

Impact of skin cancer screening and secondary prevention campaigns on skin cancer incidence and mortality: A systematic review

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Background: Benefits of skin cancer screening remain controversial.

Objective: We sought to update evidence on the impact of skin cancer screening and secondary prevention campaigns on skin cancer incidence, mortality, stage-specific incidence, and interval cancers after negative screening.

Methods: We searched MEDLINE and EMBASE for studies published in English or German between January 1, 2005, and February 4, 2015. Two reviewers independently performed study selection, data extraction, and critical appraisal. Results were described in a narrative synthesis.

Results: Of 2066 records identified in databases and 10 records found by manual search, we included 15 articles. Overall, evidence suggests that with implementation of skin cancer screening, incidence of in situ and invasive skin cancer increased; increasing rates of thin and decreasing rates of thick melanoma were observed. After cessation of screening, invasive melanoma incidence decreased. A significant melanoma mortality reduction was shown in a German study; 2 other studies observed fewer deaths than expected. No study on interval cancers was identified.

Limitations: Publication bias cannot be ruled out. Most studies are limited because of their ecological design.

Conclusion: Large ecological studies, a cohort study, a case-control study, and a survey indicate benefits of skin cancer screening, but the evidence level is very low. (J Am Acad Dermatol <http://dx.doi.org/10.1016/j.jaad.2016.07.045>.)

Key words: incidence; interval cancers; melanoma; mortality; screening; secondary prevention; skin cancer; stage-specific incidence; systematic review; thickness.

Cancer of the skin including melanoma along with basal cell carcinoma and squamous cell carcinoma—often referred to as nonmelanoma skin cancer—is the most frequent cancer not only in the United States¹ but also in other industrialized countries with predominantly light-skinned

people.² Since 1975, age-standardized melanoma incidence in the United States nearly tripled to 22.9 per 100,000 persons (US standard population) in 2012, whereas melanoma mortality was 2.7 per 100,000 persons and remained relatively stable for the last 2 decades.³

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Supplemental Tables I to VI are available at <http://www.jaad.org>. PROSPERO registration number: CRD42014013400.

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Survival from melanoma highly depends on tumor stage.⁴⁻⁷ Hence, skin cancer screening has the potential to reduce melanoma mortality by detecting tumors at an earlier stage with better prognosis. However, benefits of skin cancer screening remain controversial.

In Germany, nationwide skin cancer screening was implemented in 2008 whereby a visual whole-body skin examination conducted by trained physicians (dermatologists, general practitioners) is covered by the statutory health insurance every second year.⁸ In contrast, the US Preventive Services Task Force (USPSTF) concluded in their 2009 recommendation statement—based on a systematic review of Wolff et al⁹—that evidence was insufficient to assess the balance of benefits and harms of skin cancer screening.¹⁰ The latest systematic review of Wernli et al¹¹ commissioned by the USPSTF resulted in a draft recommendation statement that evidence was still insufficient.¹² The review included only literature published in English and excluded studies in settings other than primary care.¹¹ For evaluating the potential benefit of skin cancer screening the USPSTF draft recommendation statement¹² was mainly focused on melanoma mortality reduction.

Considering these restrictions an extensive systematic review is necessitated to give a comprehensive overview on up-to-date evidence about benefits of diverse screening activities in different settings. Therefore, we sought to systematically review literature on the impact of skin cancer screening or secondary prevention campaigns on skin cancer incidence, mortality, stage-specific incidence, or interval cancers after negative screening (see detailed PICO-Structure of our research question in [Supplemental Table I](#)).

METHODS

We conducted a systematic review based on a study protocol that was registered in PROSPERO, the international prospective register of systematic reviews (<http://www.crd.york.ac.uk/PROSPERO/>; registration number: CRD42014013400).

Literature search

To identify relevant studies, we systematically searched MEDLINE via PubMed and EMBASE via Ovid. Criteria for eligibility included all study

designs. We used an empirically guided approach to develop the search strategy¹³ that is shown in [Supplemental Table II](#). Literature search was limited to articles in English or German published since January 1, 2005. This temporal limitation was chosen because we sought to tie in with the above mentioned review of Wolff et al⁹ that searched studies until August 2005. We last searched on February 4, 2015, and checked new MEDLINE search results continuously (last update: June 27, 2016). In addition, reference lists of included articles were hand-searched.

Study selection

Two reviewers independently performed title and abstract screening and assessed full-text articles for eligibility criteria listed in [Supplemental Table III](#).

Reasons for exclusions were documented at each stage and consensus on study selection was reached by discussion.

Interventions of our interest comprised screening programs, opportunistic screening, mobile screening units, Euromelanoma Day, training campaigns about skin cancer screening, and secondary prevention campaigns that encourage people to get screened. Self-examination of the skin was not considered. Because we were interested in stage-specific incidence rates as a surrogate parameter for melanoma mortality, we did not include studies reporting only proportions of thick and thin melanoma or comparing only mean or median tumor thickness.

Furthermore, we only extracted incidence rates with a certain reference population as denominator, but no absolute numbers of diagnosed melanoma with unknown denominator. Reviews containing results of relevant studies published since 2005 were excluded if the therein cited articles could be obtained and included as original studies. To describe the available evidence we did not exclude studies of poor quality (either in study design or conduct or with poor reporting quality) from the review, but we excluded them from the results tables ([Table II](#), [Table III](#), and [Supplemental Table VI](#)).

Data extraction

Data were collected in duplicate independently by 2 reviewers with piloted forms. A guiding manual

CAPSULE SUMMARY

- Early diagnosis has the potential to reduce skin cancer morbidity and melanoma mortality.
- Screening appears to be associated with an increased incidence of nonmelanoma skin cancer, melanoma in situ, and thin melanoma, and with decreased thick melanoma incidence and mortality.
- Current evidence indicates benefits of screening, but the evidence level is very low.

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