Introduction

Cancer is a leading cause of disease burden and mortality worldwide. In Spain, according to the National Statistics Institute, 107,188 deaths in 2010 were caused by cancer (28.06% of all deaths), with the most frequent tumour sites among women being breast, followed by colorectal and lung. Among men, the most frequent sites were lung, colorectal and prostate.

Cervical cancer has low incidence and mortality rates in Spain, and data for 2008 show 1948 new diagnoses (6.3 per 100,000 women) and 712 deaths (1.9 per 100,000 women). Screening is a secondary prevention method that has proved to be effective in improving the prognosis for a large number of patients with several types of cancer. In Spain, the Ministry of Health, Social Services and Equality recommends that breast, colorectal and cervical cancer screening be conducted. As in other countries, prostate-specific antigen (PSA) screening is not recommended in Spain, but despite this, frequent opportunistic PSA screening is done.

Previous studies in Spain have found that people with lower knowledge and awareness levels about cancer and its prevention are also the ones who perceive there to be more barriers to screening and show a lower engagement with preventive practices. In Spain, the National Cancer Strategy recommends cervical cancer screening via Pap smears for women aged between 25 and 64 years by initially conducting two annual smears followed by one every 3 years. Almost all cervical cancer screening activity is undertaken opportunistically. Spanish reports show a 65–70% uptake in the target population. By 2010, six Spanish autonomous regions had implemented population-based screening programmes for colorectal cancer (CRC), representing 40% of the total Spanish population. These programmes include men and women aged 50–69 years as their target population using faecal occult blood test (FOBT) every 2 years. Adherence to these programmes ranged from 5.4 to 21.6%.

Using data from a nationwide representative survey, this study aims to: (i) describe the awareness of screening tests for colorectal, breast, cervical and prostate cancer and describe the association of awareness with socio-demographic and health-related variables; and (ii) describe and analyze uptake of these screening tests in Spain, identifying predictors of adherence.

Methods

This epidemiological population-based cross-sectional study was conducted using individual data drawn from the Oncobarometro Survey (OS). The approach used by this survey was a home-based personal interview to examine a nationwide representative sample of the civilian non-institutionalized population aged ≥18 years. The OS was conducted by the Centro de Investigaciones Sociológicas under the aegis of the Fundación de la Asociación Española Contra el Cáncer.

The survey covered 7938 adults, and the estimated overall sample error was ±1.12%. The data collection period started in November 2012.
2010 and finished in December 2010. Details of methodology are described elsewhere.16

The dependent variables were created from the following questions included in the questionnaire:

1) Awareness was assessed by asking participants: Now I am going to mention several medical tests for cancer detection, please tell me if you already know them or if this is the first time you have heard of them? The tests mentioned were FOBT, mammography, Pap smear and PSA.

2) Uptake of cancer screening tests was assessed by asking participants whether they had received any of the following screening tests within the previous 2 years: FOBT, mammography (only women), Pap smear (only women) and PSA (only men). Participants were given four possible answers ‘Yes, by own initiative’, ‘Yes, following medical advice’, ‘Yes, as part of an annual medical checkups’ or ‘No’. The first three options were categorized as ‘Yes’ for uptake.

The uptake analysis was only conducted among subjects included in the target population defined as men and women aged 50–69 years for FOBT, women aged 40–69 years for mammography, women aged 25–64 years for Pap smears and men aged 50–74 years for PSA.

The independent variables included socio-demographic characteristics such as sex, age, having or not having a partner, number of children (‘none’ or ‘one or more’), nationality (‘Spanish born’ or ‘immigrant’), educational level (‘primary’, ‘secondary’ or ‘university’ studies completed) and social class (‘high’, ‘median’ or ‘low’).

We also analyzed variables associated with health status, such as self-perceived health and comorbidity. We defined as a comorbidity the self-reported presence of any chronic diseases and was divided into three categories (‘none’, ‘one’ and ‘two or more’) before analysis.

Three specific questions about cancer were also analyzed:
(i) What do you think your risk of having cancer at some point in your life is? Possible answers to this variable were dichotomized into ‘Very high/high’ and ‘Low/very low’. (ii) Have you ever received any advice from a health professional (physician, nurse or pharmacist) about cancer prevention? Possible answers were ‘Yes’ or ‘No’. (iii) Over the past 6 months, have you received, read or heard of any information about cancer? Possible answers were ‘Yes’ or ‘No’.

Statistical analysis
We described the awareness (entire population) and uptake (target populations) for each of the four screening tests analyzed according to the study variables. Qualitative variables are expressed as frequencies and percentages. Comparisons were carried out using the χ² test or Fisher’s exact test, as appropriate.

To estimate the independent effect of study variables on the awareness and uptake of any of the screening methods analyzed, we also obtained the corresponding adjusted odds ratio (OR) by means of multivariate logistic regression analysis. The multivariate models were conducted using those variables that, in the bivariate analysis, were statistically significant and those that, although not statistically significant, were of interest from a healthcare and an epidemiological viewpoint.

Estimates were made using STATA program, and statistical significance was set at a two-tailed α < 0.05.

No ethical approval was required, as the database provided by the Centro de Investigaciones Sociológicas was anonymous and publicly available.

Results
The number of subjects interviewed was 7938 and 50.9% of them were female. Table 1 shows the prevalence of awareness about FOBT, mammography, cytology/Pap smears and PSA according to study variables.

The prevalence of subjects who were aware of the FOBT test was 38.55% [95% confidence interval (CI): 37.40–39.68], mammography was 95.03% (95% CI: 94.49–95.50), Pap smears was 70.84% (95% CI: 69.81–71.91) and PSA was 54.72% (95% CI: 53.57–55.86). The bivariate analysis showed that a significantly higher proportion of women knew about FOBT (42.07% vs. 34.78%), mammography (98.07% vs. 91.85%) and Pap smears (85.38% vs. 55.60%) compared with men, whereas men had higher awareness of PSA (57.91% vs. 51.56%). Subjects in the 40–74-year age-group reported higher awareness of all screening tests analyzed than those younger or older.

Variables significantly and independently associated with awareness about the screening tests identified by multivariate logistic regression are shown in table 2. As in the bivariate analysis, after adjusting for possible confounders, women maintained better awareness levels than men for FOBT, mammography and Pap smears. The greatest difference was observed for Pap smears, with an adjusted OR of 6.06 (95% CI: 5.30–6.93). This means that the probability that a woman reported being aware of Pap smears was six times greater than for a man.

In all tests, the oldest age-group had the lowest awareness, except for PSA, where those aged >74 years were significantly more aware of it than those aged 18–39 (OR 1.24; 95% CI: 1.01–1.52) years.

Living with a partner and having children were variables associated with awareness of FOBT, Pap smears and PSA. Subjects born in Spain reported awareness of FOBT (OR 1.41; 95% CI: 1.16–1.71), mammography (OR 4.24; 95% CI: 3.12–5.78) and Pap smears (OR 2.24; 95% CI: 1.83–2.75) significantly more than immigrants.

Having completed secondary or university education was a positive predictor of awareness for all screening tests in all study categories. Likewise, higher social class was also associated with higher awareness.

Subjects who reported a self-perceived high risk of cancer, and who had received recommendations from healthcare workers or information about cancer, had a higher probability of knowing about any of the four screening tests studied.

Table 3 shows the uptake of FOBT, mammography, Pap smears, and PSA in the past 2 years among target populations according to study variables.

The highest uptake was found for mammography (74.46%; 95% CI: 71.96–76.14), followed by Pap smears (65.57%; 95% CI: 63.09–66.83), PSA (35.19%; 95% CI: 32.43–37.94) and FOBT (9.40%; 95% CI: 7.84–11.23).

In the bivariate analysis, uptake of mammography was highest in the 50–59-year age-group (84.69%) and uptake of Pap smears was highest in the 40–52-year age-group (70.10%). Uptake of PSA was highest in the oldest age-group (67–74 years), with a rate of 35.89%.

The only variable that was statistically associated with uptake of all the tests studied was ‘Number of chronic conditions’. Furthermore, higher compliance was seen as the number of conditions increased.

The results of the multivariate analysis carried out to estimate factors associated with uptake of each screening test among target populations are shown in table 4.

The results for the different age-groups and number of chronic conditions remained significant after multivariate adjustment.

Two other variables were positively associated with a higher probability of FOBT uptake: higher educational level and recommendation from an HCW.

Positive predictors of mammography uptake included living with a partner, being Spanish born (OR 1.75; 95% CI: 1.11–2.74) and recommendation from an HCW. Pap smear uptake was found to be independently and significantly associated with having children, being Spanish born and receiving a recommendation by an HCW and/or information about cancer in the past 6 months. Women who had a university education had 2.03 (95% CI: 1.06–2.58) times the
Table 1 Awareness about screening tests according to study variables. Spanish adult population included in the Oncobarometro Survey

<table>
<thead>
<tr>
<th>Screening test</th>
<th>Faecal occult blood (FOBT)</th>
<th>Mammography</th>
<th>Cytology/Pap smears</th>
<th>Prostate-specific antigen (PSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
<td><strong>Categories</strong></td>
<td><strong>n</strong></td>
<td><strong>%</strong></td>
<td><strong>n</strong></td>
</tr>
<tr>
<td>Sex&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>Men</td>
<td>1354</td>
<td>34.78</td>
<td>3577</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>1701</td>
<td>42.07</td>
<td>3966</td>
</tr>
<tr>
<td>Age&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>18–39 years</td>
<td>1100</td>
<td>34.69</td>
<td>3019</td>
</tr>
<tr>
<td></td>
<td>40–74 years</td>
<td>1807</td>
<td>44.27</td>
<td>3931</td>
</tr>
<tr>
<td></td>
<td>&gt;74 years</td>
<td>148</td>
<td>21.56</td>
<td>592</td>
</tr>
<tr>
<td>Living with a partner&lt;sup&gt;a,c,d&lt;/sup&gt;</td>
<td>Yes</td>
<td>1866</td>
<td>41.70</td>
<td>4273</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>1177</td>
<td>34.46</td>
<td>3226</td>
</tr>
<tr>
<td>Number of children&lt;sup&gt;a&lt;/sup&gt;</td>
<td>One or more</td>
<td>2177</td>
<td>40.47</td>
<td>5119</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>872</td>
<td>34.21</td>
<td>2413</td>
</tr>
<tr>
<td>Nationality&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>Spanish born</td>
<td>2779</td>
<td>39.59</td>
<td>6718</td>
</tr>
<tr>
<td></td>
<td>Immigrant</td>
<td>242</td>
<td>29.75</td>
<td>722</td>
</tr>
<tr>
<td>Educational level&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>Primary studies</td>
<td>1250</td>
<td>30.69</td>
<td>3765</td>
</tr>
<tr>
<td></td>
<td>Secondary studies</td>
<td>1032</td>
<td>44.10</td>
<td>2282</td>
</tr>
<tr>
<td></td>
<td>University</td>
<td>763</td>
<td>50.81</td>
<td>1475</td>
</tr>
<tr>
<td>Social class&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>High</td>
<td>705</td>
<td>53.91</td>
<td>1298</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>1088</td>
<td>38.98</td>
<td>2669</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>1197</td>
<td>32.78</td>
<td>3402</td>
</tr>
<tr>
<td>Self-rated health&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>Excellent/good</td>
<td>2133</td>
<td>39.28</td>
<td>5204</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fair/very poor</td>
<td>908</td>
<td>36.67</td>
</tr>
<tr>
<td>Number of chronic conditions&lt;sup&gt;a,d&lt;/sup&gt;</td>
<td>None</td>
<td>1772</td>
<td>36.12</td>
<td>4663</td>
</tr>
<tr>
<td></td>
<td>One or more</td>
<td>781</td>
<td>42.03</td>
<td>1768</td>
</tr>
<tr>
<td></td>
<td>Two or more</td>
<td>502</td>
<td>42.81</td>
<td>1112</td>
</tr>
<tr>
<td>Self-perceived risk of cancer&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>Very high/High</td>
<td>1346</td>
<td>44.95</td>
<td>2901</td>
</tr>
<tr>
<td></td>
<td>Low/very low</td>
<td>1139</td>
<td>36.67</td>
<td>2969</td>
</tr>
<tr>
<td>Recommendation from an HCW&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>Yes</td>
<td>1346</td>
<td>44.95</td>
<td>2901</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>1139</td>
<td>36.30</td>
<td>2969</td>
</tr>
<tr>
<td>Information about cancer&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>Yes</td>
<td>1530</td>
<td>39.39</td>
<td>3012</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>1522</td>
<td>31.40</td>
<td>4512</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3056</td>
<td>38.55</td>
<td>7543</td>
</tr>
</tbody>
</table>

<sup>a</sup>: Significant association for faecal occult blood (FOBT).
<sup>b</sup>: Significant association for mammography.
<sup>c</sup>: Significant association for cytology pap smears.
<sup>d</sup>: Significant association for prostate-specific antigen (PSA).

Table 2 Variables significantly and independently associated with awareness of screening tests. Spanish adult population included in the Oncobarometro Survey. Results of multivariate logistic regression model

<table>
<thead>
<tr>
<th>Screening test</th>
<th>FOBT</th>
<th>Mammography</th>
<th>Cytology/Pap smears</th>
<th>PSA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Sex</td>
<td>1.32 (1.18–1.47)</td>
<td>5.15 (3.54–6.88)</td>
<td>6.06 (5.30–6.93)</td>
<td>0.69 (0.63–0.77)</td>
</tr>
<tr>
<td>Age</td>
<td>1.43 (1.25–1.64)</td>
<td>1.27 (0.96–1.66)</td>
<td>1.23 (1.05–1.43)</td>
<td>1.97 (1.74–2.22)</td>
</tr>
<tr>
<td>Living with a partner</td>
<td>1.19 (1.03–1.37)</td>
<td>NS</td>
<td>1.45 (1.24–1.68)</td>
<td>1.39 (1.23–1.57)</td>
</tr>
<tr>
<td>Number of children</td>
<td>1.23 (1.05–1.45)</td>
<td>NS</td>
<td>1.52 (1.27–1.80)</td>
<td>1.16 (1.01–1.33)</td>
</tr>
<tr>
<td>Nationality</td>
<td>1.41 (1.16–1.71)</td>
<td>4.24 (3.12–5.78)</td>
<td>2.24 (1.83–2.75)</td>
<td>NS</td>
</tr>
<tr>
<td>Educational level</td>
<td>1.69 (1.47–1.95)</td>
<td>2.78 (1.99–3.90)</td>
<td>2.26 (1.94–2.63)</td>
<td>1.38 (1.21–1.56)</td>
</tr>
<tr>
<td>Social class</td>
<td>1.54 (1.27–1.87)</td>
<td>4.12 (1.96–8.67)</td>
<td>1.53 (1.21–1.93)</td>
<td>1.28 (1.07–1.53)</td>
</tr>
<tr>
<td>Self-perceived risk of cancer</td>
<td>1.21 (1.08–1.36)</td>
<td>1.10 (1.02–1.30)</td>
<td>1.27 (1.01–1.67)</td>
<td>1.22 (1.06–1.40)</td>
</tr>
<tr>
<td>Recommendation from an HCW</td>
<td>1.48 (1.31–1.67)</td>
<td>1.19 (1.05–1.35)</td>
<td>1.42 (1.22–1.66)</td>
<td>1.35 (1.20–1.51)</td>
</tr>
<tr>
<td>Information about cancer</td>
<td>1.61 (1.44–1.80)</td>
<td>2.7 (1.96–3.73)</td>
<td>1.93 (1.69–2.21)</td>
<td>1.8 (1.62–2.01)</td>
</tr>
</tbody>
</table>

NS: not significant; OR: odds ratio; 95% CI: 95% confidence interval.
probability of Pap smear uptake compared with those who only completed primary studies.

Finally, factors that increased the probability of PSA uptake included living with a partner, recommendation from an HCW and social class. Taking low social class as the reference, having a median social class increased uptake by 1.45 times and high social class by 2.29 times (95% CI: 1.17–2.03 and 1.60–3.29, respectively).

Discussion

Awareness of screening tests in the adult Spanish population is very high for mammography, acceptable for Pap smears among women (85.38%), very low for FOBT in both sexes (34.78% men and 42.07% women) and low for PSA, even among men aged >39 years (57.91%).

Other Spanish studies have found lower figures for mammography, with only 61.5% of women aged ≥50 years being able to mention mammography when asked about tests used to detect breast cancer.15 Our results are in line with those reported in Italy by Domati et al.,18 who found that almost 90% of the interviewed subjects were aware of preventive measures for breast cancer.

Awareness among Spanish women about cervical cancer is similar to that described in Italy and is higher than that of Estonian women.19,20 Our study is in agreement with Domati et al.’s findings on the presence of more knowledge among non-elderly women.19,20

Men in Spain seem to have low levels of awareness about possible prostate cancer prevention methods, with only slightly more than half of men knowing about the PSA test. In a survey undertaken in 2001 across six European countries and the USA, when asked to name tests to identify prostate cancer, half of all respondents stated they were unaware of any tests, and PSA was the most frequently mentioned test (by 25% of respondents).21

In Spain, the test people are least aware of is the FOBT (38.55%). Despite low awareness levels, our results are higher than those reported by Gimeno-Garcia et al.,17 who found that only 8% of the general population interviewed recognized any recommended CRC screening tests. A recent study conducted in 21 European

Table 3 Uptake of screening tests in the past 2 years among target populations according to study variables. Spanish adult population included in the Oncobarometro Survey

<table>
<thead>
<tr>
<th>Screening test</th>
<th>FOBT</th>
<th>Mammography</th>
<th>Cytology/Pap smears</th>
<th>PSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target population (age range)</td>
<td>Both sexes (50–69)</td>
<td>Women (40–69)</td>
<td>Women (25–64)</td>
<td>Men (50–74)</td>
</tr>
<tr>
<td>Variable</td>
<td>Categories</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Sex</td>
<td>Men</td>
<td>104</td>
<td>10.40</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>96</td>
<td>8.51</td>
<td>1397</td>
</tr>
<tr>
<td>Age-groups</td>
<td>Low</td>
<td>75</td>
<td>9.21</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>46</td>
<td>7.61</td>
<td>481</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>80</td>
<td>11.13</td>
<td>461</td>
</tr>
<tr>
<td>Living with a partner</td>
<td>Yes</td>
<td>160</td>
<td>9.78</td>
<td>1039</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>41</td>
<td>8.36</td>
<td>351</td>
</tr>
<tr>
<td>Number of children</td>
<td>One or more</td>
<td>177</td>
<td>9.54</td>
<td>1224</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>24</td>
<td>8.53</td>
<td>170</td>
</tr>
<tr>
<td>Nationality</td>
<td>Spanish born</td>
<td>194</td>
<td>9.59</td>
<td>1317</td>
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<tr>
<td></td>
<td>Immigrant</td>
<td>5</td>
<td>6.78</td>
<td>62</td>
</tr>
<tr>
<td>Educational level</td>
<td>Primary studies</td>
<td>114</td>
<td>8.37</td>
<td>802</td>
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<tr>
<td></td>
<td>Secondary studies</td>
<td>52</td>
<td>11.65</td>
<td>332</td>
</tr>
<tr>
<td></td>
<td>University</td>
<td>33</td>
<td>10.59</td>
<td>256</td>
</tr>
<tr>
<td>Social class</td>
<td>High</td>
<td>38</td>
<td>11.27</td>
<td>245</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>64</td>
<td>8.42</td>
<td>523</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>92</td>
<td>9.40</td>
<td>590</td>
</tr>
<tr>
<td>Self-rated health</td>
<td>Excellent/good</td>
<td>112</td>
<td>8.86</td>
<td>845</td>
</tr>
<tr>
<td></td>
<td>Fair/poor/very poor</td>
<td>89</td>
<td>10.31</td>
<td>547</td>
</tr>
<tr>
<td>Number of chronic conditions</td>
<td>None</td>
<td>82</td>
<td>7.54</td>
<td>744</td>
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<tr>
<td></td>
<td>One</td>
<td>66</td>
<td>10.35</td>
<td>398</td>
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<td></td>
<td>Two or more</td>
<td>52</td>
<td>12.85</td>
<td>255</td>
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<td>Self-perceived risk of cancer</td>
<td>Very high/high</td>
<td>99</td>
<td>11.57</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Low/very low</td>
<td>67</td>
<td>9.08</td>
<td>503</td>
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<tr>
<td>Recommendation from an HCW</td>
<td>Yes</td>
<td>85</td>
<td>13.32</td>
<td>521</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>115</td>
<td>7.88</td>
<td>860</td>
</tr>
<tr>
<td>Information about cancer</td>
<td>Yes</td>
<td>102</td>
<td>12.54</td>
<td>623</td>
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<td></td>
<td>No</td>
<td>99</td>
<td>7.50</td>
<td>770</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>9.40</td>
<td>1397</td>
<td>74.46</td>
</tr>
</tbody>
</table>

NR; not recommended; HCWs: healthcare workers.


b: Significant association for mammography.

c: Significant association for cytology.

d: Significant association for PSA.

e: Significant association for FOBT.
countries showed that awareness of CRC is low in Europe, as only 51% had knowledge of CRC screening.12

The predictors of higher awareness found in our study are in line with those reported in scientific literature.8,9,10,12,17–21

Lower awareness of screening tests among immigrants compared with the Spanish-born adult population is a relevant issue that has been described previously in Spain and elsewhere.8,9,11,19

Comprehensive health education campaigns can help increase participation in prevention programmes and must be strengthened in Spain, in particular among immigrants who are a vulnerable group.8,9,11,19

The uptake of recommended screening tests among target populations in Spain showed acceptable figures for mammography and Pap smears (74.46 and 65.57%, respectively) and very low figures for FOBT (9.4%).

Among Spanish women aged 50–69 years (target population), uptake of a mammography within the previous 2 years is well >80%. In Europe, notably in Sweden, the UK, The Netherlands and Italy, population screening participation rates vary between 55 and 90%.22,23 Lower figures are found in Greece, where only 25% of women aged between 40 and 69 years had received a mammography within the past 2 years.24 Recent Spanish studies using population surveys showed uptake rates of 83% in women aged 50–69 years in a national representative sample and 60.5% in urban women aged between 40 and 69 years.13,14

The proportion of Spanish women aged 25–64 years who reported having Pap smears in the previous 3 years was 65.57%. Results of the European Health Interview Survey for Spain showed an adherence rate for Pap smears in the previous 3 years of 66.1% (95% CI: 64.8–67.4) among the target population.25 Spain’s figures fall between those found in Northern European countries, England, Italy and Greece, which have figures ranging between 70 and 80%, and those found in Eastern European countries, which have lower figures.19,24,26

In our study population, only 9.4% of men and women aged 50–69 years had received an FOBT in the past 2 years. These low figures can be partially explained by the fact that only around 40% of the Spanish population live in a region with a population-based screening programme.5,6 However, even in regions where the screening programme exists, uptake is low, ranging from 5 to 22%.8 Participation rates found in other European programmes are much higher, e.g. 56.8% in the UK and 44.6% in Italy.27,28

In Spain, Gimeno-García et al.17 described that among 600 consecutively interviewed Spanish individuals aged >50 years, only 12% had ever undergone any CRC screening.

Screening for prostate cancer using PSA is not recommended in Spain. Despite this, in our sample, >46% of men aged 67–74 years had undergone a PSA test in the past 2 years. To our knowledge, this is the first report of PSA uptake in a nationwide representative sample in Spain, so comparison is not possible. Local studies conducted in primary care centres estimate that a high proportion (30–45%) of men >50 years receives this test every year.6,7

In our study population, age is associated with uptake of mammography, Pap smears and PSA. Our results are in agreement with previous studies conducted in Spain using surveys that found a lower uptake of breast and cervical cancer screening among older women in the target population.13,14,25 As has previously been described in our study, low awareness levels are the most probable reason for the low levels of mammography uptake we found.

Lower uptake of cervical screening among immigrant women is of concern, as many immigrant women come from developing countries where cervical cancer rates are high.11

### Table 4

<table>
<thead>
<tr>
<th>Screening test</th>
<th>FOBT</th>
<th>Mammography</th>
<th>Cytology/Pap smears</th>
<th>PSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Categories</td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Target population (age range)</td>
<td>Both sexes (50–69)</td>
<td>Women (40–69)</td>
<td>Women (25–64)</td>
<td>Men (50–74)</td>
</tr>
<tr>
<td>Age-groupsa</td>
<td>Low</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>NS</td>
<td>3.26 (2.44–4.35)</td>
<td>1.53 (1.20–1.94)</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>NS</td>
<td>2.79 (2.10–3.70)</td>
<td>1.46 (1.19–1.79)</td>
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<td>Living with a partner</td>
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<td>1</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>NS</td>
<td>1.32 (1.03–1.69)</td>
<td>NS</td>
</tr>
<tr>
<td>Number of children</td>
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<td>1</td>
<td>NS</td>
<td>1.30 (1.06–1.61)</td>
</tr>
<tr>
<td></td>
<td>One or more</td>
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<td>1</td>
</tr>
<tr>
<td>Nationality</td>
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<td>NS</td>
<td>1.75 (1.11–2.74)</td>
</tr>
<tr>
<td></td>
<td>Spanish born</td>
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<td>1.51 (1.07–2.15)</td>
<td>1.62 (1.32–1.99)</td>
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<tr>
<td></td>
<td>University</td>
<td>1.49 (1.01–2.23)</td>
<td>NS</td>
<td>2.03 (1.60–2.58)</td>
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<td>1</td>
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<tr>
<td></td>
<td>Median</td>
<td>NS</td>
<td>1.48 (1.06–2.08)</td>
<td>1.33 (1.01–1.75)</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>NS</td>
<td>1.75 (1.22–2.52)</td>
<td>1.30 (0.93–1.81)</td>
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<td>Number of chronic conditions</td>
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<tr>
<td></td>
<td>One</td>
<td>1.55 (1.15–2.09)</td>
<td>1.89 (1.47–2.43)</td>
<td>1.40 (1.15–1.69)</td>
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<td></td>
<td>Two or more</td>
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<tr>
<td>Recommendation from an HCW</td>
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<tr>
<td></td>
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<td>1.48 (1.06–2.08)</td>
<td>1.33 (1.01–1.75)</td>
<td>1.32 (1.06–1.64)</td>
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<tr>
<td>Information about cancer</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
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<td>1.55 (1.15–2.09)</td>
<td>1.89 (1.47–2.43)</td>
<td>1.40 (1.15–1.69)</td>
</tr>
</tbody>
</table>

OR: odds ratio; 95% CI: 95% confidence interval; NS: not significant.

We agree with other authors’ findings on the relationship between education levels and test uptake. We found that increasing levels of education had higher ORs for FOBT and Pap smear uptake. High social class was a positive predictor of PSA uptake in our population. Increased use of private medical services among men in the higher social class may explain this association.

In our population, the impact of co-morbid conditions on all screening tests analyzed was consistent, and we found that uptake increased as the number of co-morbid conditions increased. Several studies conducted in Spain and elsewhere also find this association.13,14,29–31

As expected, subjects interviewed who had received a recommendation from a health professional about cancer prevention had a higher probability of having any of the screening tests analyzed. Several studies reach the same conclusion; in a recent review, it was found that a lack of physician recommendation for CRC screening was the most consistently reported provider-related barrier in older persons.10,17

The low uptake of FOBT and the high uptake of a non-recommended test (PSA) found in our study suggest the need for possible interventions. The low uptake of FOBT may reflect the inability of the healthcare system to increase awareness of the benefits of adopting preventive behaviour among target populations. As has been previously mentioned, this underlines the need to develop programmes aiming to inform and motivate men and women to use screening services on a regular basis. A further issue affecting participant screening compliance is provider motivation. Possible interventions targeted at providers include provider audit and feedback, incentives and reminders.4,5,10,11,22

The strengths of our study lie in its use of data from a survey covering a large nationwide representative sample of the Spanish population and our ability to control for a broad range of important covariates.

However, there are a number of study limitations. First, screening test use was measured by self-reported data. Therefore, we are unable to adequately distinguish screening from diagnostic tests or tests that people had for reasons other than screening. However, in a recent meta-analysis, self-reported information was demonstrated to have good levels of agreement with medical records for mammography, Pap smears and FOBT.32,33 Second, results from survey data may be affected by non-response bias or the tendency of interviewees to give socially desirable responses. Furthermore, individuals who are better educated, more health conscious and who tend to use screening tests more often may be over-represented in the study. Third, awareness of any preventive practice results is difficult to compare, as the type and number of questions used to collect this information are frequently different. Fourth, use of a cross-sectional survey means causality cannot be inferred, as ‘reverse causality’ must be considered. Finally, information on the type of health care insurance (private or public) is not collected by the OS and could affect the results if it is associated with screening practices.

We conclude that awareness about screening tests in the Spanish adult population is adequate for mammography, improvable for cytology and very low for FOBT in both sexes. Results are similar for uptake data, with acceptable figures for mammography, moderate for Pap smear and unacceptably low for FOBT. Certain factors such as immigration status, lower educational level and not suffering from chronic conditions act as barriers to participation in screening programmes, so an effort must be made to target specific populations. Recommendation from a health professional about cancer prevention strongly increases screening uptake. Our data suggest that although PSA is not recommended, this opportunistic screening is frequently used in Spain.

Conflicts of interest: None declared.

Key points

- To our knowledge, this is the first report of awareness and uptake of four cancer screening tests in a nationwide representative sample in Spain.
- Awareness and uptake results showed acceptable figures for mammography, moderate for Pap smears and unacceptably low for FOBT.
- Our data suggest that although PSA is not recommended, this opportunistic screening is frequently used in Spain.
- Factors such as immigration status, lower educational level or income and not suffering from chronic conditions are negative predictors for uptake.
- These results underline the need to develop public health educational programmes to reduce inequalities and improve the use of cancer screening services in Spain.

References


Widening educational differences in cancer survival in Norway

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Background: All-cause and cause-specific mortality have long been known to be associated with various indicators of socio-economic status, and social gradients have been shown also for cancer survival. In recent decades, several studies have reported increasing social differentials in mortality rates. This study aims to investigate the development with respect to cancer survival, which has not been done before. Methods: Discrete-time hazard regression models for cancer deaths among women and men diagnosed with cancer 1970–2007 at age 30–89 were estimated, using register data encompassing the entire Norwegian population. The analysis was based on >200 000 cancer deaths during over 2 million person-years of exposure among >440 000 individuals diagnosed with cancer. Results: There has been an increasing advantage for women of all educational categories when compared with those with only compulsory schooling. No such widening of the educational gap has appeared with respect to cancer survival among men. Conclusions: Increasing educational differentials in health at the time of diagnosis, health behaviour and cancer treatment seem plausible, and would to some extent accord with the increasing social gaps in all-cause or cause-specific mortality rates that have been reported in other studies. Also, it is not impossible that such trends in the educational gradients in health and treatment are stronger for women than for men, though such sex differences have not been indicated in mortality studies. There is no obvious explanation for the complete absence of change in the education effects among men.

Introduction

It has long been recognized that higher socio-economic status, whether measured as educational level, income or occupation, is associated with lower all-cause mortality. Furthermore, mortality from many specific causes follows the same pattern. In recent decades, it has been shown that cancer survival is influenced by socio-economic status as well: among cancer patients, the chance of dying (from cancer) is, for example, highest for the less educated.

In many countries, the socio-economic differences in mortality seem to have increased during the past decades. Such a