, and for clustering of women within GP practices.<sup>24</sup>

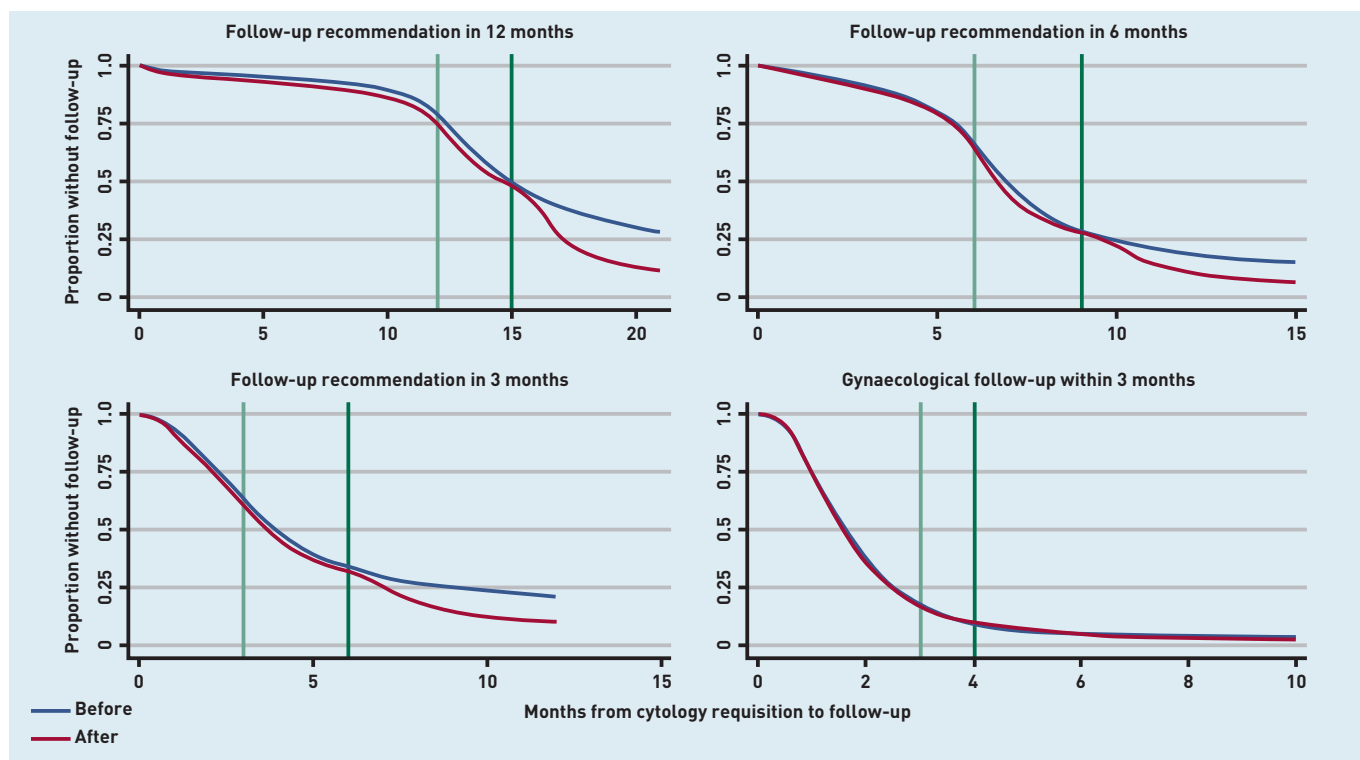
Kaplan–Meier plots displayed the time from date of initial cervical cytology to date of follow-up, or censoring due to missed follow-up, at the end of the observation period, whichever came first.

To determine if the GP reminder effect was modified by the sociodemographic characteristics of the women, follow-up proportions 7 or 9 months after the recommended date of follow-up (that is, 6 months after a reminder for the after group) between before and after groups were compared in a stratified analysis. Associations between follow-up status and sociodemographic factors were estimated as described above and adjusted for age (as a continuous variable) and type of follow-

up recommendation. Effect on GP practice variation was explored by calculating follow-up proportions 7 or 9 months after the recommended date of follow-up (that is, 6 months after a reminder for the after group) for each practice before and after implementation of the reminder system. To ensure high statistical precision, only GP practices with four or more cervical cytologies in need of follow-up were included. The proportions were listed according to order of practice proportions in scatterplots, and the interquartile range was estimated. Pitman's test for comparing variances of follow-up proportions of paired GP practices was additionally used (Stata command: `sdpair`).<sup>25</sup> Only practices that were active both before and after were included in this test. All statistical analyses were conducted using Stata version 14.

## RESULTS

In the study period, 1 487 155 cervical cytologies were performed in general practice. Of these, 1 321 846 (88.9%) had no follow-up recommendation, and 12 758 (0.8%) had less than 6 months to observe follow-up adherence after the GP reminder. This left 152 551 (10.3%) eligible women in the study period. The authors included 33 020 cervical cytologies



**Figure 2. Proportion of cervical cytologies without follow-up before and after implementation of reminders, stratified by follow-up recommendation.<sup>a</sup>**  
<sup>a</sup>First vertical line is the time point for recommended follow-up. Second vertical line is the time point when a reminder was generated for the after group. Follow-up recommendations within 3 months (needing to consult a gynaecologist) had a GP reminder 1 month after recommended date of follow-up (that is, after 4 months), whereas recommendations for follow-up in 3, 6, or 12 months had a GP reminder 3 months after date of recommended follow-up (that is, after 6, 9, or 15 months).

(from 29 978 women) before, and 60 725 cytologies (from 49 981 women) after the implementation in the analyses (Figure 1). Table 1 shows the baseline characteristics of the included women and cytologies. Follow-up recommendations and types of diagnosis differed between the before and after groups.

Table 2 presents the likelihood of not being followed-up, stratified by type of follow-up recommendation. Follow-up recommendations roughly corresponded to certain diagnoses. As indications for follow-up recommendations might have changed over time, sensitivity analyses were performed with adjustments for diagnoses, but this did not change the results substantially (further information is available from the authors on request).

Figure 2 shows a marked temporal reduction in no follow-up when a GP reminder was generated for the after group, most markedly for those with a recommendation of follow-up in 12 months, and less markedly for those with a recommendation of follow-up within 3 months.

Table 3 shows that follow-up was most complete for women  $\geq 35$  years, ethnic Danes, and women who are highly educated. The proportion without follow-up decreased significantly from before to after implementation in all sociodemographic groups. The effect was lowest among

younger women (aged 23–34 years) and women living alone.

The interquartile interval of follow-up proportions among GP practices in the before group ranged from 79% to 94% (interquartile range [IQR] 15). Comparable estimates for the after group were 88% to 100% (IQR 12). The variation between follow-up proportions decreased significantly from before to after among the 1527 paired practices (ratio of standard deviations 0.67, 95% confidence interval [CI] = 0.63 to 0.70), visualised by a more horizontal after line compared with the before line (Figure 3).

## DISCUSSION

### Summary

The proportion of women without follow-up was almost halved following the implementation of the reminder system. It had a positive effect in all sociodemographic groups and reduced the variation in follow-up proportions among GP practices. The quality of the screening programme was thus improved. However, 2.5% to 11.7% of cervical cytologies had no follow-up 6 months after a GP reminder, depending on the type of follow-up recommendation.

### Strengths and limitations

The risk of selection bias was reduced as the authors used prospectively collected national data from the DPDB. These records have been almost complete since

**Table 3. Association (odds ratios) between no follow-up<sup>a</sup> and sociodemographic status**

	Before		After		After versus before (ref)	
	n [% without follow-up] <sup>b</sup>	OR (95% CI) <sup>c</sup>	n [% without follow-up] <sup>b</sup>	OR (95% CI) <sup>c</sup>	OR (95% CI) <sup>c</sup>	P <sup>d</sup>
<b>Age group, years</b>						
23–34	15 650 (14.8)	1 (ref)	27 905 (9.2)	1 (ref)	0.53 (0.49 to 0.57)	
35–44	9793 (14.1)	0.79 (0.72 to 0.85)	17 588 (7.5)	0.63 (0.57 to 0.70)	0.44 (0.40 to 0.48)	0.001
45–54	5227 (12.7)	0.66 (0.59 to 0.74)	10 207 (6.5)	0.49 (0.43 to 0.55)	0.43 (0.37 to 0.48)	0.003
55–64	2350 (15.5)	0.79 (0.69 to 0.89)	5025 (7.2)	0.56 (0.48 to 0.66)	0.36 (0.30 to 0.43)	0.005
<b>Ethnicity</b>						
Non-Western	1374 (22.0)	1 (ref)	2507 (12.6)	1 (ref)	0.46 (0.36 to 0.55)	
Western	746 (18.1)	0.86 (0.67 to 1.11)	1548 (10.7)	0.87 (0.66 to 1.14)	0.48 (0.34 to 0.62)	0.833
Danish	30 323 (13.7)	0.58 (0.49 to 0.68)	55 937 (7.7)	0.50 (0.42 to 0.59)	0.47 (0.44 to 0.49)	0.644
<b>Education, years</b>						
<10	6267 (17.3)	1 (ref)	11 072 (10.3)	1 (ref)	0.47 (0.42 to 0.53)	
>10 to <15	17 321 (13.6)	0.72 (0.66 to 0.79)	30 970 (7.3)	0.60 (0.54 to 0.66)	0.44 (0.40 to 0.47)	0.301
>15	8348 (12.6)	0.66 (0.60 to 0.74)	16 592 (7.1)	0.59 (0.52 to 0.66)	0.47 (0.42 to 0.52)	0.962
<b>Cohabitation</b>						
Living alone	12 450 (12.8)	1 (ref)	24 441 (7.8)	1 (ref)	0.52 (0.48 to 0.57)	
Married/cohabiting	19 999 (15.0)	1.03 (0.95 to 1.11)	35 559 (8.1)	0.93 (0.86 to 1.01)	0.44 (0.41 to 0.47)	0.002

<sup>a</sup>Follow-up proportions were studied 6 months after a GP reminder — that is, 7 months after recommended date of follow-up for women with a recommendation for gynaecological follow-up within 3 months, and 9 months after date of recommended follow-up for women with a recommendation for follow-up in 3, 6, or 12 months. <sup>b</sup>Numbers per cervical cytology. Numbers vary due to missing data. <sup>c</sup>Adjusted for type of follow-up recommendation. Ethnicity, education, and cohabitating status also adjusted for age. <sup>d</sup>Test for interaction showing if effects of reminders were modified by sociodemographic factors. CI = confidence interval. OR = odds ratio. Ref = reference.

2005.<sup>26</sup> The study enjoyed high statistical precision from the large number of included cervical cytologies and general practices. Misclassification due to ambiguous or imprecise coding was minimised as national standards for SNOMED coding of diagnoses and follow-up were adopted in Denmark in 2007.

A weakness of this observational study is the before–after design, as other changes may have caused the effects. For instance, small improvements were observed for the after group even before the introduction of the reminders, but the largest effects began to show at the exact time of the reminder introduction. The authors excluded women with identification errors as it was not possible in registries to study their follow-up. However, these women may be at greater risk of not returning for follow-up, therefore prevalence of follow-up proportions may be underestimated, though the authors do not expect it to affect the associations.

Differences in the distribution of follow-up recommendations persisted between before and after groups. This was expected, because of the design of the study. In particular, cytologies with late follow-up recommendation were more likely to receive a reminder (and be included in the after group) than those with a short follow-up recommendation. Therefore, all analysis of follow-up proportions

were stratified by type of follow-up recommendation. Distribution of diagnoses also differed from before to after within each type of follow-up recommendation group (further information is available from the authors upon request). This may have been a consequence of introducing human papilloma virus (HPV) triage and a change to liquid-based screening techniques in pathology departments during the study period.<sup>11,20</sup> Even though adjusting for diagnosis did not alter associations much, confounding may persist (further information is available from the authors upon request).

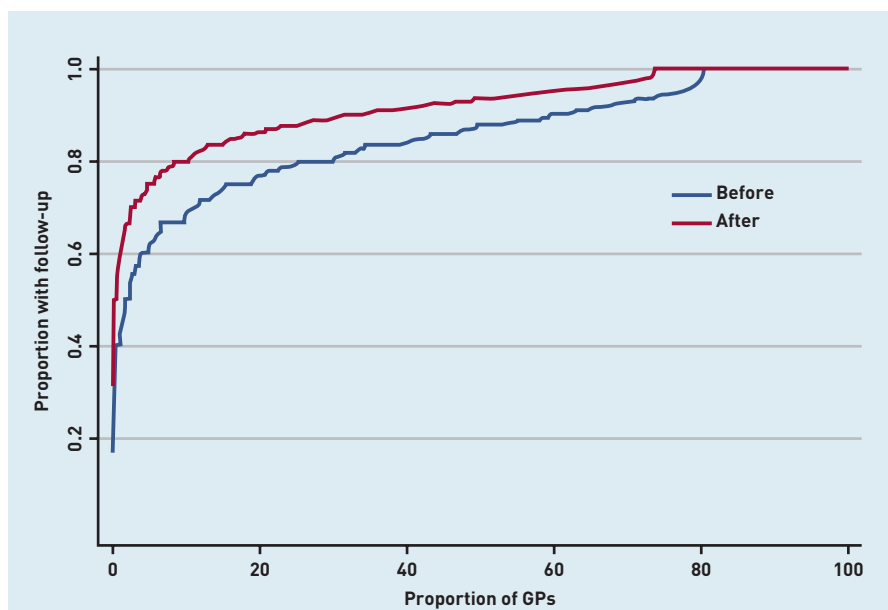
#### Comparison with existing literature

Other studies found varying improvement in follow-up using GP reminders,<sup>13–15</sup> but these did not investigate effects on sociodemographic variations. In this study, the reminder improved follow-up in all social groups. However, 6.5% to 12.6% of the women were not followed up, particularly younger and low-educated women with non-Western ethnicity. Other studies have found similar inequalities.<sup>6,27</sup> Inequalities persisted with reminders, and as the reminders had a smaller relative effect among women living alone and younger women, relative inequalities may thereby increase, even though the absolute differences in these groups were reduced.

The most profound effect of reminders



**Figure 3. GP variations in cervical cytology follow-up proportions. Proportions of 1692 GP practices before, and 1943 GP practices after, listed according to proportion of women with follow-up. Observation of follow-up adherence ended 6 months after a GP reminder was generated to the after group. This entailed 7 months after recommended date of follow-up for women with a 'recommendation for follow-up within 3 months', and 9 months for women with a 'recommendation for follow-up in 3, 6, or 12 months'.**



was found for cervical cytologies with a recommendation of follow-up in 12 months. Approximately 80% of these cytologies were normal but still needed follow-up, for example, due to surveillance for earlier dysplasia (further information is available from the authors upon request). Normal test results are generally excluded from studies on follow-up,<sup>13-15</sup> even though it is assumed that 8% of women develop new pre-cancerous dysplasia after cone biopsy treatment, and 80% within 2 years.<sup>28</sup> Additionally, incidence rate ratios of cervical cancer are increased for up to 15.5 years after an abnormal cytology.<sup>29</sup> Some of these women are followed in general practice.<sup>11</sup> A smaller, significant effect was found among women with a recommendation of follow-up within 3 months. Approximately 30% of these have a high-grade squamous intraepithelial lesion (HSIL) diagnosis (further information is available from the authors upon request). However, as almost 30% of women with cervical squamous intraepithelial neoplasia (CIN) III are expected to receive a cancer diagnosis if no subsequent adequate treatment is performed,<sup>30</sup> even small improvements for this group may be important. For women with a recommendation for follow-up in 3 months, 95% and 99% of results were inadequate in the before and after study populations, respectively (further

information is available from the authors upon request). Women with this type of follow-up recommendation also improved follow-up, but do not necessarily have an increased risk of cancer.

#### Implications for practice

Reminders improved the follow-up of women participating in cervical cancer screening, regardless of sociodemographic characteristics. The effect was seen in a healthcare system with a relatively high follow-up rate, which proves that the GP reminder intervention delivers strong results. However, challenges with follow-up and social inequalities persist, and this finding needs further consideration. Electronic reminders are currently sent to the general practice that performed the cytology and thus not necessarily to the woman's current GP. In Denmark, 23% of the population aged 18-30 years change GP practice each year, whereas the corresponding figure is only 4% for women aged  $\geq 50$ .<sup>31</sup> Thus, reminders may address social inequality among the young if sent to the woman's current GP or to the woman herself. The intervention decreased the variation in follow-up proportions between GPs. This implies that the GP reminder served as a supportive tool for GPs, as follow-up of women now depends to a lesser extent on individual GPs.

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#### Ethical approval

None required.

#### Provenance

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#### Competing interests

The authors have declared no competing interests.

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