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EQ-5D-5L × DCE

Linking EQ-5D-5L and Stated Preference Mortality Risk Valuation

Using a Hybrid Choice Framework

A perspective from outside the HRQoL community –
An applied example of integrating EQ-5D-5L into a discrete choice experiment (DCE)

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Mortality risk valuation · cardiovascular disease · Poland · n = 1,299

Why link EQ-5D-5L with a DCE?

Stated preference methods value mortality risk reductions – outputs feed VSL and benefit-cost analysis in health and environmental policy.

But preferences are not formed in a vacuum. Underlying health is plausibly a key driver of how people trade off risk and money.

EQ-5D-5L is the standard HRQoL instrument. Can it carry that information into a DCE?

Research question

Does latent health – as captured by EQ-5D-5L – systematically shape preferences and WTP for cardiovascular mortality-risk reductions?

...and is EQ-5D-5L the right vehicle for that information in a CVD-risk context?



Study design & modelling approach

The survey

Stated preference survey · Poland · n = 1,299 adults

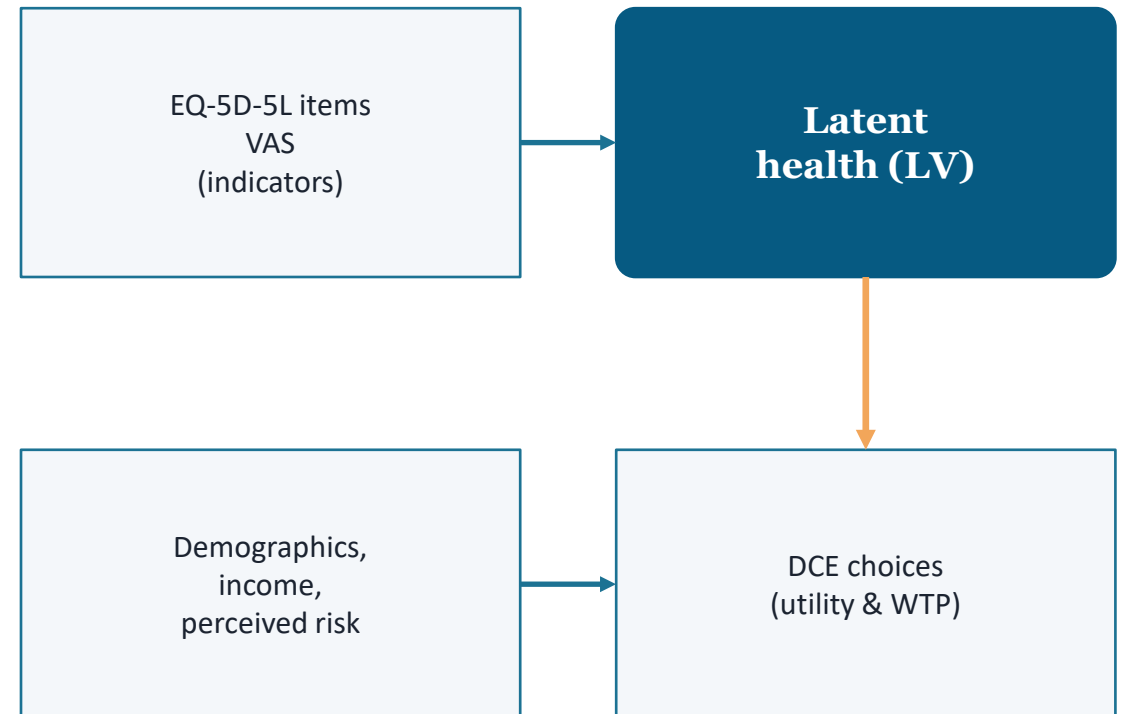
DCE on cardiovascular disease (CVD) mortality risk

Attributes: Not-SQ alternative · Risk reduction · Annual cost

Before the DCE, respondents reported:

- EQ-5D-5L profile (mobility, self-care, usual activities, pain, anxiety)
- VAS health rating
- Chronic conditions, CVD history (self & family), BMI
- Perceived baseline mortality risk (relative & absolute)

Hybrid choice framework



Estimation: simultaneous hybrid choice mixed logit in WTP-space (via maximum simulated likelihood).

The latent health variable (LV) is normalized to mean 0 and variance 1 in the population.



Model 1 – EQ-5D-5L (+ VAS) as indicators of latent health

LV is jointly identified from the 5 EQ items (ordered probits) and VAS (OLS).

Measurement equations behave as expected

Higher LV → better-health responses on every indicator

Indicator	LV loading	Direction
Mobility (OP)	-1.72***	✓
Self-care (OP)	-2.38***	✓
Usual activities (OP)	-2.19***	✓
Pain (OP)	-1.30***	✓
Anxiety / Depression (OP)	-0.58***	✓
VAS (OLS)	+0.13***	✓

Higher LV ↔ fewer problems on EQ items, higher VAS. The latent variable is reading as “healthier.”

...but the choice equation surprises us

Interaction of attributes with LV:

Attribute × LV	Coef. (PLN/year)
Not-SQ × LV	+85.10***
Risk* × LV	+60.58***

Healthier respondents (higher LV) are more likely to choose non-SQ and have higher WTP for risk reduction.

Interpretation: holding other factors constant, a one-standard-deviation increase in the latent health variable (indicating better health) is associated with an additional WTP of 60.58 PLN/year for risk reduction.

Baseline WTP estimates are 158.18 PLN/year for the Not-SQ alternative and 90.05 PLN/year for each unit of risk reduction (one fewer death per 1,000 people per decade).

Puzzle: why would healthier people pay more to reduce CVD mortality risk?

Model 2 — A CVD-specific health construct

Replace EQ-5D-5L items with measures tailored to cardiovascular risk:

New indicators for LV

Now LV reads as CVD risk / “anti-health” — all loadings positive and significant.

Indicator	LV loading
BMI / 10 (OLS)	+0.12***
Chronic diseases (OP)	+0.29***
CVD — self (OP)	+0.37***
CVD — family history (OP)	+0.25***
Risk perception — relative (OP)	+0.26***
Risk perception — absolute (OLS)	+0.01**

Higher LV \leftrightarrow higher BMI, reporting health issues, and higher perceived risk. The latent variable is reading as the opposite of being “healthier.”

Interaction of attributes with LV (= CVD risk):

Attribute \times LV	Coef. (PLN/year)
Not-SQ \times LV	+689.50***
Risk* \times LV	+393.87***

Higher CVD-specific risk \rightarrow higher WTP for risk reduction. The expected direction.

Interpretation: holding other factors constant, a one-standard-deviation increase in the latent health variable (indicating better health) is associated with an additional WTP of 393.87 PLN/year for risk reduction.

Baseline WTP estimates are 179.54 PLN/year for the Not-SQ alternative and 56.35 PLN/year for each unit of risk reduction (one fewer death per 1,000 people per decade).

Same DCE data, different health construct \rightarrow the same signs on WTP interactions.

Model 3 – Each EQ-5D-5L dimension as a separate interaction

MXL with correlations in WTP-space — random parameters on attributes, interacted directly with each EQ-5D-5L dimension.

Dimension (× attribute, WTP-space)	Not-SQ (PLN/year)	Risk (PLN/year)	Interpretation
Mobility	-24.92***	+15.20***	More mobility issues → less non-SQ, but higher WTP for risk reductions
Self-care	+21.33*	-18.12***	Opposite pattern to mobility — signs flip
Usual activities	+9.68 n.s.	+4.39 n.s.	No detectable effect on either attribute
Pain	+10.00 n.s.	+2.94**	Weak on non-SQ, only modest effect on WTP for risk reductions
Anxiety / Depression	+2.46 n.s.	-7.95***	No non-SQ effect, but lower WTP for risk reductions

After letting preferences vary independently, the dimensions don't tell a consistent story.

Baseline WTP estimates are 297.81 PLN/year for the Not-SQ alternative and 118.85 PLN/year for each unit of risk reduction (one fewer death per 1,000 people per decade).



Sanity check — does EQ-5D-5L track health the way we'd expect?

Outside the DCE, we regressed health & risk perception measures on each other (9 specifications: ordered probits and OLS).

Chronic / CVD history → perceived risk, VAS, EQ-5D-5L

Always significant, results as expected

Healthy respondents (no chronic / CVD conditions) rate their own risk lower and have better VAS / EQ-5D-5L scores. Consistent across all 9 model specifications.

EQ-5D-5L → perceived risk, VAS

+0.13* (less rel. risk)**
+14.8* (less abs. risk)**
+0.06* (higher VAS)**

Better EQ-5D-5L correlates with less perceived risk on both Likert and per-1,000 scales, and with a higher VAS score.

VAS → perceived risk

+0.28* (less rel. risk)**
n.s. (abs. risk)

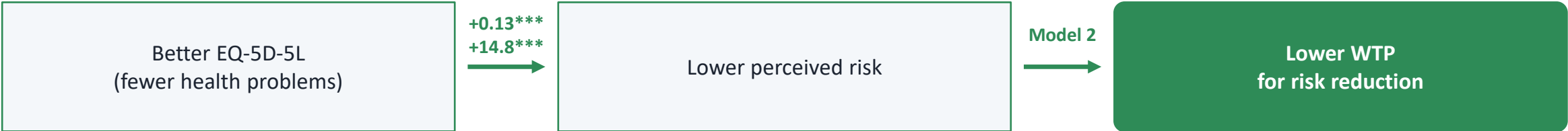
Higher VAS also correlates with less perceived risk, in the expected direction. Across the 9 specifications, results align with health intuition.

So the EQ-5D-5L instrument is doing a good job as a health summary — the issue isn't the measurement itself, but how (or whether) it carries useful preference information.

The contradiction

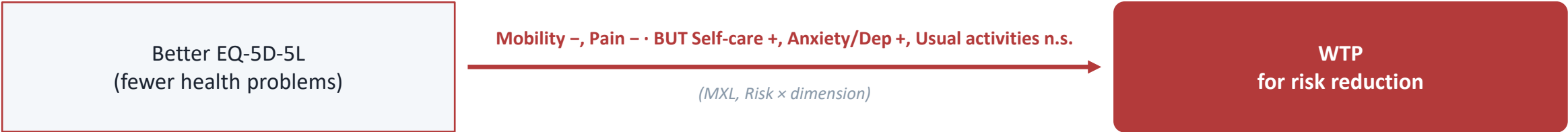
Putting the two halves of the analysis side by side reveals an inconsistency in how EQ-5D-5L behaves.

WHAT WE'D EXPECT



Each step is empirically supported: EQ-5D-5L tracks perceived risk (slide 7); perceived risk drives WTP (Model 2).

WHAT THE DATA ACTUALLY SHOW (DIRECT)



*Better EQ-5D-5L correlates with lower perceived risk — yet **the dimensions disagree on WTP, with Self-care and Anxiety/Depression pointing the wrong way.** The economic-preference signal is not consistent with the perceived-risk signal.*



Putting it together

Model 1

LV from EQ-5D-5L + VAS

Healthier respondents → higher WTP

Counter-intuitive in a CVD-risk context?

Model 2

LV from BMI · chronic · CVD · risk perception

Higher CVD risk → higher WTP

Expected direction. Everything checks out.

Model 3

MXL: each EQ-5D-5L dimension separately

Signs vary, many non-significant

Mobility & self-care signs flip; usual activities is silent. Hybrid spec confirms LVs capture other heterogeneity, not the dimension itself.

EQ-5D-5L summarizes health well, but in our application its preference signal points the opposite way of disease-specific measures.

Takeaways for using EQ-5D-5L with economic preferences for domain-specific risk reductions



EQ-5D-5L is a validated health summary

It correlates with chronic conditions, CVD history and self-rated risk – exactly as expected.



But it isn't a one-size-fits-all preference modifier

For CVD-mortality risk, it produces a counter-intuitive “healthier → higher WTP” pattern, while disease-specific health measures give the expected sign.



Item-by-item, EQ-5D-5L dimensions disagree on WTP

EQ-5D-5L dimensions do load on WTP, but in mixed directions — Mobility and Pain point one way, Self-care and Anxiety/Depression the other. Several go opposite to what the EQ-5D-5L → perceived-risk relationship would predict. The instrument is not a clean vehicle for WTP for domain-specific mortality-risk reduction.



Practical implication

When linking HRQoL to stated-preference valuation, match the health construct to the risk being valued. Treat EQ-5D-5L interactions in economic models with care – they may carry information that is not preference-relevant (incidental results).



Thank you



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