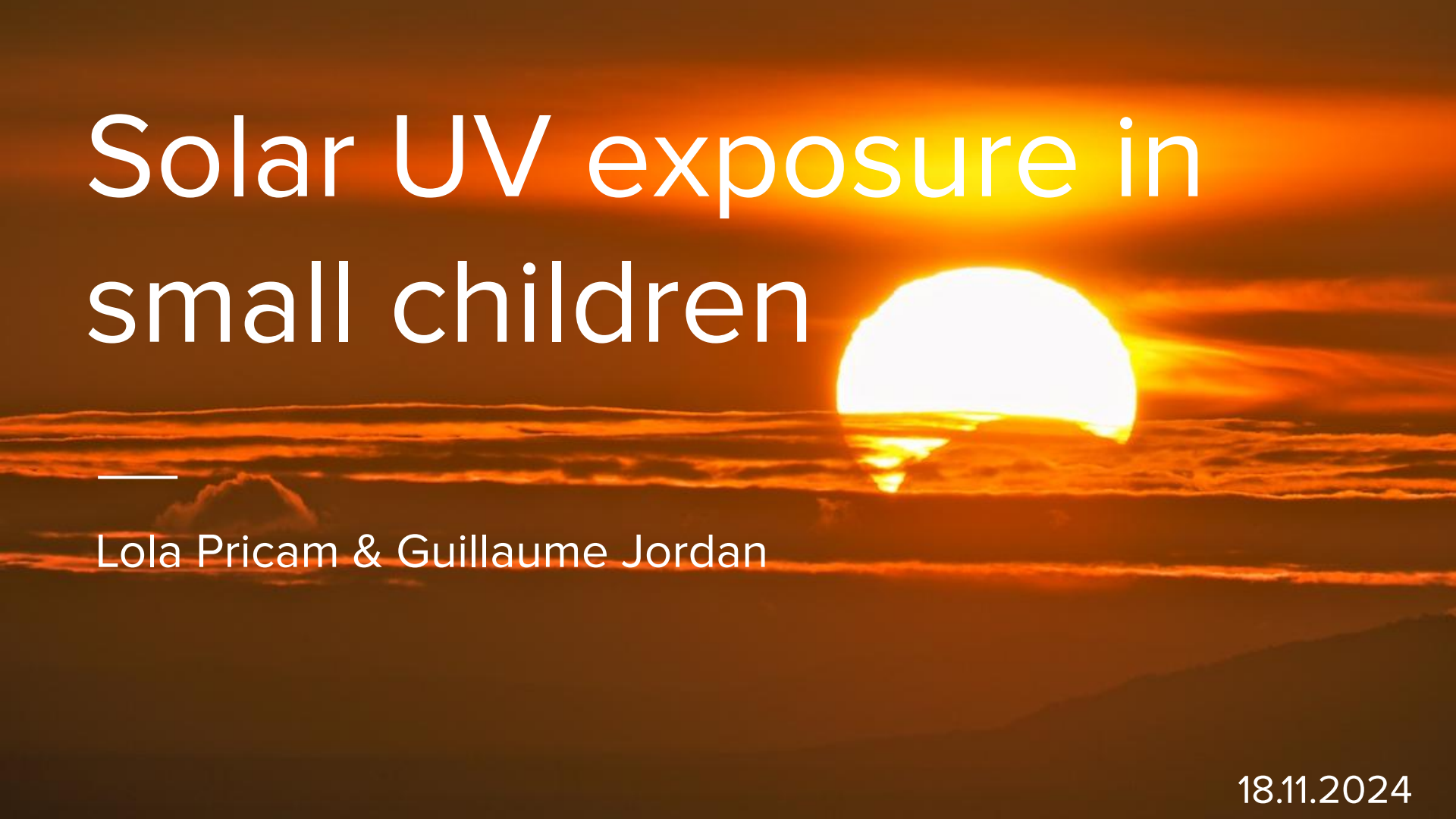


# Solar UV exposure in small children



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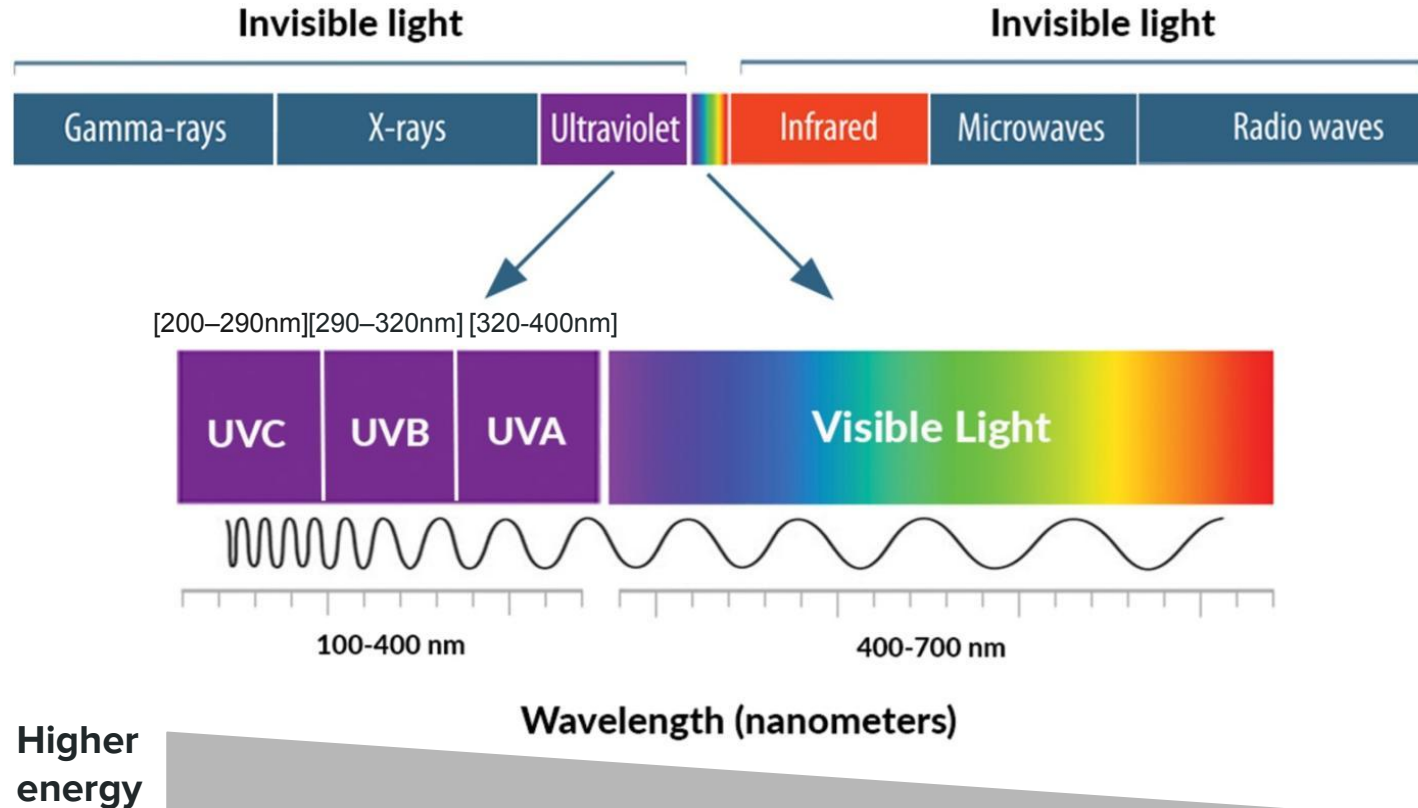
Lola Pricam & Guillaume Jordan

18.11.2024

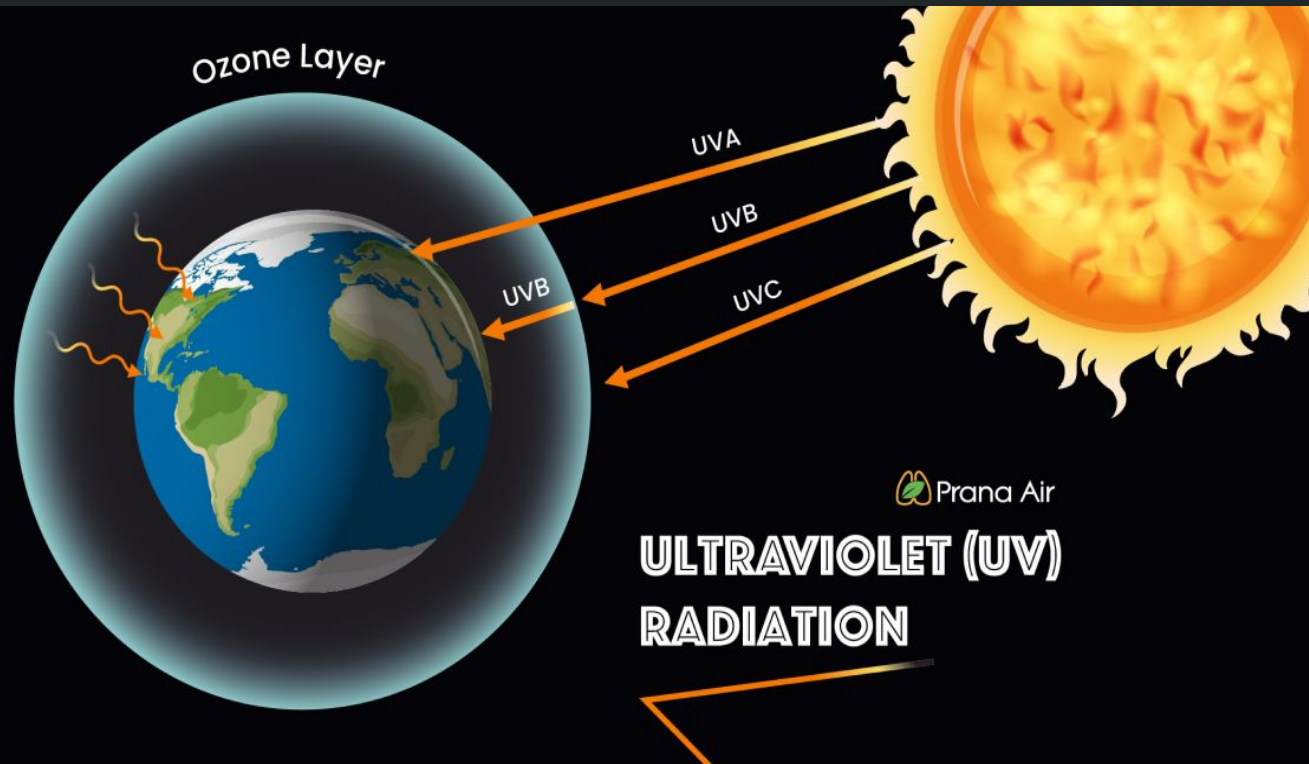
# Table of contents

1. Contexte
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2. Impacts
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  - b. Eye
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3. Risk factors
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# Electromagnetic radiation



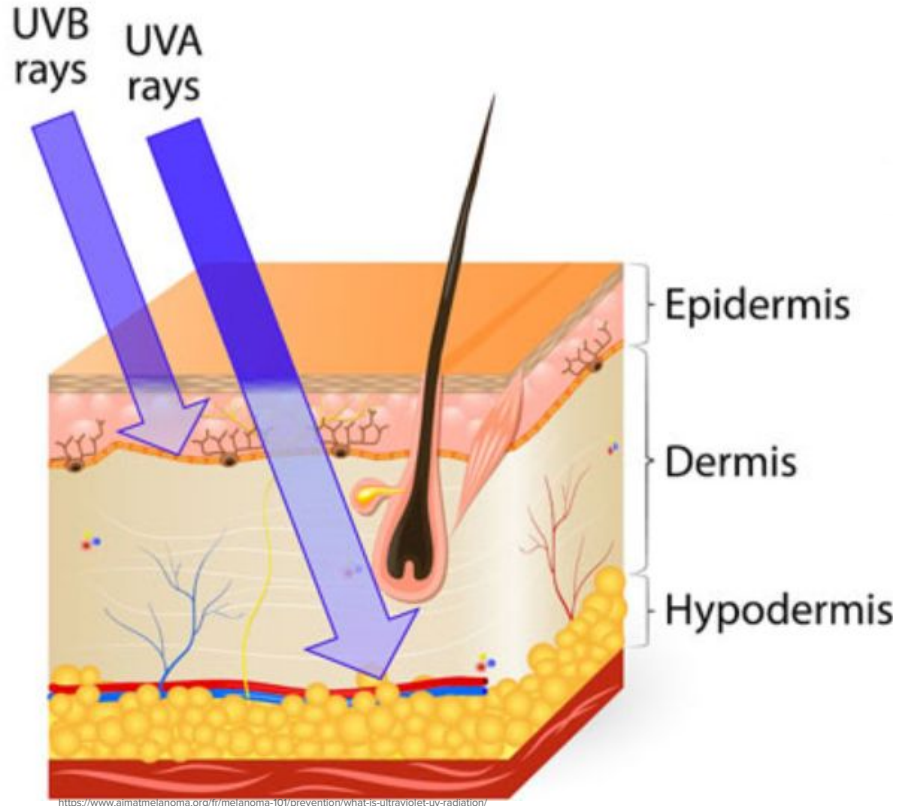
# UV on earth



At earth surface:

- 95% UVA
- 5% UVB

# Impact of UV on skin



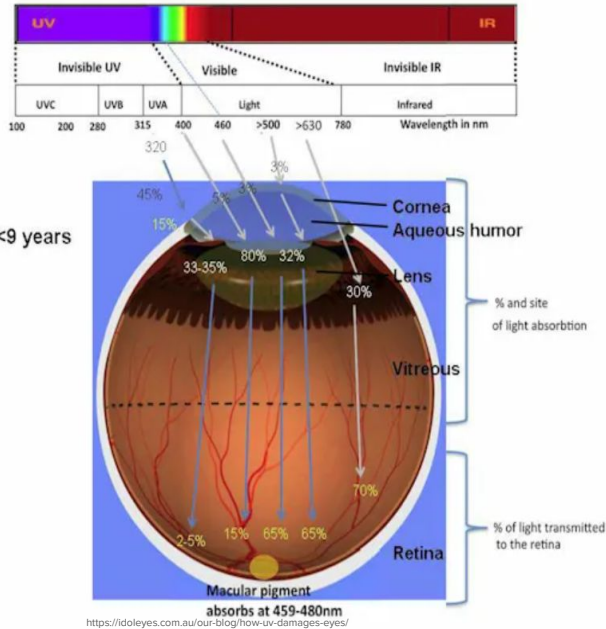
## UVA :

- skin aging
- DNA damage
- sun allergy

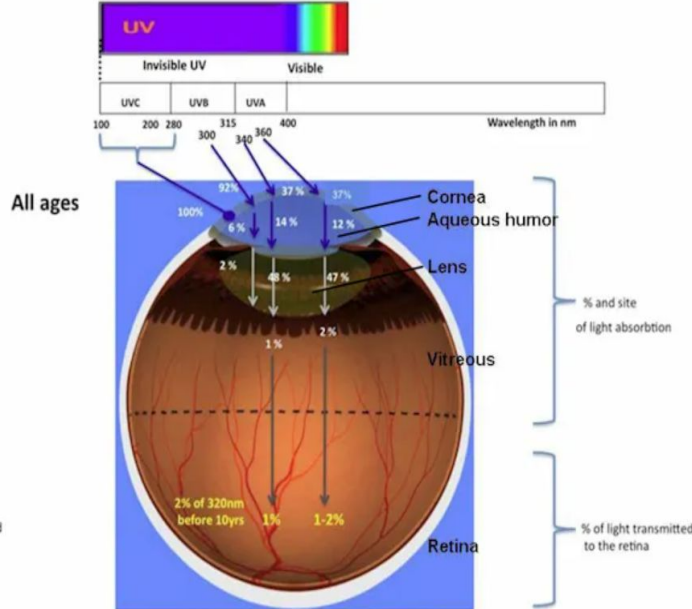
## UVB :

- Skin cancer
- Can cause sunburn 1000 times faster than UVA !!

# Impact on eyes



2-5% UV from 320nm can reach retina



1% of UV or less can reach retina

To the cornea :

- pterygium
- pinguecula
- keratites

To the lens:

- cataracts

# Positive impact

## UVB contribute to creation of Vitamin D:

- Skin (cholecalciferol) → Liver (hydroxycholecalciferol (25(OH)D3))
- Kidneys and other cells (dihydroxycholecalciferol (1,25(OH)2D3))

## Role of Vitamin D:

- enhancing the intestinal absorption calcium → Particularly important for children's bones formation
- strengthening our immune system
- helps regulate cell growth

UVR has been used for decades to treat skin diseases, especially psoriasis





Time of the day

Cloudiness

Month of the year

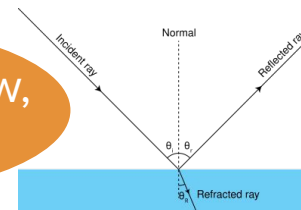
Altitude

# Risk factors

Reflection of snow, water and sand

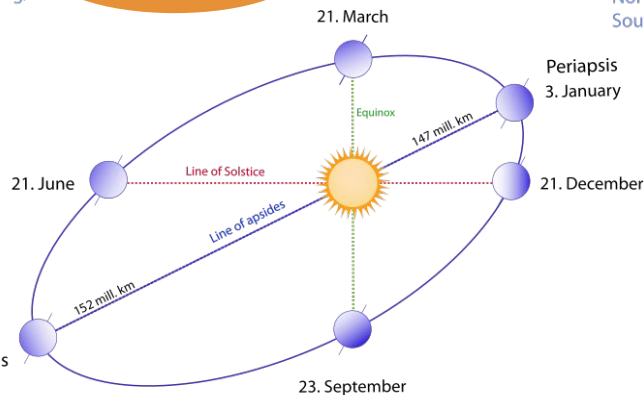
Type of skin

Latitude



Northern spring/  
Southern fall

Northern winter/  
Southern summer



Northern summer/  
Southern winter

Northern fall/  
Southern spring

[https://simple.wikipedia.org/wiki/Earth%27s\\_orbit](https://simple.wikipedia.org/wiki/Earth%27s_orbit)

| Skin Type | History of Sunburning or Tanning                             |
|-----------|--------------------------------------------------------------|
| I         | Always burns easily, never tans                              |
| II        | Always burns easily, tans minimally                          |
| III       | Burns moderately, tans gradually and uniformly (light brown) |
| IV        | Burns minimally, always tans well (moderate brown)           |
| V         | Rarely burns, tans profusely (dark brown)                    |
| VI        | Never burns, deeply pigmented (black)                        |



# Dose depending on latitude

SED = Standard Erythemal Dose ; skin type independent

1 SED / day : safe for most people [7]

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Comparison between :

Durham (UK)

Townsville (AUS)

Annual erythemally effective  
dose

**3600 - 4000 SED**

**14 000 SED**

Summer period

2280 SED

6620 SED

Winter period

186 SED

3940 SED

# In Switzerland

Recommended value : **0,3 SED / day**

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Study on 120 children :

Average annual exposure to the chest :

**160 - 260 SED**

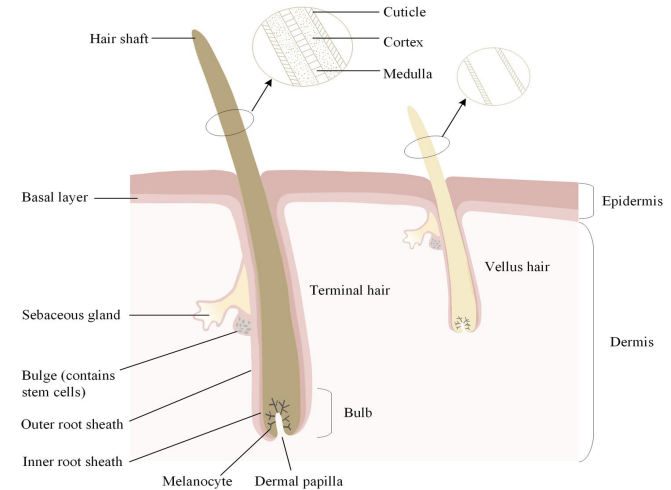
Comparison with fruit and vegetable  
gardeners : **648 SED**



Figure : Image of a child wearing the strap containing the two dosimeters. The UV dosimeter is on the left, with the two sensors that measure UVA and UVB radiation.

# Why are children more impacted ?

- According to studies : ~ **25%** of lifetime exposure occur before age 18 [10] or **40-50%** of total solar UV received to age 60 occur before 20 [11]
- Vellus hair follicles closer to the skin surface  
→ greater risk of melanoma
- Vitamin D production reduces with age  
→ the need is higher during childhood
- Skin is thinner and has less pigmentation
- Lenses filter less UV



[12]

**Overall → children's skin and eye are more sensitive to UV radiations**

# Childhood Sun Exposure

| Study                        | Place of registration          | Place of birth             | Outcome   | Age at arrival                 | RR estimate <sup>a</sup><br>(95% CI) <sup>b</sup> : males | RR estimate<br>(95% CI): females |
|------------------------------|--------------------------------|----------------------------|-----------|--------------------------------|-----------------------------------------------------------|----------------------------------|
| <i>Low-to-high migration</i> |                                |                            |           |                                |                                                           |                                  |
| Khlat [19]                   | Australia                      | England                    | Mortality | Native-born (ref) <sup>c</sup> | 1.00                                                      | 1.00                             |
|                              |                                |                            |           | 0–<15                          | 0.90 (0.74–1.10)                                          | 0.79 (0.61–1.03)                 |
|                              |                                |                            |           | 15–24                          | 0.41 (0.32–0.54)                                          | 0.43 (0.29–0.62)                 |
|                              |                                |                            |           | 25+                            | 0.32 (0.27–0.39)                                          | 0.32 (0.27–0.39)                 |
|                              |                                | Ireland/Scotland/<br>Wales | Mortality | Native-born (ref)              | 1.00                                                      | 1.00                             |
|                              |                                |                            |           | 0–<15                          | 0.77 (0.55–1.07)                                          | 0.70 (0.45–1.11)                 |
|                              |                                |                            |           | 15–24                          | 0.46 (0.32–0.66)                                          | 0.52 (0.32–0.85)                 |
|                              |                                |                            |           | 25+                            | 0.31 (0.22–0.41)                                          | 0.29 (0.19–0.43)                 |
| <i>High-to-low migration</i> |                                |                            |           |                                |                                                           |                                  |
| Mack and<br>Floderus [14]    | Seattle                        | California                 | Incidence | Other SSN (ref)                | 1.00                                                      | 1.00                             |
|                              |                                |                            |           | CA/AZ SSN                      | 1.11 (0.82–1.51)                                          | 1.26 (0.91–1.69)                 |
| Autier [28]                  | Belgium,<br>France,<br>Germany | Sunny places               | Incidence | Never lived sunny place        | 1.00                                                      | NS                               |
|                              |                                |                            |           | Born sunny place               | 6.56 (1.84–23.4)                                          |                                  |
|                              |                                |                            |           | Sunny place <10 yrs            | 4.31 (1.68–11.1)                                          |                                  |
|                              |                                |                            |           | Sunny place 10–22 yrs          | 2.38 (0.42–13.6)                                          |                                  |
|                              |                                |                            |           | Sunny place 23+ years          | 1.52 (0.55–4.22)                                          |                                  |

# Limitations of the data

- Exposure values difficult to measure
- Study on children are quite difficult → lack of studies
- Pretty old studies

# Recommendations

Federal Office of Public Health (OFSP)

| [min]                            | personnes particulièrement sensibles aux UV, à la peau ou claire très claire et enfants |         |            |
|----------------------------------|-----------------------------------------------------------------------------------------|---------|------------|
|                                  | matin                                                                                   | midi    | après-midi |
| février, mars, octobre, novembre | 50 - 120                                                                                | 20 - 60 | 30 - 120   |
| avril, septembre                 | 30 - 60                                                                                 | 15 - 30 | 20 - 50    |
| mai jusqu'à août                 | 20 - 45                                                                                 | 10 - 20 | 15 - 30    |

Table 1. Combined duration of exposure to the sun in the morning from 9am (summer time: 10am), in the middle of the day from 12.30pm (summer time: 1.30pm), and in the afternoon from 3pm (summer time: 4pm), after which solar erythema may appear on exposed parts of the body in a standing position.[13]

|                   | personnes particulièrement sensibles aux UV, à la peau claire ou très claire et enfants |            |             |
|-------------------|-----------------------------------------------------------------------------------------|------------|-------------|
|                   | matin                                                                                   | midi       | après-midi  |
| janvier, décembre | >4 h                                                                                    | 1½ - 2½ h  | n/a*        |
| février, novembre | 2½ - 3½ h                                                                               | ½ - 1½ h   | 2 - 3 h     |
| mars, octobre     | 1 - 2 h                                                                                 | ¼ - ½ h    | ½ - 3 h     |
| avril, septembre  | 30 - 45 min                                                                             | 10 min     | 15 - 30 min |
| mai, août         | 15 - 30 min                                                                             | 5 - 10 min | 10 - 15 min |
| juin, juillet     | 15 - 20 min                                                                             | 5 - 10 min | 10 - 15 min |

\* La dose reçue est trop faible pour produire 600 UI.

Table 2. Duration of exposure to the sun in the morning from 9am (summer time: 10am), in the middle of the day from 12.30pm (summer time: 1.30pm) and in the afternoon from 3pm (summer time: 4pm), to produce afternoon from 3pm (summer time: 4pm), to produce 600 international units of vitamin D (standing, face, hands and arms exposed to the sun) [13]

# Behavioural rules



**Avoid the sun between 11 am and 3 pm**



**Wear clothes and hats**



**Suncream**



**Sunglasses**



**Daily intake of 400 IU of vitamin D will prevent vitamin D deficiency rickets in infants.**



# Thank you for your attention !

Any questions ?

18.11.2024

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