

# UV AND SKIN CANCER; SUNBEDS IN PERSPECTIVE

Frank R. de Gruijl,

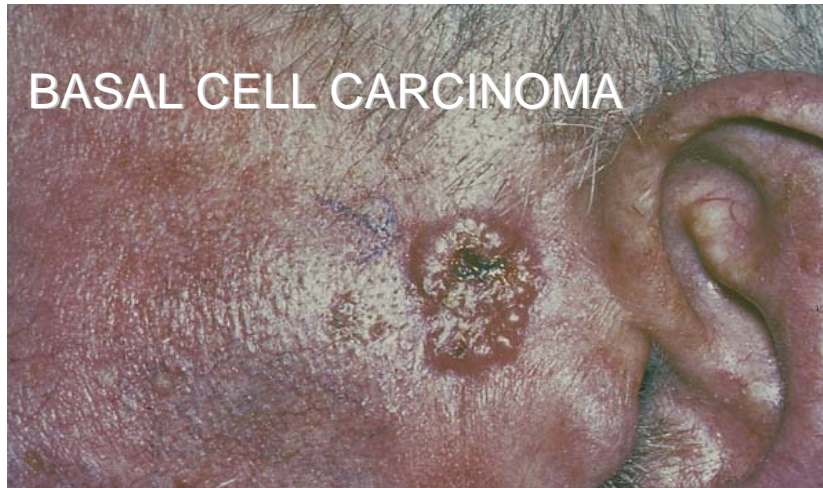
Personal history:

“Skin Cancers from Ozone Layer Depletion” to “Vitamine D and health effects”



# SKIN CANCERS in NL

BY FAR MOST FREQUENT FORM OF CANCER



In NL:

~ 14.000 lung cancers/yr

> 35.000 BCC/yr

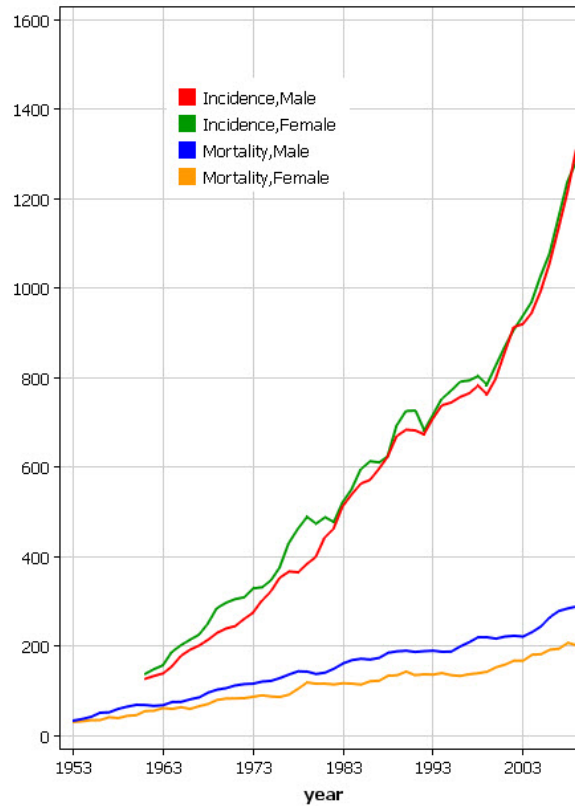


Many UV mutations ( $10^4$ - $10^5$ /cell), but not in drivers like Braf & Nras

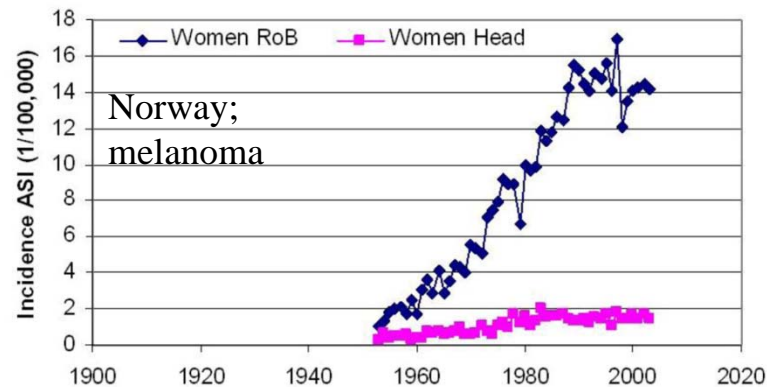
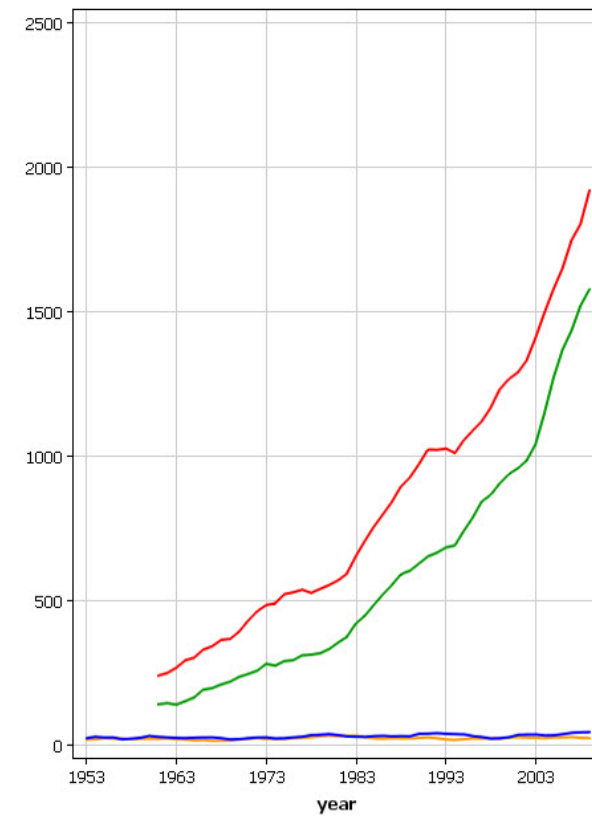
# UPWARD TRENDS IN SKIN CANCERS

# IN EUROPE

Sweden  
Melanoma of skin  
Numbers age 0-85+



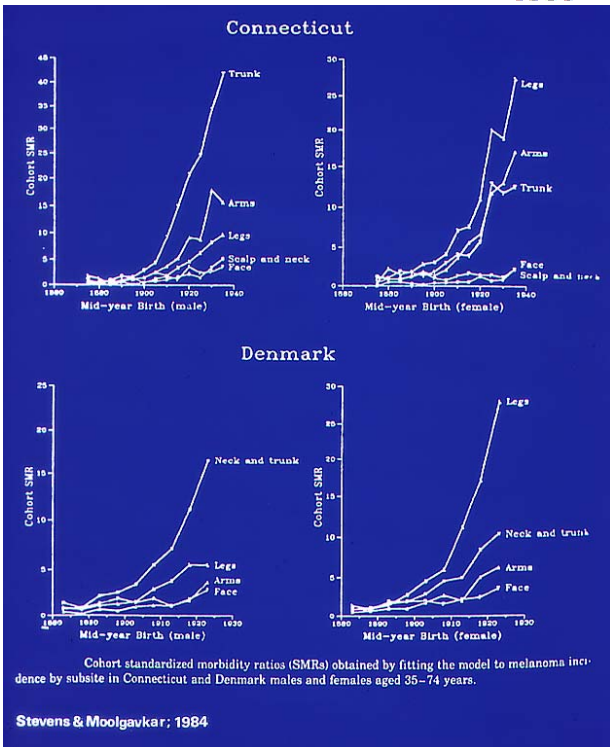
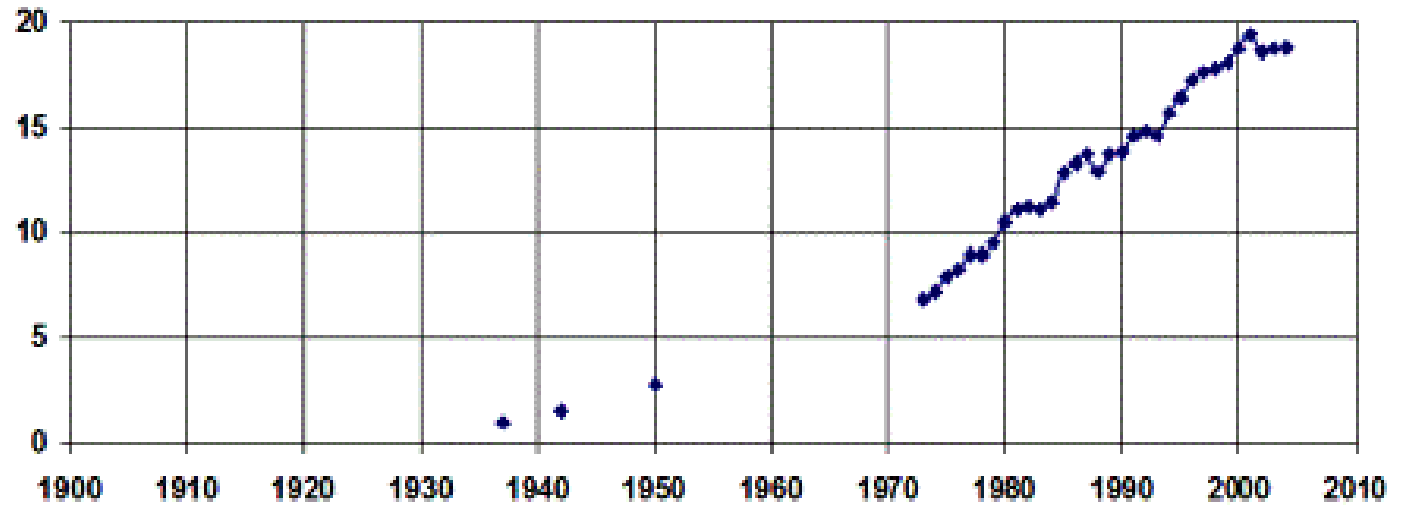
Sweden  
Skin, non-melanoma  
Numbers age 0-85+



UPWARD  
TRENDS  
IN SKIN  
CANCERS

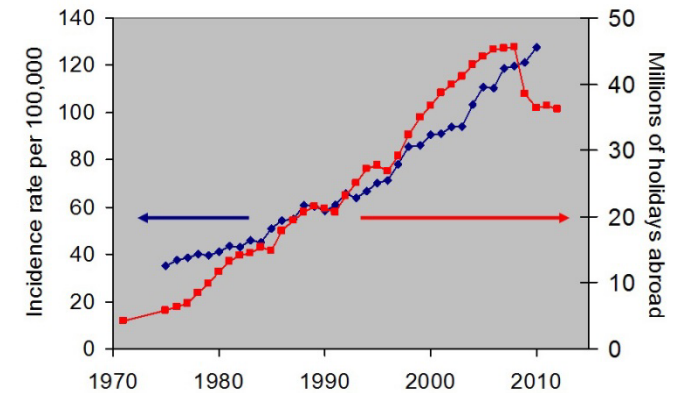
IN USA &  
EUROPE

US Melanoma Incidence per 100000 people



MELANOMA  
INCREASES  
in SUCCESSIVE  
BIRTH COHORTS  
from < 1900

Year

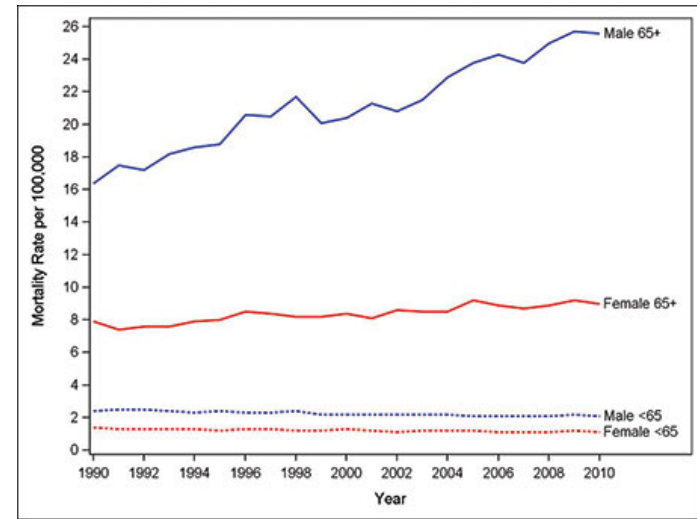


Skin Cancer UK,  
Diffey, Skin Care Forum, 2014

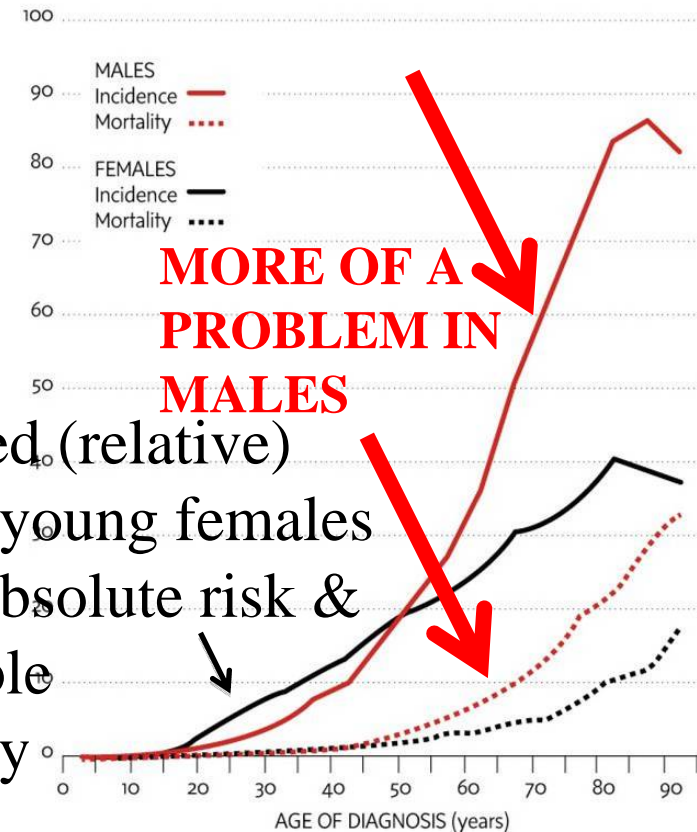
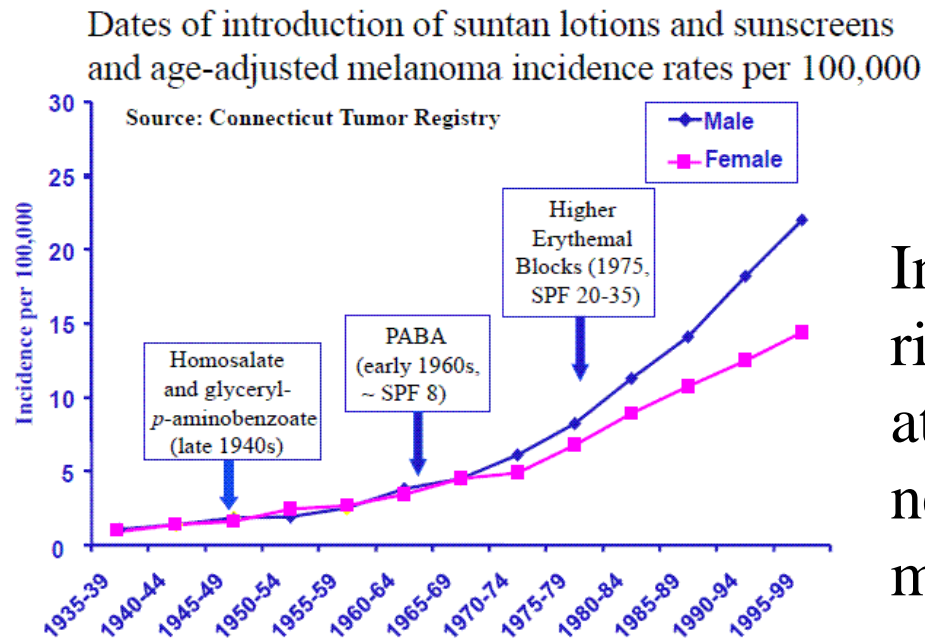
UP WITH  
SUNBATHING

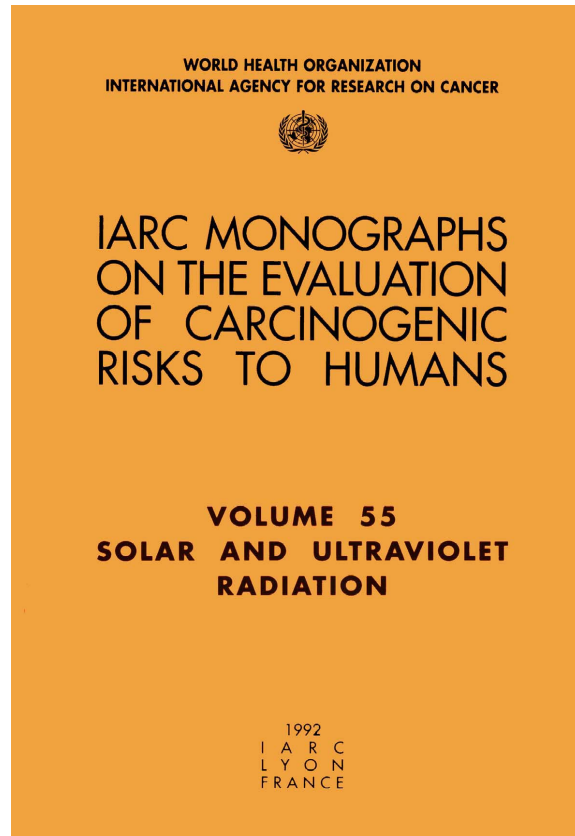


In 1923, French style icon **Coco Chanel** “accidentally” developed a **tan** while on her yacht in France



MELANOMA OF THE SKIN, rate per 100,000, Canada, 2009





1992:

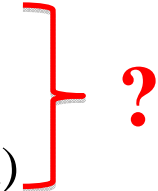
## SOLAR AND ULTRAVIOLET RADIATION

**Solar radiation** (Group 1)

Ultraviolet A,B,C radiations (Group 2A)

Use of sunlamps and sunbeds (Group 2A)

Exposure to fluorescent lighting (Group 3)



2006:

“There is sufficient evidence in humans for the carcinogenicity of **solar radiation.**” (Group 1)

“There is sufficient evidence in humans for the carcinogenicity of the use of **UV-emitting tanning devices.**” (Group 1)

2012 (part D of Volume 100 of the IARC Monographs):

Types of radiation classified in Group 1

- Ionising radiation

....

- **Solar radiation**

- **Ultraviolet radiation** (wavelengths 100–400 nm, encompassing UVA, UVB, and UVC)

**SOLAR UV SPECTRUM HIGHLY VARIABLE –  
ARTIFICIAL UV LAMP SPECTRUM CONSTANT &  
SELECTED FOR SPECIFIC EFFECTS**

UVB rich lamps:

phototherapy of psoriasis,  
UV hardening,

....

UVA rich lamps:

phototherapy of scleroderma,  
NO (lowering blood pressure),  
tanning\*,

....

\* UVA (98%) source faster tanning, with lower total UV dose (in SED),  
than with a summer-sun-like UV lamp (95% UVA 5% UVB)

(Miller et al, BJD 2008).

# INFLATION OF MELANOMA STATS:

DIAGNOSTIC DRIFT IN MELANOMA; more and more erring on the safe side

confirmed by comparisons of historical samples

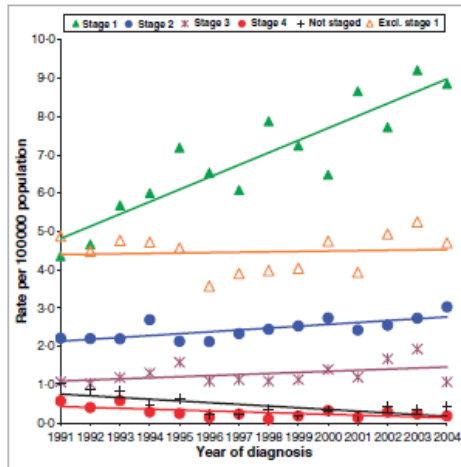


Fig 2. European age-standardized incidence rates of malignant melanoma by stage in Norfolk, Suffolk and Cambridgeshire in 1991–2004.

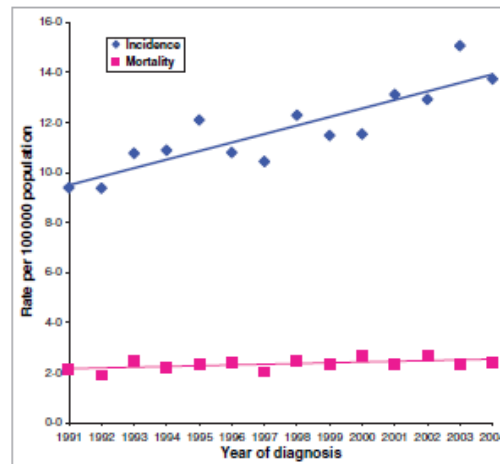
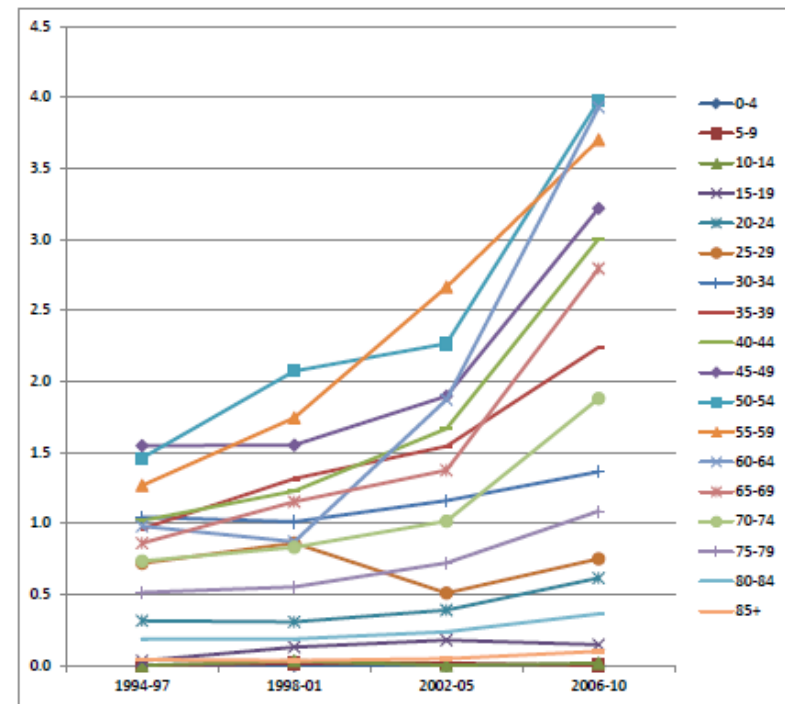


Fig 1. European age-standardized incidence and mortality rates for malignant melanoma in Norfolk, Suffolk and Cambridgeshire in 1991–2004.

B In situ melanomas, females

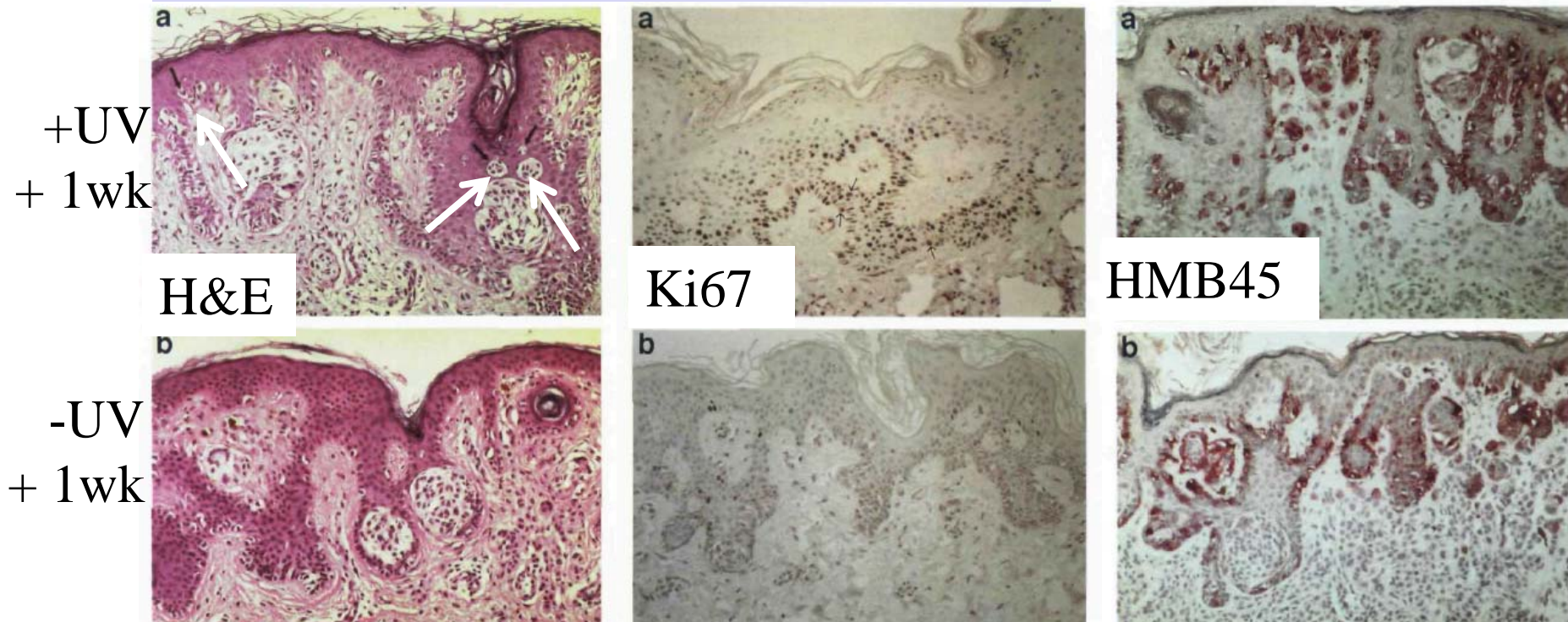


clear “period effect” of increasing thin and in situ melanomas in the Netherlands (increases by birth cohort in “true” melanomas)  
 Van de Leest et al, Eur J Cancer 2015



# INFLATION MELANOMA STATS: UV-IRRADIATED NEVI: activation

Tronnier et al JID 1995  
BJD 1997



Melanocytes in nevi:

PCNA, KiS7 (antiTopoisomeraseIIalpha), KiS11(antiKi67) up  
after single UV overexposure (4 MED; more transient after 2 MED)  
prognostic markers in melanoma

“The UV-irradiated nevus should be added to the list of so-called  
simulators of malignant melanoma” (Tronnier & Wolff, Am Dermatopathol. 1995)

mouse dermal melanocytes proliferate after overdosis UVB not UVA

Van Schanke et al, JID 2005



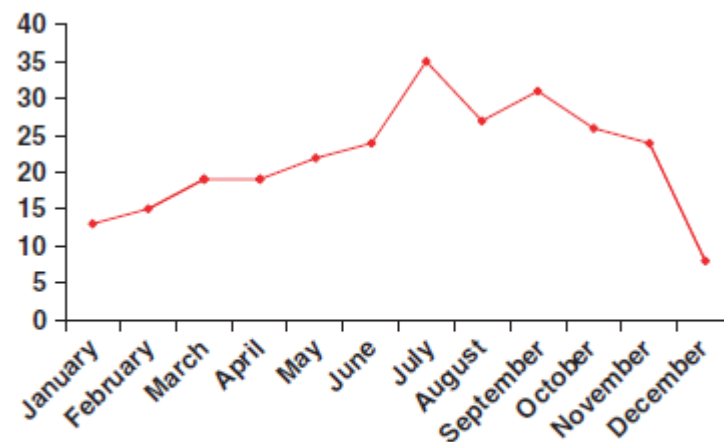


## **SUNBURNS VERY COMMON!!!**

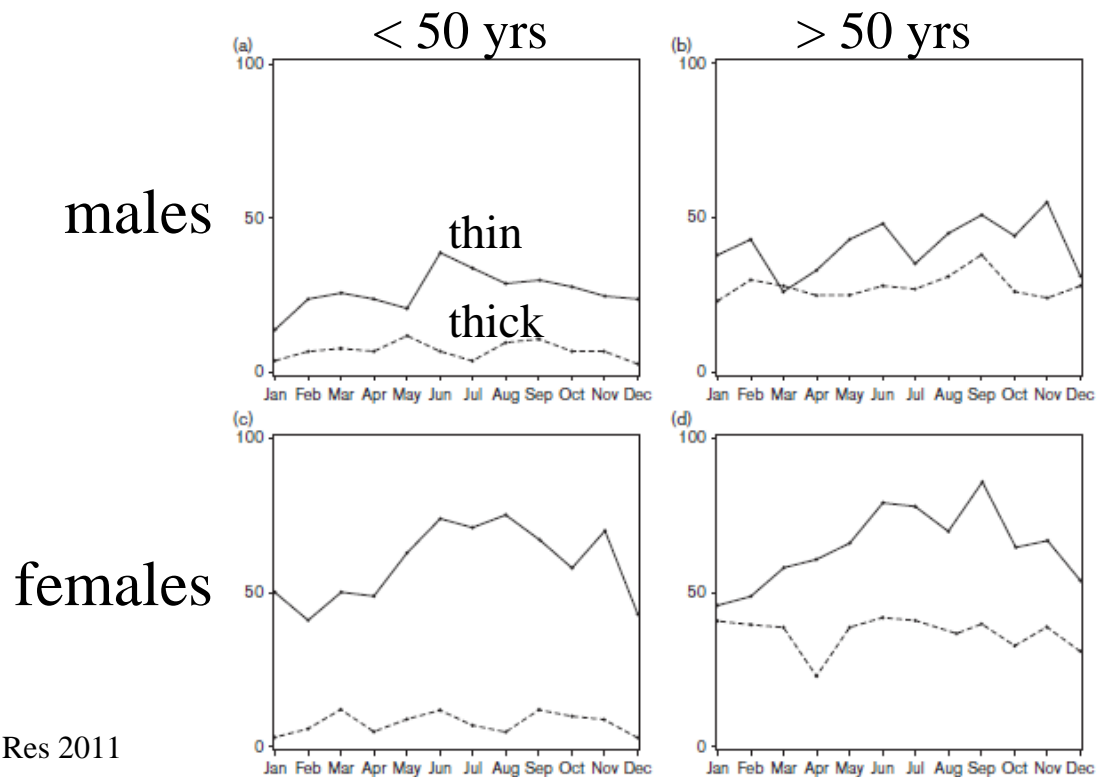
Telephone surveys:  
**30 – 50%** of people  
got sunburned  
in last 12 months



# SUMMER INCREASES IN MELANOMA



Downes et al Clin Exp Dermatol 2010



Challiol et al Mel Res 2011

Monthly numbers of invasive cutaneous melanomas of Breslow thickness less than 2 mm (continuous line) or 2 mm and greater (dotted line) diagnosed in Northern Ireland for the period 1984–2006 in (a) men aged below 50 years, (b) men aged 50 years and above, (c) women aged below 50 years, and (d) women aged 50 years and above.

# SUNBED USE ASSOCIATED WITH SUNBATHING



Sunbed users more often outdoor sunbathers  
( $p < 0.01$ ); Thieden et al Arch Dermatol 2005

OddsRatio sunbeduser/sunbather = 7 overall = 10 for regular users  
(Westerdahl J et al, Br J Cancer 2000;82:1593-9)  
= 4.1 (95% 1.8 – 9.0)  
(Gordon et al, J Hlth Physiol 2012)

for a user the odd to be a sunbather is 4 to 10 times higher than for non-users

→ a sunbed user is typically also a sunbather!

→ STRONG CORRELATION  
(COLLINEARITY) BETWEEN  
SUNBED USE AND SUNBATHING:  
(mostly not/inadequately handled):



From Wikimedia Commons, the free-media repository

## HIGHEST RISK FROM SUNBED OR SUN?

## sunbed vs sun doses; minor to a minor fraction of population

annual UV dose ~ squamous cell carcinoma

Annual sun dose, median, (DK, Thieden et al JID 2004)

166 SED/yr

95% range

37 – 551

Sunbed use, medians,

12 min/session (Bock et al BTJ 2013) @ UVI 12 =

2.2 SED/session

6 sessions in 2012 on average

by 14.6 % of population of 14-45yrs (Scheider et al, Hautarzt 2016)

180 min sunbed/yr (Bock et al BTJ 2013) @ UVI 12 =

32 SED/yr

Mediterranean holiday (Petersen et al BJD 2013)

57 SED/week

Average 10.5 days (UK office of Natl Stats 2013) =

86 SED/holiday

40 million holiday trips/yr from UK (population 63.2 million)

Annual dose (n=164) correlated far more strongly with sun than sunbed exposures

# days sun exposure shoulders/upper body:

$r = 0.51, p < 0.001$

# days sun exposure during outdoor sports:

$r = 0.39, p < 0.001$

# sunbed sessions:

$r = 0.26, p = 0.02$

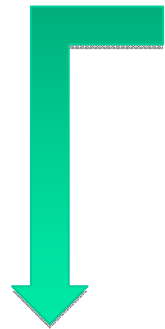
( $r =$  Spearman rank correlation coefficient)

(Thieden et al. JID 2004)



ESTIMATED PAF, population attributal fraction.  
not 'hard figures', but soft/dubious ones

Skin cancer type	Number of cases	Extra cases	PAF (%)
Squamous cell carcinoma	8123	1998	24.6 ?
Melanoma	4677	422	9.0 ?
<i>The Netherlands 2010; TNO 'PAF' report 2014</i>			



arbitrary/dubious assumptions  
on RR and extrapolations to life long  
sun exposure; age independent RR  
from sunbed use, collinearity between  
sun and sunbed exposures?

....



RR from metastudy based on  
studies different in  
proxi of sun exposure, proper dose  
metrics, confounding correction,  
accury sun exposure vs sunbed  
exposure, proper sunbed exposure  
metric. RR constant, independent  
of age, location etc?  
collinearity sun & sunbed effects?

....

## CONCLUSIONS

- trends of increasing skin cancer incidences date back to before WW II; long before sunbeds
- men use sunbeds less than women; but skin cancer, incl. melanoma (mortality!), more of a problem in men
- increases thin/in situ melanoma shift in diagnosis and UV activation of (atypical) nevi, not accompanied with increases in mortality → inflation of melanoma statistics (particularly in young female sunbed users?)
- population wide sun exposure dominated over sunbed exposure; sun (holidays) > sunbed exposure; appropriate UV dose metrics?
- sunbed users are commonly also sunbathers → high covariance/collinearity largely ignored and not/inadequately analyzed --- (sunbed risk = sun risk?)

## FRAMING THE NEWS & MISGUIDANCE, DELIBERATELY?



### THE CASE OF CLARE OLIVER

(† 2007, at age 26);  
news coverage in Australia

- visited solaria 10 times (at age 19)
- mostly referred to solarium as the cause of the melanoma



- spent years acquiring a tan outdoors; only referred to in 1 out of 10 statements (>100)
- campaigned against solaria
- leading to solaria ban in Australia (?)