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# **Predicting Disease-Burden in EQ-5D US Units from Seven Other Measurement Systems (EQ-5D UK, HALEX, HUI MARK 2, HUI MARK 3, QWB-SA, SF-6D(12), SF-6D(36))**

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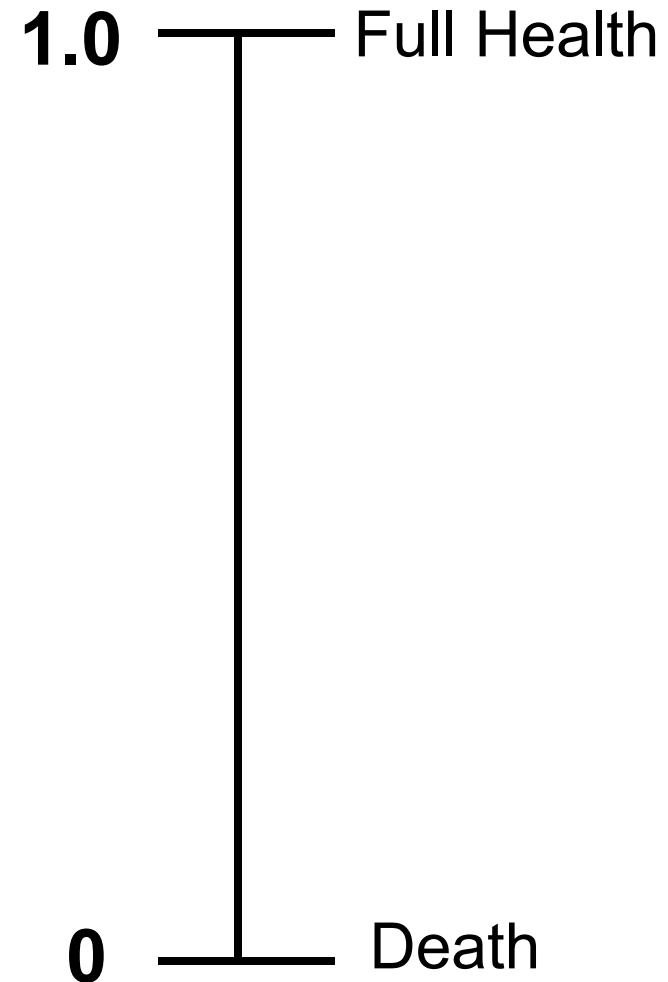
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# Measuring Disease-Burden

Health-related quality-of-life measures with preference-based scoring systems are constructed such that . . .

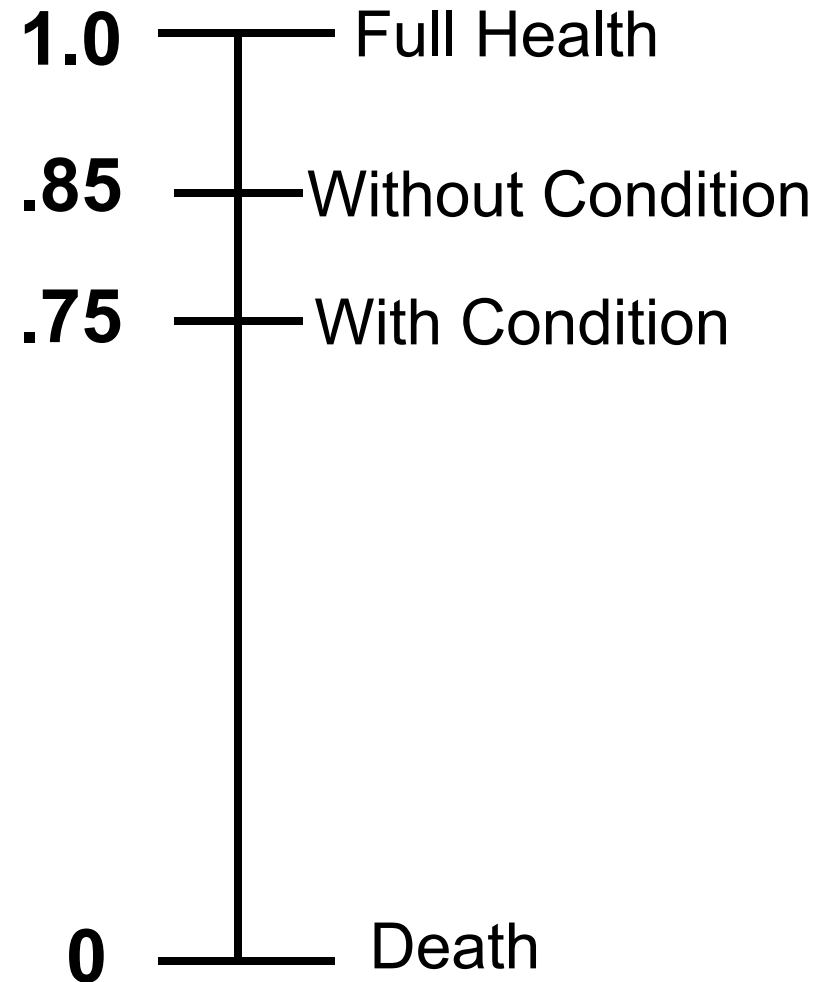




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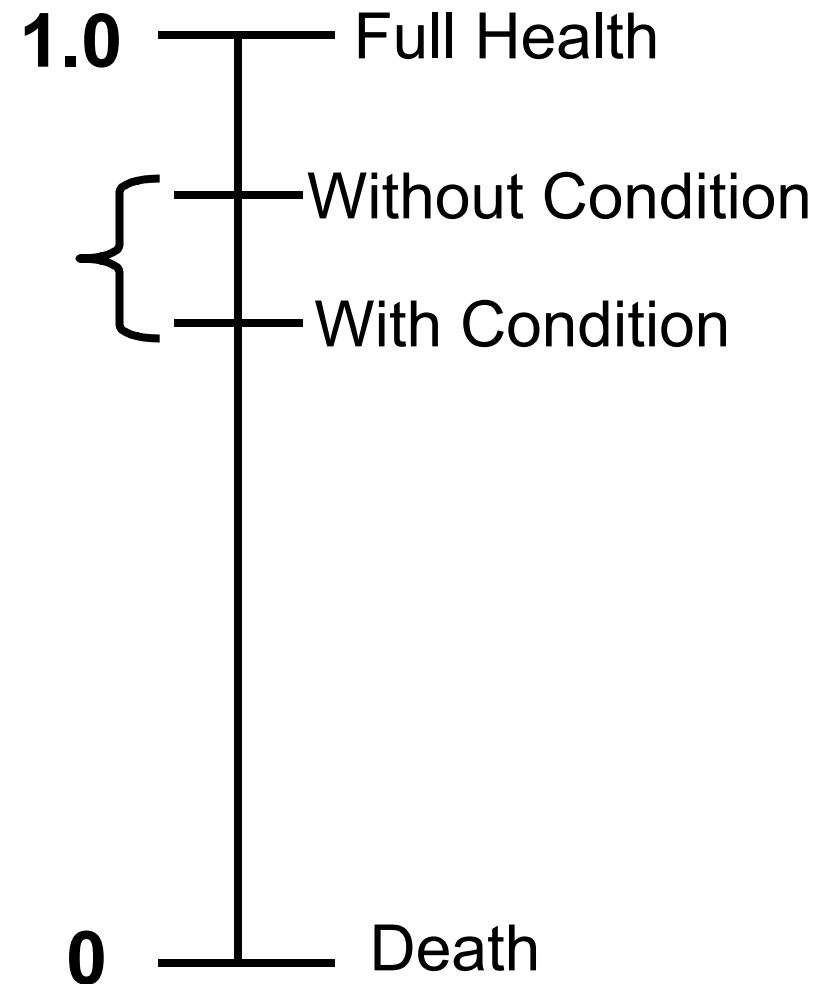


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# Measuring Disease-Burden

Disease-burden is the change in health-related quality-of-life score related to having a health condition.

$$\begin{aligned} \text{Disease-burden} &= 0.75 - 0.85 \\ &= -0.10 \end{aligned}$$





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## Preference-Based Systems for Measuring Disease-Burden

- ❑ There are several generic health-related quality-of-life scoring systems used to measure disease-burden. Preference-based summary scores include:
  - EQ-5D with UK Scoring
  - EQ-5D with US Scoring
  - Health Utilities Index Mark 2
  - Health Utilities Index Mark 3
  - Quality of Well-being Scale
  - SF-6D from the SF-36 or SF-12
  
- ❑ **Disease-burdens measured from different scoring systems are not numerically identical!**



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## Our Objective

- ❑ To create a simple algorithm that converts disease-burden from other scoring systems to the EQ-5D US.
- ❑ Note: These algorithms map disease-burden, not scores.



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## Data Source

- ❑ National Health Measurement Study
- ❑ Nationally representative telephone survey of US adults aged 35-89
- ❑ 3844 completed interviews
- ❑ Includes:
  - EQ-5D
  - HALex
  - Health Utilities Index
  - Quality of Well-being Scale
  - SF-36 version 2



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# Analyses

- ❑ We restrict our analyses to the 3383 respondents who completed all HRQoL measures
- ❑ We calculate disease burden for 31 health conditions
- ❑ Weighted to be nationally representative

$$\begin{aligned} \text{Score} = & \beta_0 + \beta_{\text{Cond}}(\text{Condition}) + \beta_{\text{age}}(\text{Age}) + \beta_{\text{sex}}(\text{Sex}) \\ & + \beta_{\text{edu}}(\text{Education}) + \beta_{\text{home}}(\text{OwnHome}) + \beta_{\text{race}}(\text{Race}) \end{aligned}$$



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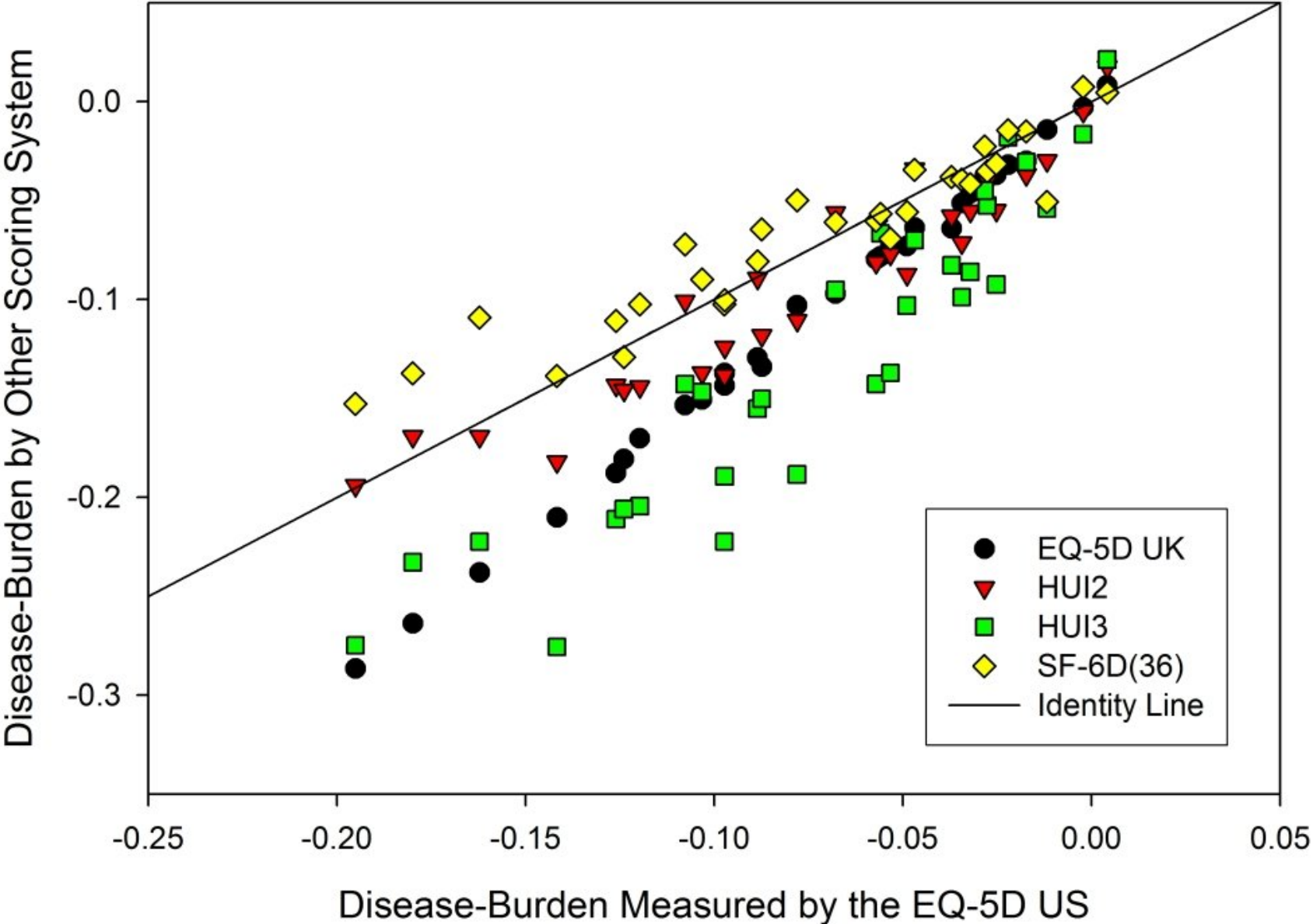


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## 31 Health Conditions, all n>65

- CAD with bypass
- CAD with stent
- CAD with medication
- CAD without bypass/stent/medication
- Hospitalized stroke
- Unhospitalized stroke
- DM with insulin
- DM with medication
- DM without insulin or medication
- Arthritis
- Cataract
- Macular degeneration
- Glaucoma
- Other eye condition
- Sleep problems
- Asthma
- Chronic bronchitis
- Emphysema
- Other respiratory condition
- Depression/Anxiety with medication
- Depression/Anxiety without medication
- GI ulcer with medication
- GI ulcer without medication
- Thyroid disorder with medication
- Thyroid disorder without medication
- Back pain with surgery
- Back pain with medication
- Back pain without surgery or medication
- Current Smoker
- Obese
- Morbidly Obese

# Disease-Burden Measured by 5 Scoring Systems





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# Conversion Algorithms

$$EQ5D(US) = \beta_{OtherSystem} (OtherScoringSystem)$$

## Mapping Algorithm

$$EQ-5D\ US = 0.6855 * EQ-5D\ UK$$

$$EQ-5D\ US = 0.5681 * HALex$$

$$EQ-5D\ US = 0.8467 * HUI2$$

$$EQ-5D\ US = 0.5816 * HUI3$$

$$EQ-5D\ US = 1.0409 * QWB-SA$$

$$EQ-5D\ US = 1.0860 * SF6D(12)$$

$$EQ-5D\ US = 1.1266 * SF6D(36)$$



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# Measuring Model Fit in the Out of Sample Tests

- ❑ Bias
- ❑ Standard deviation of differences between actual and predicted disease-burden



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# Out of Sample Test 1

- ❑ Medical Expenditure Panel Survey 2000
- ❑ N=11,421
- ❑ 46 chronic conditions
- ❑ Adjust for age, gender, race/ethnicity, income, and education
- ❑ Test conversion algorithms for the EQ-5D UK and the SF-6D(12)



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## Out of Sample Test 2

- ❑ US Valuation of the EuroQol EQ-5D Health States
- ❑ N=4,048
- ❑ 19 health conditions
- ❑ Adjust for age and gender
- ❑ Test conversion algorithms for the HUI2 and HUI3



## Bias in Disease-Burden Estimates

<b>In Sample</b>	<b><u>Measure</u></b>	<b><u>Bias Before Conversion</u></b>	<b><u>Bias After Conversion</u></b>
	EQ-5D UK	-0.0331	0.0003
	SF6D(12)	0.0057	-0.0001
	HUI2	-0.0157	-0.0020
	HUI3	-0.0555	-0.0016

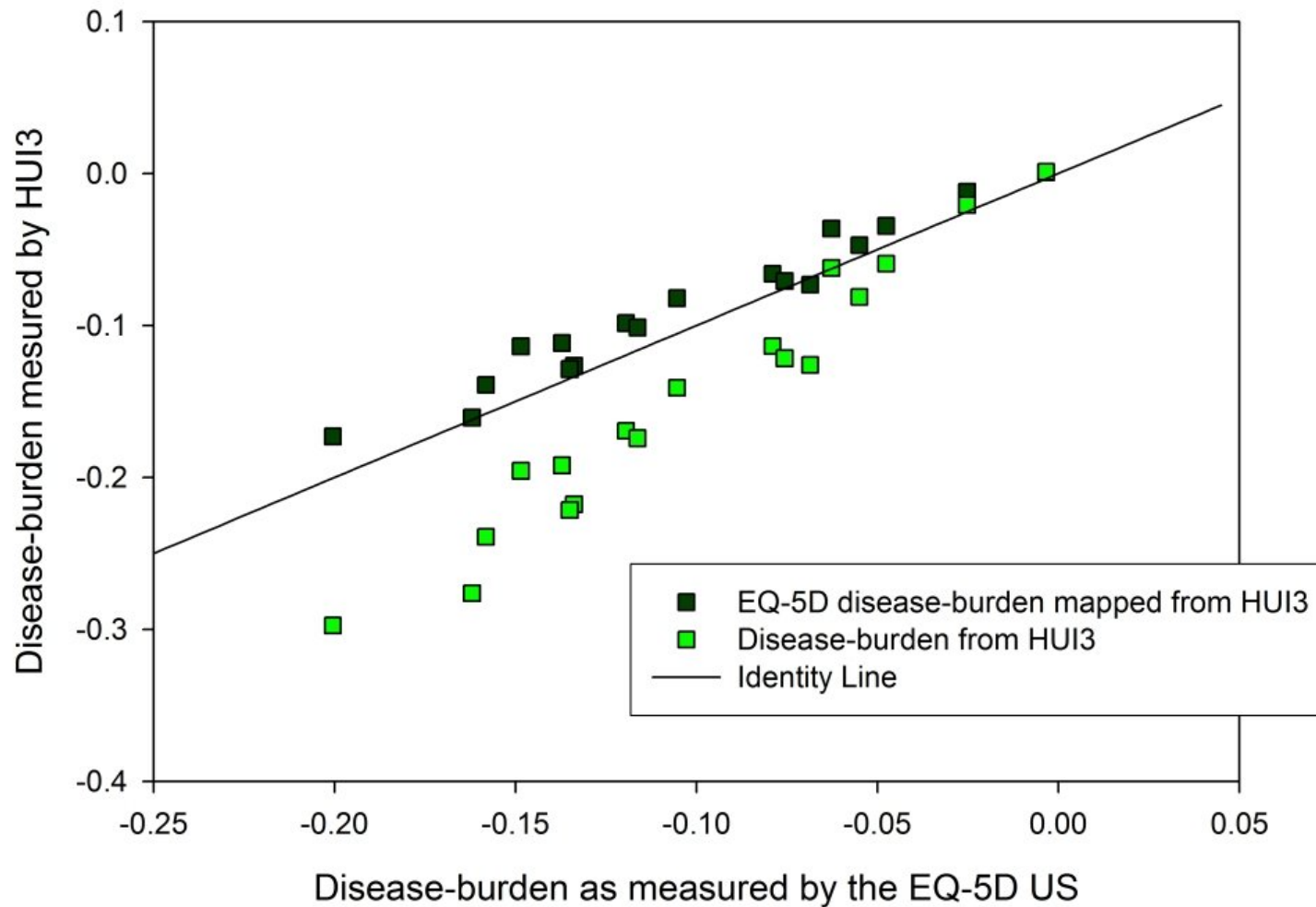
<b>Out of Sample</b>	<b><u>Measure</u></b>	<b><u>Bias Before Conversion</u></b>	<b><u>Bias After Conversion</u></b>
	EQ-5D UK	-0.0313	0.0012
	SF6D(12)	0.0134	0.0083
	HUI2	0.0080	0.0224
	HUI3	-0.0486	0.0144

**Conclusion: Bias substantially improves after conversion**



# Bias in Disease-Burden Estimates

Most Improved - HUI3





## Error in Disease-Burden Estimates

<b>In Sample</b>	<b><u>Measure</u></b>	<b><u>SD Before Conversion</u></b>	<b><u>SD After Conversion</u></b>
	EQ-5D UK	0.0251	0.0027
	SF6D(12)	0.0218	0.0215
	HUI2	0.0170	0.0166
	HUI3	0.0365	0.0201

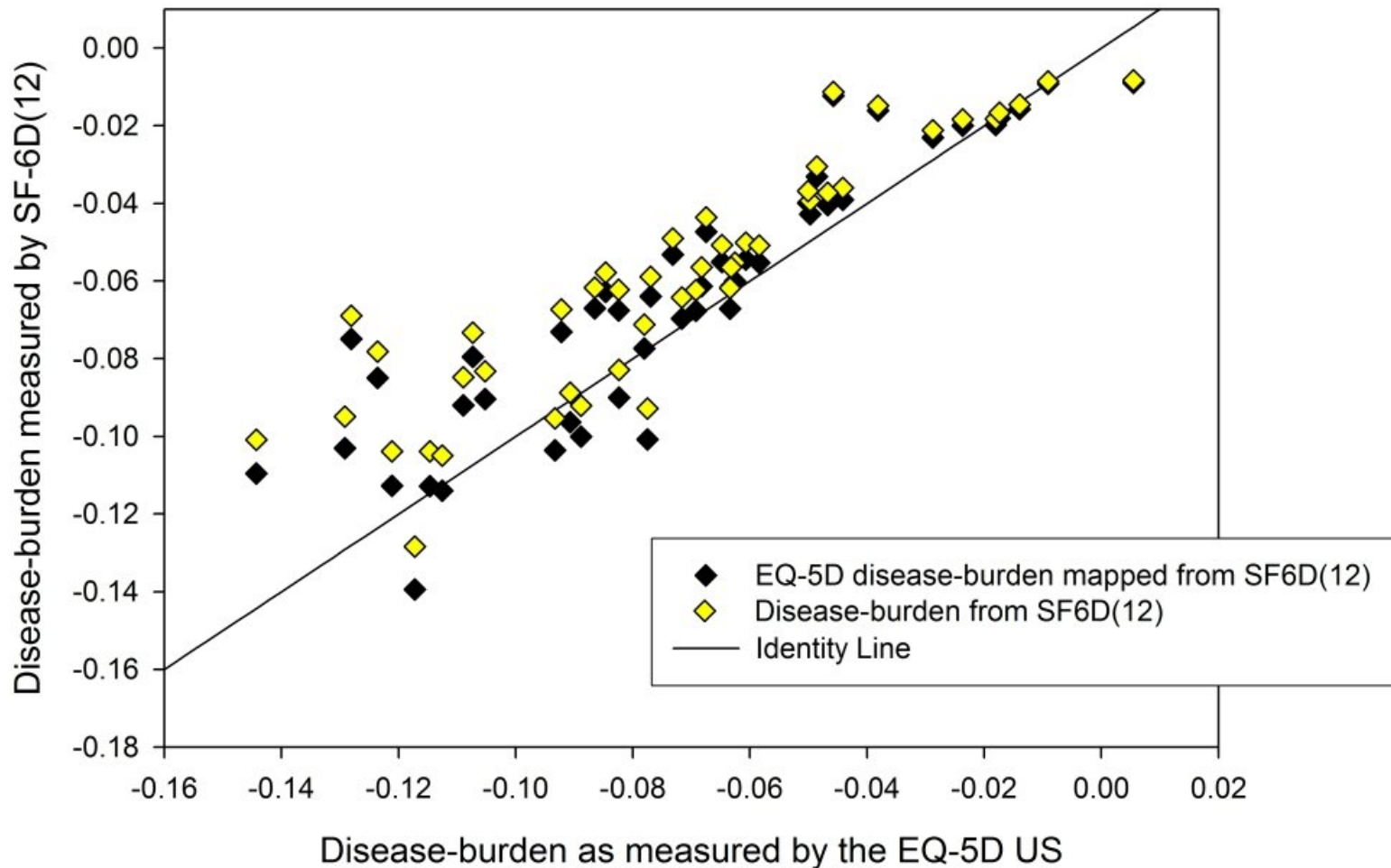
<b>Out of Sample</b>	<b><u>Measure</u></b>	<b><u>SD Before Conversion</u></b>	<b><u>SD After Conversion</u></b>
	EQ-5D UK	0.0160	0.0021
	SF6D(12)	0.0152	0.0152
	HUI2	0.0091	0.0125
	HUI3	0.0340	0.0103

**Conclusion: Error remains large after conversion**



# Error in Disease-Burden Estimates

Least Improved - SF-6D(12)





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# Strengths

- ❑ Large, nationally representative surveys
- ❑ Co-administration of the most widely used health-related quality of life measures
- ❑ Models are easy to use
- ❑ Models fit well
- ❑ Models are relatively unbiased in out-of-sample tests



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# Limitations

- ❑ Number of health conditions is low
- ❑ Responders must be healthy enough to complete survey – missing severe disease-burdens
- ❑ Conversion algorithms have not been tested in patient samples
- ❑ Error associated with mapped disease-burden is large



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# Conclusions

- ❑ This method produces relatively unbiased estimates for disease-burden across HRQoL scoring systems
  - This simple method improves the ability to compare disease-burdens estimates from different HRQoL scoring systems
  
- ❑ Current error variance associated with this method limits its usability
  - Future work should examine non-linear cross-walks between HRQoL scores



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**Thank you!**

We look forward to your comments and questions.

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