What we know about ultraviolet radiation and skin cancer: Implications for artificial tanning

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Facts

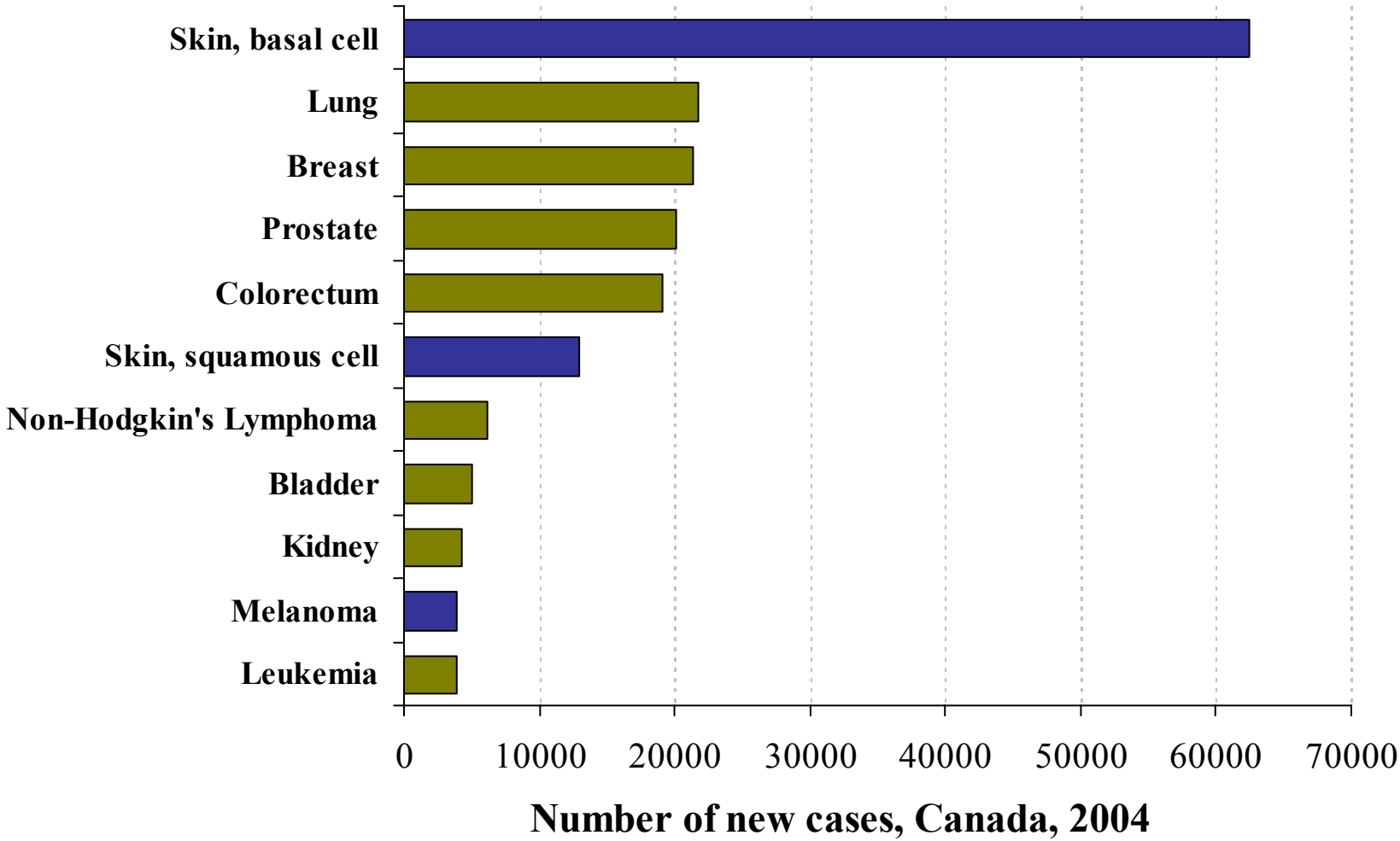
- Skin cancer is the most common cancer in Canadians
  - Melanoma, the most fatal form, is a common cancer of young adults, especially females
  - Skin cancer incidence is increasing
- Solar radiation is carcinogenic, causing skin cancer
  - Broad-spectrum UVR is carcinogenic
- Tanning equipment emits broad-spectrum UVR
  - Exposure to TE known to be a human carcinogen
- Use of tanning equipment increases risk of melanoma
- Prevalence of tanning equipment use is highest in female adolescents/young adults

Fact #1

Skin cancer is the most common cancer in Canadians

- Melanoma, the most fatal form, is a common cancer of young adults, especially females
- Skin cancer incidence is increasing

Most common cancers, Canada, 2004



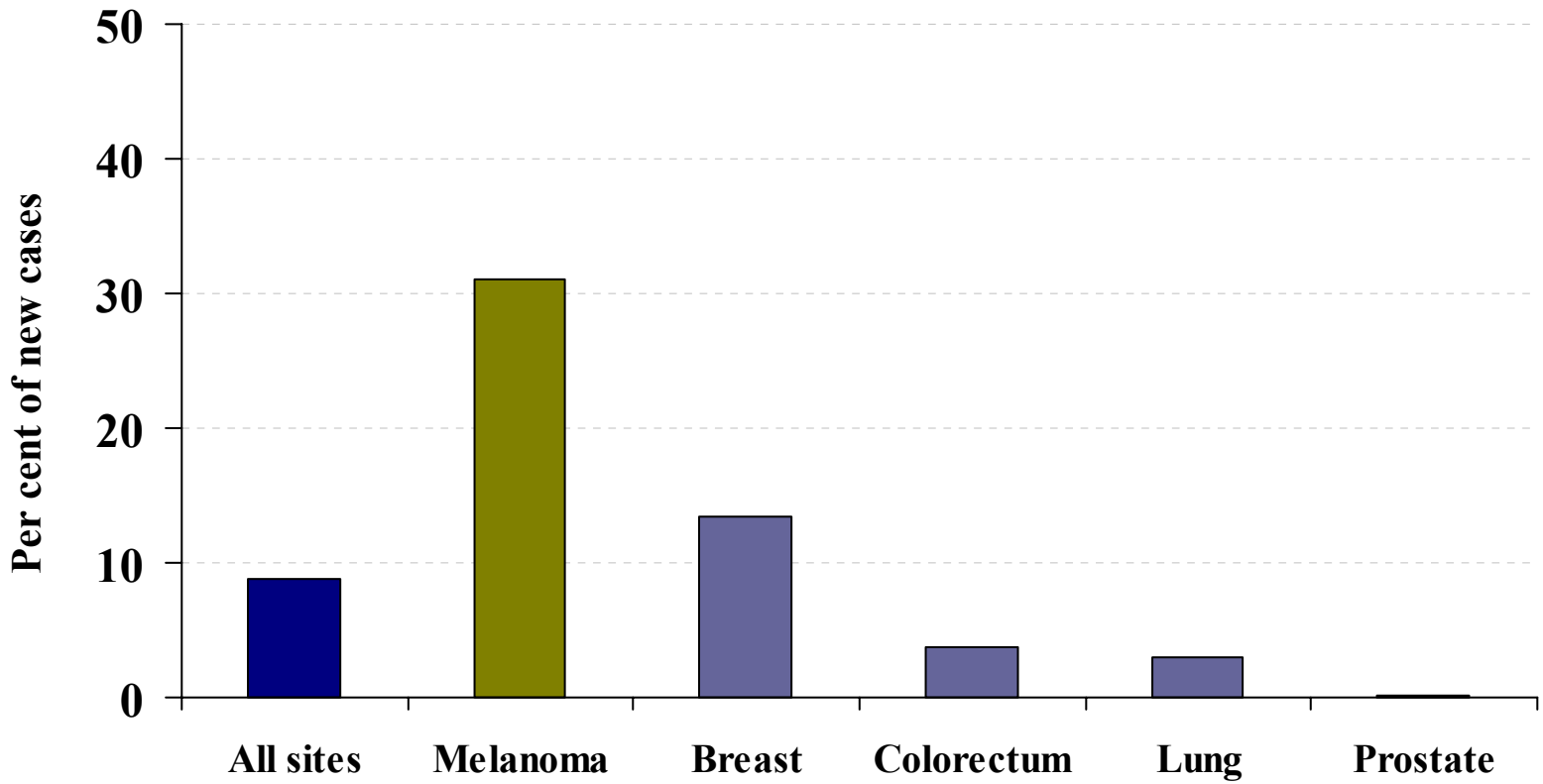
Source: Canadian Cancer Statistics 2004

Melanoma is common in young adults, especially women

- 8% of all cancer diagnosed in 20-44 year olds is melanoma
  - 800 diagnoses/year in Canada
  - Rate in young women - 1.4 times that in young men
- Nearly 1/3 of melanomas occur in this age group

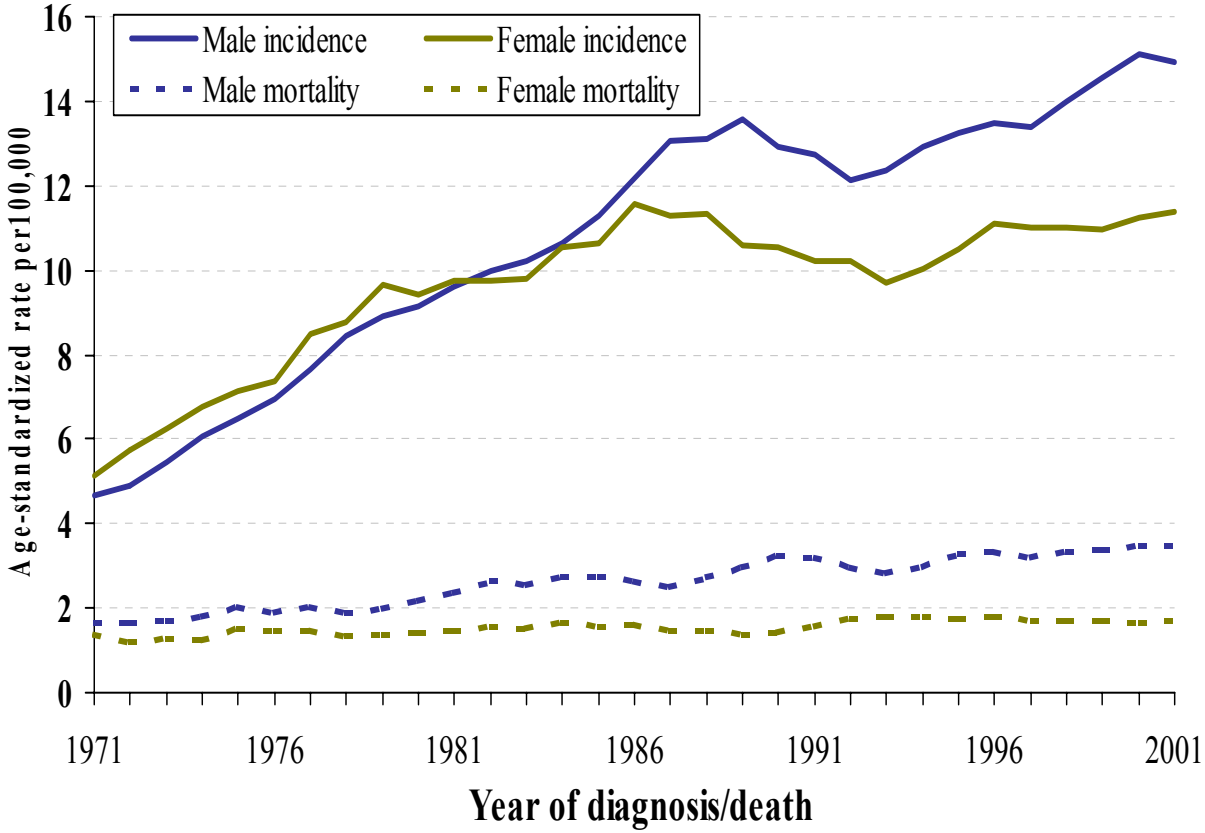
Source: Cancer in Young Adults in Canada, 1990-1999

Melanoma and common cancers: % diagnosed at age 20-44 vs. 45+



Source: Cancer in Young Adults in Canada, 1990-1999

Melanoma incidence/mortality, Ontario, 1971-2002



Source: Cancer Care Ontario (Ontario Cancer Registry, 2004).

3-year moving averages standardized to the Canadian 1991 population.

Fact #2

Solar radiation is carcinogenic, causing skin cancer

- Broad-spectrum UVR is carcinogenic

International Agency for Research on Cancer (1992):

- Solar radiation is a human carcinogen causing all forms of skin cancer*
- UVA and UVB are carcinogenic in animals and probably in humans*

National Toxicology Program, Report on Carcinogens (2000, 2002):

- Solar radiation is known to be a human carcinogen
- Broad-spectrum UVR is known to be a human carcinogen
- UVA and UVB are reasonably anticipated to be a human carcinogen

Epidemiologic evidence for solar radiation causing skin cancer

- Risk of skin cancer is higher in light-skinned than dark-skinned populations
- Individuals with sun-sensitive skin are at higher risk than those who do not burn/tan easily
- In fair-skinned populations, incidence is generally higher where ambient UVR is higher
- Incidence per unit skin area is greatest on sun-exposed sites and lower for rarely exposed sites
- Epidemiologic studies consistently find increased risk associated with sun exposure

How does the sun and skin cancer?

- Both amount ***and*** pattern of exposure relevant
  - ***the higher the total lifetime exposure,*** the greater the risk for all types of skin cancer
  - ***the more intermittent the pattern of exposure,*** the greater the risk for melanoma
    - melanoma risk is *less* in outdoor vs. indoor workers
  - basal cell carcinoma intermediate for both

What is “intermittent” exposure?

- Irregular pattern of exposure
  - opposite of “outdoor work”
- Indicators of “intermittent” exposure
  - weekend vs. weekday exposure
  - recreational (i.e., non-occupational) sun exposure
  - “sunny” vacations especially in winter months
  - sunburn
- Increased risk of melanoma 60-70% using such crude measures

Children/youth may be particularly vulnerable to carcinogenic effects of sun

- Epidemiologic study results suggestive
- Melanoma occurs at a relatively young age
- Moving from low to high risk environment at a young age increases risk vs. place of origin *or* later age at migration
- Moles arise prior to age 20
  - moles result from sun exposure
  - many moles increase the risk of melanoma

Other susceptible subgroups

Pigmentation

- light skin; red (or fair) hair
- skin that burns easily and tans poorly
- tendency to freckle
- many moles (for melanoma)

Genetic

- Personal or close family history of skin cancer
- Some rare gene mutations/conditions

Fact #3

Tanning equipment emits broad-spectrum UVR

- Exposure to sunlamps and sunbeds is carcinogenic

International Agency for Research on Cancer (1992):

- Use of sunlamps and sunbeds entails exposures that are probably carcinogenic to humans*

National Toxicology Program, Report on Carcinogens (2000, 2002)

- Exposure to sunlamps or sunbeds is known to be a human carcinogen

Fact #4

Use of tanning equipment increases risk of melanoma

Melanoma and use of tanning equipment: epidemiologic evidence

- 10 of 13 melanoma studies contributed to a recent meta-analysis*
  - 9 case-control and 1 cohort
- 8 of 10 had positive association with "ever use"
  - pooled estimate of relative risk (95% CI) = **1.25** (1.05-1.49)
- 5 of 5 studies with 1st exposure as young adult had positive association with "ever use"
  - relative risk (RR) estimate = **1.69** (1.32-2.18)
- 6 studies had some dose information
  - RR estimate for highest dose vs. never use = **1.61** (1.21-2.12)

* Source: Gallagher, Spinelli, Lee. (Cancer Epidemiol Biomarkers Prev 2005)

Summary: Skin cancer and use of tanning equipment

- Studies of melanoma indicate that use of tanning equipment increases risk, especially if use begins early in life and/or is frequent
- 1 study of other types of skin cancer had similar increases in risk for both basal cell and squamous cell cancers
- Studies conducted over past 20 years – composition of UV emissions from TE have changed towards higher UVA to UVB ratio
  - Later studies have results similar to earlier studies
  - UVA also has many negative effects – no evidence that it is less important for melanoma

Conclusions

- Skin cancer is very common and is increasing
- Broad-spectrum UVR is carcinogenic, regardless of the source
- UVR is the only important cause of skin cancer, responsible for most melanomas, basal cell carcinomas and squamous cell carcinomas
- Subgroups of fair-skinned populations are particularly susceptible to carcinogenic effects of UVR
- Use of tanning equipment, especially at younger ages increases, skin cancer risk