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# Participation in cancer screening programmes

## Results of the German Health Interview and Examination Survey for Adults (DEGS1)

### Background and purpose

Cancer is responsible for a great proportion of mortality and disease burden in the population. In 2010, cancer accounted for 26.2% of all cases of death in Germany, making it the second most common cause of death (after cardiovascular diseases at 41.1%) [1]. As cancer is increasingly common later in life, demographic changes mean that certain types of cancer increase with the growing proportion of the elderly [2]. On the other hand, cancer mortality rates (age-standardised death rates) are decreasing overall, and the chances of survival for cancer patients have significantly improved in recent decades. This is largely due to the progress made in cancer therapy but also to the early detection of cancer [3]. The aim of cancer screening tests is to detect the disease at the earliest possible stage. This permits early commencement of a suitable therapy and hence gentle treatment with a better chance of success. Screening tests for common types of cancer have been offered as part of statutory health insurance for over 30 years. The cancer screening services target age- and sex-specific groups in which the relevant types of cancer are more prevalent. Statutory health insurance currently covers screening for cervical cancer, breast cancer, prostate cancer, colon cancer and skin cancer [4].

The World Health Organization (WHO) has defined criteria and guidelines for screening tests [5]. Based on these criteria, statutory health insurance on-

ly covers screening tests if effective treatment for the relevant type of cancer exists and if it can be unequivocally diagnosed in the development or early disease stage by means of diagnostic measures. Furthermore, sufficient physicians and facilities must be available to secure the diagnosis and carry out the treatment [6].

From population-related surveys and the payment data of health insurers, it is known that a growing number of people in Germany are not only aware of the existing cancer screening services but also participate in them. However, it is still the case that only part of the population is reached. Age, sex, the level of education/socioeconomic status, partnership, children, health condition and utilisation of GP health care services [7, 8, 9, 10] are seen as determinants that can influence the extent to which screening programmes are used. For the success of cancer screening programmes—in terms of reducing the disease burden and mortality at the population level—awareness, acceptance and willingness to undergo cancer screening tests are decisive factors within the various target groups.

The aim of the current analysis is to provide an overview of the awareness, knowledge and participation in cancer screening programs within the German population and to discuss possible influencing factors. For this purpose, data from the first wave of the "German Health Interview and Examination Survey for Adults" (DEGS1) conducted by the Robert Koch Institute (RKI) were analysed. The

focus was on the types of cancer screening that are offered to men and women by statutory health insurance.

### Methods

The "German Health Interview and Examination Survey for Adults" (DEGS) is part of the health monitoring system at the Robert Koch Institute (RKI). The concept and design of DEGS have been described in detail elsewhere [11, 12, 13, 14, 15]. The first wave (DEGS1) was conducted between 2008 and 2011 and comprised interviews, examinations and tests [16, 17]. The target population comprises the residents of Germany aged 18–79 years. DEGS1 has a mixed design that permits both cross-sectional and longitudinal analyses. For this purpose, a random sample from local population registries was drawn to complete the participants of the "German National Health Interview and Examination Survey 1998" (GNHIES98) who re-participated. A total of 8,152 persons participated, including 4,193 first-time participants (response rate 42%) and 3,959 revisiting participants of GNHIES98 (response rate 62%). In all, 7,238 persons attended one of the 180 examination centres, and 914 were interviewed only. The net sample ( $n=7,988$ ) permits representative cross-sectional analyses and time trend analyses to be performed for the age range of 18–79 years in comparison with GNHIES98 ( $n=7,124$ ) [15]. The data of the revisiting participants can be used for longitudinal analyses.

**Tab. 1** Cancer screening tests offered by statutory health insurance and covered by DEGS1. (Joint Federal Committee [4])

Goal of cancer screening	Type of examination	Target group	Age	Examination interval
Early detection of skin cancer	Whole-body skin examination	Women, men	From 35 years	Every 2 years
Early detection of colon cancer	Stool examination (rapid test for occult, i.e. hidden, blood in the stool)	Women, men	From 50 to 54 years	Annually
	Colonoscopy	Women, men	From 55 years	Two colonoscopies at an interval of 10 years
Early detection of cervical cancer	Cervical smear test	Women	From 20 years	Annually
Early detection of breast cancer	Breast palpation	Women	From 30 years	Annually
	Mammography as part of the national mammography screening programme	Women	From 50 to 69 years	Every 2 years
Early detection of prostate cancer	Prostate palpation (digital rectal examination)	Men	From 45 years	Annually

**Tab. 2** Awareness of the recommendations of statutory health insurance regarding participation in cancer screening, categorised by sex, age groups and socioeconomic status (proportion in percent with 95% confidence intervals)

Sex	Socio-economic status	Age group in years						
		18–29	30–39	40–49	50–59	60–69	70–79	Total
Women	<b>Total</b>	<b>74.0 (69.8–77.9)</b>	<b>78.8 (73.8–83.0)</b>	<b>91.0 (87.4–93.6)</b>	<b>96.8 (95.2–97.9)</b>	<b>98.0 (96.3–98.9)</b>	<b>93.6 (90.3–95.8)</b>	<b>88.5 (87.0–89.9)</b>
	Low	61.2 (50.8–70.7)	51.7 (34.2–68.7)	76.4 (62.4–86.4)	91.6 (83.9–95.8)	96.6 (91.8–98.6)	88.2 (81.5–92.7)	78.8 (74.3–82.8)
	Medium	76.6 (71.2–81.3)	82.1 (75.9–86.9)	94.6 (91.4–96.7)	98.3 (96.6–99.1)	98.3 (96.4–99.2)	96.1 (92.4–98.1)	91.0 (89.4–92.4)
	High	84.0 (70.6–91.9)	89.3 (83.3–93.3)	92.7 (86.4–96.2)	97.3 (93.3–98.9)	98.4 (91.9–99.7)	100 (100.0–100.0)	92.7 (89.9–94.8)
Men	<b>Total</b>	<b>45.2 (40.5–50.0)</b>	<b>62.4 (56.2–68.1)</b>	<b>79.5 (74.5–83.7)</b>	<b>91.2 (88.2–93.4)</b>	<b>92.9 (90.4–94.8)</b>	<b>92.3 (89.6–94.4)</b>	<b>75.7 (73.6–77.8)</b>
	Low	40.0 (29.0–52.1)	40.2 (26.8–55.3)	65.8 (51.6–77.6)	84.4 (75.8–90.4)	91.9 (85.1–95.8)	88.7 (78.6–94.4)	66.7 (61.6–71.5)
	Medium	43.6 (38.1–49.3)	64.7 (56.4–72.1)	82.4 (76.2–87.3)	92.1 (88.2–94.8)	91.6 (87.6–94.4)	92.8 (89.0–95.1)	75.8 (72.9–78.5)
	High	59.5 (45.5–72.1)	75.7 (66.3–83.2)	83.4 (75.5–89.1)	94.2 (89.5–96.9)	96.5 (93.2–98.2)	96.8 (92.5–98.6)	84.3 (80.8–87.3)
<b>Total</b>	<b>59.2 (55.8–62.5)</b>	<b>70.5 (66.2–74.5)</b>	<b>85.1 (81.6–88.0)</b>	<b>94.0 (92.4–95.3)</b>	<b>95.5 (94.0–96.6)</b>	<b>93.0 (91.0–94.7)</b>	<b>82.2 (80.7–83.5)</b>	

n<sub>unweighted</sub> = 6,839

The cross-sectional and trend analyses are carried out with a weighting factor that corrects deviations in the sample from the population structure (as of 31 December 2010) with regard to age, sex, region and nationality, as well as community type and education [15]. A separate weighting factor was prepared for the examination part. Calculation of the weighting factor also considered the re-participation probability of the GNHIES98 participants, based on a logistic regression model. For the purpose of conducting trend analyses, the data from GNHIES98 were age-adjusted to the population level as of 31 December 2010. A non-response analysis and a comparison of selected indicators with data from census statistics indicate a high level of representativity of the net sample in the resident population of Germany aged 18–79 years [15].

To take into account both the weighting as well as the correlation of the participants within a community, the confidence

intervals were determined with SPSS-20 procedures for complex samples. Differences were regarded as statistically significant if the respective 95% confidence intervals did not overlap.

For the analyses of participation in cancer screening, information from the computer-assisted personal interview (CAPI) was used (n=7,988). In this interview, participants were asked whether they are aware that participation in cancer screening is recommended by health insurers and whether they regularly undergo such screening. They were then asked whether they had ever undergone screening for cancer in specific locations. If the answer was yes, participants were asked when the last screening test had taken place. Participants had a choice of five possible answers: time periods from “within the last 12 months” to “more than 10 years ago”. With these answer categories, it was possible to assess whether the last specific cancer screening test was conducted within the recommend-

ed examination interval. This aspect is the focus of the analysis presented here. The information on participation in the various cancer screening tests (presented in **Tab. 1**) was collected in DEGS1 and subsequently analysed.

Additionally, in DEGS1, men from the age of 45 years were asked whether they had undergone a so-called PSA test within the specified time periods. This test to determine the prostate-specific antigen (PSA) is not included in the services offered by statutory health insurance for the early detection of prostate cancer, since there is still international controversy surrounding the test [18].

The descriptive analyses are limited in each case to the various age- and sex-specific groups of participants. This results in different sample sizes for the individual questions. Additionally, the associations between the variables age, sex and socioeconomic status (SES) were investigated. SES was determined using an index that includes information on school education

and vocational training, professional status and net household income (weighted by household needs) and which enables a classification into low-, medium- and high-status groups [19].

## Results

### Awareness of the recommendations of statutory health insurers to participate in cancer screening

In all, 88.5% of women and 75.7% of men interviewed were aware of the recommendations of statutory health insurers regarding participation in cancer screening programmes. The percentage of women and men who are aware of these recommendations increased with age (up to 69 years). Younger women and men in particular are not aware of the screening services offered. A social gradient was noted in the level of awareness in women of the age groups up to 59 years. The proportion of women who are aware of these recommendations is significantly lower for women with low SES than it is for those with medium or high SES (■ Tab. 2).

### Regularity of participation in cancer screening

According to the survey, 67.2% of women (from the age of 20 years) and 40.0% of men (from the age of 35 years) regularly participate in cancer screening (■ Tab. 3). Another 16.2% of women and 19.2% of men also undergo cancer screening tests but only irregularly (data not shown). Among men, the proportion of regular participants increases with age (up to 69 years). For women, the proportion of regular participants increases up to the age of 59 years and peaks between 50 and 69 years. In this age group, over three quarters of women indicated that they participate regularly in cancer screening. It should be noted that this age group is also the target group of the national mammography screening programme, i.e. women who are invited for cancer screening regularly every 2 years. With the exception of 50- to 69-year-old women, the proportion of

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### Participation in cancer screening programmes. Results of the German Health Interview and Examination Survey for Adults (DEGS1)

#### Abstract

A growing number of people in Germany participate in the cancer screening services offered by statutory health insurance. Using data from the first wave of the German Health Interview and Examination Survey for Adults (DEGS1), current levels of participation in cancer screening services were determined. DEGS1 (2008–2011) permits representative cross-sectional analyses to be performed. In DEGS1, persons who were entitled to different cancer screening services were interviewed on their awareness, participation and regular utilisation of cancer screening for different types of cancer. Overall, 67.2% of women and 40.0% of men participate regularly. Participation rates fluctuate to a great extent for individual types of cancer screening. Women participate in cancer screening

more frequently than men do. For women, a better socioeconomic status was associated with higher participation rates. Participation rates improve with increasing age, meaning that the difference in participation rates between women and men becomes smaller. The current analyses present information on specifically targeted population groups to promote informed decision-making about cancer screening, so that participation rates can be improved further. The analyses thus provide an important basis for health policy measures.

#### Keywords

Health survey · Cancer screening · Colon cancer · Breast cancer · Prostate cancer

### Inanspruchnahme von Krebsfrüherkennungsuntersuchungen. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1)

#### Zusammenfassung

Eine wachsende Zahl von Menschen in Deutschland nimmt die von der Gesetzlichen Krankenversicherung angebotenen Krebsfrüherkennungsuntersuchungen (KFU) in Anspruch. Mit Daten der ersten Erhebungswelle der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1) wurden aktuelle Inanspruchnahmeraten ermittelt. DEGS1 ist ein bundesweiter Befragungs- und Untersuchungssurvey (2008–2011), der repräsentative Querschnittsanalysen dazu ermöglicht. In DEGS1 wurden die jeweils anspruchsberechtigten Personen zur Kenntnis, Regelmäßigkeit sowie zur turnusmäßigen Inanspruchnahme von KFU für einzelne Krebsarten befragt. Regelmäßig gehen insgesamt etwa 67,2% der Frauen und 40,0% der Männer zur KFU. Bei den einzelnen Unter-

suchungen schwanken die Teilnahmeraten stark. Frauen nehmen an vielen KFU häufiger teil als Männer, und eine bessere sozioökonomische Lage war bei ihnen mit höheren Teilnahmeraten assoziiert. Im Alter verbessern sich die Teilnahmeraten und nähern sich zwischen den Geschlechtern an. Die Auswertungen geben Hinweise auf Bevölkerungsgruppen, die gezielt angesprochen und darin unterstützt werden sollten, eine informierte Entscheidung zur KFU zu treffen, um die Teilnahmeraten weiter zu erhöhen. Sie stellen damit eine wichtige Grundlage für gesundheitspolitische Maßnahmen dar.

#### Schlüsselwörter

Gesundheitssurvey · Krebsfrüherkennung · Darmkrebs · Brustkrebs · Prostatakrebs

those who regularly participate in cancer screening is significantly higher for women with a high SES than for women with a low SES. For men, participation in cancer screening does not show any social gradient.

### Participation in special cancer screening tests

#### Early detection of skin cancer

In all, 25.8% of women and 22.9% of men aged 35 years and older underwent a whole-body examination of their skin for skin cancer screening within the 2 years before the interview (■ Tab. 4). For men,

**Tab. 3** Regular participation in cancer screening tests, categorised by sex, age groups and socioeconomic status (proportion in percent with 95% confidence intervals)

Sex	Socioeconomic status	Age groups in years							Total
		20–29	30–34	35–39	40–49	50–59	60–69	70–79	
Women	Total	50.0 (44.5–55.6)	65.8 (57.4–73.3)	71.8 (64.4–78.0)	73.5 (69.4–77.1)	76.3 (72.8–79.5)	76.0 (72.2–79.5)	53.2 (48.1–58.2)	67.2 (65.3–69.0)
	Low	37.8 (26.2–51.0)	38.2 (17.0–65.0)	44.6 (23.6–67.7)	52.1 (39.8–64.1)	68.4 (56.1–78.6)	66.2 (55.2–75.7)	41.9 (32.6–51.8)	51.0 (46.4–55.6)
	Medium	49.5 (42.7–56.3)	66.0 (54.8–75.7)	73.2 (65.1–79.9)	75.6 (70.7–79.9)	77.7 (73.1–81.6)	80.5 (76.5–83.9)	58.5 (52.6–64.2)	69.9 (67.4–71.6)
	High	67.7 (54.5–78.6)	85.2 (74.4–91.9)	85.5 (75.7–92.2)	86.5 (79.9–91.1)	79.9 (72.0–86.0)	73.4 (63.7–81.3)	67.3 (53.4–78.6)	79.4 (76.0–82.4)
Men	Total	–	–	10.1 (6.2–16.0)	24.0 (20.3–28.1)	46.9 (42.4–51.4)	58.5 (54.0–62.9)	57.2 (52.1–62.2)	40.0 (37.5–42.5)
	Low	–	–	5.3 (0.7–29.9)	14.9 (9.0–23.7)	37.7 (27.5–49.2)	49.6 (37.9–61.3)	50.0 (38.0–61.9)	33.3 (27.8–39.4)
	Medium	–	–	9.4 (5.0–16.8)	25.6 (20.4–31.5)	48.4 (42.5–54.4)	59.7 (53.1–66.0)	58.5 (51.5–65.1)	41.6 (38.5–44.8)
	High	–	–	14.2 (7.7–24.7)	25.8 (20.0–32.6)	51.8 (43.2–60.4)	63.1 (55.2–70.4)	67.2 (57.5–75.6)	42.3 (38.3–46.4)
Total	50.0 (44.5–55.6)	65.8 (57.4–73.3)	40.4 (35.3–45.8)	48.3 (45.2–51.4)	61.6 (58.6–64.5)	67.4 (64.4–70.4)	55.0 (51.2–58.7)	55.5 (53.8–57.2)	

n<sub>unweighted</sub> = 4,137

the proportion increases with age. Among women, there are hardly any differences with regard to age groups. The sex difference in the elderly is remarkable: The proportion of 60–69- and 70–79-year-old women who used the early detection of skin cancer is lower than for men. There is no social gradient for screening participation.

### Early detection of colon cancer

In all, 45.4% of women and 24.8% of men aged between 50 and 54 years received a test strip for detecting blood in the stool (haemocult test) for the purpose of early detection of colon cancer (■ **Tab. 4**) during the last 12 months before the interview. The majority of interviewed women and men stated that they submitted this test strip with the required stool samples for examination (84.8%). There is no significant influence of the SES on testing behaviour either for men or for women in this age group.

From the age of 55 years, the haemocult test is recommended at an interval of 2 years for those who do not wish an early-detection colonoscopy offered from that age. Overall, 54.2% of women and 51.6% of men aged 55 years and older indicated that they received the test

within the 2 years preceding the interview (■ **Tab. 4**). Almost all of them subsequently submitted the test strip for examination (96.0%). Among women, there is an influence of age on the frequency of participation: with increasing age, fewer women participate. When stratified by age groups, there is no social gradient in participation for both women and men.

From the age of 55 years, policyholders are entitled to preventive colonoscopies. In case of normal results, they are entitled to a repeat colonoscopy after 10 years. Colonoscopies are carried out both as part of cancer screening tests (early-detection colonoscopy) and also to clarify concrete cases of suspected disease or as part of aftercare services. However, DEGS1 did not ask why the last colonoscopy was undertaken. This means that whereas the DEGS1 data can be used to describe overall the degree to which people make use of colonoscopies for the target group of those aged 55 years and over, this is not the case for the subset of early-detection colonoscopies. More than half of women (55.4%) and men (54.1%) eligible for the service had a colonoscopy within the last 10 years (see ■ **Tab. 4**). Women and men aged between 55 and 59 years had at least one colonoscopy (women 47.2%,

men 44.9%). One possible reason is that they had just reached the age of eligibility. There is no clear gradient with regard to SES.

### Early detection of cervical cancer

Every second woman from the age of 20 years (52.8%) had a cervical smear test for early detection of cervical cancer within the 12 months preceding the interview. Women aged between 40 and 49 years had the highest participation rate (60.7%), whereas the lowest rate was found among women aged 70 years and older (35.5%; ■ **Tab. 5**). A significant influence of the SES is present: 30- to 59-year-old women with a low SES show lower participation rates in cancer screening (within the 12 months prior to the interview) than women with a high SES.

### Early detection of breast cancer

Almost two thirds of women from the age of 30 years (62.1%) reported that they had undergone a clinical breast examination in the 12 months before the interview. The highest participation rates were observed for women in the age groups of 40–49 and 50–59 years (69.9% and 69.1%, respectively), the lowest for women aged 70 years and older (44.9%; ■ **Tab. 5**). SES

**Tab. 4** Regular participation in cancer screening tests intended for women and men, categorised by sex, age groups and socioeconomic status (proportion in percent with 95% confidence intervals)

Sex	Socioeconomic status	Age group in years	35-39	40-49	50-54	55-59	60-69	70-79	Total
<b>Whole-body skin examination from 35 years: within the last 2 years</b> n <sub>unweighted</sub> = 1,667	<b>Total</b>	<b>Women</b>	23.3 (17.8-29.9)	27.8 (24.2-31.7)	26.4 (22.9-30.2)	26.4 (22.9-30.2)	26.5 (22.6-30.8)	22.5 (18.6-26.9)	25.8 (23.8-27.8)
	Low		6.4 (2.0-19.2)	18.6 (10.4-31.0)	21.9 (14.5-31.7)	21.9 (14.5-31.7)	21.9 (13.8-33.1)	18.9 (12.4-27.8)	19.7 (15.5-24.7)
	Medium		11.7 (7.9-16.9)	25.8 (21.6-30.6)	25.6 (21.8-29.8)	25.6 (21.8-29.8)	28.1 (23.4-33.4)	22.7 (18.2-27.9)	25.2 (23.0-27.6)
	High		16.8 (11.1-24.8)	42.9 (35.0-51.2)	33.6 (26.7-41.2)	33.6 (26.7-41.2)	27.6 (19.6-37.4)	40.8 (27.6-55.5)	36.7 (32.2-41.4)
	<b>Total</b>	<b>Men</b>	12.6 (8.9-17.6)	19.6 (16.1-23.6)	23.0 (19.7-26.6)	23.0 (19.7-26.6)	29.0 (25.0-33.4)	28.8 (24.1-34.0)	22.9 (20.9-25.1)
	Low		2.5 (0.3-16.4)	12.4 (6.6-22.0)	17.9 (11.0-27.8)	17.9 (11.0-27.8)	23.4 (14.3-35.8)	19.4 (11.8-30.8)	16.4 (12.6-21.1)
	Medium		14.1 (9.0-21.6)	22.3 (16.9-28.8)	22.8 (18.5-27.8)	22.8 (18.5-27.8)	26.4 (21.7-31.7)	28.8 (23.0-35.3)	23.4 (20.7-26.4)
	High		13.9 (7.9-23.2)	19.1 (14.2-25.2)	28.4 (21.7-36.2)	28.4 (21.7-36.2)	38.8 (31.3-46.9)	43.7 (33.5-54.4)	27.2 (23.6-31.1)
	<b>Total</b>		17.9 (14.3-22.1)	23.6 (21.0-26.5)	24.7 (22.1-27.4)	24.7 (22.1-27.4)	27.7 (24.8-30.8)	25.3 (22.0-28.9)	24.4 (22.8-26.0)
	<b>Haemoccult test<sup>a</sup> from 50 to 54 years: within the last 12 months</b> n <sub>unweighted</sub> = 307	<b>Total</b>	<b>Women</b>	45.4 (40.3-50.7)	62.5 (56.5-68.3)	54.8 (50.2-59.3)	62.5 (56.5-68.3)	54.8 (50.2-59.3)	48.6 (43.0-54.2)
Low			44.0 (29.9-59.1)	55.8 (39.4-71.1)	40.5 (30.7-51.1)	55.8 (39.4-71.1)	40.5 (30.7-51.1)	43.5 (33.9-53.7)	44.3 (37.5-51.4)
Medium			43.5 (36.9-50.3)	61.4 (53.5-68.8)	59.3 (53.5-64.9)	61.4 (53.5-68.8)	59.3 (53.5-64.9)	53.3 (46.6-59.9)	57.7 (53.7-61.6)
High			53.7 (43.0-64.0)	69.3 (56.6-79.6)	60.0 (50.0-69.3)	69.3 (56.6-79.6)	60.0 (50.0-69.3)	41.5 (29.9-54.2)	59.2 (52.4-65.7)
<b>Total</b>		<b>Men</b>	24.8 (20.2-30.1)	50.3 (44.4-56.3)	48.3 (43.6-53.1)	50.3 (44.4-56.3)	48.3 (43.6-53.1)	56.6 (50.8-62.0)	51.6 (48.4-54.9) <sup>a</sup>
Low			17.8 (9.6-30.6)	44.1 (29.8-59.5)	43.4 (31.5-56.1)	44.1 (29.8-59.5)	43.4 (31.5-56.1)	48.6 (37.0-60.5)	45.6 (37.7-53.7)
Medium			25.4 (19.2-32.7)	52.5 (43.2-61.7)	48.8 (42.2-55.5)	52.5 (43.2-61.7)	48.8 (42.2-55.5)	58.2 (51.2-65.0)	53.1 (48.6-57.5)
High			30.5 (19.9-43.6)	51.6 (39.4-63.7)	50.3 (42.5-58.1)	51.6 (39.4-63.7)	50.3 (42.5-58.1)	64.6 (55.0-73.1)	54.3 (48.8-59.7)
<b>Total</b>			35.0 (31.3-38.8)	56.5 (52.0-61.0)	51.7 (48.4-54.9)	56.5 (52.0-61.0)	51.7 (48.4-54.9)	52.2 (47.8-56.5)	53.0 (50.5-55.5) <sup>a</sup>
<b>Colonoscopy from 55 years: within the last 10 years</b> n <sub>unweighted</sub> = 1,889		<b>Total</b>	<b>Women</b>	47.2 (41.3-53.1)	58.3 (53.8-62.6)	57.5 (52.7-62.2)	47.2 (41.3-53.1)	58.3 (53.8-62.6)	57.5 (52.7-62.2)
	Low		38.2 (24.1-54.6)	51.7 (40.9-62.4)	45.6 (36.2-55.3)	38.2 (24.1-54.6)	51.7 (40.9-62.4)	45.6 (36.2-55.3)	46.6 (39.9-53.5)
	Medium		50.1 (42.7-57.5)	60.2 (54.9-65.3)	63.5 (57.5-69.2)	50.1 (42.7-57.5)	60.2 (54.9-65.3)	63.5 (57.5-69.2)	59.0 (55.7-62.3)
	High		42.4 (31.2-54.4)	61.4 (51.8-70.2)	70.8 (58.7-80.5)	42.4 (31.2-54.4)	61.4 (51.8-70.2)	70.8 (58.7-80.5)	56.6 (50.3-62.8)
	<b>Total</b>	<b>Men</b>	44.9 (38.7-51.3)	58.5 (53.4-63.5)	55.4 (49.7-60.9)	44.9 (38.7-51.3)	58.5 (53.4-63.5)	55.4 (49.7-60.9)	54.1 (50.8-57.3)
	Low		39.1 (26.3-53.6)	55.5 (42.2-68.1)	55.4 (42.8-67.2)	39.1 (26.3-53.6)	55.5 (42.2-68.1)	55.4 (42.8-67.2)	51.6 (43.9-59.2)
	Medium		45.7 (36.4-55.2)	58.1 (51.6-64.4)	52.2 (44.6-59.6)	45.7 (36.4-55.2)	58.1 (51.6-64.4)	52.2 (44.6-59.6)	53.1 (48.7-57.4)
	High		47.4 (36.4-58.7)	61.0 (52.4-69.0)	68.7 (58.7-77.2)	47.4 (36.4-58.7)	61.0 (52.4-69.0)	68.7 (58.7-77.2)	58.8 (52.9-64.5)
	<b>Total</b>		46.1 (41.4-50.8)	58.4 (55.0-61.7)	56.6 (52.9-60.2)	46.1 (41.4-50.8)	58.4 (55.0-61.7)	56.6 (52.9-60.2)	54.8 (52.5-57.0)

<sup>a</sup>For the haemoccult test, the information given in the "Total" column refers to participants aged between 55 and 79 years

**Tab. 5** Regular participation in cancer screening tests intended for women, categorised by age groups and socioeconomic status (proportion in percent with 95% confidence intervals)

Socioeconomic status	Age group in years						Total
	20–29	30–39	40–49	50–59	60–69	70–79	
<b>Cervical smear from 20 years:</b>							
<b>Total</b>	52.3 (46.9–57.6)	59.3 (54.4–64.1)	60.7 (56.3–64.9)	54.8 (50.9–58.6)	49.6 (44.9–54.4)	35.5 (30.8–40.4)	52.8 (51.0–54.6)
Low	43.5 (31.2–56.7)	35.9 (20.8–54.5)	40.2 (28.9–52.6)	35.2 (25.7–46.0)	38.8 (29.9–49.4)	29.4 (21.2–39.1)	36.6 (32.4–41.1)
Medium	50.7 (43.7–57.6)	60.3 (53.6–66.6)	62.0 (56.7–66.9)	55.5 (50.6–60.3)	52.1 (46.6–57.5)	37.4 (31.6–43.6)	53.9 (51.8–56.1)
High	67.9 (54.4–79.0)	73.6 (65.0–80.8)	73.7 (65.9–80.3)	67.7 (60.3–74.3)	57.9 (48.3–66.9)	50.7 (37.5–63.9)	68.3 (64.3–72.0)
<b>Breast palpation from 30 years:</b>							
<b>Total</b>	–	58.9 (54.0–63.6)	69.9 (65.7–73.8)	69.1 (65.3–72.6)	62.2 (57.6–66.5)	44.9 (40.0–49.9)	62.1 (60.2–64.1)
Low	–	32.1 (18.2–50.0)	49.9 (37.8–62.1)	55.0 (44.4–65.1)	49.8 (38.9–60.7)	32.9 (24.4–42.7)	43.7 (39.2–48.4)
Medium	–	60.8 (54.1–67.1)	72.1 (66.8–76.8)	70.9 (66.2–75.2)	66.0 (60.6–71.0)	50.7 (44.3–57.1)	65.3 (62.8–67.8)
High	–	72.3 (63.1–79.9)	79.2 (72.0–84.9)	75.2 (68.3–81.1)	67.5 (57.9–75.8)	59.0 (44.9–71.7)	73.4 (69.5–77.0)
<b>Mammography from 50 to 69 years:</b>							
<b>Total</b>	–	–	–	68.5 (64.1–72.6)	74.9 (70.1–79.1)	–	71.3 (68.0–74.4)
Low	–	–	–	61.1 (49.5–71.1)	64.7 (53.0–74.8)	–	63.0 (55.2–70.3)
Medium	–	–	–	71.6 (66.4–76.3)	80.1 (74.7–84.5)	–	75.4 (71.6–78.8)
High	–	–	–	65.9 (57.1–73.8)	70.3 (60.7–78.4)	–	67.4 (60.8–73.4)

has a clear impact here: with the exception of women aged 60–69 years, women with a low SES show significantly lower participation rates in this particular screening test over the 12 months preceding the interview than women of high SES. Between the ages of 50–69 years, women are eligible for biennial radiological breast examinations as part of the national mammography screening programme. Mammographies can be carried out as part of a cancer screening programme, to clear up a concrete suspected diagnosis or as part of aftercare. DEGS1 asked for the reason for the last mammography to ensure that the existing data could be used to provide an overview of women's participation in mammography overall and also of participation in the national mammography screening programme. Overall, 71.3% of women in the target group aged between 50 and 69 years stated that they had had a mammography within the last 24 months. Slightly more women aged 60–69 years were examined than in the younger age groups (74.9% vs. 68.5%; ■ **Tab. 5**). There is no SES gradient.

To state their reasons for participating in their last mammography, participants could choose from several answer categories (multiple answers were possible). The most common reason for the last mammography (within the last 24 months) was an invitation by the national mammography screening programme (65.4%). This means that about half of all eligible women between 50 and 69 years of age were reached by the national mammography screening programme and underwent the examination (49.2%).

### Early detection of prostate cancer

Only 38.9% of eligible men from the age of 45 years underwent a palpation test within the last 12 months before the interview. The participation rate increased with age. Among men aged 70–79 years, the participation rate reached 55.5%. However, the proportion of those who underwent examination in the 12 months preceding the interview was very low, especially for younger men (20.2%; ■ **Tab. 6**). There is no SES gradient.

The PSA blood test is also used for the diagnosis of prostate carcinoma. However, an increased PSA value cannot be un-

**Tab. 6** Regular participation in cancer screening tests intended for men, categorised by age group and socioeconomic status (proportion in percent with 95% confidence intervals)

		Socioeconomic status		Age group in years				
		Low	Medium	45–49	50–59	60–69	70–79	Total
<b>Prostate palpation from 45 years:</b> within the last 12 months <i>n</i> <sub>unweighted</sub> = 973	<b>Total</b>			<b>20.2 (15.9–25.4)</b>	<b>32.5 (28.7–36.6)</b>	<b>48.8 (44.4–53.2)</b>	<b>55.5 (49.9–60.9)</b>	<b>38.9 (36.5–41.4)</b>
	Low	12.8 (6.1–25.1)	23.8 (16.3–33.4)	44.6 (31.9–58.1)	46.2 (33.9–59.0)	32.1 (26.4–38.4)		
	Medium	24.1 (17.8–31.9)	33.5 (28.3–39.0)	48.9 (43.1–54.7)	57.2 (50.7–63.4)	40.3 (37.1–43.7)		
	High	16.8 (10.5–25.9)	38.4 (30.2–47.3)	51.8 (43.5–60.0)	65.5 (55.0–74.7)	42.3 (37.5–47.2)		
<b>PSA value<sup>a</sup> from 45 years:</b> within the last 12 months <i>n</i> <sub>unweighted</sub> = 785	<b>Total</b>			<b>12.0 (8.4–16.9)</b>	<b>25.0 (20.9–29.6)</b>	<b>40.4 (35.9–45.0)</b>	<b>45.7 (40.3–51.3)</b>	<b>30.6 (28.2–33.1)</b>
	Low	7.4 (1.5–29.1)	16.5 (9.6–27.1)	28.6 (18.6–41.4)	31.2 (21.4–43.1)	21.3 (16.9–26.4)		
	Medium	14.5 (9.4–21.7)	25.0 (19.2–31.9)	38.1 (32.5–43.9)	45.9 (39.1–52.9)	30.4 (27.1–34.0)		
	High	9.9 (5.5–17.2)	32.9 (25.3–41.6)	53.8 (45.8–61.6)	68.0 (58.3–76.4)	40.0 (35.1–45.1)		

<sup>a</sup>No examination as part of the cancer screening programme offered by statutory health insurance

equivocally attributed to prostate cancer, as there can also be other causes such as inflammation. Therefore, statutory health insurance does not offer the PSA test for early detection of prostate cancer as part of the cancer screening programme. In this case, men must pay for the test themselves as an individual health service [20]. However, if the palpation test result is positive, it is often followed up by a PSA analysis. In all, 30.6% of men aged 45 years and over indicated that they had their PSA level checked within the last 12 months.

The majority of men (89.5%) who had undergone palpation of the prostate in the last 12 months stated that the PSA level was also determined within that time period. However, the two examinations may have been performed separately and in any order. This aspect was not covered by DEGS1. Overall, 10.1% of men aged 45 years or over stated that the PSA level was tested but no palpation of the prostate took place (data not shown). PSA testing is clearly influenced by a person's SES: significantly fewer men of low SES underwent this examination than men of medium or high SES. When stratified by age, this effect is evident only in 60- to 79-year-old men and only for the low compared to the highest SES group. Participation in an examination by palpation was not influenced by SES.

## Discussion

Analysis of the data presented here shows that a vast majority of adults in Germany, who are the target group of statutory health insurance for cancer screening programmes, are aware of the recommenda-

tion to participate in such programmes. According to these data, about two thirds of women and less than half of the men regularly undergo cancer screening. Participation rates in individually offered cancer screening tests differ to a high degree. There are many reasons for this, and they have to do, for example, with organisation (invitation to attend mammography screening versus individuals taking the initiative to make an appointment themselves in the case of other screening, e.g. prostate cancer screening) and level of awareness (skin cancer screening has only been offered by statutory health insurance since 2008). Overall more women than men participate in cancer screening. With increasing age, participation rates rise, especially among men, and the difference between the sexes decreases. This probably has to do with rising numbers of doctor visits and a resulting increase in participation probability [7, 8]. SES has an influence on awareness and participation in early-detection programmes, especially among women. For age-stratified data, the status effect often remains among women: more educated women with a higher income more frequently undergo cancer screening. Among men, status effects are less frequent and less pronounced.

Information on adult participation in cancer screening programmes can be obtained from population-related interviews and from the payment data of health insurers. Interviews have the advantage that in the analysis, information on participation can be related to individuals. In addition, interviews permit inclusion of supplementary questions and issues related to participation

in cancer screening, for example, reasons for non-participation. On the other hand, statements that participants make about their own participation in screening programmes are subject to a certain degree of uncertainty. In other surveys on cancer screening participation rates, such differences have also been observed and discussed [21, 22]. A comparison of the results on cancer screening participation from DEGS1 with other data sources shows a good correlation with other interview data and a certain degree of deviation in prevalence when compared to the payment data. With the exception of the mammography, DEGS1 did not ask the reason for participation in individual cancer screening tests. The listed examinations are also offered free of charge for statutory health insurance policyholders given the relevant indication, for example, to investigate a suspected disease. In that case, the fees charged by the attending physician are different. This can result in differences when comparing the DEGS1 data with payment information. For example, regular participation in the offered biennial *skin cancer screening* programme is reported to be about one quarter in DEGS1 but amounts to about 33.3% for women and 31.9% for men according to the payment data of the Central Research Institute of Ambulatory Health Care in Germany [23]. In the telephone interview "German Health Update" 2010 conducted by the RKI (GEDA 2010), every third person interviewed reported that they had participated in skin cancer screening before [21]. In DEGS1, about half of eligible women and men stated that they had under-

gone a *colonoscopy* before. In a survey of the Lebensblicke Foundation conducted in 2010, similar colonoscopy rates were found [24]. However, as was the case with DEGS1, no distinction was made based on the reasons for the colonoscopy. In contrast, the payment data for the period 2003–2011 suggest that only 20% of all persons aged between 55 and 74 years had a colonoscopy as part of cancer screening [25]. According to DEGS1, roughly every second woman from the age of 20 years had a *cervical smear for early detection of cancer of the cervix*. The Bertelsmann Health Monitor showed that in 2007 just over 50% of women had participated in this programme (within 2 years) [26]. About 70% of eligible women reported in DEGS1 that they had had a *mammography* in the previous 2 years. A survey among AOK policyholders showed an equally high participation rate (ever participated) in the year 2007 [27]. However, in both cases the data provided referred to mammographies in general, i.e. independently of the national mammography screening programme that was set up in 2005. The evaluation of the mammography screening programme showed a participation rate of 53.7% for the time period 2008–2009 [28]. In DEGS1, just over a third of men stated that they regularly participated in a *prostate screening test* (palpation examination). Here, too, there is relatively good correlation with other surveys: In the Bertelsmann Health Monitor, just over a third of men reported that they had participated in prostate cancer screening (within 2 years) [26]. A survey from 2004 on participation rates in this cancer screening programme offered by statutory health insurance found a regular yearly participation rate of 25% [29].

The level of acceptance of these preventive measures can be estimated on the basis of the analyses of cancer screening participation. With the help of data collected in DEGS1, the population groups that are aware of and regularly participate in cancer screening programmes can be described in more detail. However, it is also possible to identify groups who are not as yet sufficiently informed about cancer screening and who so far have made use of such services infrequently or not at all.

With regular health surveys conducted as part of health monitoring it will be possible in future to determine participation rates and to make statements on trends, also with respect to newly launched or recently expanded screening tests. For the purpose of implementing the research results in practice, it is important not only to determine who is not participating but also why they are not doing so. These reasons were determined for skin and colon cancer screening in the GEDA 2010 telephone interviews of the RKI [21]. Indications of what type of support target groups need to make an informed decision are important sources for health policy planning and can help to further improve participation in cancer screening programmes.

An extension of cancer screening is planned within the framework of the National Cancer Plan, among other measures. These plans are inspired by the relevant European guidelines [30]. Providing better information to policyholders about the benefits and risks of cancer screening as well as sending regular letters of invitation to improve participation rates are planned. These measures aim to strengthen cancer screening programmes and, by permitting early cancer detection, should help improve the chances of survival of those affected and thus reduce cancer mortality rates in the population [18].

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### References

1. Statistisches Bundesamt (2011) Todesursachenstatistik 2010. <http://www.gbe-bund.de>. Accessed 30 Oct 2012
2. Robert Koch-Institut, Gesellschaft der epidemiologischen Krebsregister (2012) Krebs in Deutschland 2007/2008. 8. Ausgabe. RKI, Berlin
3. Robert Koch-Institut (2010) Verbreitung von Krebserkrankungen in Deutschland. Entwicklung der Prävalenzen zwischen 1990 und 2010. Beiträge zur Gesundheitsberichterstattung des Bundes. RKI, Berlin
4. Gemeinsamer Bundesausschuss (2011) Richtlinie über die Früherkennung von Krebserkrankungen in der Fassung vom 18. Juni 2009, zuletzt geändert am 16. Dezember 2010, veröffentlicht im Bundesanzeiger Nr. 34: S 86, in Kraft getreten am 3. März 2011
5. Wilson JM, Jungner YG (1968) Principles and practices of screening for disease. World Health Organization, Geneva
6. Sozialgesetzbuch Fünftes Buch (2012) Vierter Abschnitt Leistungen zur Früherkennung von Krankheiten, § 25 Gesundheitsuntersuchungen. <http://www.gesetze-im-internet.de>. Accessed 30 Oct 2012
7. Scheffer S, Dauven S, Sieverding M (2006) Soziodemografische Unterschiede in der Teilnahme an Krebsfrüherkennungsuntersuchungen (KFU) in Deutschland – Eine Übersicht. Gesundheitswesen 68(3):139–146
8. Bergmann E, Kalcklösch M, Tiemann F (2005) Health care utilisation. Initial results of the Telephone Health Survey 2003. Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz 48:1365–1373
9. Starker A, Saß AC, Ziese T (2006) Inanspruchnahme von Gesundheits- und Krebsfrüherkennungsuntersuchungen. Wer nutzt sie (nicht) und warum? Gesundheitswesen 68(7):A125
10. Starker A, Saß AC (2007) Eigenverantwortung + Hausarzt = gut versorgt? Ergebnisse des Telefonischen Gesundheits surveys 2004 zum Präventionsverhalten in Deutschland. Prävention und Gesundheitsförderung 2(Supplement 1):P124
11. Kurth BM, Lange C, Kamtsiuris P et al (2009) Health Monitoring at the Robert Koch-Institute. Status and perspectives. Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz 52(5):557–570
12. Kurth BM (2012) Das RKI-Gesundheitsmonitoring – was es enthält und wie es genutzt werden kann. Public Health Forum 20(76):4.e1–4.e3
13. Gößwald A, Lange M, Kamtsiuris P, Kurth BM (2012) DEGS: German health interview and examination survey for adults. A nationwide cross-sectional and longitudinal study within the framework of health monitoring conducted by the Robert Koch-Institute. Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz 55:775–780
14. Scheidt-Nave C, Kamtsiuris P, Gößwald A et al (2012) German health interview and examination survey for adults (DEGS) – design, objectives and implementation of the first data collection wave. BMC Public Health 12:730
15. Kamtsiuris P, Lange M, Hoffmann R et al (2013) The first wave of the German health interview and examination survey for adults (DEGS1). Sampling design, response, sample weights, and representativeness. Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz 56:620–630

16. Robert Koch-Institut (2009) DEGS – Studie zur Gesundheit Erwachsener in Deutschland. Projektbeschreibung. Beiträge zur Gesundheitsberichterstattung des Bundes. RKI, Berlin
17. Gößwald A, Lange M, Dölle R, Hölling H (2013) The first wave of the German health interview and examination survey for adults (DEGS1). Participant recruitment, fieldwork, and quality management. Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz 56:611–619
18. Kraywinkel K, Bertz J, Laudi A et al (2012) Epidemiologie und Früherkennung häufiger Krebserkrankungen in Deutschland. GBE kompakt. 3(4). RKI (Hrsg), Berlin. <http://www.rki.de/gbe-kompakt>. Accessed 06 Aug 2012
19. Lampert T, Kroll L, Mütters S, Stolzenberg H (2013) Measurement of socioeconomic status in the German health interview and examination survey for adults (DEGS1). Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz 56:631–636
20. Medizinische Dienst des Spitzenverbandes Bund der Krankenkassen e.V. (2012) PSA-Test zur Früherkennung von Prostatakrebs. <http://www.igel-monitor.de>. Accessed 04 Dec 2012
21. Starker A, Bertz J, Saß AC (2012) Inanspruchnahme von Krebsfrüherkennungsuntersuchungen. In: Robert Koch-Institut (Hrsg) Daten und Fakten: Ergebnisse der Studie „Gesundheit in Deutschland aktuell 2010“ Beiträge zur Gesundheitsberichterstattung des Bundes. RKI, Berlin
22. Streich W, Hellmeier W (2009) Teilnahme an Vorsorge- und Früherkennungsuntersuchungen. NRW Kurz und informativ, April 2009. [http://www.lzg.gc.nrw.de/\\_media/pdf/gesundheitsberichtedaten/nrw-kurz-und-informativ/teilnahme-vorsorge-frueherkennung\\_0905.pdf](http://www.lzg.gc.nrw.de/_media/pdf/gesundheitsberichtedaten/nrw-kurz-und-informativ/teilnahme-vorsorge-frueherkennung_0905.pdf). Accessed 30 Oct 2012
23. Zentralinstitut für die kassenärztliche Versorgung in der Bundesrepublik, Altenhofen L (2012a) Teilnahme an gesetzlichen Früherkennungsuntersuchungen im Jahr 2011. Unveröffentlichte Sonderauswertung für das Robert Koch-Institut. Accessed 15 Oct 2012
24. Stiftung Lebensblicke, Wuppermann D (2011) Aktueller Wissensstand der Bevölkerung zur Darmkrebsvorsorge. Persönliche Mitteilung über unveröffentlichte Auswertungen. Accessed 09 July 2011
25. Zentralinstitut für die kassenärztliche Versorgung in der Bundesrepublik (2012) Teilnahme an gesetzlichen Früherkennungsuntersuchungen und an Beratungen zur Prävention des Darmkrebs im Jahr 2011. [http://www.zi.de/cms/fileadmin/images/content/PDFs\\_alle/Beteiligungsdaten\\_2011\\_Deutschland\\_erw.pdf](http://www.zi.de/cms/fileadmin/images/content/PDFs_alle/Beteiligungsdaten_2011_Deutschland_erw.pdf) Accessed 30 Oct 2012
26. Koch K, Scheibler F (2007) Einstellungen und Informationsstand zur Früherkennung: Informiert und doch getäuscht. In: Böcken J, Braun B, Amhof R (Hrsg) Gesundheitsmonitor 2007 Gesundheitsversorgung und Gestaltungsoptionen aus der Perspektive von Bevölkerung und Ärzten. Bertelsmann Stiftung, Gütersloh, S 178–200
27. Zok K (2007) Wahrnehmung und Akzeptanz von Früherkennungsuntersuchungen. Ergebnisse einer Repräsentativ-Umfrage unter GKV-Versicherten. WIdO Monitor 03/2007. [http://www.wido.de/fileadmin/wido/downloads/pdf\\_wido\\_monitor/wido\\_mon\\_3-07\\_0108.pdf](http://www.wido.de/fileadmin/wido/downloads/pdf_wido_monitor/wido_mon_3-07_0108.pdf). Accessed 30 Oct 2012
28. Kooperationsgemeinschaft Mammographie (2012) Evaluationsbericht 2008–2009. Ergebnisse des Mammographie-Screening-Programms in Deutschland. Kooperationsgemeinschaft Mammographie, Berlin
29. Sieverding M, Mattered U, Ciccarello L et al (2008) Prostatakarzinomfrüherkennung in Deutschland. Untersuchung einer repräsentativen Stichprobe. Urologe 47(9):1233–1238
30. Bundesministerium für Gesundheit (2012) Fortschritte für die Krebsbekämpfung – Kabinett beschließt das Gesetz zur Weiterentwicklung der Krebsfrüherkennung und zur Qualitätssicherung durch klinische Krebsregister. Pressemitteilung vom 22. August 2012. [http://www.bundesgesundheitsministerium.de/fileadmin/dateien/Pressemitteilungen/2012/2012\\_03/120822\\_PM\\_61\\_Kabinett\\_beschliesst\\_das\\_Gesetz\\_zur\\_Weiterentwicklung\\_der\\_Krebsfrueherkennung.pdf](http://www.bundesgesundheitsministerium.de/fileadmin/dateien/Pressemitteilungen/2012/2012_03/120822_PM_61_Kabinett_beschliesst_das_Gesetz_zur_Weiterentwicklung_der_Krebsfrueherkennung.pdf). Accessed 10 Sept 2012