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Current Perspective

The many unanswered questions related to the German skin cancer screening programme

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Abstract In 2008, the first nationwide skin cancer screening (SCS) programme in the world was established in Germany. The main reason to implement the SCS programme in Germany was the expected reduction of costs of care due to earlier detection of skin cancer. The aim of this commentary is to raise and discuss several unanswered questions related to the German SCS programme. The evidence of a temporary mortality decline of skin melanoma after SCS in Schleswig-Holstein is lower than previously assumed and the temporary decline may have been caused by other factors than screening (e.g. awareness effects, selection bias, data artifact, and random fluctuation). The evaluation of the nationwide effect of SCS on skin cancer mortality is hampered by birth cohort effects and low quality of the routine cause-of-death statistics. The nationwide skin melanoma mortality did not decrease from 2007 through 2014. The time interval between screenings after a screening without pathological findings is unclear. Appropriate research designs are needed that monitor and evaluate the effect of SCS not only on skin cancer mortality but also on other factors that may help to judge the potential benefits and harms of SCS including aggressiveness of therapy, costs of care,

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quality of life, and stage-specific incidence rates of skin cancer. Furthermore, SCS may profit from a high-risk strategy instead of population-wide screening and from newer technologies for early detection of skin cancer (e.g. dermoscopy).

In 2008, the first nationwide skin cancer screening (SCS) programme in the world was established in Germany [1]. The basis for the implementation of the programme was an ecological study entitled 'Skin Cancer Research to Provide Evidence for Effectiveness of Screening in Northern Germany' (SCREEN) in the Federal State of Schleswig-Holstein (SH), Germany [2]. Since July 2008, all health-insured people aged 35 years or more in Germany are offered a biannual SCS that includes visual whole-body examination of the skin by trained and certified physicians. The main reason to implement the programme in Germany was the expected reduction of costs of care due to earlier detection of skin cancer. However, until now, no research has systematically evaluated the cost development for the care of skin cancer patients in Germany.

SCREEN is the only population-based screening project that ecologically showed a steep decline of the mortality rate of skin melanoma in the general population. A major drawback of this project was its limited capacity to evaluate the effect of screening on the mortality of skin cancer. The evaluation relied on routine cause-of-death statistics of SH rather than individual data of screened and unscreened people to assess mortality. The aim of this commentary is to raise and discuss several unanswered questions related to the German SCS programme.

1. Was the observed temporary skin melanoma mortality decline in SH right after the SCREEN project real?

The observed mortality decline in SH 5 years after SCREEN was accompanied by a considerable increase of deaths due to malignant neoplasms of ill-defined, secondary and unspecified sites (10th revision of the International Statistical Classification of Diseases: C76–C80) that is not explainable by an increase of the incidence of these neoplasms. Incorrect assignment of 8–35 and 12–23 skin melanoma deaths per year as C76–C80 among men and women, respectively, during 2007 through 2010 could explain the transient skin melanoma mortality decline in SH. The temporary mortality increase of malignant neoplasms of ill-defined, secondary and unspecified sites was only observed in SH. No other federal state (overall 16 states) in Germany provided this specific pattern [3]. It is therefore possible that the temporary mortality decline of skin melanoma in SH is an artifact due to low data quality of the cause-of-death statistics in SH. Furthermore, it has been argued that the temporary mortality decline of skin melanoma in SH could also be caused by chance as the population and consequently the number of melanoma deaths were quite small [4].

2. Was the temporary mortality decline in SH after SCREEN mainly due to a temporary increase of the skin cancer awareness of the general population caused by the public campaigns prior to SCREEN?

From 2001 through 2003, several public campaigns and political activities were undertaken to increase awareness for skin cancer in SH. Furthermore, a screening pilot project including 8 h training courses for 200 dermatologists and non-dermatologists and screening of 6000 people in SH during 2000–2001 preceded the SCREEN project [2]. Katalinic *et al.* [2] concede that the observed skin melanoma mortality decline in SH after SCREEN may be due to these pre-SCREEN activities rather than the SCS in SCREEN itself.

3. Was the temporary mortality decline in SH after SCREEN mainly due to selection bias?

If the temporary mortality decline in SH after SCREEN was due to a selection effect, these selection forces could be used to implement a high-risk strategy for SCS instead of an unselected population-wide SCS. During the period July 2003 through June 2004, 50% (men: 46%, women: 56%) of all newly registered skin melanoma in the cancer registry of SH were contributed by 19% (men: 10%, women: 27%) of the population of SH that participated in SCREEN (all aged 20 years or more) [2]. If these 19% participants of SCREEN would have been a random selection of all inhabitants of SH, one would have expected that these participants contributed about 19% of all skin melanoma in SH plus an unknown number of skin melanoma that were detected earlier due to screening-induced lead time and overdiagnosis. Neither the lead time nor the proportion of overdiagnosis due to SCS is known until now. If lead time produced the extra amount of newly detected skin melanoma during SCREEN, one would expect some decline of the incidence of skin melanoma after the end of SCREEN and before the introduction of the nationwide SCS programme. In fact, data from the SH cancer registry (www.GEKID.de, accessed 15th