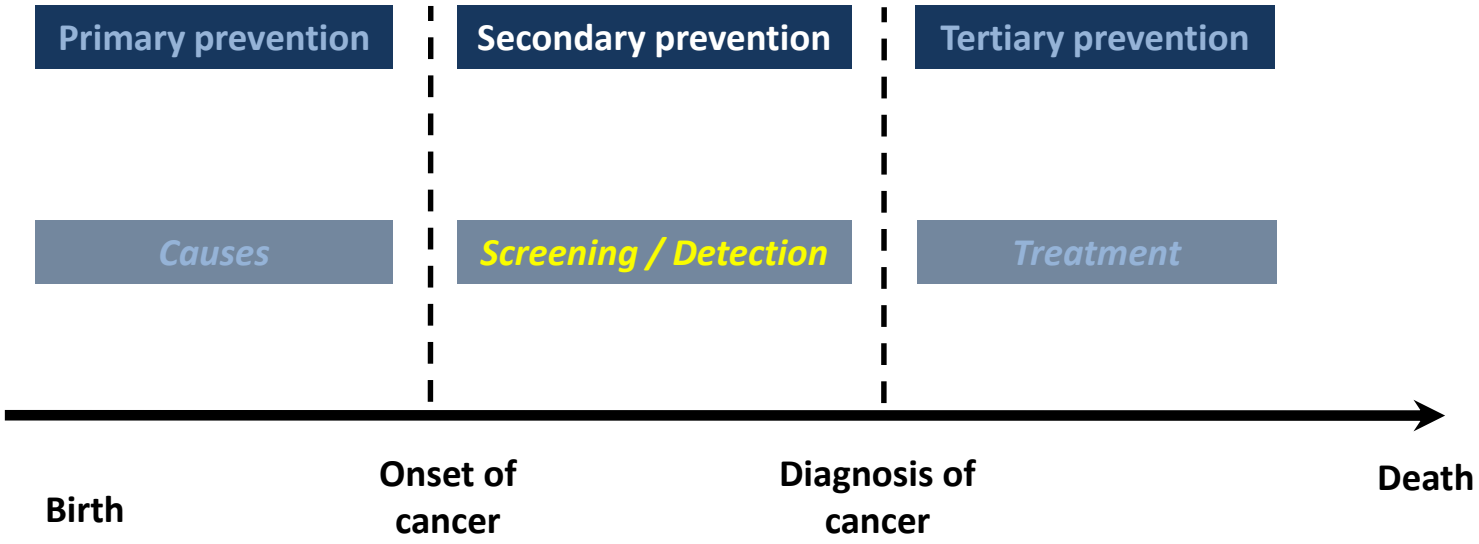
QIMR Berghofer
Medical Research Institute

Melanoma screening: *the epidemiologic principles*

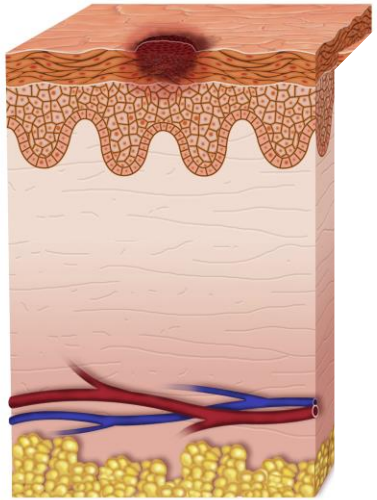
David Whiteman

Deputy Director, QIMR Berghofer
Head, Cancer Control Group

Strategies for melanoma control

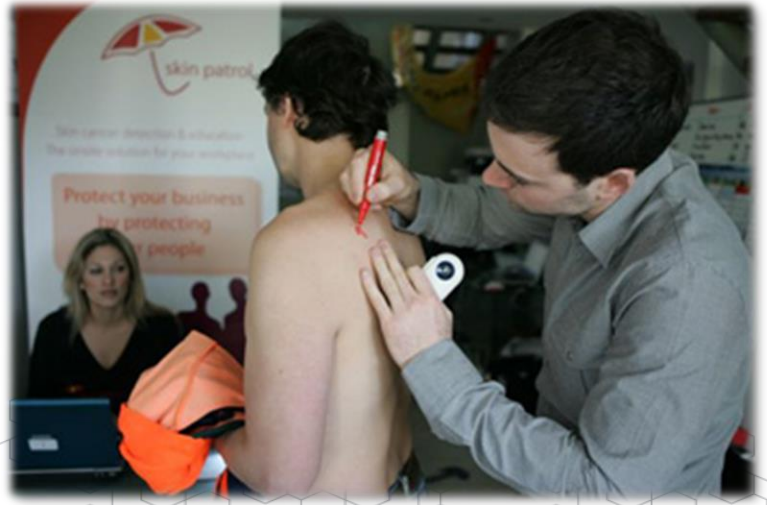


Aim of early detection = *reduce melanoma mortality*



Early detection options

1. **Population screening:** *breast, cervix, bowel*
2. **Targeted screening:** *'high-risk' patients*
3. **Opportunistic screening:** *'case finding'*



Population screening definition

*"A screening test is performed on an **asymptomatic** individual to determine that cancer might be present and that further evaluation, including a biopsy and staging, is necessary."*

Brawley and Kramer, J Clin Oncol, 2005

Population screening criteria

1. The condition sought should be an important health problem.
2. There should be an accepted treatment for patients with recognised disease.
3. Facilities for diagnosis and treatment should be available.
4. There should be a recognisable latent or early symptomatic stage.
5. There should be a suitable test or examination.
6. The test should be acceptable to the population.
7. The natural history of the condition, including development from latent to declared disease, should be adequately understood.
8. There should be an agreed policy on whom to treat as patients.
9. The cost of case finding (including diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole.
10. Case finding should be a continuing process and not a ‘once and for all’ project.

Melanoma Population screening criteria

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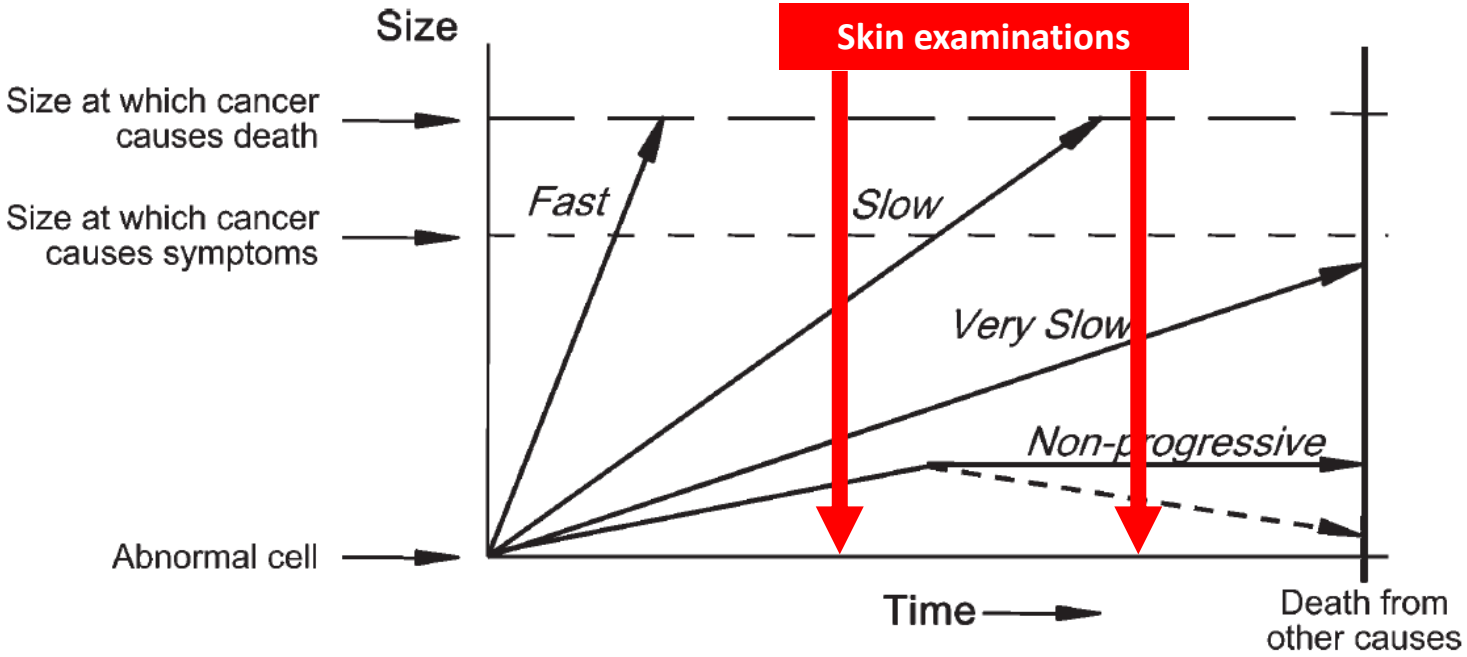
The heterogeneity of cancer



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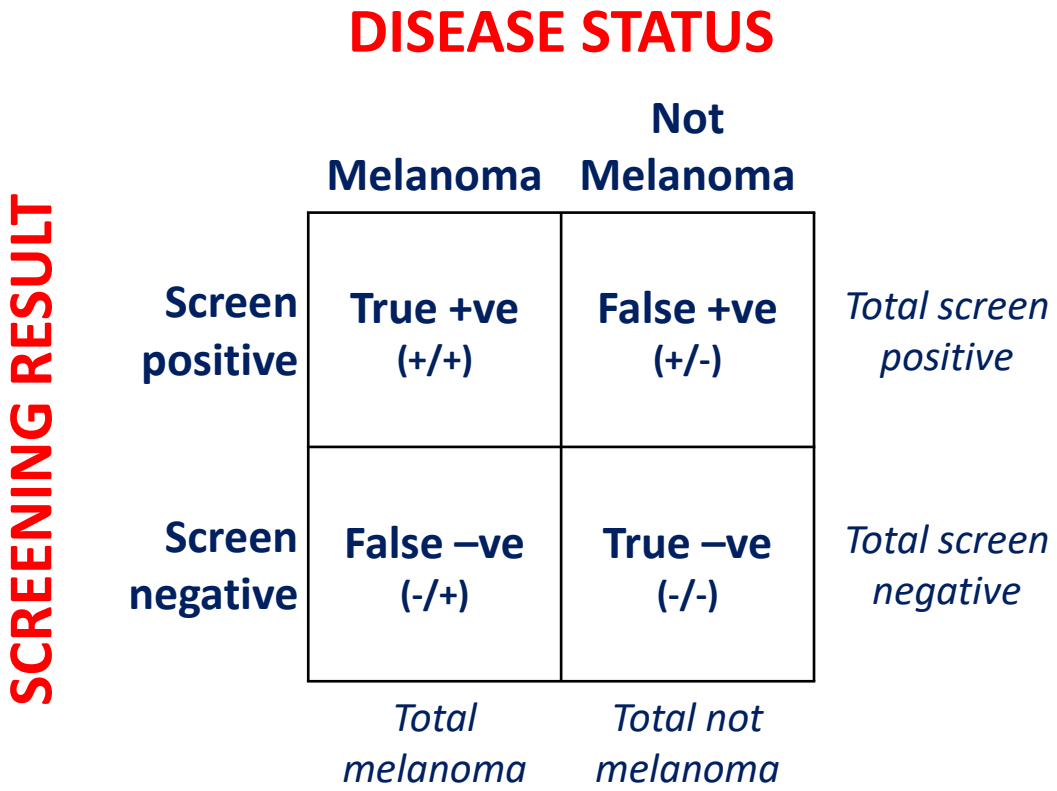
Whole-body skin examination
vs
technology

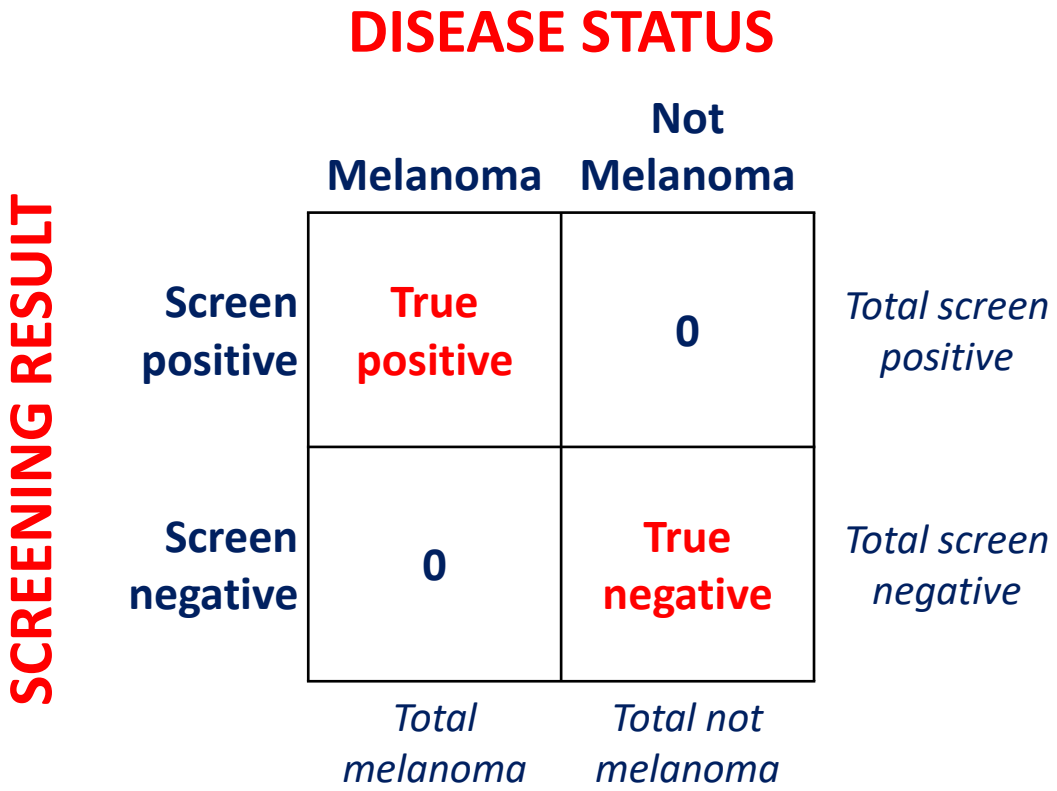
Key metrics for screening tests

1. Sensitivity
2. Specificity
3. Positive Predictive Value
4. Negative Predictive Value
5. Number needed to screen

How the metrics are calculated



The perfect test



How the metrics are calculated

$$\textbf{Sensitivity} = \frac{\text{True +ve}}{\text{(True +ve + False –ve)}}$$

*The proportion of all people with **true melanomas** who are correctly identified by the screening test*

How the metrics are calculated

$$\text{Sensitivity} = \frac{\text{True +ve}}{\text{(True +ve + False –ve)}}$$

DISEASE STATUS

INDEPENDENT OF MELANOMA PREVALENCE

SCREENING RESULT

	Melanoma	Not Melanoma	
Screen positive	**True +ve (+/+)**	**False +ve (+/-)**	*Total screen positive*
Screen negative	**False –ve (-/+)**	**True –ve (-/-)**	*Total screen negative*
	Total melanoma	*Total not melanoma*	

How the metrics are calculated

$$\textbf{Specificity} = \frac{\text{True -ve}}{\text{(False +ve + True –ve)}}$$

*The proportion of all people **who do not have** melanoma for whom the screening test is negative*

How the metrics are calculated

$$\textbf{Specificity} = \frac{\text{True -ve}}{\text{(False +ve + True –ve)}}$$

DISEASE STATUS

SCREENING RESULT

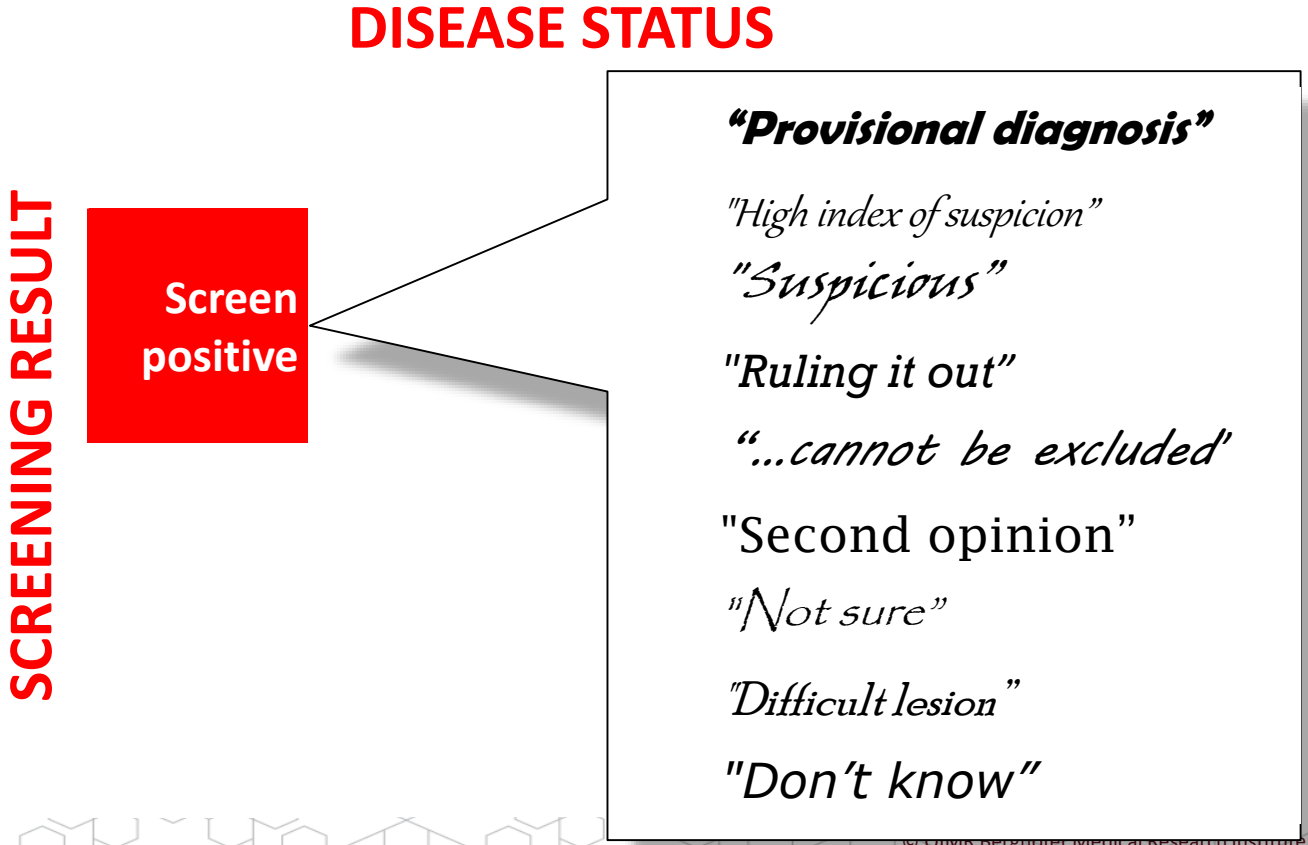
	Melanoma	Not Melanoma	
Screen positive	True +ve (+/+)	**False +ve (+/-)**	*Total screen positive*
Screen negative	False –ve (-/+)	**True –ve (-/-)**	*Total screen negative*
	Total melanoma	*Total not melanoma*	

How the metrics are calculated

$$\textbf{PPV} = \frac{\text{True +ve}}{\text{(True +ve + False +ve)}}$$

*The proportion of all people who are told "**you might have melanoma**" who actually do have melanoma*

How the metrics are calculated



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	Total melanoma	*Total not melanoma*	

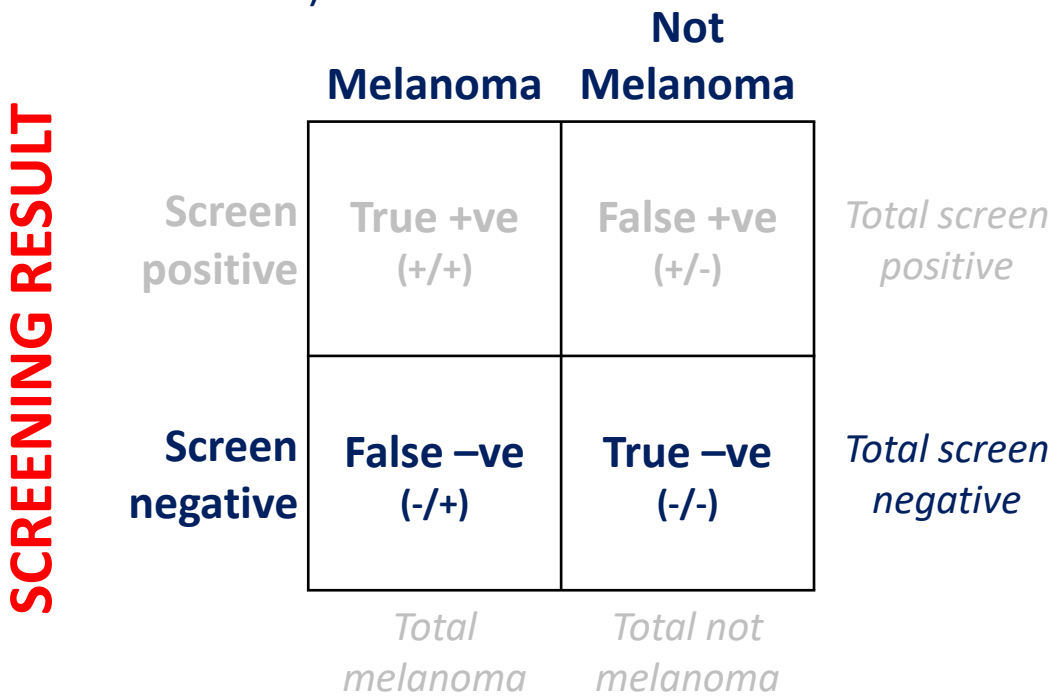
How the metrics are calculated

$$\textbf{NPV} = \frac{\text{True -ve}}{\text{(False- ve + True -ve)}}$$

*The proportion of all people who are told "**you don't have melanoma**" who actually do not have melanoma*

How the metrics are calculated

$$\text{NPV} = \frac{\text{True -ve}}{\text{(False- ve + True -ve)}}$$



Units of analysis: *people vs lesions*

Multiplicity of skin cancer endpoints

What are the screening metrics for melanoma?

Clinical outcomes from skin screening clinics within a community-based melanoma screening program

Joanne F. Aitken, PhD,[a,b] Monika Janda, PhD,[a,c] Mark Elwood, MD,[d] Philippa H. Youl, MPH,[a] Ian T. Ring, FAFPHM,[e] and John B. Lowe, DrPH[f]
Brisbane, Queensland, Carlton, Victoria, and Wollongong, New South Wales, Australia; and Iowa City, Iowa

Table II. Histopathological diagnosis for lesions excised or biopsied*

	Histopathological diagnosis										
Suspected diagnosis	Total (n = 1343)	Melanoma (n = 33)	BCC (n = 259)	SCC (n = 97)	HMF (n = 1)	Benign nevus (n = 433)	Dysplastic nevus (n = 96)	Lentigo (n = 103)	Seborrheic keratosis (n = 85)	Solar keratosis (n = 87)	Other (n = 149)
Melanoma	161	15	7	3	1	68	18	19	12	4	14
BCC	371	1	200	51	0	19	2	5	12	28	53
SCC	87	1	21	28	0	1	0	1	8	16	11
HMF	5	0	0	0	0	1	0	2	1	1	0
Benign nevus	171	0	4	0	0	101	21	23	4	3	15
Dysplastic nevus	368	10	8	2	0	211	51	39	28	4	15
Lentigo	11	1	0	0	0	4	0	4	0	0	2
Seborrheic keratosis	52	3†	2	1	0	19	2	5	11	3	6
Solar keratosis	47	0	13	6	0	2	0	0	3	17	6
Other	70	2‡	4	6	0	7	2	5	6	11	27

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POSITION STATEMENT

Screening and early detection of skin cancer

Cancer Council Australia

* Endorsed by the Australasian College of Dermatologists

- Do ***not*** recommend mass or population-based screening for melanoma or NMSC
- Do recommend GPs to identify high-risk patients
- Do recommend GPs to counsel high-risk patients

Rationale

- there is insufficient evidence that population screening offers reduced morbidity and mortality

QIMR Berghofer Medical Research Institute

Clinical Practice Guidelines
for the
Management of Melanoma
in Australia and New Zealand

Australian Government
National Health and Medical Research Council
NHMRC

New Zealand
GUIDELINES GROUP
Te Rōpū Rarangi Tohutohu
Promoting Effective Health and Disability Services

Recommendation

	Grade
1. In the absence of substantive evidence as to its effectiveness in reducing mortality from melanoma, population-based skin screening cannot be recommended	C

Recommendation

	Grade
2. Individuals at high risk of melanoma and their partner or carer be educated to recognise and document lesions suspicious of melanoma, and to be regularly checked by a clinician with six-monthly full body examination supported by total body photography and dermoscopy as required	C

Early detection options

1. Population screening: *breast, cervical, colorectal*
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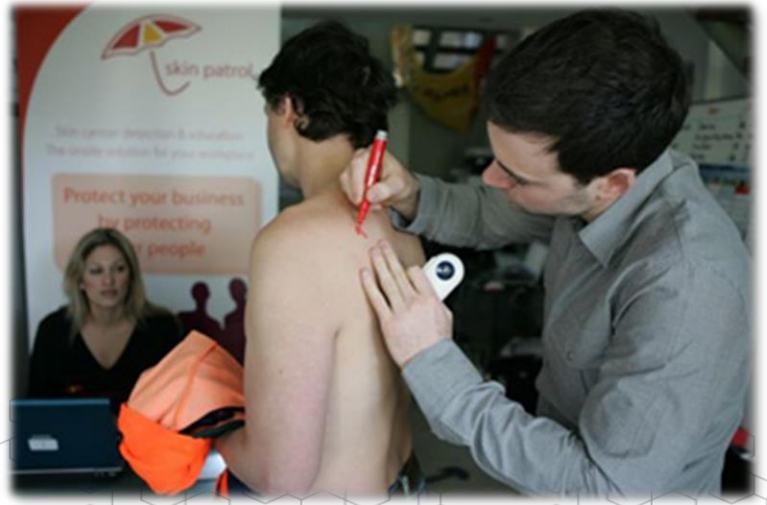
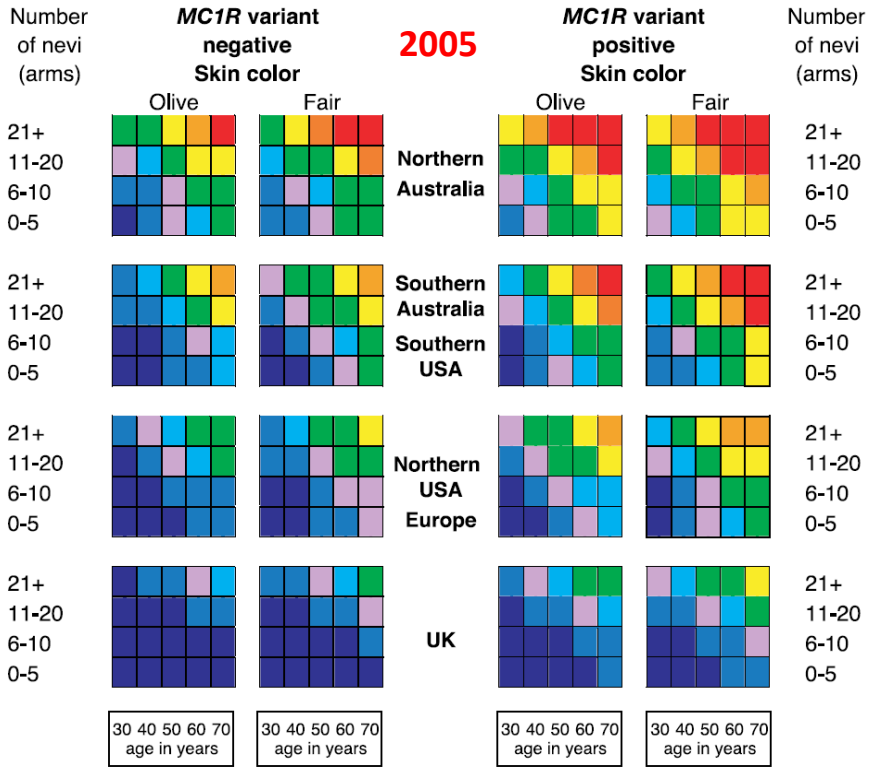


Can we identify patients at high risk of melanoma?

A Risk Prediction Tool for Melanoma?

David C. Whiteman and Adèle C. Green

Queensland Institute of Medical Research, Brisbane, Queensland, Australia



PERSONAL RISK
CUTANEOUS
RONA M. MACKIE
T. C.

PETER BAADE

1989

Risk Factors and Individual Probabilities of Melanoma for Whites

Eunyoung Cho, Bernard A. Rosner, Diane Feskanich, and Graham A. Colditz

2005

Identifying Individuals at High Risk of Melanoma: A Practical Predictor of Absolute Risk

Thomas R. Fears, DuPont Guerry IV, Ruth M. Pfeiffer, Richard W. Sagebiel, David E. Elder, Allan Halpern, Elizabeth A. Holly, Patricia Hartge, and Margaret A. Tucker

2006

Predicting melanoma risk for the Australian population

Victoria Mar,[1] Rory Wolfe[2] and John W Kelly[1]

2011

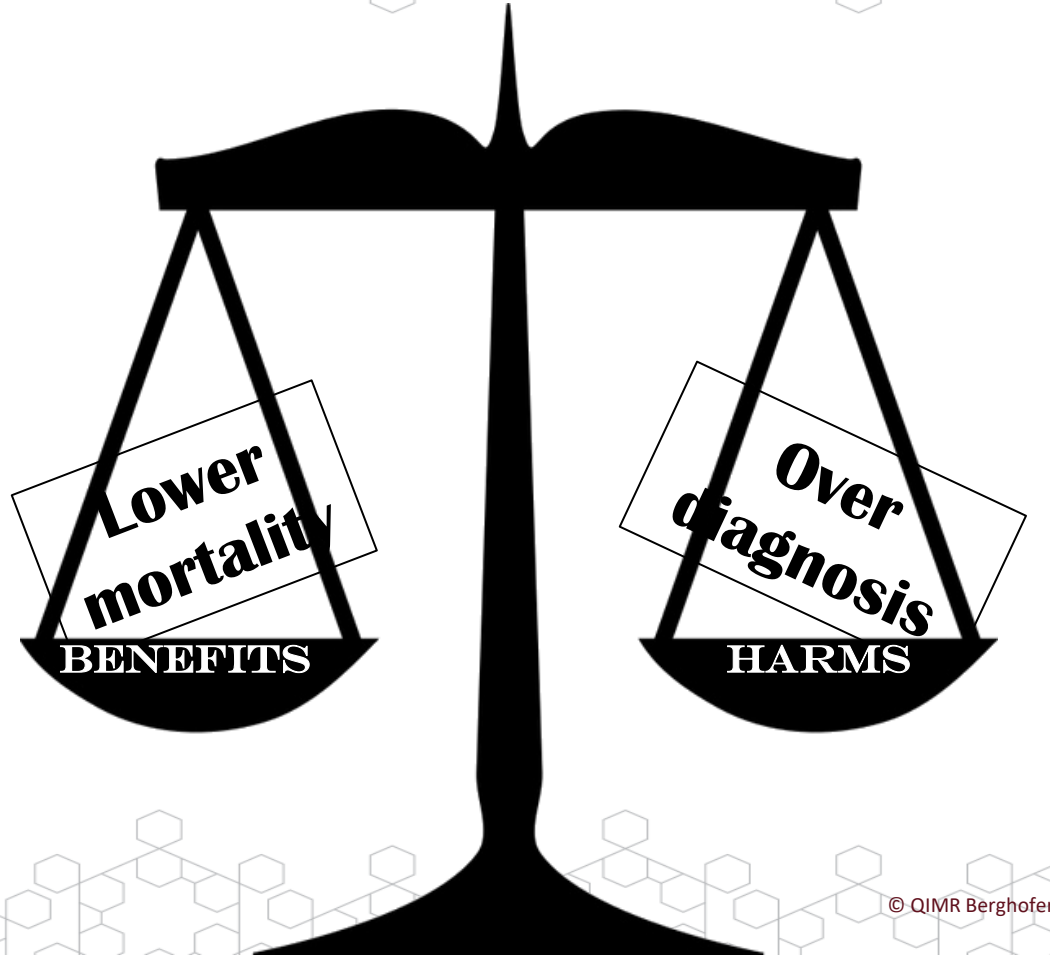
JAMA Dermatology | Original Investigation

Development and External Validation of a Melanoma Risk Prediction Model Based on Self-assessed Risk Factors

Kylie Vuong, MBBS, MIPH, FRACGP; Bruce K. Armstrong, MBBS (Hons), PhD, FAFPHM; Elisabete Weiderpass, MD, MSc, PhD; Eiliv Lund, PhD; Hans-Olov Adami, PhD; Marit B. Veierod, PhD; Jennifer H. Barrett, PhD; John R. Davies, PhD; D. Timothy Bishop, PhD; David C. Whiteman, MBBS(Hons), PhD; Catherine M. Olsen, PhD; John L. Hopper, PhD; Graham J. Mann, PhD; Anne E. Cust, MPH(Hons), PhD; Kevin McGeechan, PhD; and the Australian Melanoma Family Study Investigators

2016

The early detection conundrum



Overdiagnosis

The diagnosis of a [*cancer*] that would otherwise not go on to cause symptoms or death

Overdiagnosis ≠ false positive

Overdiagnosis ≠ "overcalling"

Overdiagnosis ≠ misdiagnosis

Overdiagnosis in melanoma?

Journal of Surgical Oncology 1998;67:73–76

Non-Metastasizing Melanoma?

ROBERT C. BURTON, MD, PhD,[1]* AND BRUCE K. ARMSTRONG, MBBS, DPhil[2]
[1]Anti-Cancer Council of Victoria, Victoria, Australia
[2]New South Wales Cancer Council, New South Wales (NSW), Australia

Melanoma Research 1994, **4**, pp. 107–113

Recent incidence trends imply a non-metastasizing form of invasive melanoma

R. C. Burton* and B. K. Armstrong
Newcastle Melanoma Unit, PO Box 119, Wallsend, NSW 2287, Australia. Tel (+61) 49 236169; Fax (+61) 49 236984 (R. C. Burton); International Agency for Research on Cancer, Lyons, France (B. K. Armstrong).

Acta Derm Venereol 2011; 91: 499–503

REVIEW ARTICLE

Are All Melanomas Dangerous?

Carsten NØRGAARD[1], Martin GLUD[1] and Robert GNIADECKI[1,2]

KATY BELL

Summary and conclusions

- **Population screening for melanoma**
  - the metrics are not good..
  - the challenge of all the other non-lethal skin pathology
  - currently not recommended by Australian policy-makers
- **Targeted screening for melanoma**
  - Feasible, at least in theory
  - Mortality gains unknown
- **Balancing the benefits and harms of screening**
  - more research needed…