

# Looking younger & wellbeing

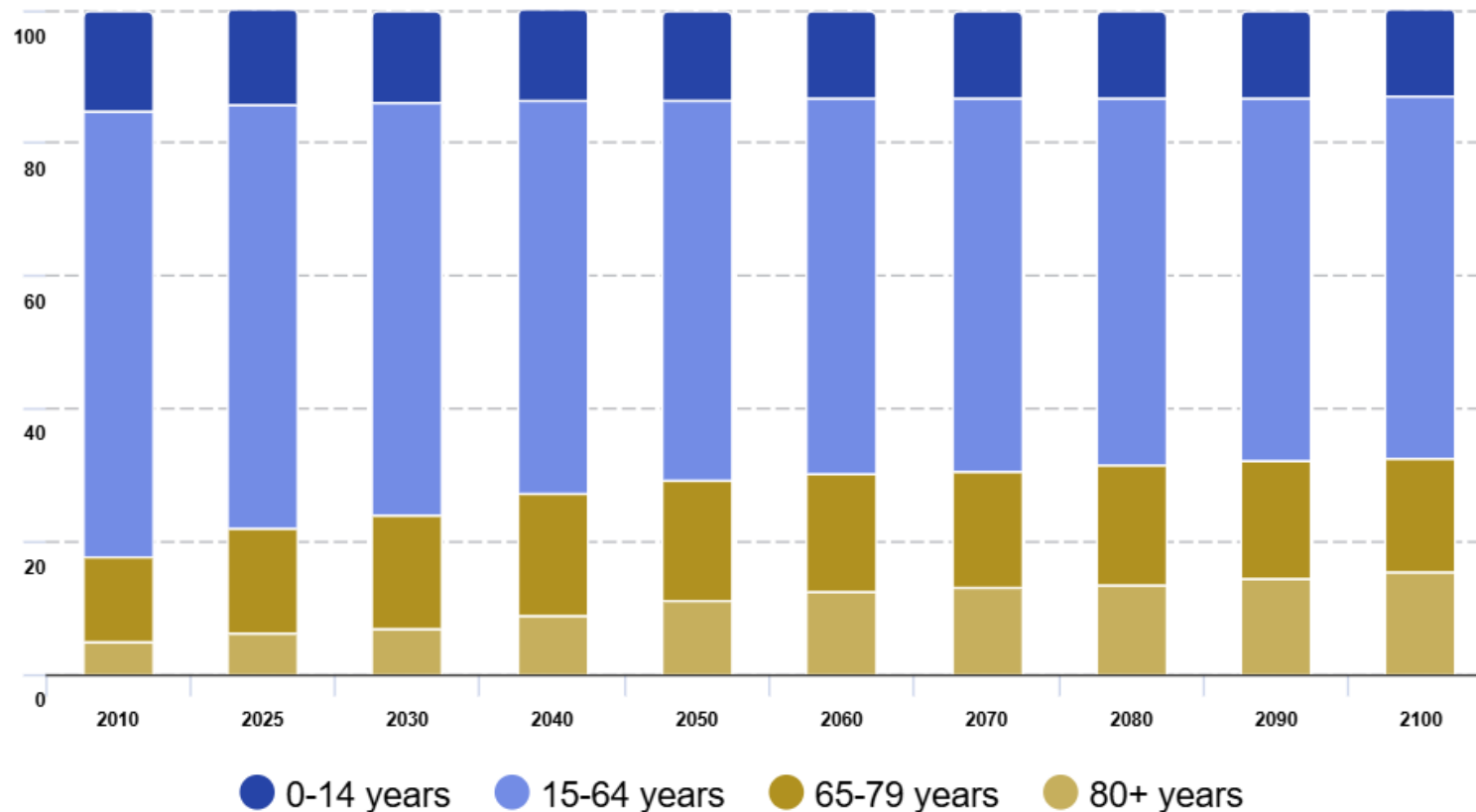
Unilever

David Gunn (& Mike Hoptroff and Xuelan Gu)

## It's an ageing world

Population structure by major age groups, EU, 2010-2100

(% of total population)



2030-2100:  
projections  
(EUROPOP2023).  
Source: Eurostat:

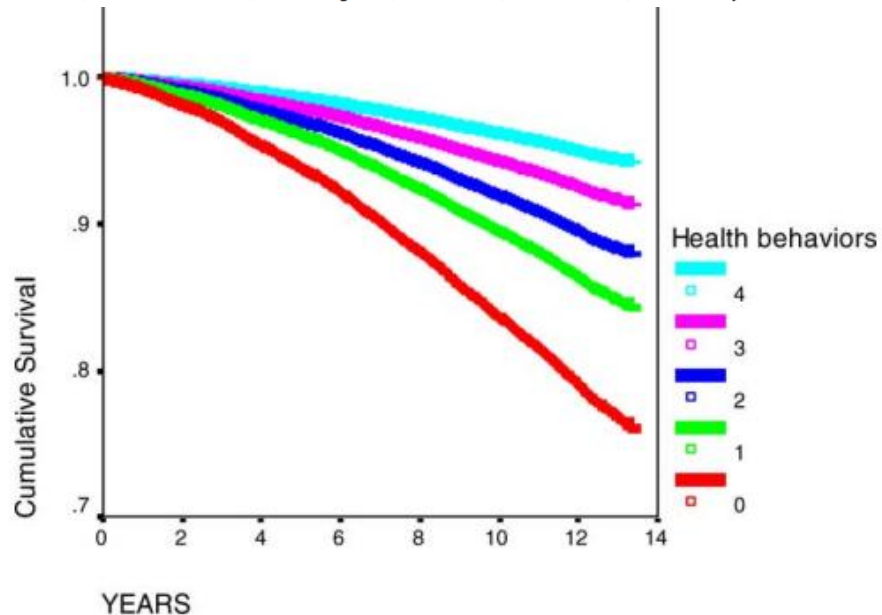
## Health-span strongly linked to healthy behaviours

OPEN ACCESS Freely available online

PLOS MEDICINE

### Combined Impact of Health Behaviours and Mortality in Men and Women: The EPIC-Norfolk Prospective Population Study

Kay-Tee Khaw<sup>1\*</sup>, Nicholas Wareham<sup>2</sup>, Sheila Bingham<sup>3</sup>, Ailsa Welch<sup>1</sup>, Robert Luben<sup>1</sup>, Nicholas Day<sup>1</sup>



**Figure 1.** Survival Function According to Number of Health Behaviours in Men and Women Aged 45–79 Years without Known Cardiovascular Disease or Cancer, Adjusted for Age, Sex, Body Mass Index and Social Class, EPIC-Norfolk 1993–2006

doi:10.1371/journal.pmed.0050012.g001



eClinicalMedicine

Volume 92, February 2026, 103741



Minimum combined sleep, physical activity, and nutrition variations associated with lifeSPAN and healthSPAN improvements: a population cohort study

Nicholas A. Koemel<sup>a b c</sup>, Raaj K. Biswas<sup>a b c</sup>, Matthew N. Ahmadi<sup>a b c</sup>

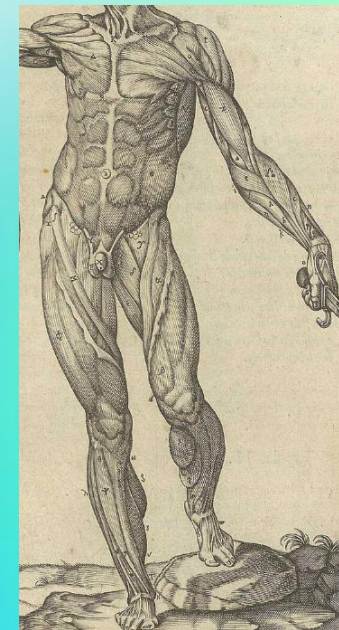
**UK Biobank study of ~59,000** (median age: 64.0 years; 45.4% male)

### Increase of:

- 24 min/day of sleep
- 3.7 min/day of moderate-to-vigorous physical activity, and
- a 23-point (of 100) diet quality increase = 4 additional years of health-span

# What has health-span got to do with looking younger?

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Juan Valverde de Amusco's *Historia de la composicion del cuerpo humano* (Rome, 1560) & Gaspar Becerra illustration

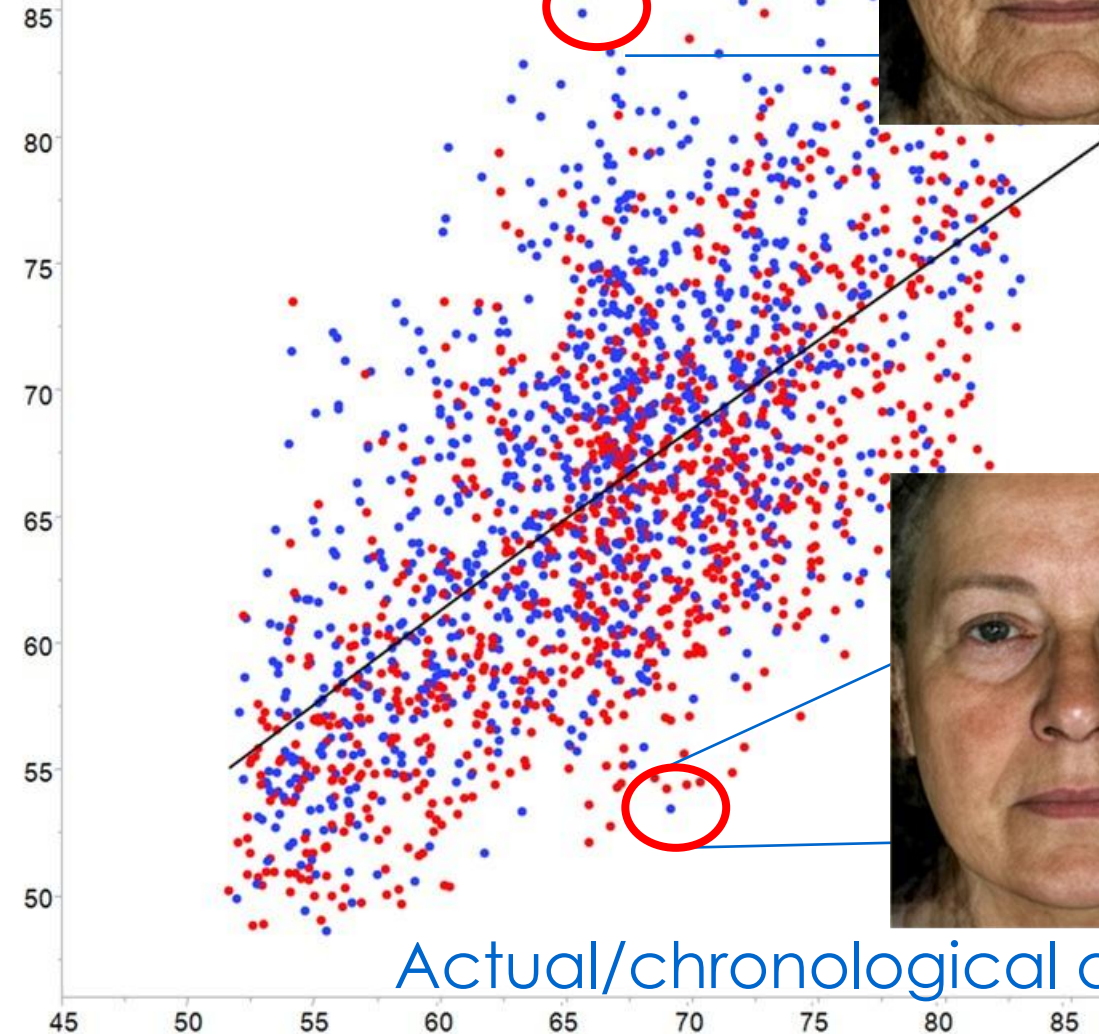
# Does youthful looks link to better health and longevity?



**Perceived age of 2,693 subjects**  
**288 assessors – 75,096 age assessments >1 year.**



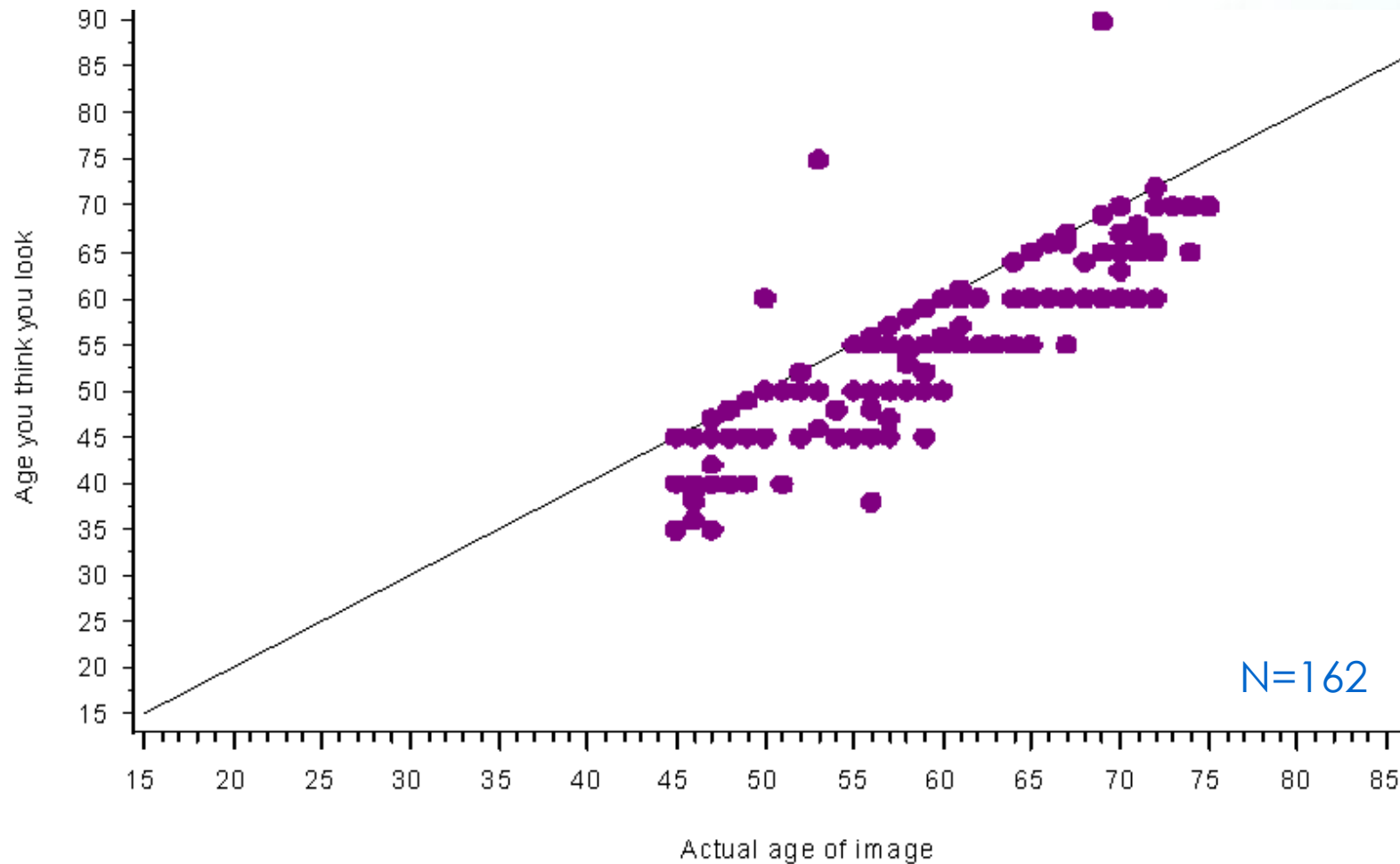
Perceived age



Actual/chronological age

# Self-assessed perceived age – not a good measure of youthful looks?

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# What conditions and diseases does youthful looks associate with?

Those who look young for their age had:

- Less Chronic Obstructive Pulmonary Disease (COPD)
- Less osteoporosis
- Fewer cataracts
- Less Age-Related Hearing Loss (ARHL)
- Better cognition (g-factor)



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Improving Patient Outcomes in Skin Disease Worldwide

Volume 188, Issue 3  
March 2023

JOURNAL ARTICLE

**Younger facial looks are associate with a lower likelihood of several age-related morbidities in the middle-aged to elderly**



Selma Mekić, Luba M Pardo, David A Gunn, Leonie C Jacobs, Merel A Hamer, M Arfan Ikram, Eline J Vinke, Meike W Vernooij, Annet E G Haarman, Eric F Thee ... [Show more](#)

## Supporting evidence

- Bone mineral density in 460 women aged 25-93 years.

[Home](#) > [AGE](#) > Article

### Perceived age is associated with bone status in women aged 25–93 years

Published: 20 October 2015

Volume 37, article number 106, (2015) [Cite this article](#)

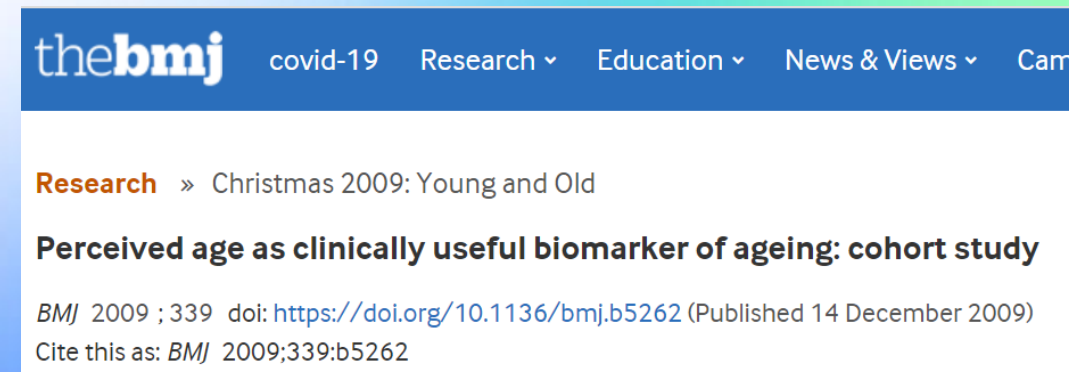
# Supporting evidence - cognition

1) In Nutrition and Health of Aging Population in China Project (NHAPC), n=612:

- Those who looked old for their age had higher cognitive impairment (Mini-Mental State Examination).

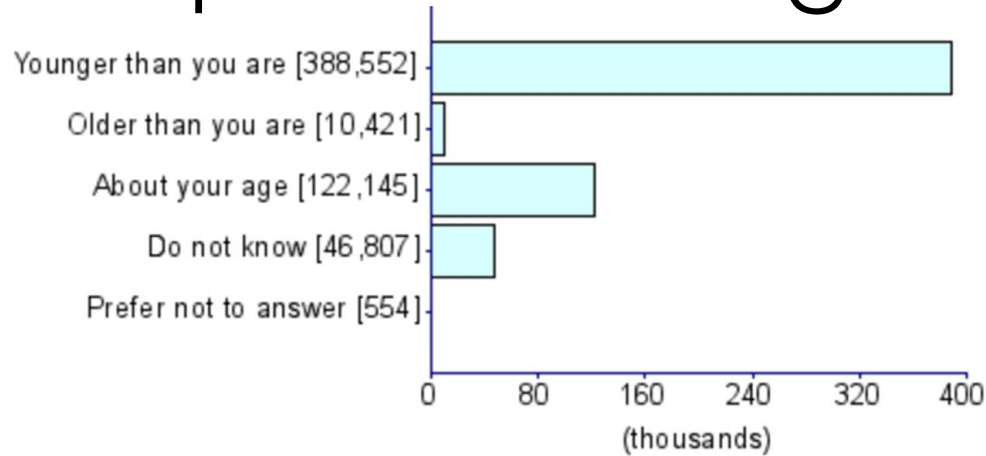


2) Danish cohort (n=1826): Those who looked younger for their age had better cognition (MMSE & cognitive tests)



# Self-perceived age predictive of dementia

## Self-perceived age!



UK Biobank Data – health information on 500,000 participants between 2006 and 2010

- 79 significant genetic associations.
- 19/79 linked to skin ageing or pigmentation
- 14/79 linked to balding.

Follow up of 12.3 years (median).

Those rated themselves looking older had:

- Higher cognitive impairment risk (Digit Symbol Substitution Test, n=42,639)
- Higher risk of dementia (n= $\sim$ 200,000)

A screenshot of a research article page from 'Alzheimer's Research & Therapy'. The page features a navigation bar with links for Home, About, Articles, Submission Guidelines, and a 'Submit manuscript' button. The article title is 'Facial aging, cognitive impairment, and dementia risk', published on 06 November 2024. The authors listed are Xinming Xu, Guliyeerke Jigeer, David Andrew Gunn, Yizhou Liu, Xinrui Chen, Yi Guo, Yaqi Li, Xuelan Gu, Yanyun Ma, Jiucun Wang, Sijia Wang, Liang Sun, Xu Lin, and Xiang Gao.

# What about longevity (mortality)?

Perceived age – passport-type images.

Cohort of n=1826: follow-up 7 years.

- Risk of death increases by 11% every year you are older.
- Risk of death increases by 14% for every year **you look** older.
- It is better to be a year older than look a year older



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Cam

Research » Christmas 2009: Young and Old

**Perceived age as clinically useful biomarker of ageing: cohort study**

*BMJ* 2009 ; 339 doi: <https://doi.org/10.1136/bmj.b5262> (Published 14 December 2009)

Cite this as: *BMJ* 2009;339:b5262

# How far into the future does it last?

- Face or surrounding driving links to health?
- Predicts death 7-12 years after photos.
- Where face gave a younger age, that twin lived longer.



*Journals of Gerontology: Medical Sciences*  
cite as: *J Gerontol A Biol Sci Med Sci*, 2015, 1–6  
doi:10.1093/gerona/glv090  
Advance Access publication August 11, 2015

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**GERONTOLOGICAL**  
SOCIETY OF AMERICA®

Research Article

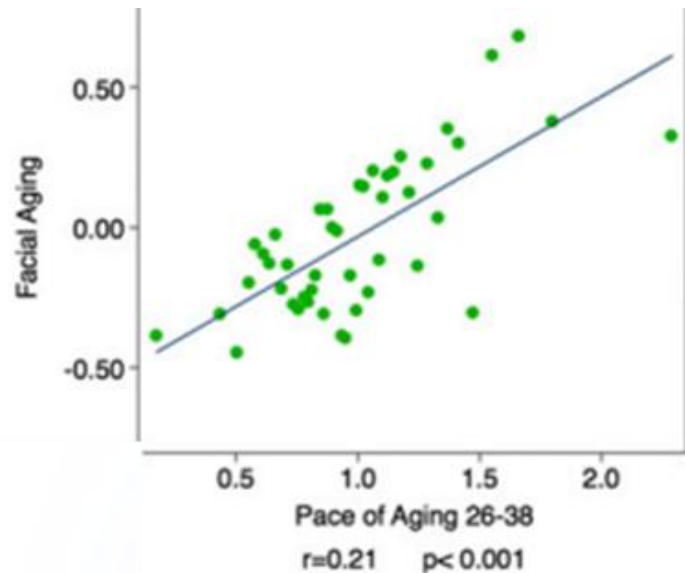
## **Mortality is Written on the Face**

David Andrew Gunn,<sup>1</sup> Lisbeth Aagaard Larsen,<sup>2</sup> Jaspal Singh Lall,<sup>1</sup>  
Helle Rexbye,<sup>2</sup> and Kaare Christensen<sup>2</sup>

# In younger healthy adults?

## Perceived facial age V blood biomarkers estimated age.

- 1) Biological age (10-biomarker US National Health and Nutrition Survey (NHANES)).
- 2) Pace of Aging calculated.



Strong association between perceived age and:

- biological age at 38 years.
- the pace of ageing over 12 years from 26 years to 38 years.




**Quantification of biological aging in young adults**

Daniel W. Belsky<sup>a,b,1</sup>, Avshalom Caspi<sup>c,d,e,f</sup>, Renate Houts<sup>c</sup>, Harvey J. Cohen<sup>g</sup>, David L. Corcoran<sup>g</sup>, Andrea Danese<sup>h,i</sup>, HonaLee Harrington<sup>c</sup>, Salomon Israel<sup>h</sup>, Morgan E. Levine<sup>i</sup>, Jonathan D. Schaefer<sup>c</sup>, Karen Sugden<sup>c</sup>, Ben Williams<sup>c</sup>, Anatoli I. Yashin<sup>b</sup>, Richie Poulton<sup>i</sup>, and Terrie E. Moffitt<sup>c,d,e,f</sup>

# Challenges to further understanding

- Which features link to which health condition?
- Longitudinal data of many diverse participants.
- Perceived age intensive to measure - 288 age-assessors & 75,096 age assessments in Rotterdam Study



# A.I. perceived age predictions also associate with health



		(a) Human		(b) Deep learning	
Model Outcome	n	Model 2		Model 2	
		Odds Ratio	P-value	Odds Ratio	P-value
Osteoporosis	2197	0.77 (0.62 - 0.96)	0.02	0.86 (0.67 - 1.11)	0.24
COPD	2282	0.76 (0.68 - 0.85)	0.00	0.75 (0.66 - 0.85)	0.00
Cataracts	2185	0.88 (0.77 - 1.02)	0.09	0.82 (0.7 - 0.97)	0.02
CVD	2271	0.93 (0.79 - 1.09)	0.35	0.99 (0.82 - 1.19)	0.90
AMD	2282	0.94 (0.86 - 1.03)	0.17	0.99 (0.9 - 1.1)	0.91
Outcome	n	B	P-value	B	P-value
ARHL	1945	-0.87 (-1.49 - -0.24)	0.01	-0.99 (-1.69 - -0.28)	0.01
Cognition	1864	0.06 (0.03 - 0.1)	0.00	0.07 (0.03 - 0.11)	0.00

## Osteoporosis and Predicted Age on higher resolution images

Model 2	
Odds Ratio	P-val
0.76189 (0.58195 - 0.99746)	0.04788



ORIGINAL ARTICLE | [Open Access](#) | CC BY NC ND

## Deep learning predicted perceived age is a reliable approach for analysis of facial ageing: A proof of principle study

Conor Turner, Luba M. Pardo , David A. Gunn, Ruediger Zillmer, Selma Mekić, Fan Liu, M. Arfan Ikram, Caroline C. W. Klaver, Pauline H. Croll, André Goedegebure, Katerina Trajanoska ... [See all authors](#)

# Explainable A.I. will help determine key features linked to health



# Summary

- **Looking old for one's age associates with:**

- Cataracts, age-related hearing loss.
- Osteoporosis and bone-mineral-density
- Cognition and dementia (12 years into future)
- Longevity (12 years into future)
- Rate of ageing in a younger cohort.



- A.I. predictions will make further study easier.
- Explainable A.I. will help identify key features linked to individual health conditions.

# Mind & Skin: further insights

Unilever



# Psychological stress & skin conditions



## The reciprocal relationship between stress and skin diseases

Original Article | Annals of Dermatology 2023;35(5):342-347 • <https://doi.org/10.5021/ad.230101>

### Psychological Stress and Atopic Dermatitis: A Focus Group

Louise Lönn Dahl<sup>1</sup>, Saly Abdelhadi<sup>1</sup>, Mikael Holst<sup>2</sup>, Sol-Britt Lonne-Rahm<sup>1,3</sup>, Klas Nordlind<sup>1</sup>, Björn Johansson<sup>1</sup>

<sup>1</sup>Division of Dermatology and Venereology, Department of Medicine Solna, Karolinska University Hospital, Karolinska Institutet, Stockholm, Sweden; <sup>2</sup>Pediatric Endocrinology Unit, Department of Woman and Child Health, Astrid Lindgren Children's Hospital, Karolinska Institutet, Stockholm, Sweden; <sup>3</sup>Center for Clinical Research, Region Sörmland, Eskilstuna, Sweden; <sup>4</sup>Department of Molecular Medicine, Karolinska Institutet, Stockholm, Sweden; <sup>5</sup>Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden

Received: March 30, 2022 | Background: Atopic dermatitis (AD) is a chronic inflammatory skin disorder.

JOURNAL OF DERMATOLOGICAL TREATMENT  
2025, VOL. 36, NO. 1, 2504082  
<https://doi.org/10.1080/09546634.2025.2504082>

### Exploring Factors, Comorbidities, Quality of Life (DLQI), and Depression (PHQ-9) in Rosacea Patients: A Comprehensive Analysis

Namrata Kumar<sup>1</sup>, Dan Jun<sup>1</sup>, He Yan Hai<sup>1</sup>, Bingxue Liu<sup>1</sup>

Dermatology and Venereology Department, The Second Affiliated Hospital of Harbin Medical University, Harbin, Heilongjiang Province, People's Republic of China

Correspondence: Bingxue Liu ([liubingxue@hbmh.edu.cn](mailto:liubingxue@hbmh.edu.cn))  
Received: 23 May 2025 | Revised: 16 June 2025 | Accepted: 26 June 2025  
Keywords: acne rosacea | comorbidities | DLQI (Dermatology Life Quality Index) | PHQ-9 (Patient Health Questionnaire-9) | QoL (Quality of Life)

Taylor & Francis | frontiers | Frontiers in Psychiatry

### Prevalence and associated factors of depression and anxiety among patients with melasma: a cross-sectional study in China

Wenjing Chen, Runan Fang, Kaihui Zhang, Yang Shen, Yuan Sun, Jiacheng Gao, Ye Zhai, Lihong Sun and Jianhong Li\*

Dermatology Department, Dongtumen Hospital, Beijing University of Chinese Medicine, Beijing, China

OPEN ACCESS

### Depression and depressive symptoms among people living with vitiligo: findings from the cross-sectional, population-based global VALIANT survey

Khaled Ezzedine<sup>a</sup>, Davinder Parsad<sup>b</sup>, John E. Harris<sup>c</sup>, Nanja van Geel<sup>d</sup>, Jackie Gardner<sup>e</sup>, Kristen Bibeau<sup>f</sup>, Jessy Gao<sup>g</sup>, Haobo Ren<sup>h</sup> and Iltefat H. Hamzavi<sup>i</sup>

<sup>a</sup>Department of Dermatology, Henri Mondor University Hospital and Université Paris-Est Créteil Val de Marne, Paris, France; <sup>b</sup>Department of Dermatology, Post Graduate Institute of Medical Education and Research, Chandigarh, India; <sup>c</sup>Department of Dermatology, University of Massachusetts Chan Medical School, Worcester, MA, USA; <sup>d</sup>Department of Dermatology, Ghent University Hospital, Ghent, Belgium; <sup>e</sup>VI Support International, Lynchburg, VA, USA; <sup>f</sup>Incyte Corporation, Wilmington, DE, USA; <sup>g</sup>Department of Dermatology, Henry Ford M

OPEN ACCESS

### Mapping the stress-skin axis: Difficulties, strategies & prospects ahead

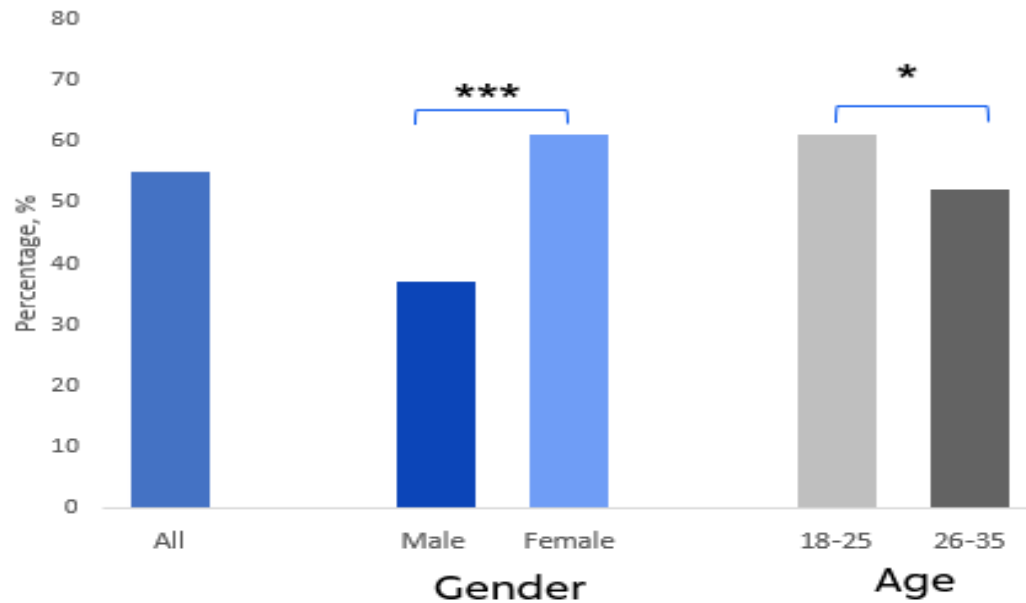
Hong Zhang,<sup>1</sup> Xuelan Gu,<sup>1,\*</sup> Yimei Tan,<sup>2,5,6,7</sup> Sijia Wang,<sup>3,7</sup> Wencai Jiang,<sup>2,5,6</sup> Bingjie Li,<sup>3</sup> and Jingjun Yang<sup>4</sup>

<sup>1</sup>Unilever, B & D Shanghai, 66 Lin Xin Road, Shanghai 200335, China

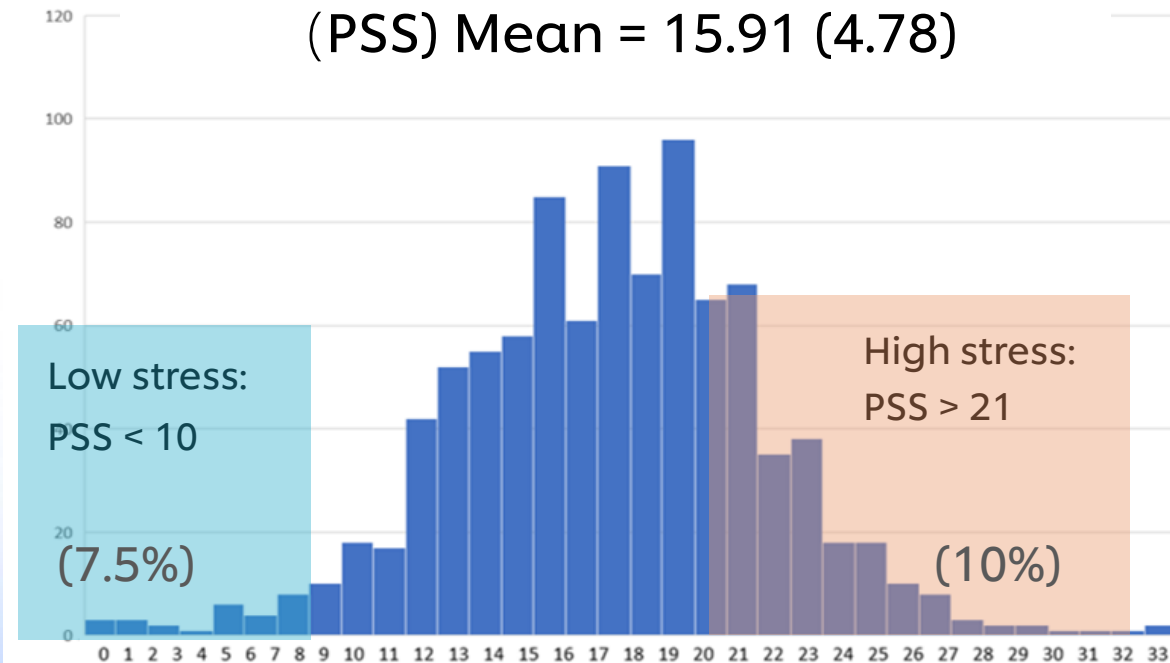
PERSPECTIVE

# Stress assessments in a Chinese population.

Experience Problems under Stress (Gender, Age difference)



Assessment of Perceived Stress Scale (PSS) Mean = 15.91 (4.78)

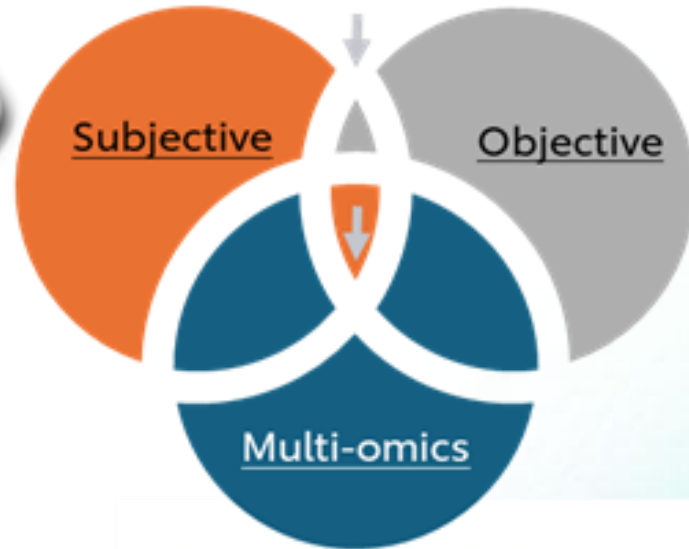


- Online questionnaires survey
- N=954, Shanghainese, 18-35 years old
- IRB approval NO. 2020-22(R)

# Stress and Skin Study

An interdisciplinary Approach

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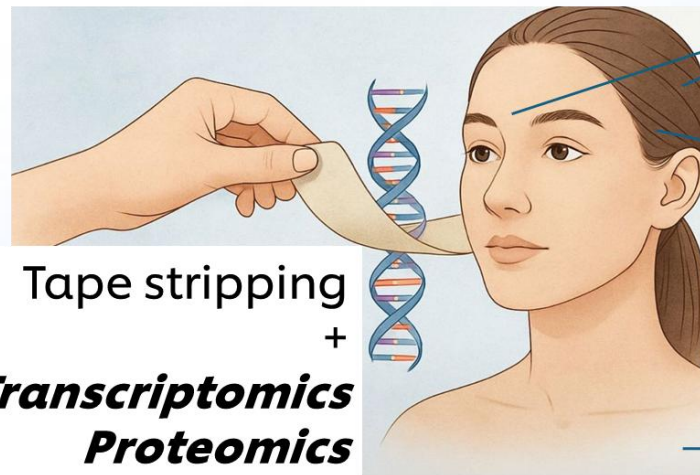
LS (n=100)

HS (n=100)

(PSS <10)

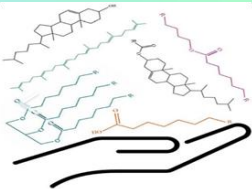
(PSS >21)

- Cross-sectional design
- n=200, Chinese females, 18-35 years old
- HGR registration No. 2022GH3740
- IRB approval No. 2021-28(R)

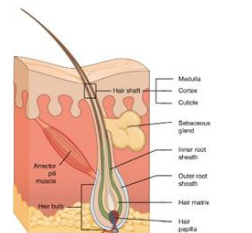


Tape stripping +  
**Transcriptomics**  
**Proteomics**  
**Lipidomics**  
**Microbiome**

Sebum (scalp & skin)  
**Lipid analysis**



Hair Cutting & Plucking  
**Transcriptomics**  
**Proteomics**

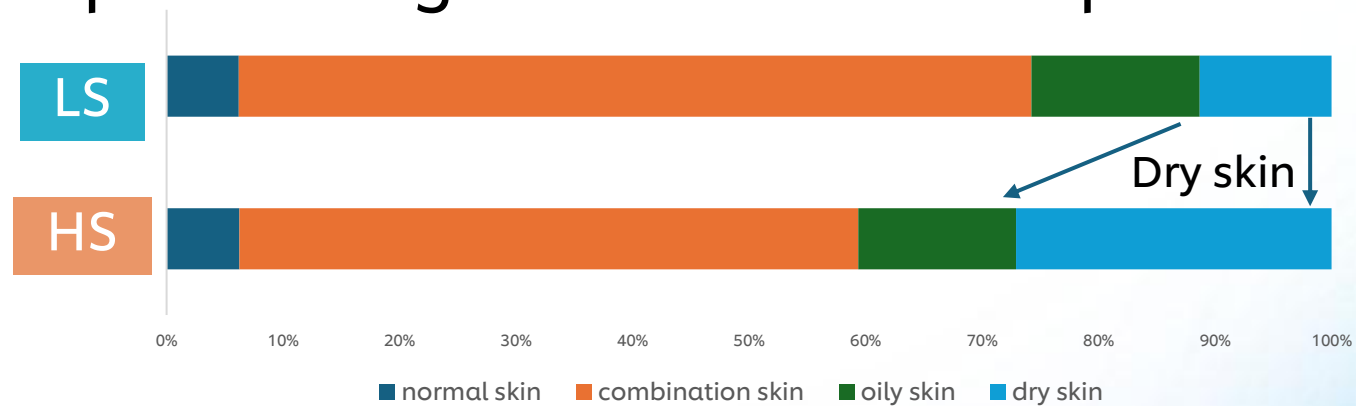


Blood sampling  
**Epigenetics**  
**Proteomics**

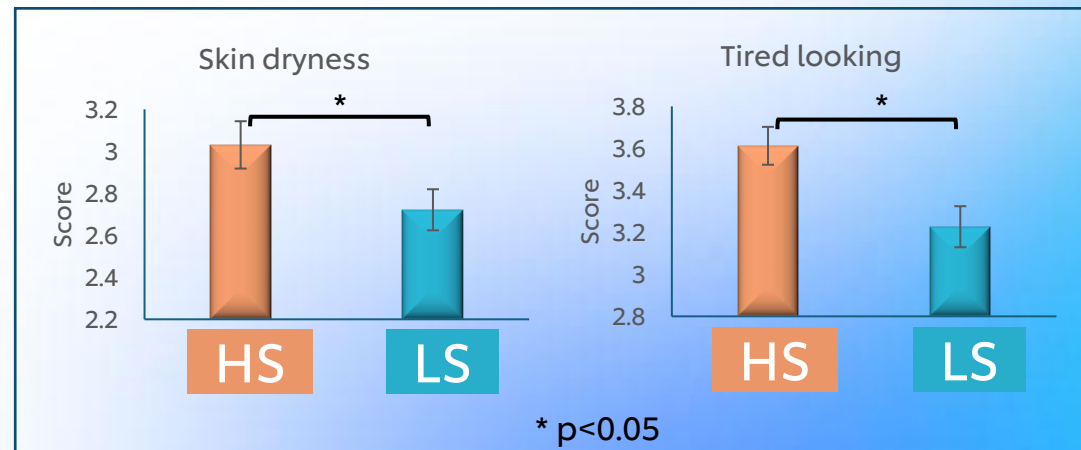


# Stress and dry skin

People with higher stress are more prone to dry skin



## Self-reported skin concerns



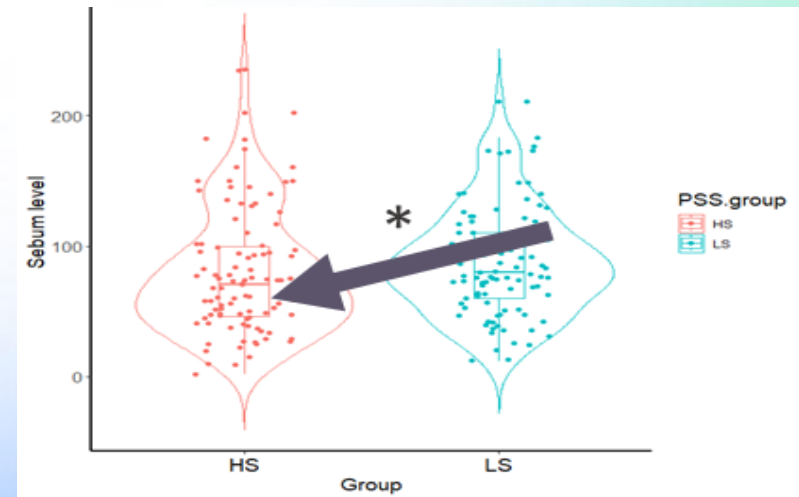
# Stress and altered skin microbiome & barrier. *Unilever*

Chronic psychological stress associated with altered microorganisms

## High vs. Low

Cutibacterium	↓
Staphylococcus	↓
Acinomyces	↑
Chryseobacterium	↑

Stress associates with lower sebum casual level and alters lipid profile

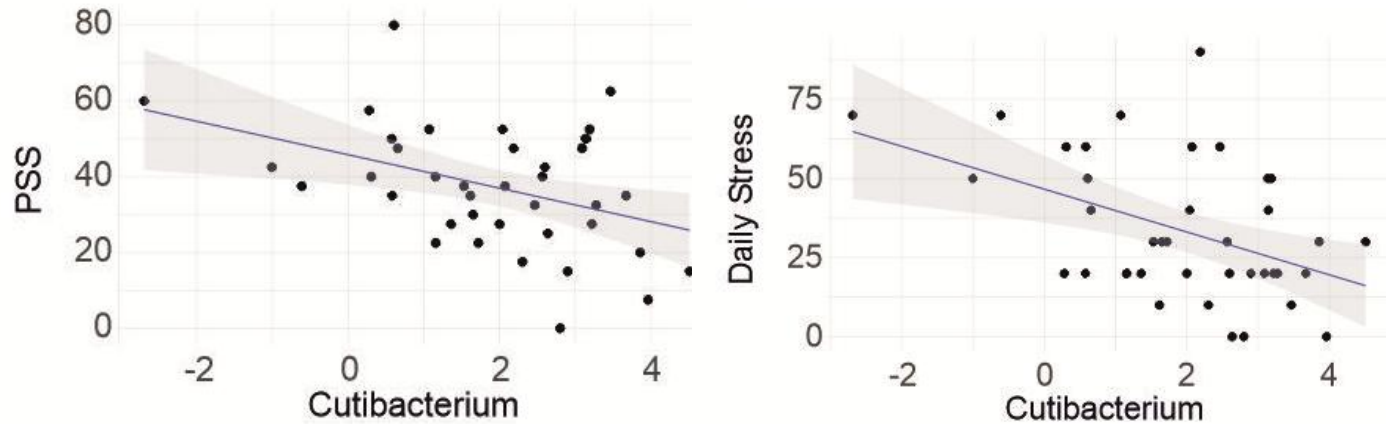


## High vs. Low

Sebum casual level	↓
Lipid components	↓

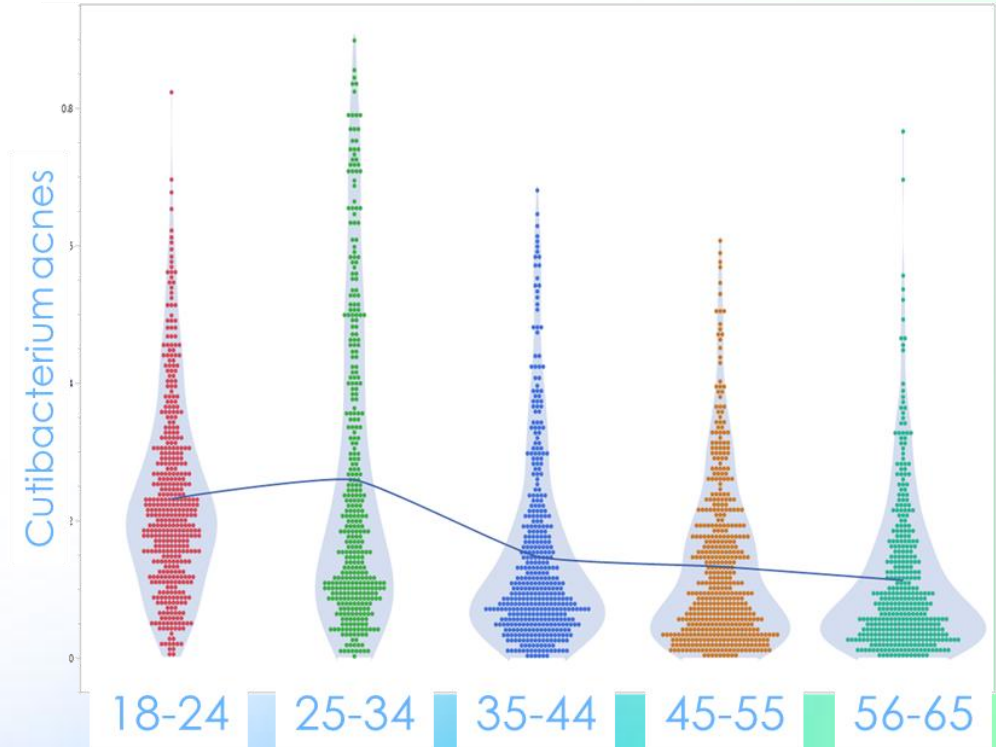
# Skin Microbiome & Psychological Stress Unilever

Elevated stress linked to a decrease in skin Cutibacteria



57 subject (29 women/ 24 men)  
Mean age 63yrs +/- 12yrs

Tyson-Carr et al 2025



Unilever Data

## Body site-specific associations between human skin microbiome composition and psychological wellbeing

John Tyson-Carr<sup>1</sup>, Joy Leng<sup>2</sup>, Margaret Scott<sup>3</sup>, Suzi Adams<sup>3</sup>, Michael Hoptroff<sup>3</sup>, Barry Murphy<sup>3</sup>, Nick Fallon<sup>1</sup>, Steve Paterson<sup>2</sup>, Anna Thomas<sup>3</sup>, Timo Giesbrecht<sup>3</sup> and Carl Roberts<sup>1</sup>

# Summary

## **Psychological stress links with skin**

- Inflammatory and autoimmune dermatological conditions.
- Dry skin and altered barrier.
- Altered skin microbiome.



# Overall Summary

- Perceived facial age and health links compelling but complexities exist.
- More reproducible longitudinal data in more diverse populations required.
- Challenges on study costs.
- A.I. predictions and explainable A.I. will help.
- Psychological wellbeing important.
- Skin appearance links to lifestyle changes and PC product-use needs further study.

Table 4. Odds of Having Higher Microtopography Grades in 1996 Relative to 1992, by Sunscreen

Intervention	Model 1	
	Odds of 1996 Compared With 1992 (95% CI)†	P Value
<b>Sunscreen‡</b>		
Daily sunscreen	1.19 (1.00–1.41)	0.046
Discretionary sunscreen	1.56 (1.29–1.88)	<0.001
Relative odds, daily sunscreen/discretionary sunscreen	0.76 (0.59–0.98)	0.033

# Acknowledgements

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Dr Andrew Mayes  
Dr David Messenger.

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