

# VITAMIN D DECODED

**How can we best address vitamin D deficiency in Australia?**

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# Disclosure Statement

- Olive Wellness Institute Advisory Panel
- Consultant to Nutrigenomix Inc.
- Founding board member of the Australasian Society of Lifestyle Medicine
- Funding from Hort Innovation (Australian Mushrooms)

15 years ago...

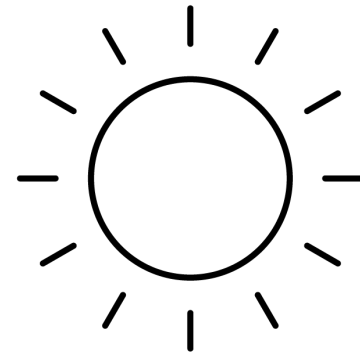


# Outline

1. Vitamin D: importance, deficiency and risk factors

2. Current guidelines and strategies

3. The role of lifestyle medicine



# Vitamin D importance, deficiency and risk factors

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# Importance of vitamin D



## THREE GIRLS WITH RICKETS

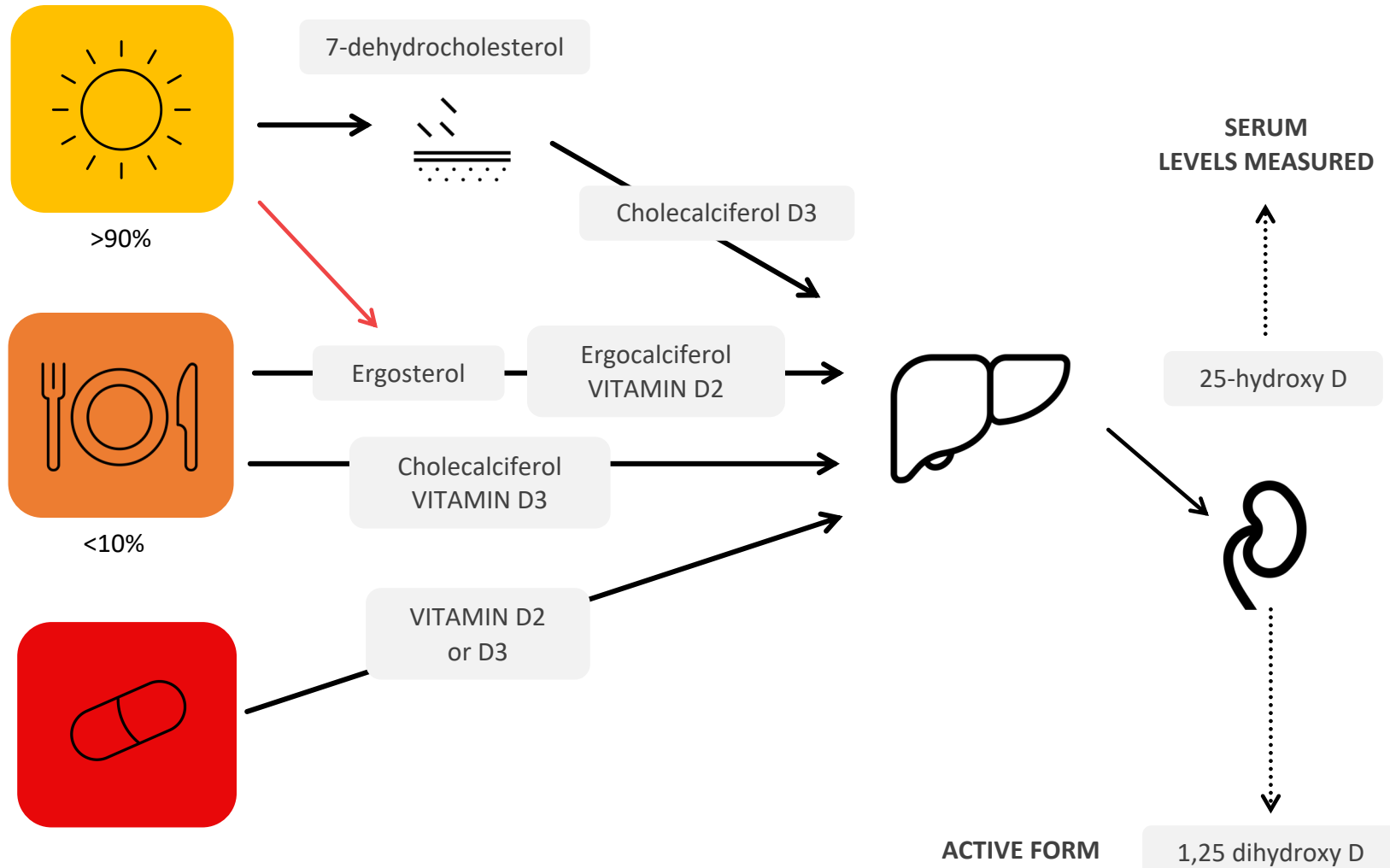
Foley J. Fossil Homids: the evidence for human evolution. Talk of Origins, 1996



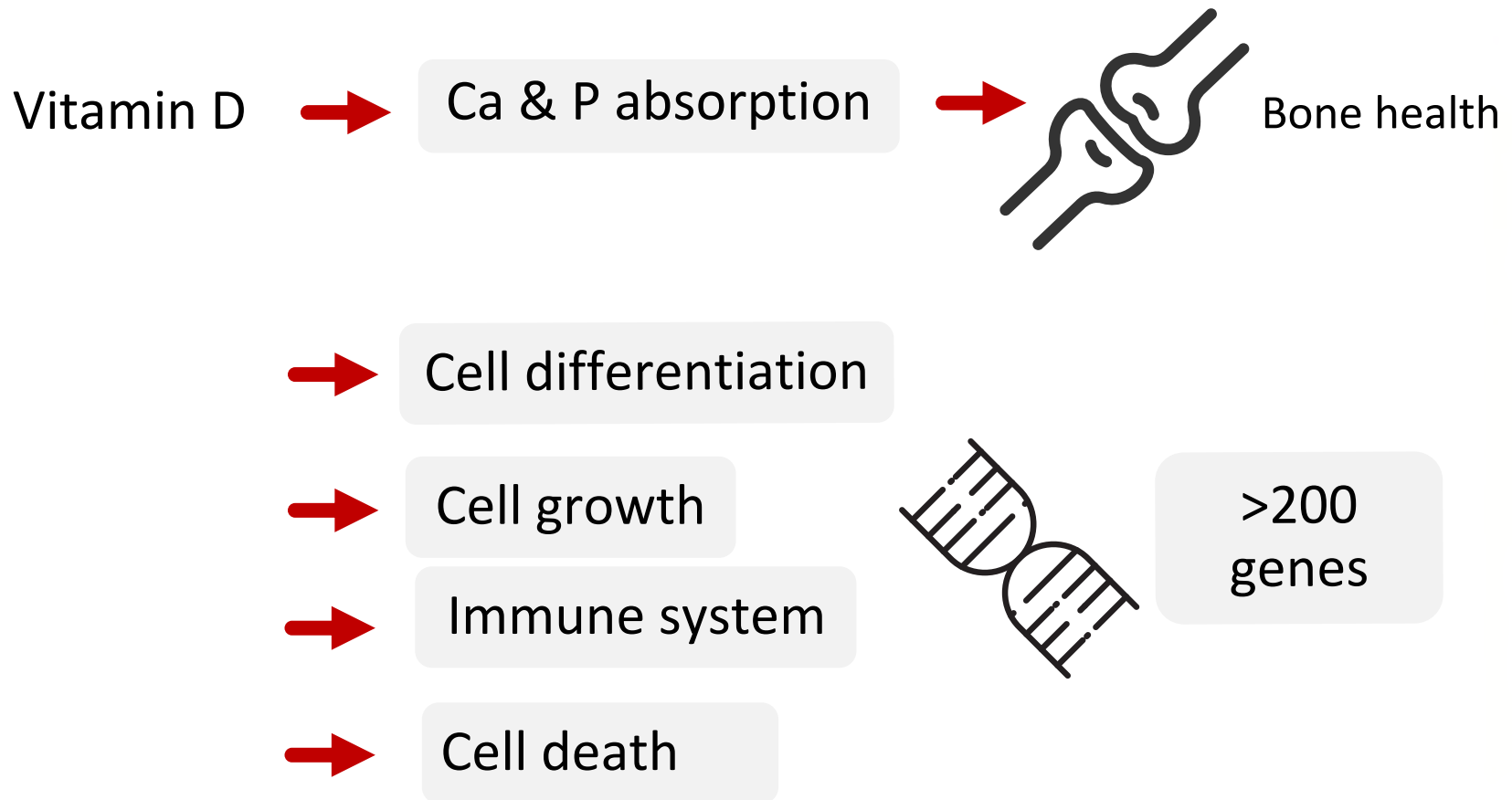
## DOG WITH RICKETS

Funk C. The Vitamines. Second ed. Baltimore: Williams & Wilkins Company; 1922

# Vitamin D metabolism



# Virtually every human cell has a vitamin D receptor





# Evidence for Vitamin D

## Established guidelines

### Musculoskeletal health

Winzenberg, Aus Fam Phys. 2012;41(3)

## Recent evidence

### Autoimmune disease

Dankers, Front Immunol. 2017;7

### Gastrointestinal health

Tabatabaeizadeh, J Res Med Sci. 2018;23

### Cancer

Young, Trends in Cancer Res. 2018;13

### Immune function

Hewison, Proc Nutr Soc. 2012;71(1)

### Cardiovascular disease

Kheiri, Clin Hypertens. 2018;24

### Mental health

Lerner, Clin Nutr ESPEN. 2018;23

### Cognition

Anastasiou, J Alzheimers Dis. 2014;42(Suppl3)

### Metabolic health

Palaniswamy, Nutr Metab Insights. 2016;8(Suppl1)

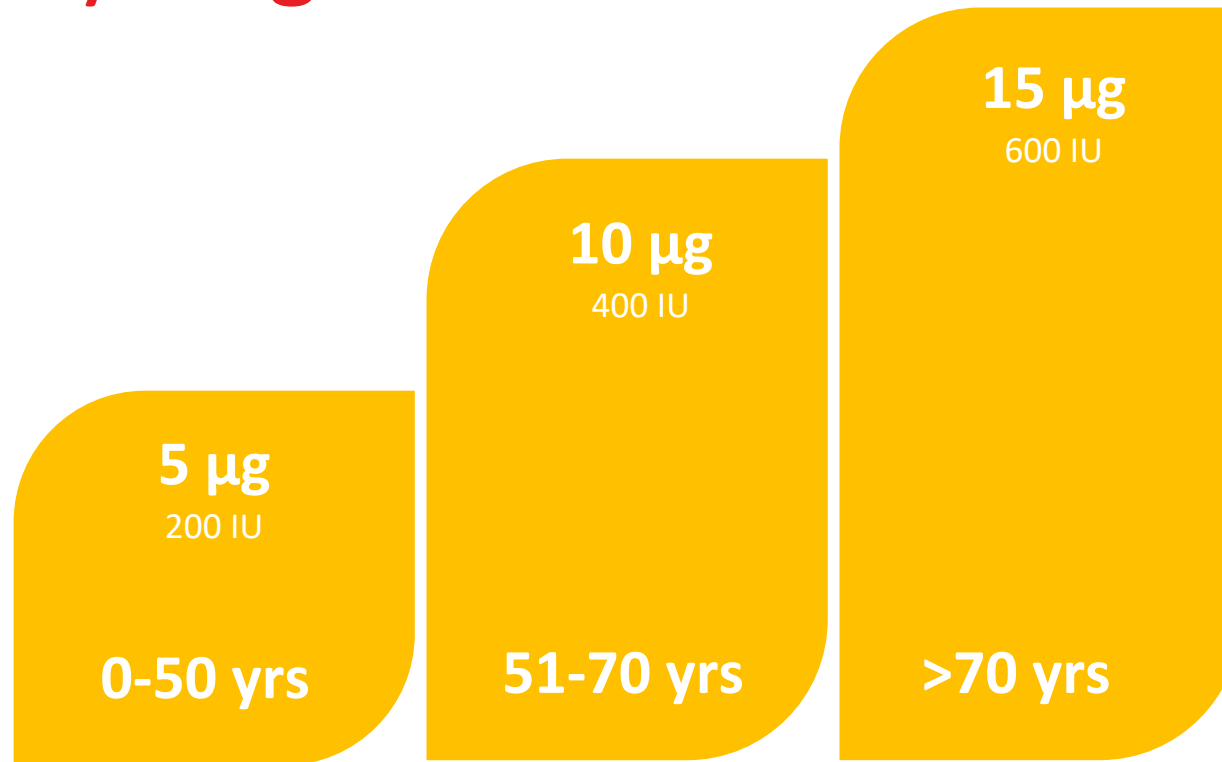
### Fertility

Pilz, Int J Environ Res Public Health. 2018;15(10)

### Muscle strength

Gunton, Bone Rep. 2018;8

# Dietary targets



## Adequate intake

1 µg cholecalciferol = 0.2 µg 25(OH)D

1 IU = 0.025 µg cholecalciferol or 0.005 µg 25(OH)D

# There are few good dietary sources of vitamin D

## ANIMAL

D3



## ENRICHED

D2/D3



## FUNGHI

D2



1  $\mu\text{g}$  = 40 IU



# How is deficiency defined?

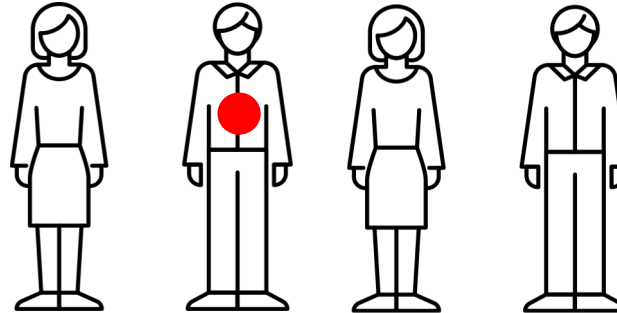
(nmol/L)	Serum 25(OH) D
≥ 50	Adequate
30 - 49	Mild deficiency
12.5 - 29	Moderate deficiency
< 12.5	Severe deficiency

**End of summer: + 10-20 nmol/L**

# Vitamin D deficiency in Australia

## 23%

2011-12  
Australian Health Survey



## 29-42%

### Office workers

Fayet-Moore, J Steroid  
Biochem Mol Biol. 2019;189

## 36%

### African immigrants

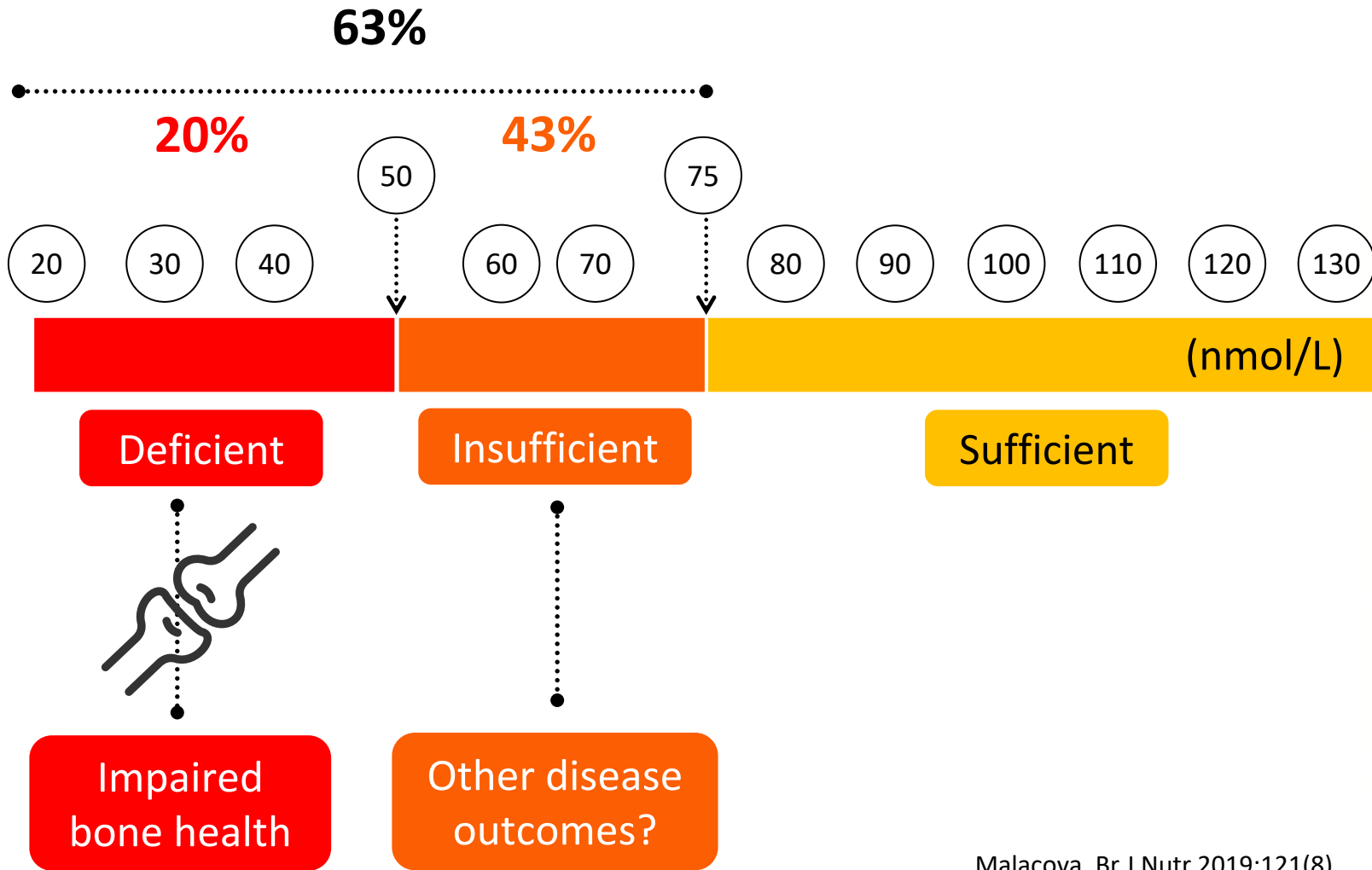
Horton-French, Int J Environ  
Res Public Health. 2019;16(16)

## 51%

### Chemotherapy patients

Isenring, Asia Pac J Clin Nutr.  
2018;27(5)

# Those without deficiency can still be at risk



Malacova, Br J Nutr 2019;121(8)  
Roth, Ann N Y Acad Sci, 2018;1430

# Determinants of vitamin D status in office workers

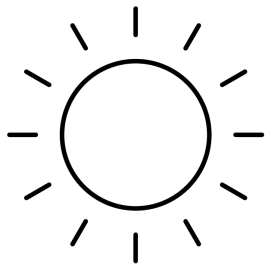


## Determinants of vitamin D status of healthy office workers in Sydney, Australia

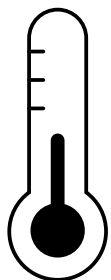
Volume 189, May 2019, Pages 127-134

Fayet-Moore F, Brock K, Wright J, Ridges L, Small P, Seibel MJ, Conigrave AD, Mason RS

# Four factors influenced vitamin D status



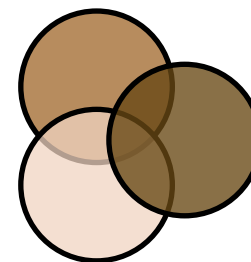
Time spent outdoors



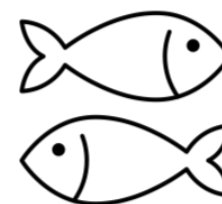
Season



**Office worker**



Skin phototype



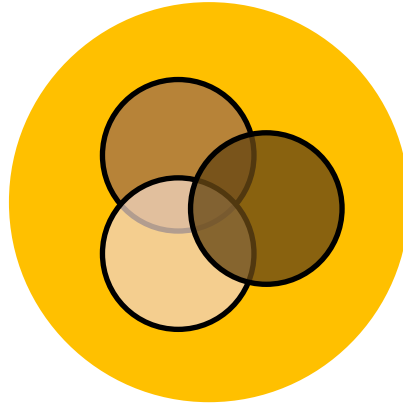
Fish intake



# Deficiency: non-modifiable factors



Season



Phototype



Born outside  
Australia



Latitude



Age

# Deficiency: modifiable factors



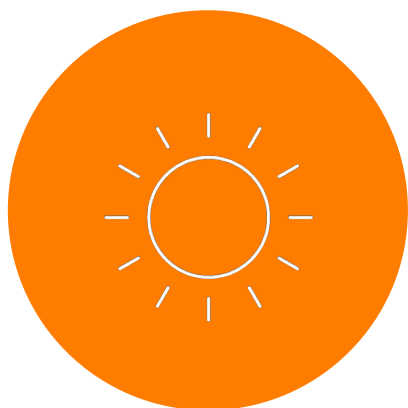
Smoking



Sedentary



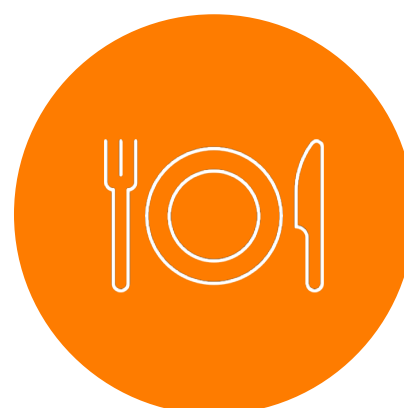
BMI >30 kg/m<sup>2</sup>



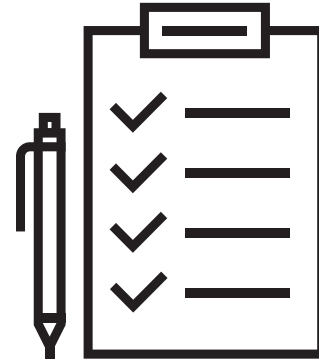
Sun exposure



Supplements



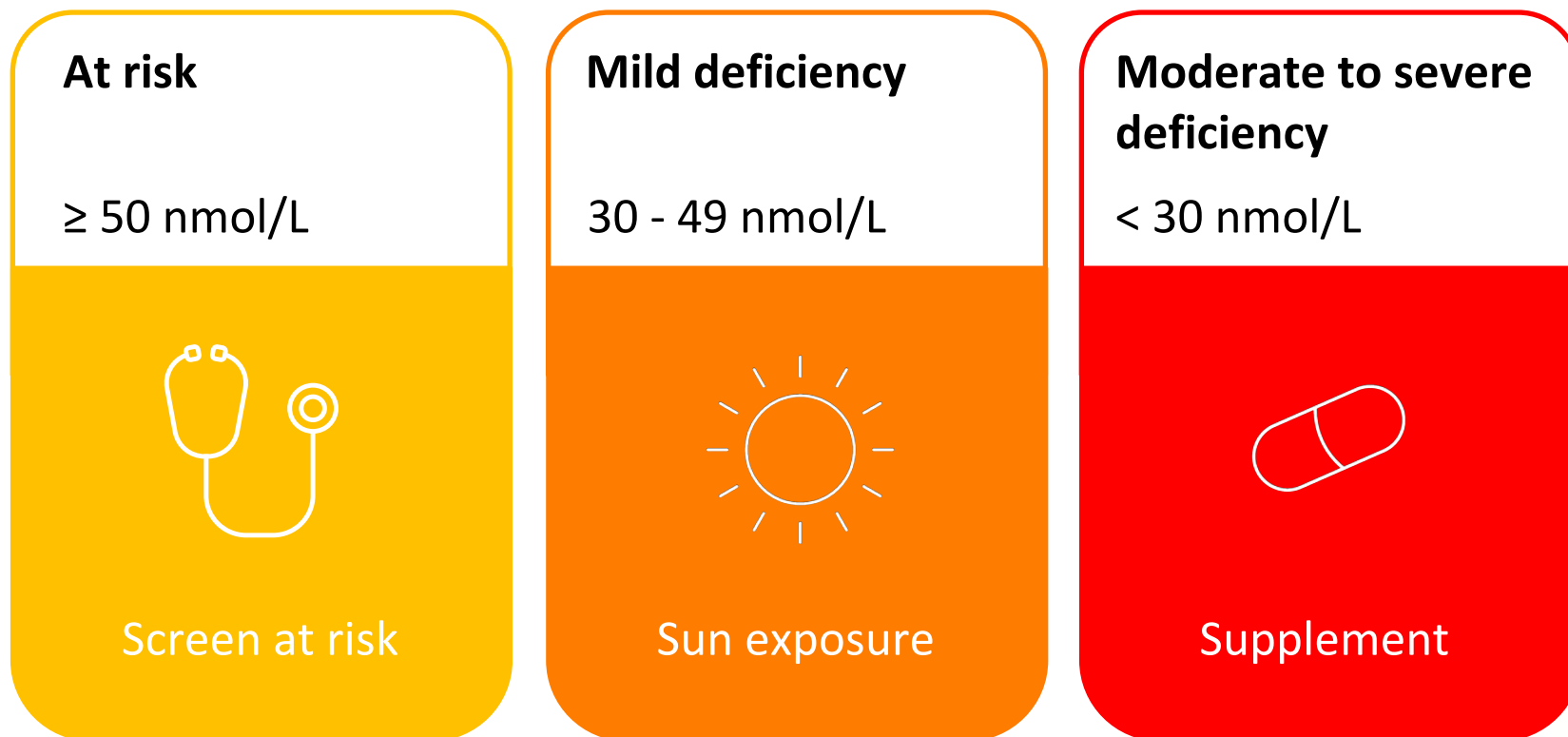
Diet



# Current guidelines and strategies

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# RACPG guidelines



# Vitamin D position paper

CLINICAL FOCUS

VOLUME 196 ISSUE 11

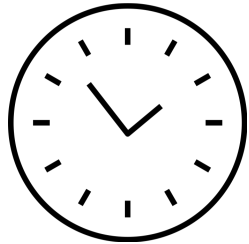
## Vitamin D and health in adults in Australia and New Zealand: a position statement

Caryl A Nowson, John J McGrath, Peter R Ebeling, Anjali Haikerwal, Robin M Daly, Kerrie M Sanders, Markus J Seibel and Rebecca S Mason

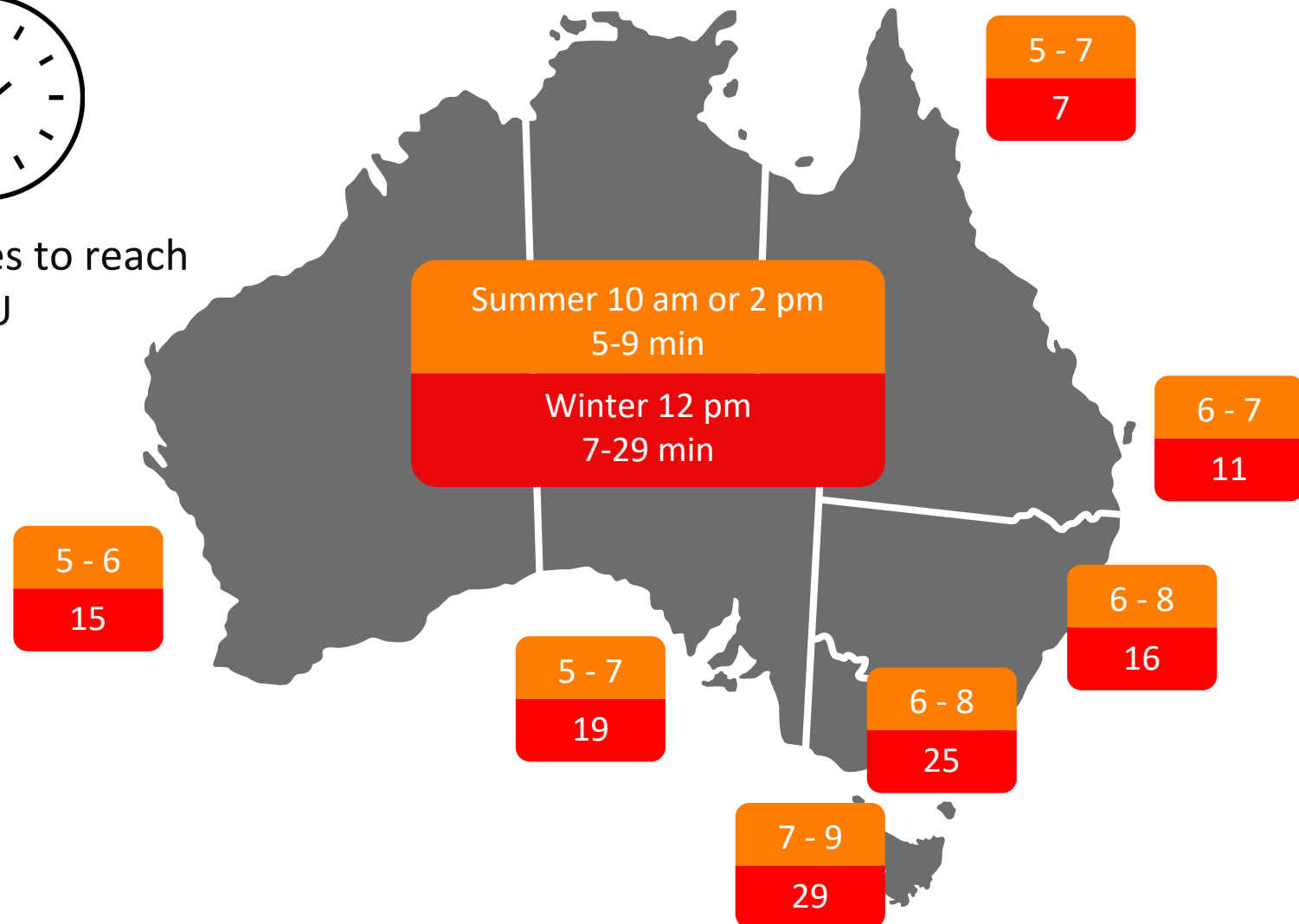
Med J Aust 2012; 196 (11): 686-687. || doi: 10.5694/mja11.10301

Published online: 18 June 2012

# Sun exposure: guidelines



Minutes to reach  
1000 IU  
(25  $\mu\text{g}$ )

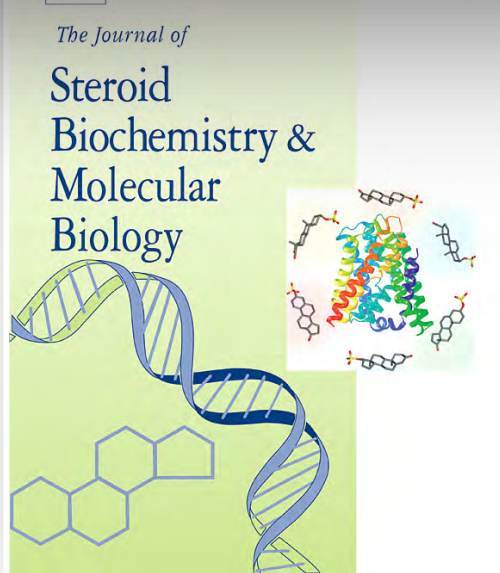


Nowson, Med J Aus. 2012;197(10)

# Difficult to achieve in winter through sun exposure alone

41.9 nmol/L in winter. At the end of the study, 69.3% of participants who complied with the summer sun exposure guidelines were 25(OH)D adequate, while only 27.6% of participants who complied with the winter sun exposure guidelines were 25(OH)D adequate at the end of the study. **The results suggest that the current Australian guidelines for sun exposure for 25(OH)D adequacy are effective for most in summer and ineffective for most in winter.**

This article is part of a Special Issue entitled '17th Vitamin D Workshop'




## Are the current Australian sun exposure guidelines effective in maintaining adequate levels of 25-hydroxyvitamin D?

Volume 155, 2016, Pages 264-270

Michael Kimlin, Jiandong Sun, Craig Sinclair, Sue Heward, Jane Hill, Kimberley Dunstone, Alison Brodie

# Balancing vitamin D needs vs. skin cancer risk

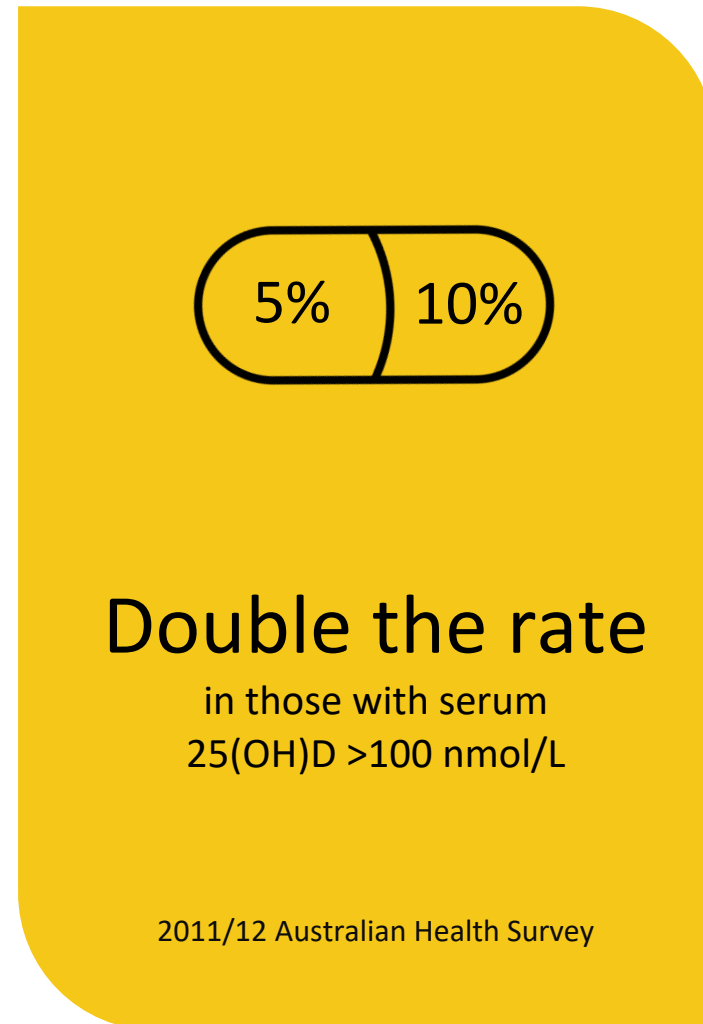
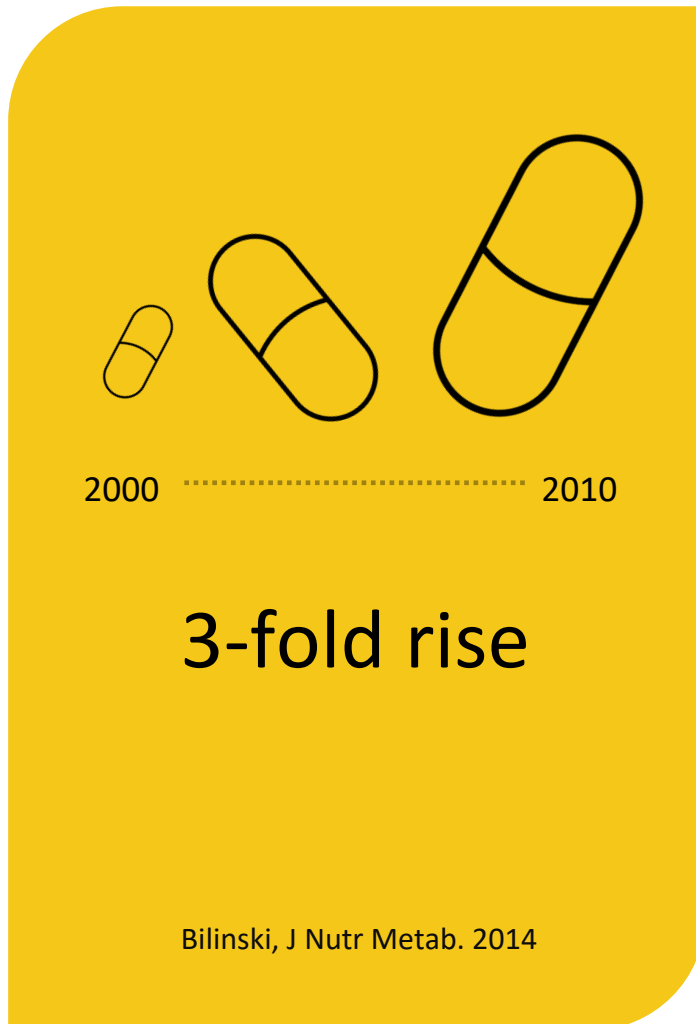


Difficult in Australia to obtain the equivalent of 1000 IU 25(OH)D while adhering to sun smart messages

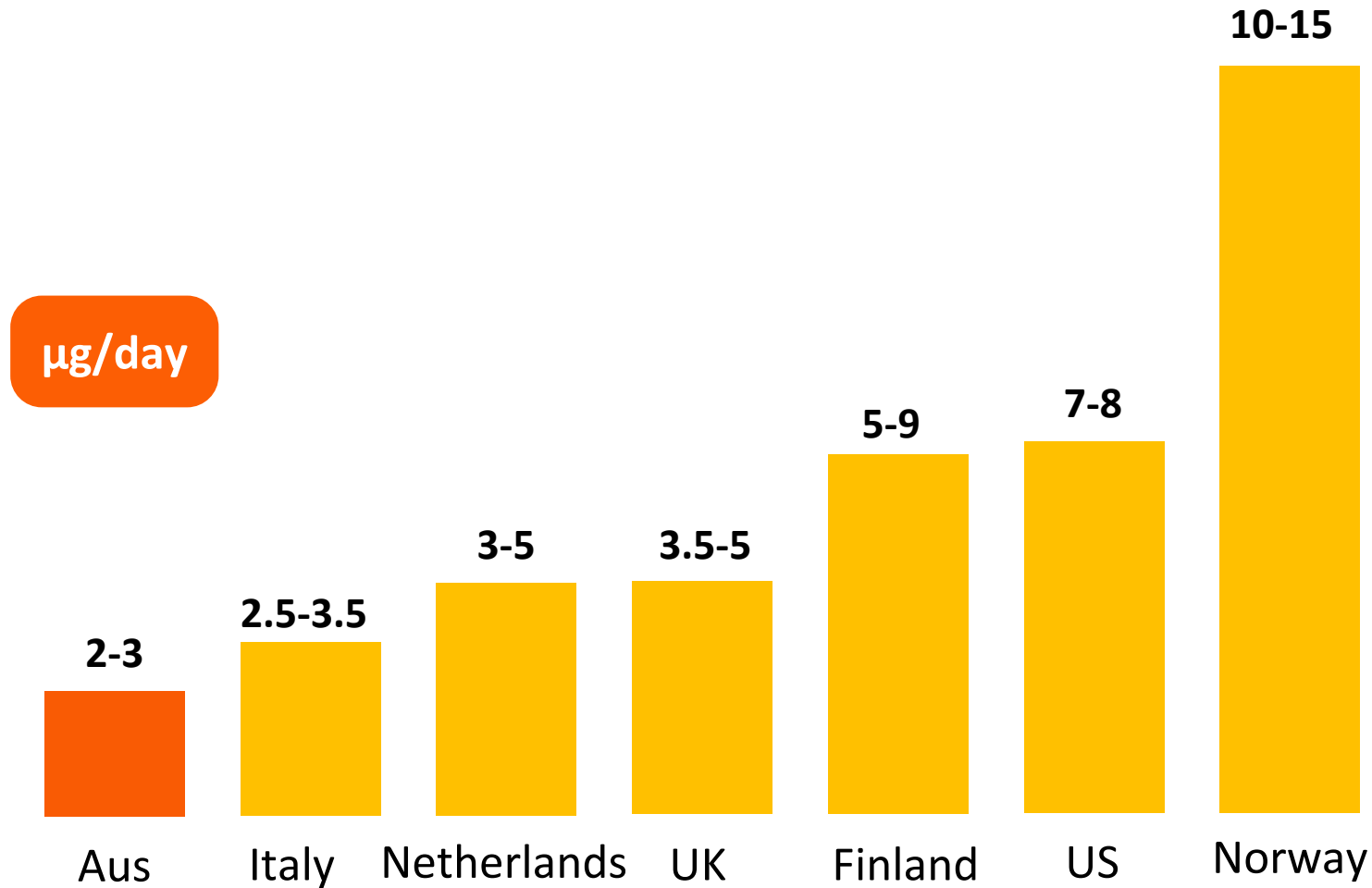
Stalgis-Bilinsk, Med J Aust. 2011;194(7)



# Some individuals may be taking supplements unnecessarily

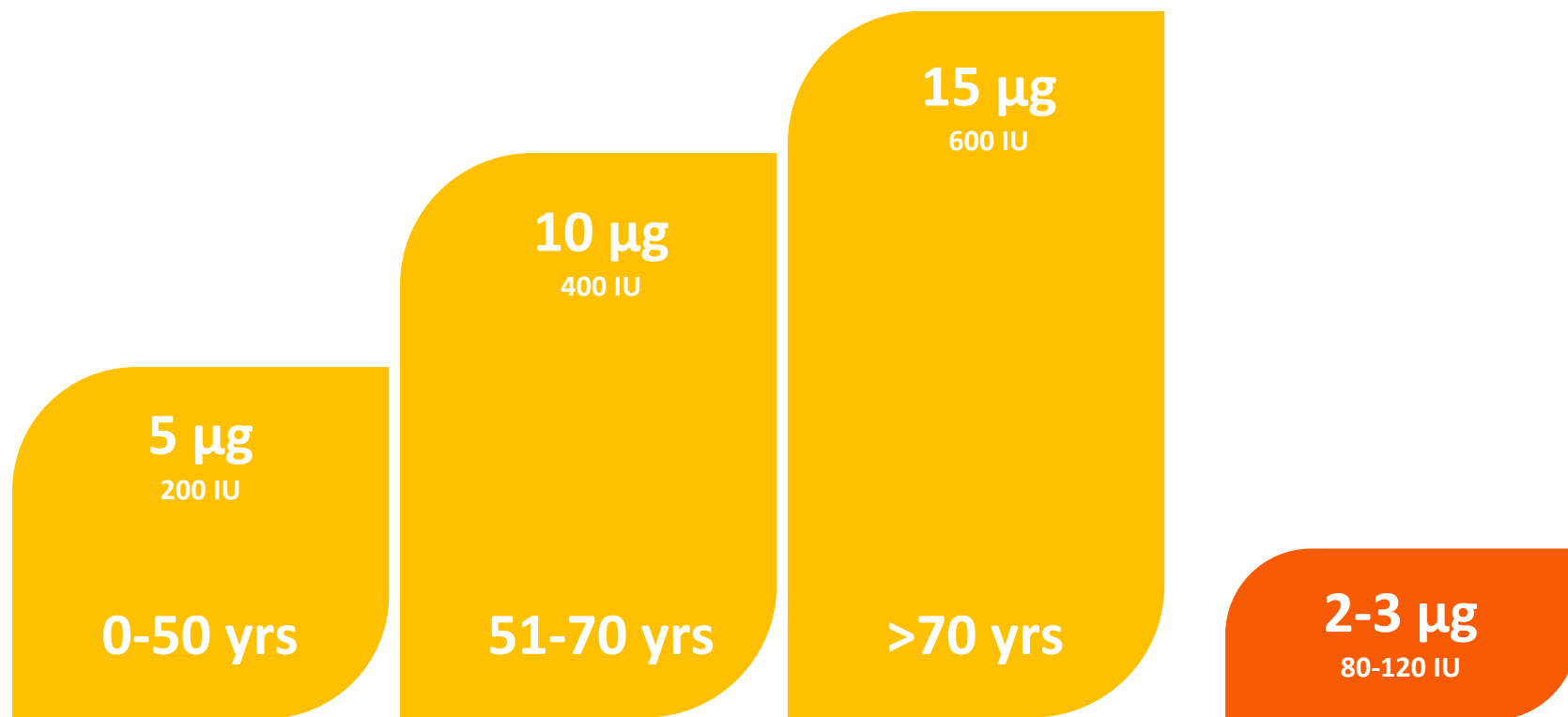


# The Australian diet is low in vitamin D



Nowson, Med J Aus. 2012;197(10).  
Calvo, J Nutr, 2005;135(2).  
Spiro, Nutr Bull, 2014;39(4)

# Dietary intakes are well below targets



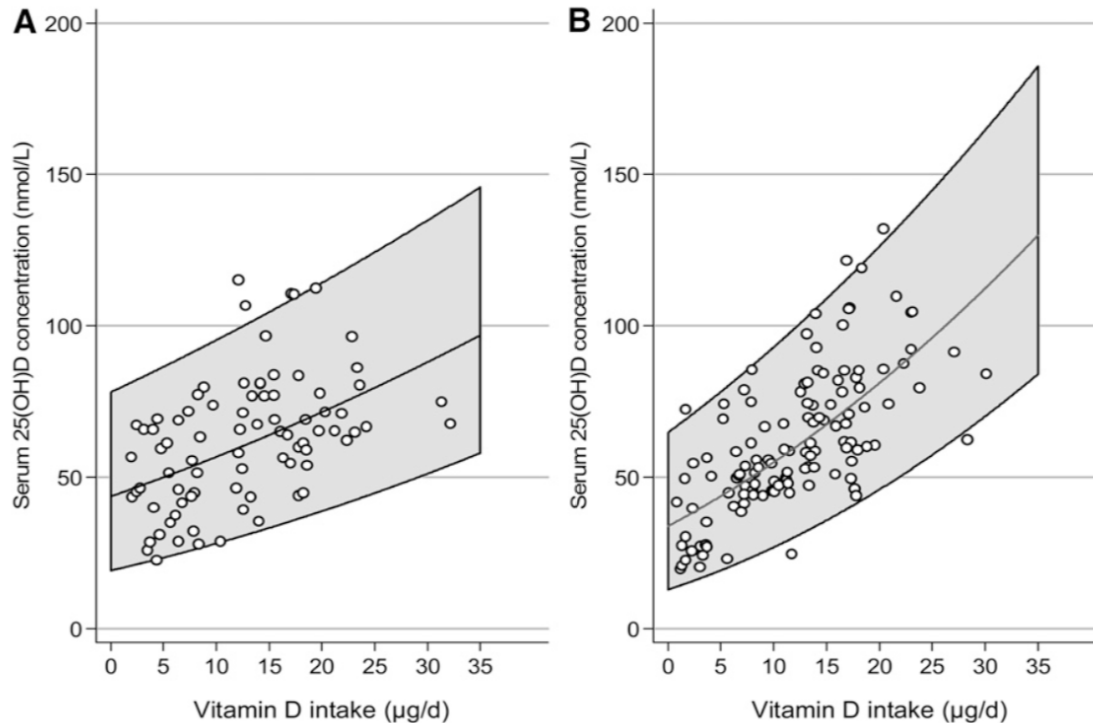
Adequate intake

Average intake

Nowson, Med J Aus. 2012;197(10)

# Some individuals need more than the Adequate Intake

65 yrs +



Men

Women

97.5%  
25  $\mu\text{g}$

AI  
10-15  $\mu\text{g}$

# Dietary sources of vitamin D

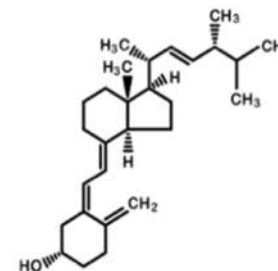
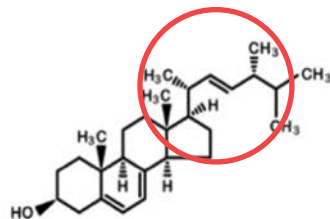
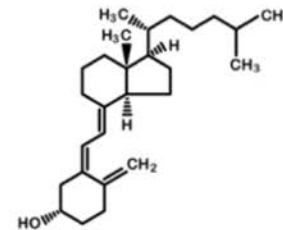
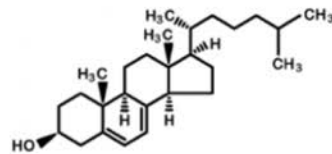
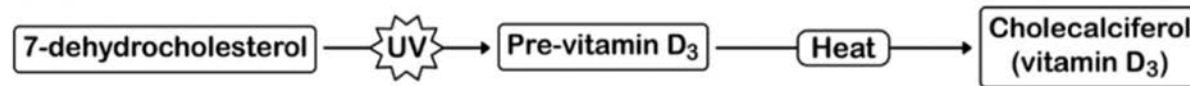


\*Cooked values  
where applicable

Australian Food Composition  
Database, 2019

Kühn, Food Chem. 2018;269

# 7-dehydrocholesterol vs. Ergosterol



# 5 button mushrooms exposed to UV provides 1000 IU



Regular

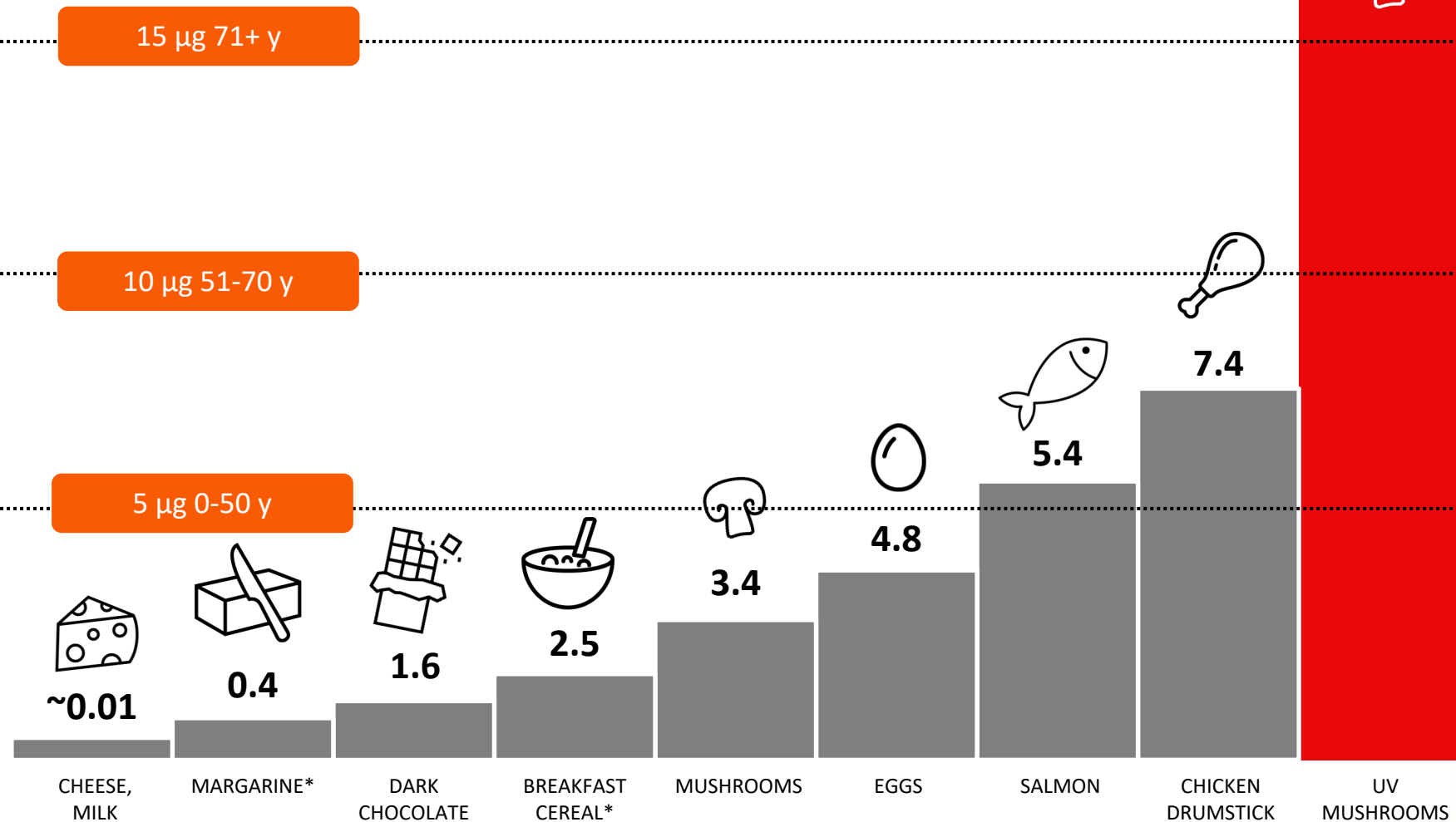
2-3  $\mu\text{g}$

UV-Exposed

24  $\mu\text{g}$

*Agaricus bisporus* mushrooms have the highest ergosterol content of all culinary mushrooms

# Comparison of sources per serve

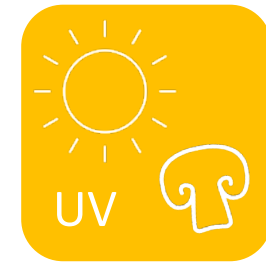
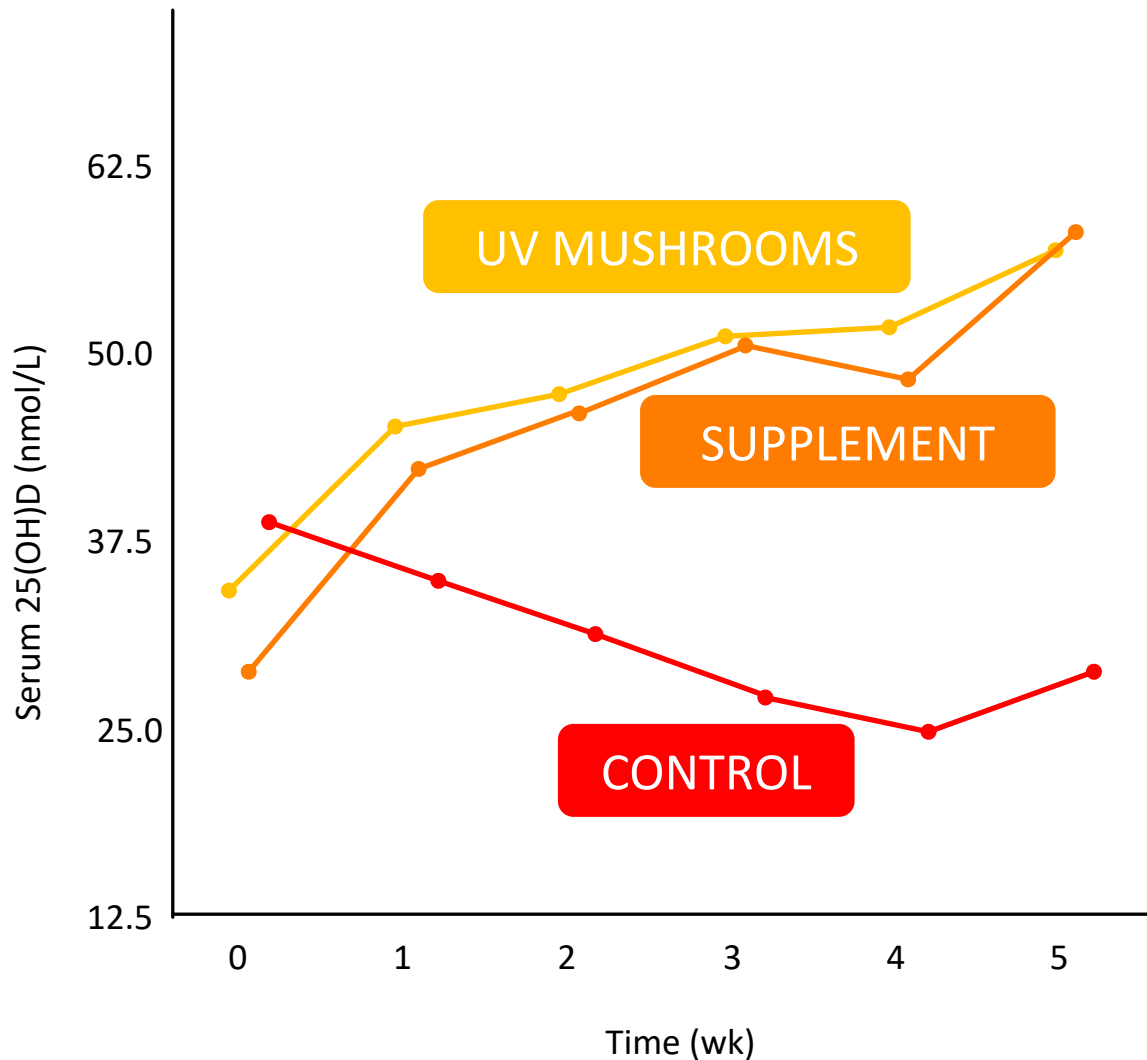


\* FORTIFIED

Australian Food Composition Database, Food Standards Australia and New Zealand, 2019  
Kühn, Food Chem. 2018;269



# Bioavailability is equivalent to supplementation



Adapted from Urbain, Eur J Clin Nutr, 2011;65

# Similar effects

**1000 IU of vitamin D**



1 UV exposed  
portobello mushroom



1 vitamin D pill



# The role of lifestyle medicine for meeting vitamin D requirements

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# Why lifestyle medicine?

Lifestyle (nutrition, smoking cessation and exercise) can prevent up to 80% of chronic disease.

Egger, Lifestyle Medicine, Academic Press (2017)



# Lifestyle medicine approach

Coaching / Behaviour change

Physical activity

Sleep health

Nutrition

## Lifestyle Medicine

Tobacco and alcohol cessation

Emotional wellness / Stress management



# More than just vitamin D



Antioxidants

Bioactives

Cooking

Vitamin D

Eating  
occasion

Flavour

# Diet: Pros & Cons

## Pros

- Whole food approach
- More than just vitamin D
- Lower risk of toxicity
- Compliance



## Cons

- Few good sources
- Effects of cooking and storage
- Access
- Food preferences
- Cooking skills
- Compliance

# Considerations for dietary recommendations



Individual & family preferences

Cooking skills

Availability & access

Adherence to recommendations

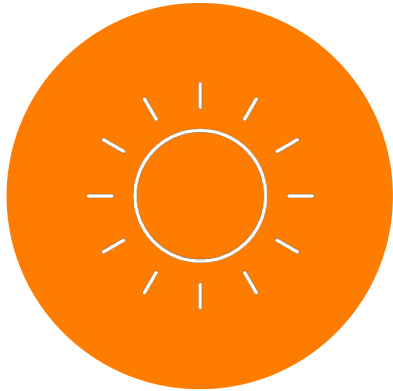


# Lifestyle Ax for vitamin D deficiency

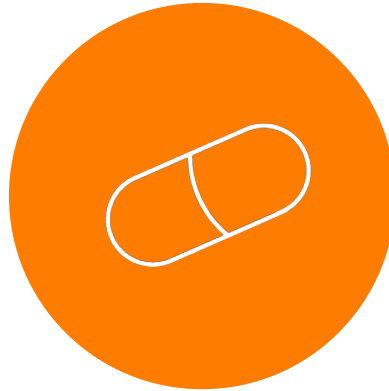
	Decreased risk	Increased risk
<b>Non-Modifiable</b>		
Season	<input type="checkbox"/> Summer/Autumn	<input type="checkbox"/> Winter/Spring
Phototype	<input type="checkbox"/> Olive (III, IV)	<input type="checkbox"/> Dark or pale (I, II, V, VI)
Office worker	<input type="checkbox"/> No	<input type="checkbox"/> Yes
<b>Modifiable</b>		
Smoking	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Supplement	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Sun exposure (time outdoors)	<input type="checkbox"/> Some	<input type="checkbox"/> None
<b>Diet</b>		
Fish	<input type="checkbox"/> Some	<input type="checkbox"/> None
Mushrooms	<input type="checkbox"/> Some	<input type="checkbox"/> None
Eggs	<input type="checkbox"/> Some	<input type="checkbox"/> None

Target the modifiable factors that the patient is willing to change first

# Pros and cons to each strategy



**Sun exposure**

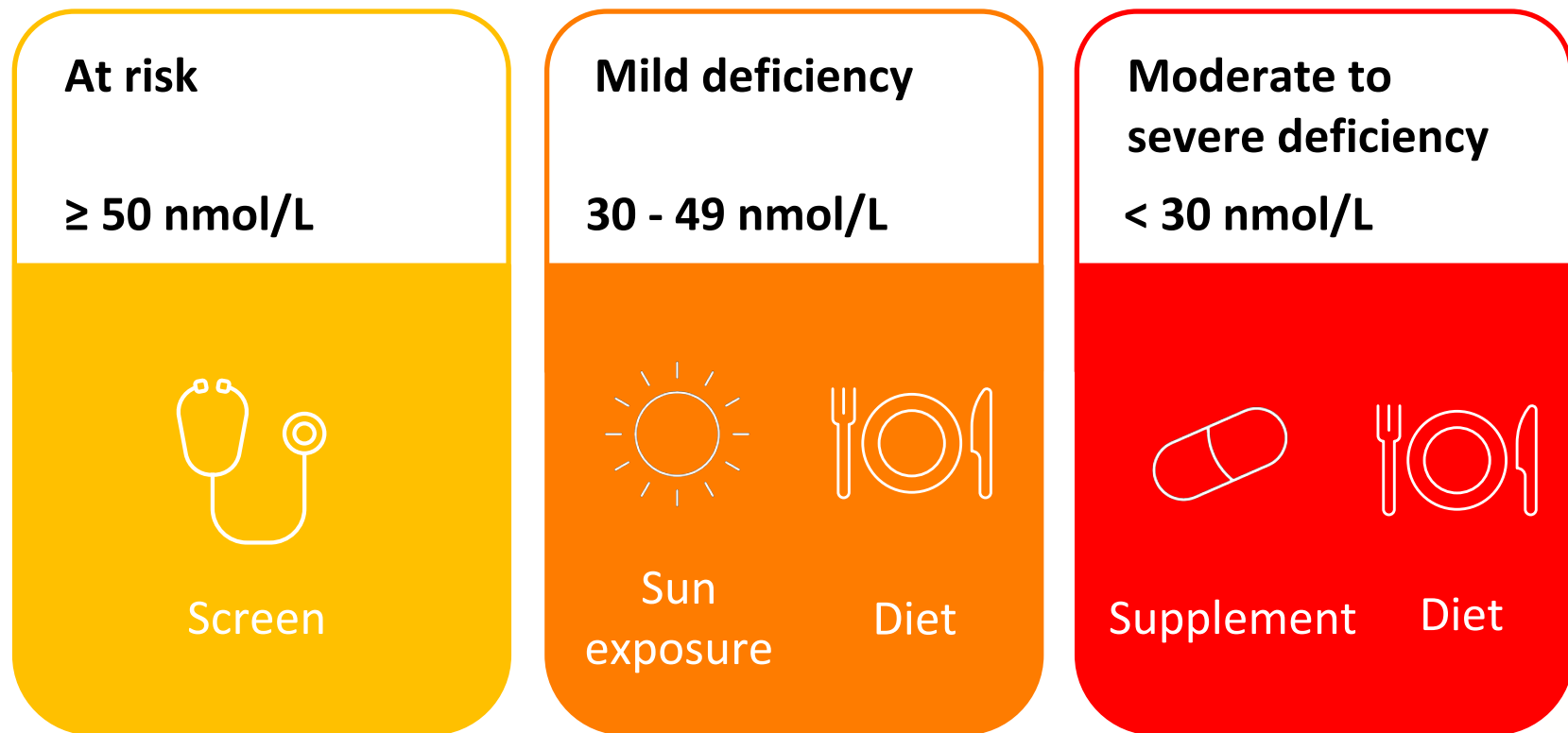


**Supplement**



**Diet**

# When it comes to vitamin D, two sources are best



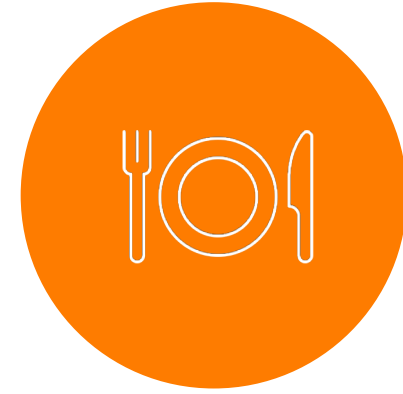
# Summary



Need to consider  
lifestyle, the individual  
& their risk factors



Only sun exposure and  
supplements are  
recommended to  
address it



Vitamin D is available  
from diet but we have  
the lowest intakes

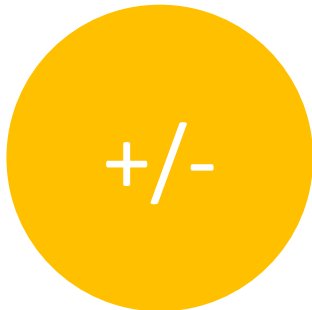
# Take Home Messages



Vitamin D deficiency  
an issue in sunny Australia



Diet can make an  
important contribution

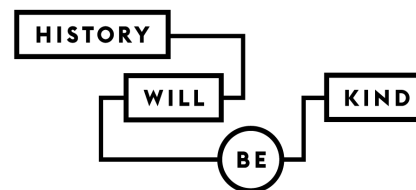


Limits to each strategy



Need to consider more  
than one source

# Acknowledgements



**Hort  
Innovation**  
Strategic levy investment

**MUSHROOM  
FUND**

This project has been funded by Hort Innovation, using the Mushroom Fund research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

THANK YOU

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Thank you.