

# **Predicting Survival: Telomere Length Versus Conventional Predictors**

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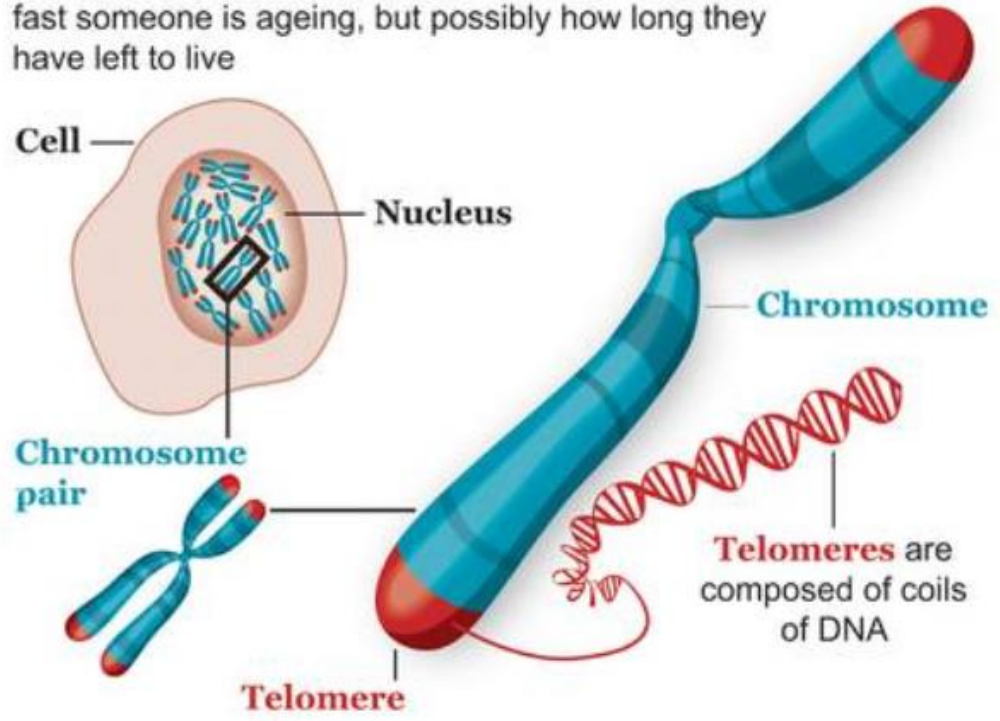
News > Science

# Test that can predict death - with a terrifying degree of accuracy

Tuesday 20 November 2012

## **i** **measure of age** How the test works

Telomere tests could be used to estimate not only how fast someone is ageing, but possibly how long they have left to live



**What is a Telomere?**

Telomeres are structures on the tips of all chromosomes which gradually get shorter with age. Short telomeres are linked with premature ageing and many diseases. By measuring telomere length scientists can see how fast someone is ageing, and calculate their biological age. This data can then be used to predict life expectancy.

Research on birds shows that new blood test can determine speed of ageing,

# What the Headline Left Out...

The article was based on a study of birds,  
NOT humans.



Seychelles Warbler

Source of the Picture:

Flickrriver.com



News > Science

# The £400 test that tells you how long you'll live



# Reports from Other Media Sources

**The New York Times**

MAY 18, 2011

*A Blood Test Offers Clues to Longevity*

**U.S. News** & WORLD REPORT

HealthDay

Nov. 8, 2012 | 2:00 p.m. EST

**DNA 'Telomere' Length Tied to Aging, Death Risk**

**n p r**

SEPTEMBER 17, 2013 12:37 PM ET

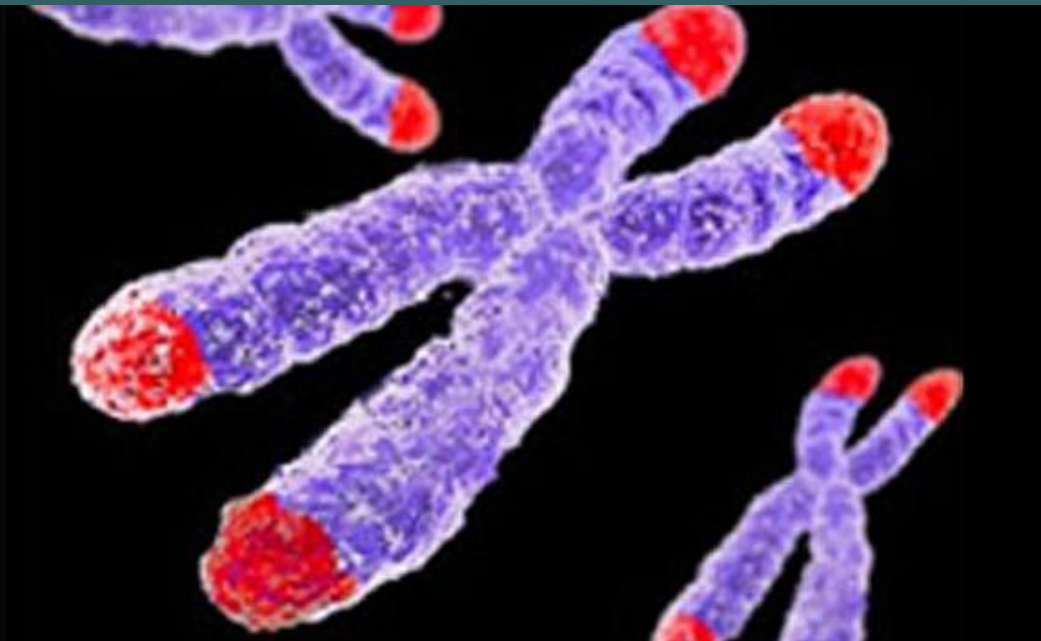
**Healthful Living May Lengthen Telomeres And Lifespans**

**The Washington Post**

May 23, 2011

**Caps on chromosomes may reveal health risks**

**How well does telomere length fare in predicting 5-year mortality compared with other established predictors of survival?**



Source: CBSnews.com

# Background

- In the quest for the elusive biomarker of aging, telomere length has generated a great deal of interest.
  - Telomeres act as a ‘molecular clock’
- Here we focus **ONLY** on mortality, not other measures of aging.
- Prior evidence regarding the relationship between leukocyte telomere length (LTL) and mortality among humans has been inconclusive.

# Data from 3 Different Countries

- Nationally-representative samples
- Respondents who completed interview, exam, and provided a DNA specimen
  - CRELES, Wave 2 (Costa Rica)
    - $N=923$  aged 61+ in 2006-08
  - SEBAS 2000 (Taiwan)
    - $N=976$  aged 54+ in 2000
  - NHANES, 1999-2002 Waves (U.S.)
    - $N=2672$  aged 60+ in 1999-2002



# Predictors

- LTL (T/S ratio measured by Q-PCR)
- Age
- Sex
- 19 other variables previously shown to predict mortality (& available for all datasets):
  - 3 Social factors
  - 2 Health behaviors
  - 7 Measures of health status
  - 7 Biomarkers

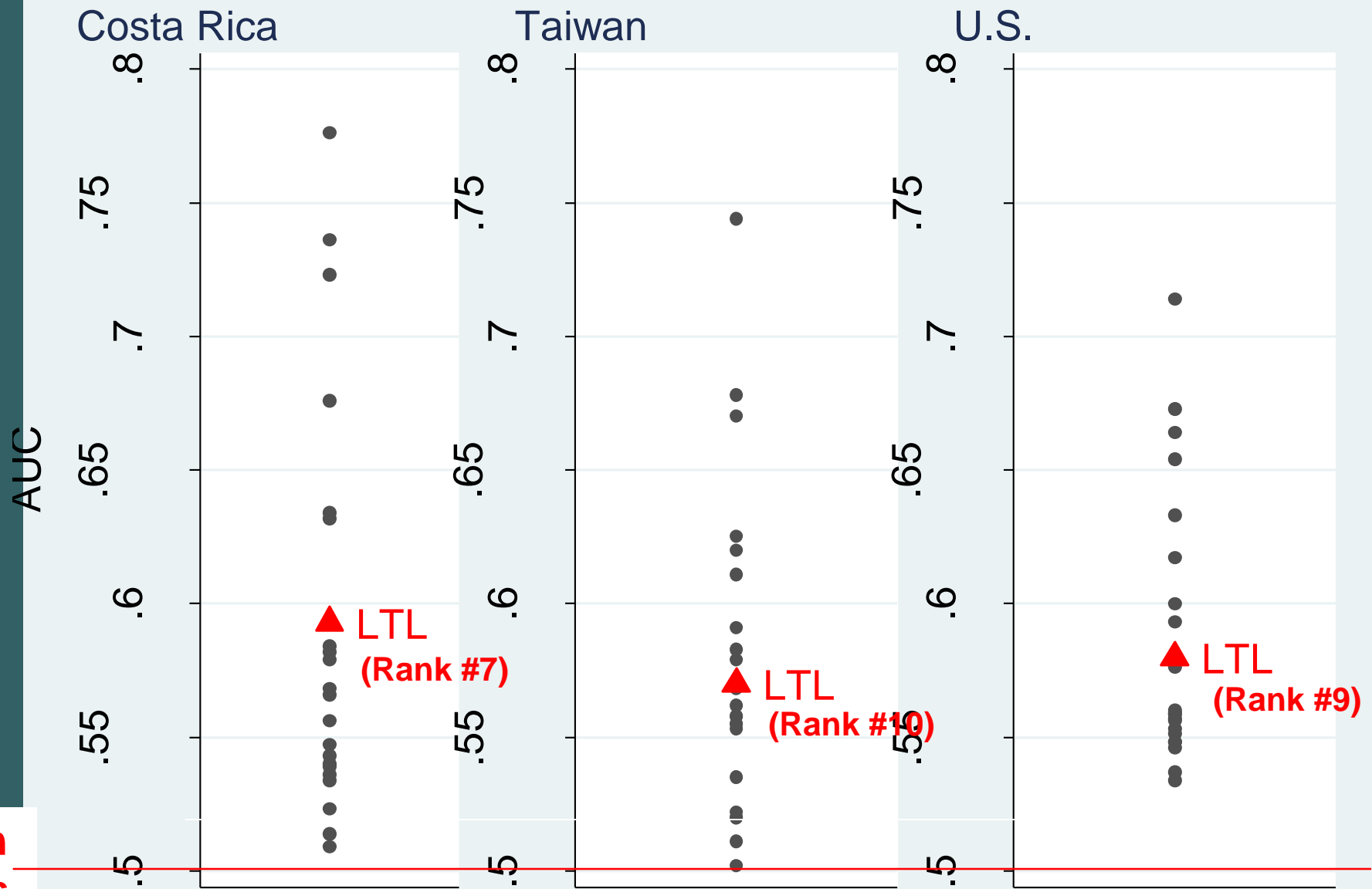
# Model

- Mortality within 5 years post-exam
- Cox hazards model
- Fit separately by country
- Multiple imputation to maximize use of the data
- Tested for non-proportional hazards; included time interactions where significant

# Measure of Predictive Ability

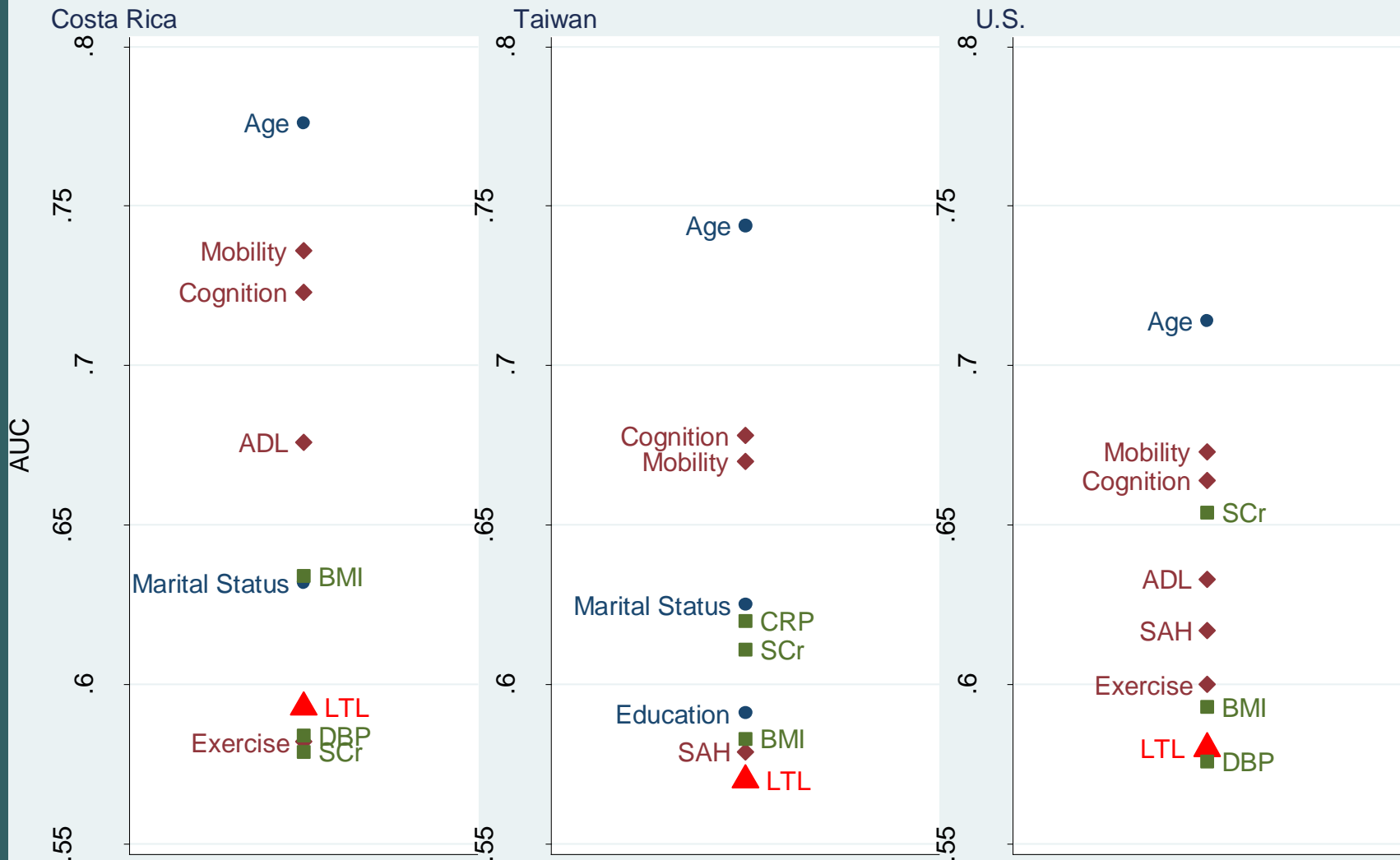
- Area under the receiver operating characteristic curve (AUC), range 0-1:
  - 0.5 = no better than chance and
  - 1.0 = perfect accuracy
- Interpretation: Probability that decedents are assigned a higher predicted probability of death than survivors
- Can be viewed as a measure of the model's overall sensitivity and specificity

Coin  
Toss

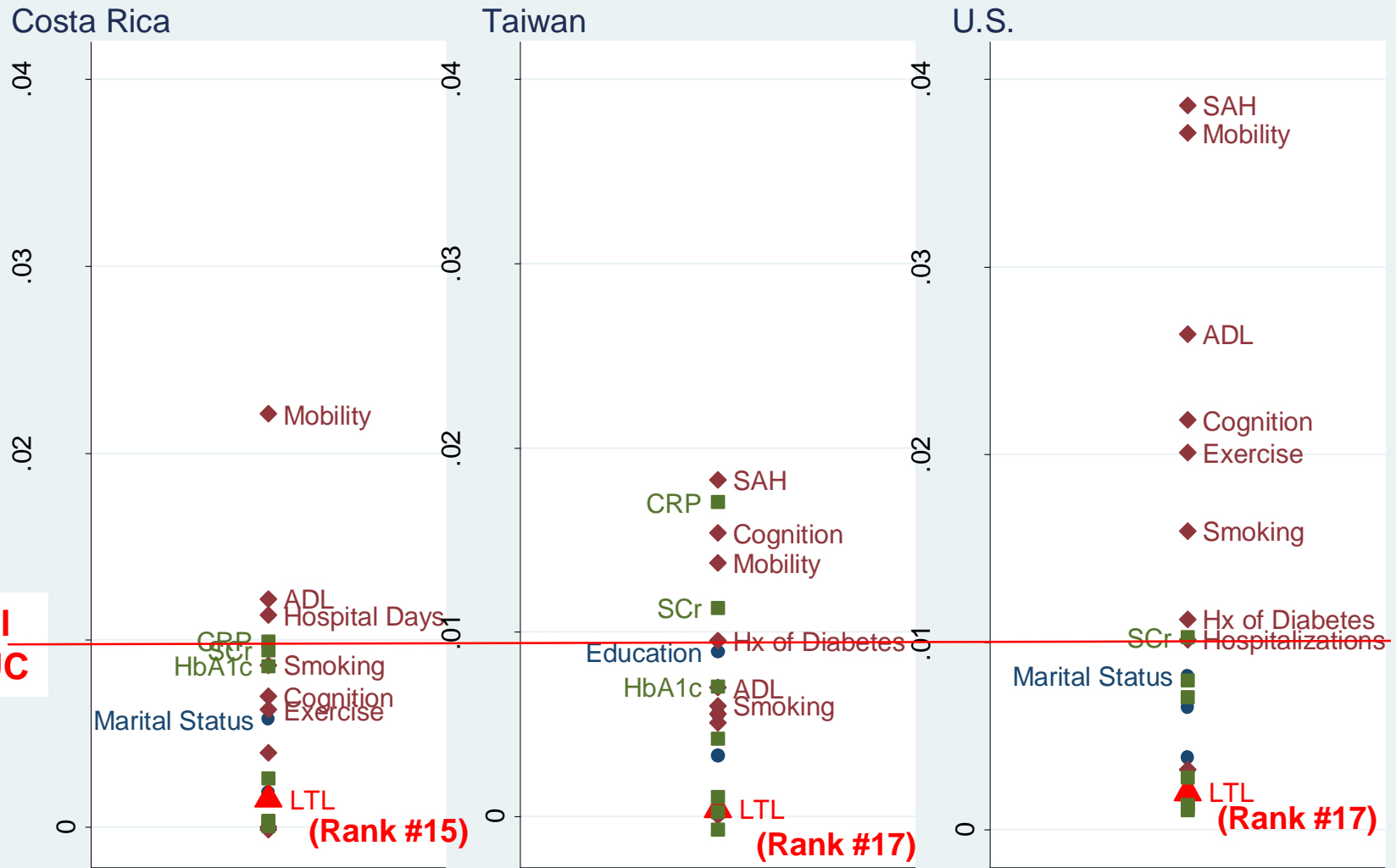


Each of 22 potential predictors is tested individually.

# Top 10 Predictors of 5-Year Mortality



# What if we control for age and sex?



Meanful Gain in AUC



# Limitations

- LTL is difficult to measure reliably
- One-time measurement (cannot assess the value of changes in LTL)
- LTL may not be a perfect surrogate for telomere length in other tissues
- Many deaths result from causes other than intrinsic aging (competing risks)
- Evaluated only in terms of ability to predict mortality

# Conclusions

- How does LTL fare in predicting mortality? Not very well.
- Net of age and sex, 13 of the 19 other predictors outperformed LTL in all three countries.
- 10 of these came from the interview:
  - Cheaper and easier to measure
  - Less invasive
- 3 biomarkers also predicted mortality better than LTL: CRP, SCr, HbA1c



**LTL may eventually help scientists understand aging, but better tools—less costly and more powerful—are available for predicting survival.**

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**Thank You...**

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