

# Evaluating benefits and harms of screening

## - the streetlight effect?

Akademisk avhandling

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### Avhandlingen baseras på följande delarbeten

- I. Johansson M, Brodersen J, Gøtzsche P, Jørgensen KJ. Screening for reducing morbidity and mortality in malignant melanoma (Protocol). Cochrane Database of Systematic Reviews 2016, Issue 9. Art No.:CD012352.
- II. Johansson M, Brodersen J, Gøtzsche P, Jørgensen KJ. Screening for reducing morbidity and mortality in malignant melanoma (Systematic Review). (Submitted)
- III. Johansson M, Hansson A, Brodersen J. Estimating overdiagnosis in screening for Abdominal Aortic Aneurysm: could a change in smoking habits and lowered aortic diameter tip the balance of screening towards harm? *BMJ* 2015;350:h825.
- IV. Johansson M, Zahl PH, Siersma V, Jørgensen KJ, Marklund B, Brodersen J. Benefits and harms of screening men for abdominal aortic aneurysm in Sweden - comparing age-matched, contemporary screened and non-screened cohorts in a population with falling incidence. (In press, the *Lancet*)

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### **Abstract**

The general aim of this thesis was to explore how the benefits and harms of screening for a potentially life-threatening disease can be evaluated.

Papers I and II are a Cochrane Systematic Review on screening for malignant melanoma. We found no randomised trials of the benefits and harms of screening for malignant melanoma. We concluded that due to the uncertainty of benefits, and risk of harms through overdiagnosis and opportunity costs, screening for malignant melanoma should not be recommended outside the confines of a well-designed, randomised trial. However, screening for malignant melanoma is already widely adopted in the Western world.

Papers III and IV explore screening for abdominal aortic aneurysm (AAA). In study III, we found that AAA screening has been introduced in several countries without adequate investigation of harms. We also found that AAA screening caused harm through the detection and subsequent surgery of AAAs that would never have caused symptoms (i.e. overdiagnosis and overtreatment). Study IV is a registry study of the benefits and harms of AAA screening in Sweden. We found that AAA-mortality in Swedish men aged 65-74 has dropped by about 70% in the last decades. Screening had, at best, a minor effect on the decline in AAA-mortality, which was likely caused mainly by reduced smoking. We estimated that for every 10 000 men invited, 2 men (95% CI -3 to 7) avoided AAA-death (not statistically significant). At the same time, 49 men were likely overdiagnosed (95% CI 25 to 73), of whom 19 men (95% CI 1 to 37) had unnecessary surgery with a risk of mortality and morbidity. The remaining 30 men were offered regular follow-up with potential psychosocial consequences. The effect on AAA-mortality in Sweden was only 7% of that in the largest randomised trial of AAA screening. The less favourable benefit-to-harm balance brings into question the continued use of AAA screening.

The overall conclusion of this thesis is that benefits of screening receive much more attention and appreciation than harms.

**Keywords:** Abdominal Aortic Aneurysm, Benefits, Harms, Malignant Melanoma, Mortality, Overdiagnosis, Overtreatment, Screening

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