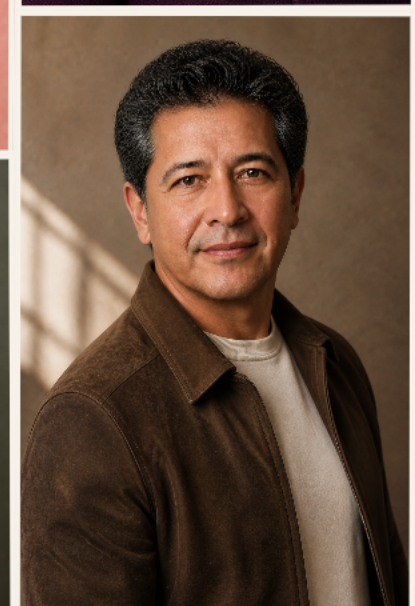
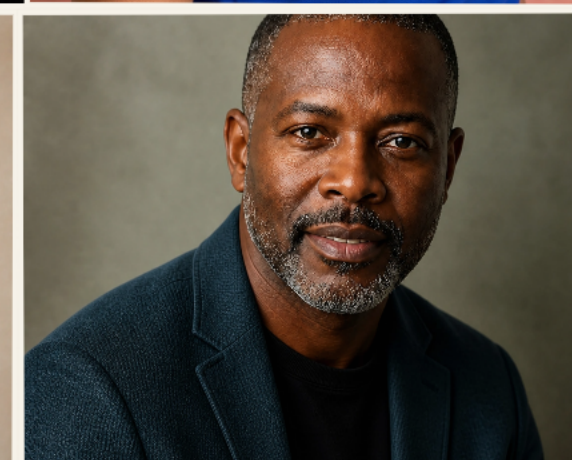
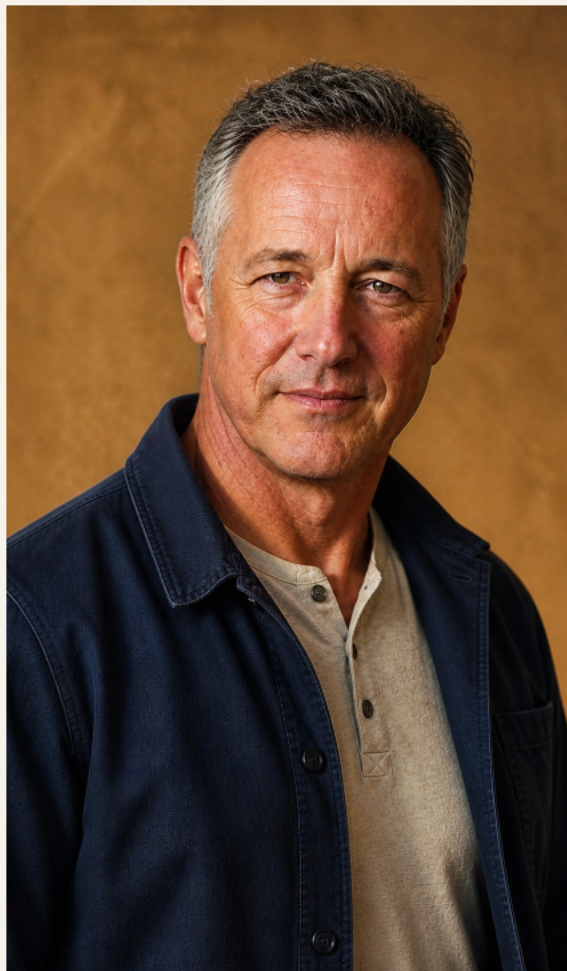


THE SCIENCE OF SKIN SUMMIT ·
SEPTEMBER 18, 2026

Skin and Hair as a Window to Systemic Longevity

*Aging is the growing gap between damage
and repair.*

HILLARY LIN, MD



Disclosures

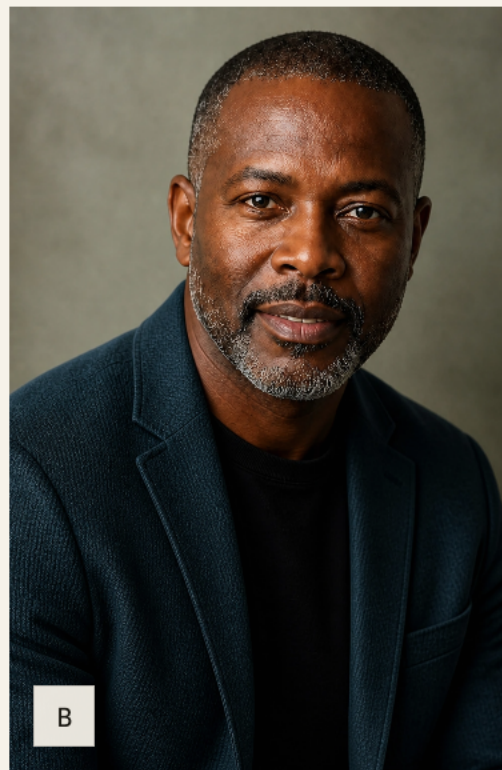
RELEVANT FINANCIAL RELATIONSHIP

Hillary Lin, MD, is co-founder and an equity holder of CareCore.

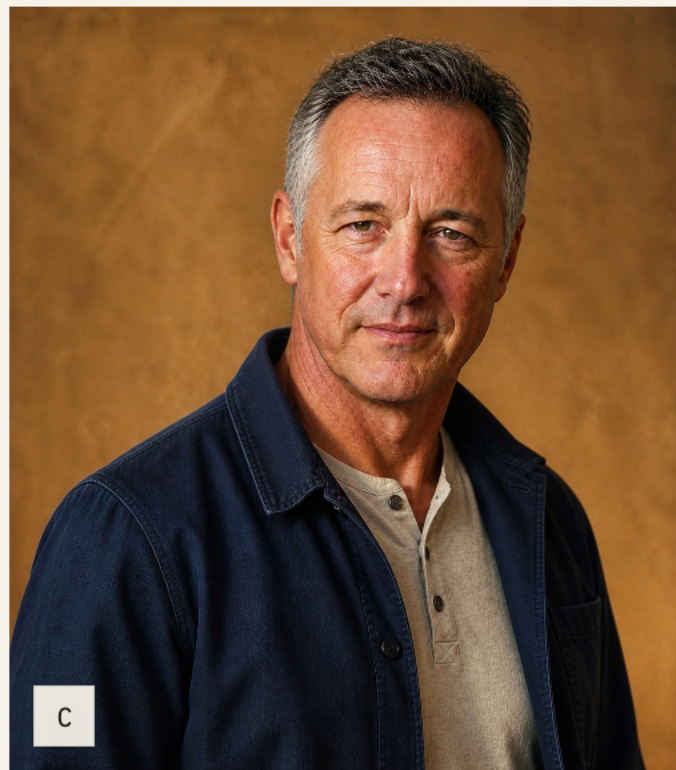
Ownership interest



A



B



C



E



F

THEY ARE ALL 52.

Who looks youngest?



D



Appearance carries signal. *It is not a diagnosis.*

1,826 TWINS AGE 70+ • 675 DEATHS • SEVEN YEARS

HR 1.03

PER PERCEIVED YEAR AFTER AGE, SEX, PHYSICAL
FUNCTION + COGNITION

WHAT IT IS

Broad population signal

WHAT IT IS NOT

A system, mechanism, or next action

HEALTHSPAN Risk · function · reserve — measured directly

Christensen et al., BMJ 2009 · PMID 20008378

HILLARY LIN, MD

ONE USEFUL MODEL

Aging is the growing gap between damage and repair.

THE HALLMARKS DESCRIBE
HOW THE GAP WIDENS.

DAMAGE LOAD

Outside + inside

UV · smoking · pollution · oxidative stress · glycation ·
inflammation · mitochondrial stress

WHEN BURDEN
OUTPACES
MAINTENANCE

*the gap
widens*

MAINTENANCE CAPACITY

Repair + clear + renew

DNA repair · proteostasis · autophagy · immune clearance ·
matrix maintenance · regeneration

OUTSIDE IN

Exposure raises local burden

INSIDE OUT

Physiology changes damage + recovery

CONSEQUENCE

Function shows what the gap has cost

López-Otín et al., Cell 2023 · PMID 36599349

HILLARY LIN, MD

OUTSIDE IN · DAMAGE SOURCE

Exposure leaves a map.

INTRINSIC / LOCAL Fine wrinkles · dryness · fragility · reduced elasticity

EXPOSURE MAP Face · lateral neck · dorsal hands and forearms

UV FEATURES Mottled pigment · lentigines · telangiectasia · elastotic texture

ACTION Protect · examine · surveil · treat locally

OUTSIDE-IN TEST Does exposed skin differ sharply from protected skin?

Patterns overlap. Neither grades systemic reserve.

Rittié & Fisher, 2015 · PMID 25561721 | Hughes et al., 2013 · PMID 23732711

PART WIDENING

MILD LAXITY

HAIR-PULL EXAM

D

INSIDE OUT · STRESS + RECOVERY

Hair can lag the event.

01 Illness · weight loss · medication · endocrine or nutritional stress →

02 Two to three months →

03 Diffuse shedding

BRING standardized photos · onset + tempo · trigger timeline · functional change

Hair locates the stressor. Function tells whether recovery kept up.

Telogen effluvium review · PMID 33541773

Both directions can leave a tissue record.

72,880

ADULTS WITHOUT KNOWN DIABETES OR CVD

SKIN AUTOFLUORESCENCE · GLYCATION BURDEN + PROTEIN TURNOVER

PER 1-AU INCREASE

OR 1.26

INCIDENT DIABETES

OR 1.33

INCIDENT CVD

OR 1.96

MORTALITY

LONG-TERM
CALIBRATION

Cardiovascular mortality attenuated after fuller adjustment in later follow-up.

A tissue record—not a direct measure of damage, repair, or whole-person age.

van Waateringe et al., Diabetologia 2019 · PMID 30460578 | Long-term follow-up · PMID 39198601

THE PRACTICAL MOVE

Bring a trajectory, not a selfie.

NOTICE + BRING

- 01 Personal baseline
- 02 Onset + tempo
- 03 Exposed / protected distribution
- 04 Illness · weight · medication · hormone · nutrition timeline

MEASURE IN CLINIC

- 01 ApoB · blood pressure · glycemia
- 02 Body composition + recovery
- 03 Grip · chair stand · gait speed
- 04 SPPB · six-minute walk · CPET when appropriate

If the claim is inside out, measure the implicated system and function directly.

Functional vital signs—not universal biological-age scores.



REFERENCE FRAME

Compared with whose baseline?

PIGMENTARY PHENOTYPE

**~13,000
participants**

3,939 DEATHS · 16
YEARS

FAMILY PATTERN

Gray hair, baldness, and facial wrinkles did not predict mortality after accounting for age.

OBSERVER / MODEL

Schnohr et al., J Gerontol A 1998 · PMID 9754140

When does an outside sign earn an inside question?

VISIBLE FINDING	SYSTEM QUESTION	CONFIRM DIRECTLY
Acanthosis or rapid spread	Metabolic, medication, or endocrine context?	BP · waist/weight · glycemia · medication/context review
Xanthelasma or tendon xanthoma	Severe lifelong atherogenic burden?	LDL-C · ApoB · family history · ASCVD risk
Severe or refractory psoriasis	Inflammatory burden and comorbidity?	Severity · established screening · treatment/follow-up owner HR 1.79 mortality if >10% BSA
Diffuse shedding	Recent physiologic stress?	Timeline · scalp exam · intake · targeted workup
Delayed healing or ulceration	Metabolic / vascular / immune impairment?	Wound + vascular exam · glycemia · risk factors

RULE *Name the finding → ask the system question → confirm directly → assign an owner.*

Psoriasis PMID 28843488 · Xanthelasma PMID 21920887 · Telogen effluvium PMID 33541773



C

DAMAGE SOURCE

Outside in · cumulative UV

REPAIR + FUNCTION

Local tissue change · strong
systemic reserve



D

DAMAGE SOURCE

Inside out · recent physiologic
stress

REPAIR + FUNCTION

Incomplete recovery · measure the
trajectory

AGING IS THE GROWING GAP

Is damage outpacing repair?

DAMAGE

Outside in, inside out, or both?

REPAIR

Is healing, clearance, and
recovery keeping up?

FUNCTION

What has changed?



SLIDES + EVIDENCE APPENDIX

hillarylinmd.com/skin-longevity

Use the surface to ask the next question—not to pronounce the whole-person verdict.

Evidence map: what kind of signal is this?

SIGNAL	BEST-SUPPORTED MEANING	CANNOT ESTABLISH	BEST USE
Perceived age	Broad composite population signal	Mechanism or individual diagnosis	Context; measure systems
Skin autofluorescence	Cumulative glycation/exposure proxy	Universal age or screening utility	Research / selected contexts
Photo-distributed change	Outside-in exposure pattern	Systemic aging rate	Prevention · exam · surveillance
Specific finding	System hypothesis or disease burden	Whole-person age	Focused workup + owner
Standardized function	Current capacity under the tested task	Lifespan or universal age	Track trajectory · intervene
Skin methylation	Chronological tissue age	Healthspan or mortality benefit	Research
Hair phenotype	Timing, family baseline, selected clue	Universal age score	Timeline + targeted evaluation

Damage source, tissue record, function, and prognosis are different layers.

Perceived age: strongest human longevity evidence

HR 1.03

PER PERCEIVED YEAR AFTER PHYSICAL + COGNITIVE FUNCTION

Cohort

1,826 Danish twins age 70+

675 deaths · seven years

Faces rated by nurses and lay assessors

Calibration

Age/sex adjusted HR 1.08

Attenuated after function and cognition

Twin analysis suggests shared inherited influences

Useful population signal. Not an individual treatment target.

Skin autofluorescence: signal and calibration

2019 · 72,880 ADULTS

Initial Lifelines result

Diabetes OR **1.26**

CVD OR **1.33**

Mortality OR **1.96**

Per 1-AU increase

2024 · 77,143 ADULTS

Longer follow-up

Cancer mortality HR **1.7**

CV mortality HR **1.4**

CV estimate no longer statistically significant after fuller adjustment

CAVEATS

Age · smoking · renal function · ancestry/optics · other fluorophores · commercial-device conflicts · no biomarker-guided outcome trial

Specific skin findings: hard outcomes and clinical routes

XANTHELASMA

MI HR 1.48

12,745 adults · up to 33 years

Stroke null

PSORIASIS >10% BSA

Mortality HR 1.79

8,760 patients + 87,600 controls

Severity matters

NEW DIABETIC FOOT ULCER

Mortality HR 2.48

414,523 people with diabetes

42.2% five-year mortality

ACANTHOSIS NIGRICANS

Metabolic clue

Prompts insulin-resistance and endocrine context

Not an aging clock or diagnosis by appearance

Disease- and finding-specific signals—not aging clocks.

Functional reserve: direct measures for clinic

NOTICE IN DAILY LIFE

- ◆ Arm use to rise from a chair
- ◆ Slower walking or new handrail dependence
- ◆ Less carrying or grip capacity
- ◆ Reduced exercise tolerance or longer recovery
- ◆ New difficulty with independent daily tasks

STANDARDIZE IN CLINIC

- ◆ Grip dynamometry
- ◆ Five-times chair stand or full SPPB
- ◆ Four-metre usual gait; guarded TUG when appropriate
- ◆ Six-minute walk or supervised CPET when warranted

RECORD

inability · pain · arm use · balance loss · aids · compensatory technique

Track the same protocol over time. Never convert one score into “years of life.”

Hair evidence: what survives scrutiny?

RETAIN

Telogen effluvium

Delayed event log; reconstruct trigger and recovery

GUARDRAIL

Gray hair / baldness

No mortality association after age adjustment in the strongest long-term cohort

TARGETED CONTEXT

Alopecia areata

Autoimmune and psychological review; no excess all-cause mortality in a large cohort

RESEARCH ONLY

Hair cortisol

Retrospective exposure archive; no screening or outcome-guided trial

DO NOT PROMOTE

**AGA/CAD ·
repigmentation · hair
minerals**

Not validated biological-age or longevity tests

Skin clocks and AI face age: measurement is not meaning

01

Performance

Can it estimate age or predict an outcome?



02

Validation

Does it add beyond age, phenotype, function, and conventional risk?



03

Decision value

Does measuring or changing it improve care?

Skin methylation

391-CpG tissue-age performance

No prospective skin-sample morbidity/function/mortality validation in the clock paper

AI perceived age

Reproduces associations with selected age-related conditions

Performance ≠ mechanism ≠ modifiability

Clinical routing guide

1 Name the finding precisely.

2 Establish baseline and tempo.

3 Map exposed versus protected distribution.

4 Ask: outside in, inside out, or both?

5 Check function and recovery.

6 Confirm the implicated system directly.

7 Assign an owner and a reassessment point.

Baseline → tempo → distribution → function → direct confirmation.

Core references + disclosure

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hillarylinmd.com/skin-longevity

DISCLOSURE

Hillary Lin, MD, is co-founder and an equity holder of CareCore.