Explaining Trends in Disability in the United States, 1963-2015

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Objectives

- Estimation of long-term trends in disability among older adults.
- To go back in time as far as possible.
- To test hypotheses to explain these trends.
- Trade-off: the further we go back, the cruder the measure of disability.

Hypotheses

1. Medical interventions keep the disabled alive.
2. As educational levels increase, disability declines.
3. As early-life conditions improve, disability declines.

Results

- In the 1970s disability increased, whereas in the 1980s and 1990s there was a decline.
- The decline in mortality from heart disease and stroke is correlated with the increase in the 1970s.
- The rise in educational levels is correlated with the decline in the 1980s and 1990s.
- Improved early-life conditions did not contribute to major trends in disability.

Data

- National Health Interview Survey.
- Harmonized and pooled data set available from IPUMS for 1963-2015.
- In many surveys, there is an open-ended age group starting at age 85.
- Therefore, the analysis has been limited to respondents aged 50-84.
- No. of cases is 1,445,626.

Outcome variable

- The outcome variable is any limitation of activity.
- Because of changes in the categories of the item over time, the outcome variable has been dichotomized into the reporting of any limitation.
- Therefore, the analysis includes covariates that explain changes in the probability of reporting any limitation in addition to covariates that explain changes in the probability of having any limitation.

Revised instrument of 1982

- Before 1982, men were asked specifically about work-related activity limitation, while women were asked about housekeeping.
- The revision affected respondents aged 71 years and over in particular.
- To control for this revision, I added a dummy variable indicating whether the survey was conducted before 1982 and interactions of this dummy variable with gender and a variable indicating age 71+.

Revised instrument of 1997

- The 1997 design of the NHIS featured a substantially revised instrument in terms of content.
- As a result there was a sharp decline in the reporting of any disability.
- To control for this revision, I added a dummy variable indicating whether the survey was conducted before 1997.

Covariates

- Age, gender, and race.
- Two variables indicating educational attainment: 0-8 years, and 13+; 9-12 years being the reference category.
- Age-standardized mortality rates from heart disease and stroke (standard = 2000).
- Interactions between gender and race and between gender and the mortality rates.

Logistic regression model

- Outcome variable: the probability of reporting any limitation of activity.
- Three questions:

1. Does the model fit major trends in the data?
2. What would have happened if mortality from heart disease and stroke had not declined?
3. What would have happened if education had not improved?

Predictions and simulations: Women

- Fig. 1a shows that the model explains major trends in reported disability (r^2=0.84).
- Fig. 1b corrects for changes in definition and presents predicted values for age 60.
- Fig. 1c shows that the decline in mortality from heart disease and stroke 'explains' the rise in the 1970s.
- Fig. 1d shows that the rise in education 'explains' the decline in the 1980s and 1990s.

Fig. 1a. Observed and predicted percentages of women aged 50-84 with any limitation of activity, United States 1963-2015

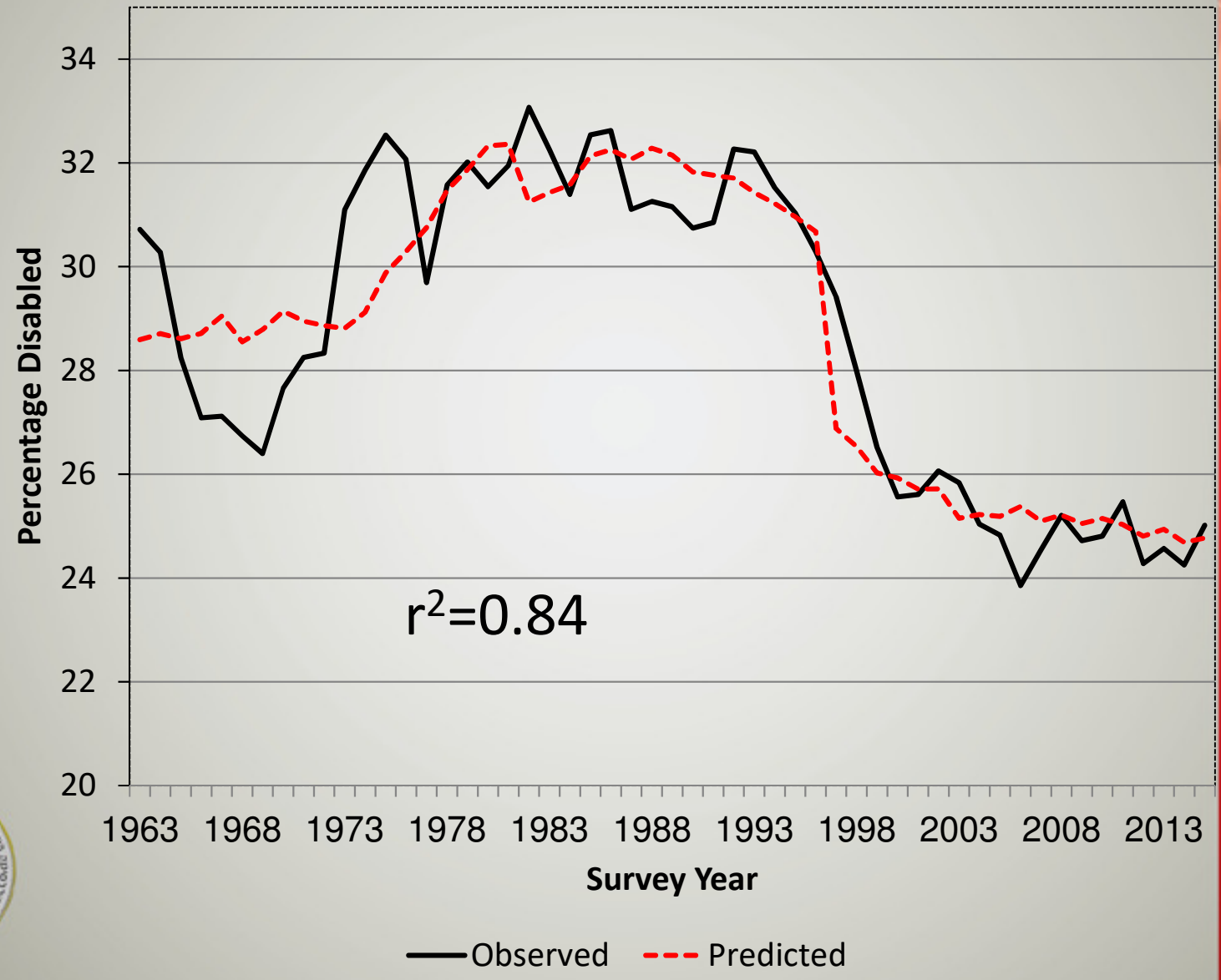


Fig. 1b. Estimate of percentage of disabled women aged 50-84, assuming constant definition at age 60, United States 1963-2015

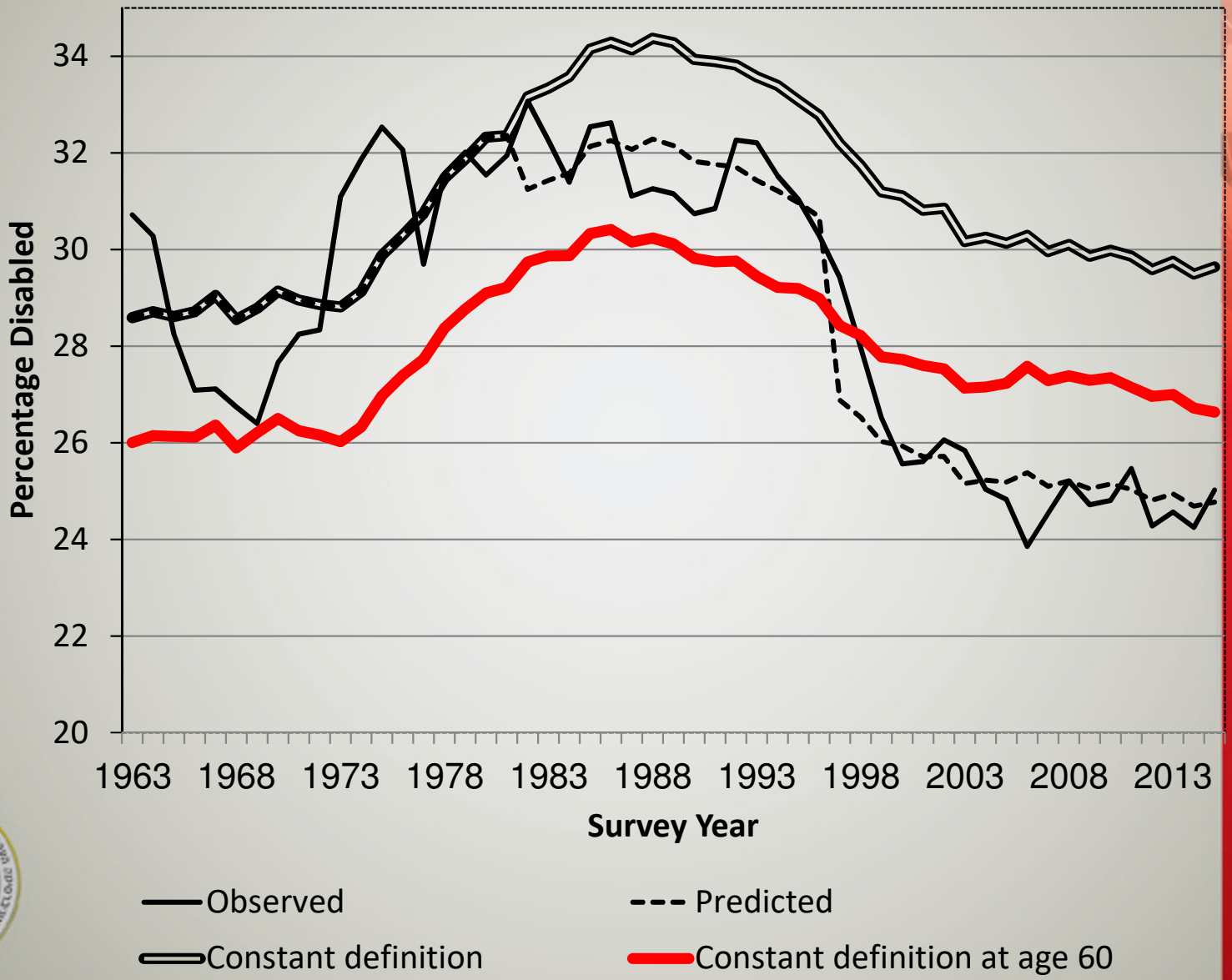


Fig. 1c. Simulation of the percentage of disabled women at age 60, assuming constant definition and no decline in mortality from heart disease and stroke after 1963, United States 1963-2015

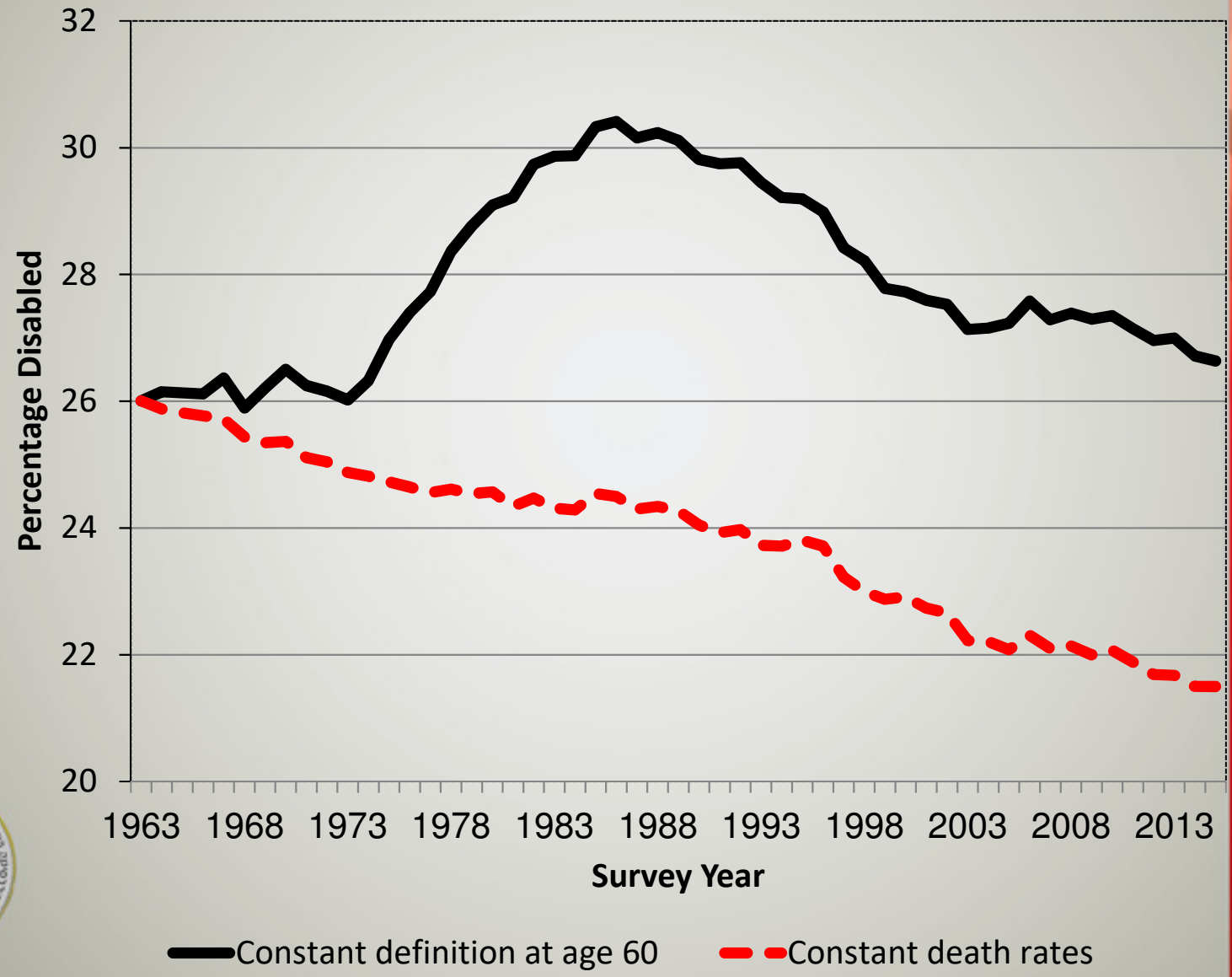
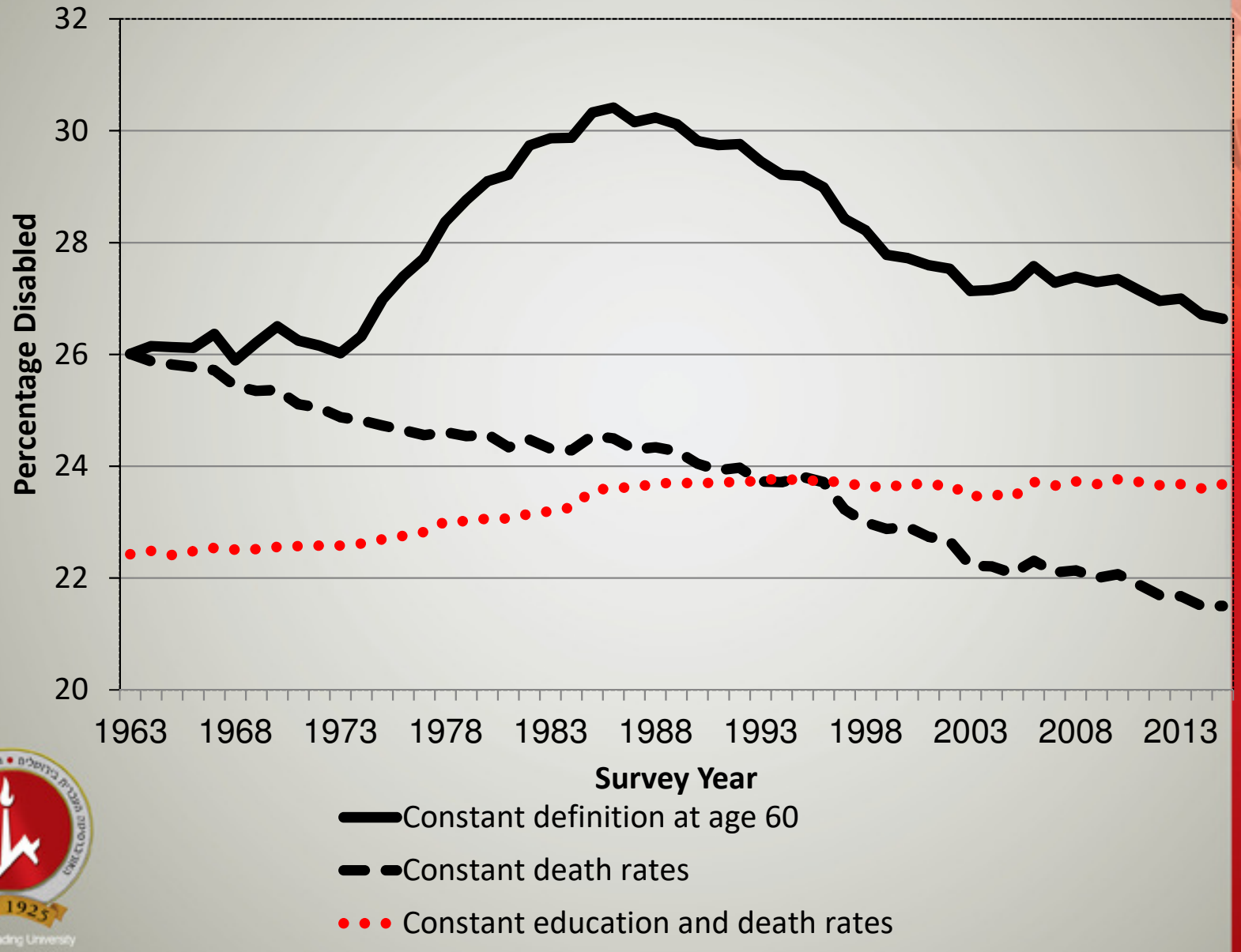


Fig. 1d. Simulation of the percentage of disabled women at age 60 with 9-12 years of education, United States 1963-2015



Conclusions: Women

- The percentage of women aged 50-84 with any limitation of activity was slightly higher in 2015 than it was in 1963.
- H1: The decline in mortality from heart disease and stroke is correlated with the rise in disability in the 1970s.
- H2: If educational levels had not increased, then the percentage of women disabled at age 50-84 would not have declined in the 1980s and 1990s.

Predictions and simulations: Men

- Fig. 2a shows that the model explains major trends in reported disability (r^2=0.96).
- Fig. 2b corrects for changes in definition and presents predicted values for age 60.
- Fig. 2c shows that the decline in mortality from heart disease and stroke 'explains' the rise in the 1970s.
- Fig. 2d shows that the rise in education 'explains' the decline in the 1980s and 1990s.

Fig. 2a. Observed and predicted percentage disabled among men aged 50-84, United States 1963-2015

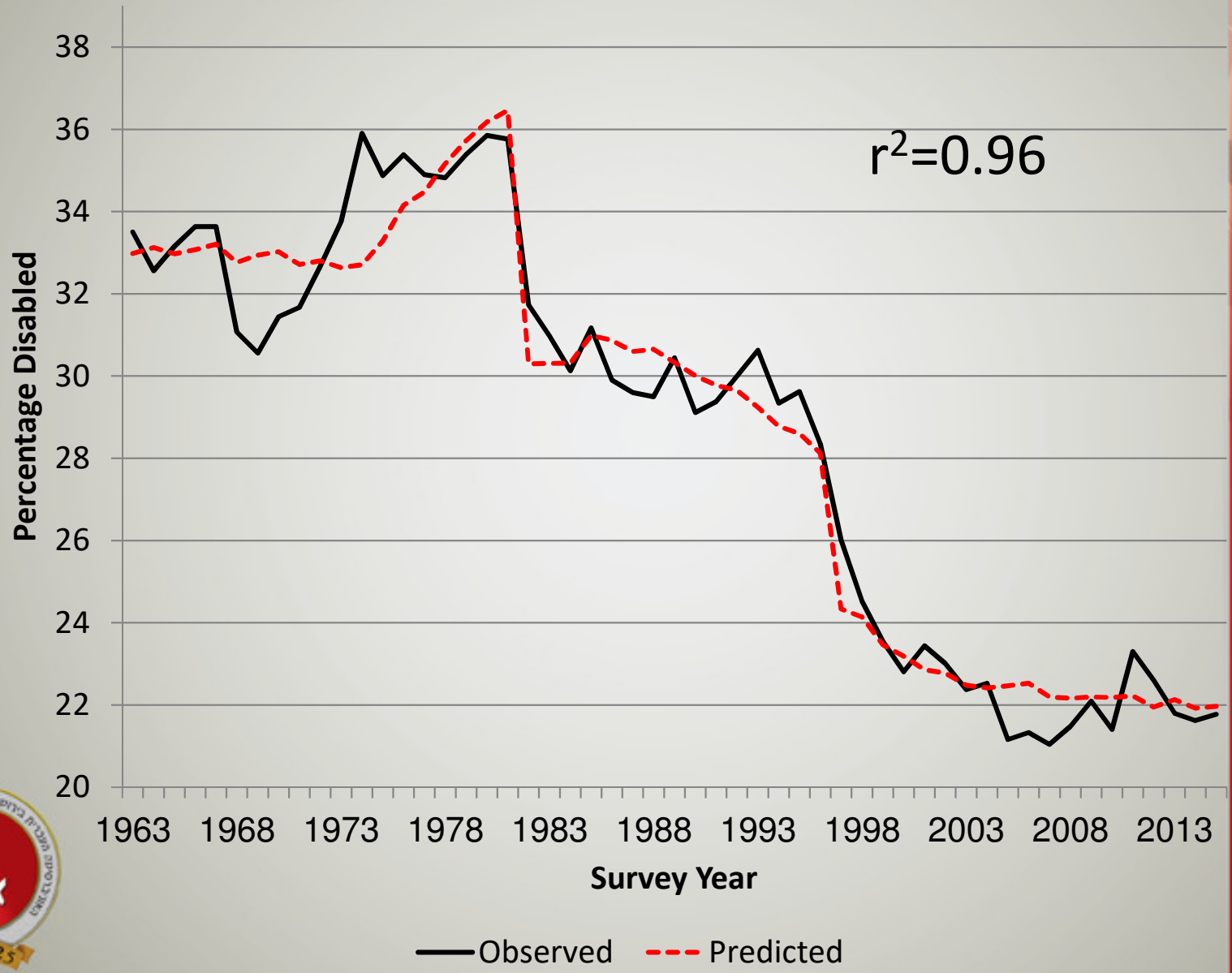


Fig. 2b. Estimate of percentage disabled among men aged 50-84, assuming constant definition at age 60, United States 1963-2015

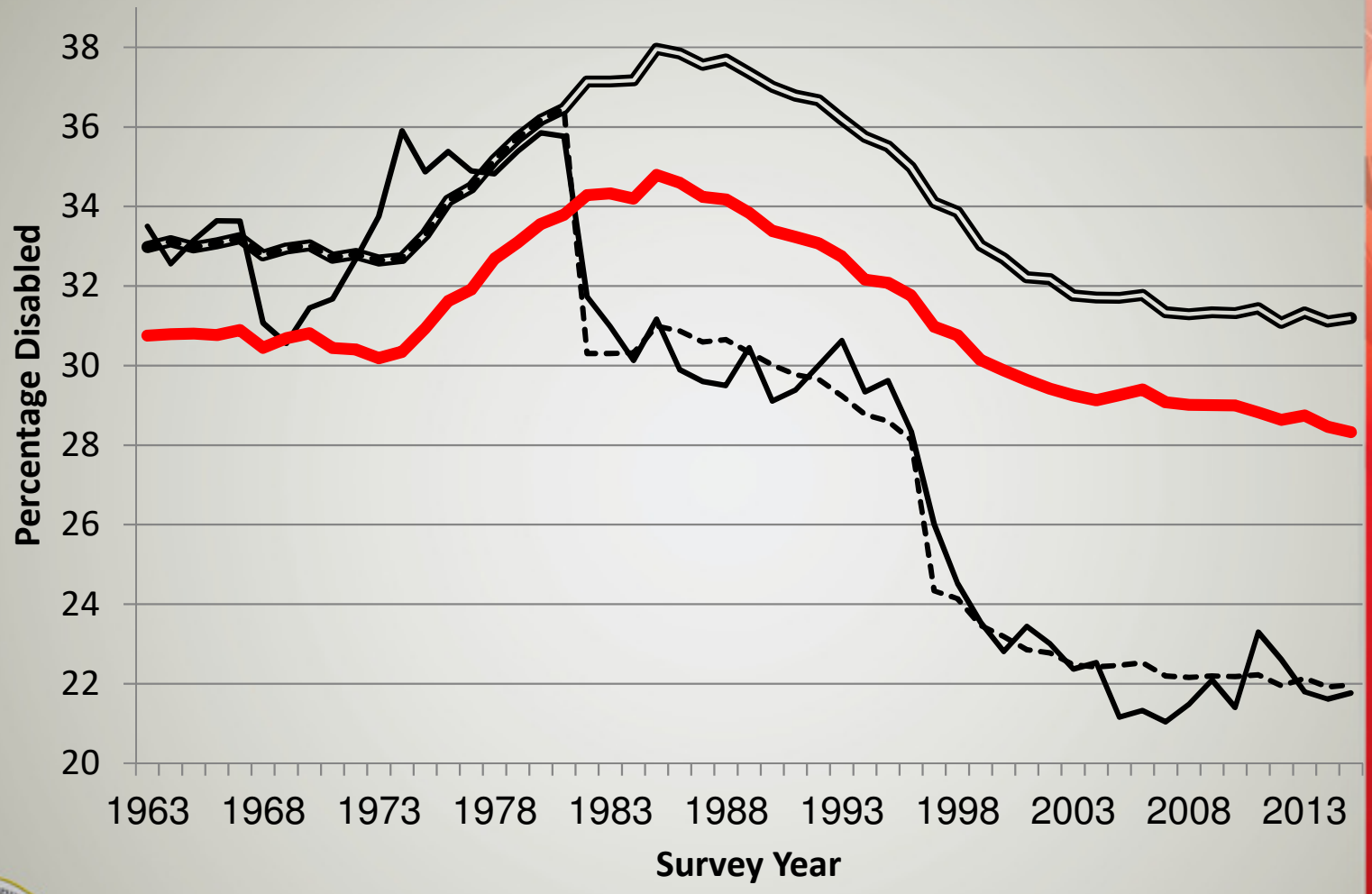


Fig. 2c. Simulation of the percentage disabled among men at age 60, assuming constant definition and no change in death rates from heart disease and stroke after 1963, United States 1963-2015

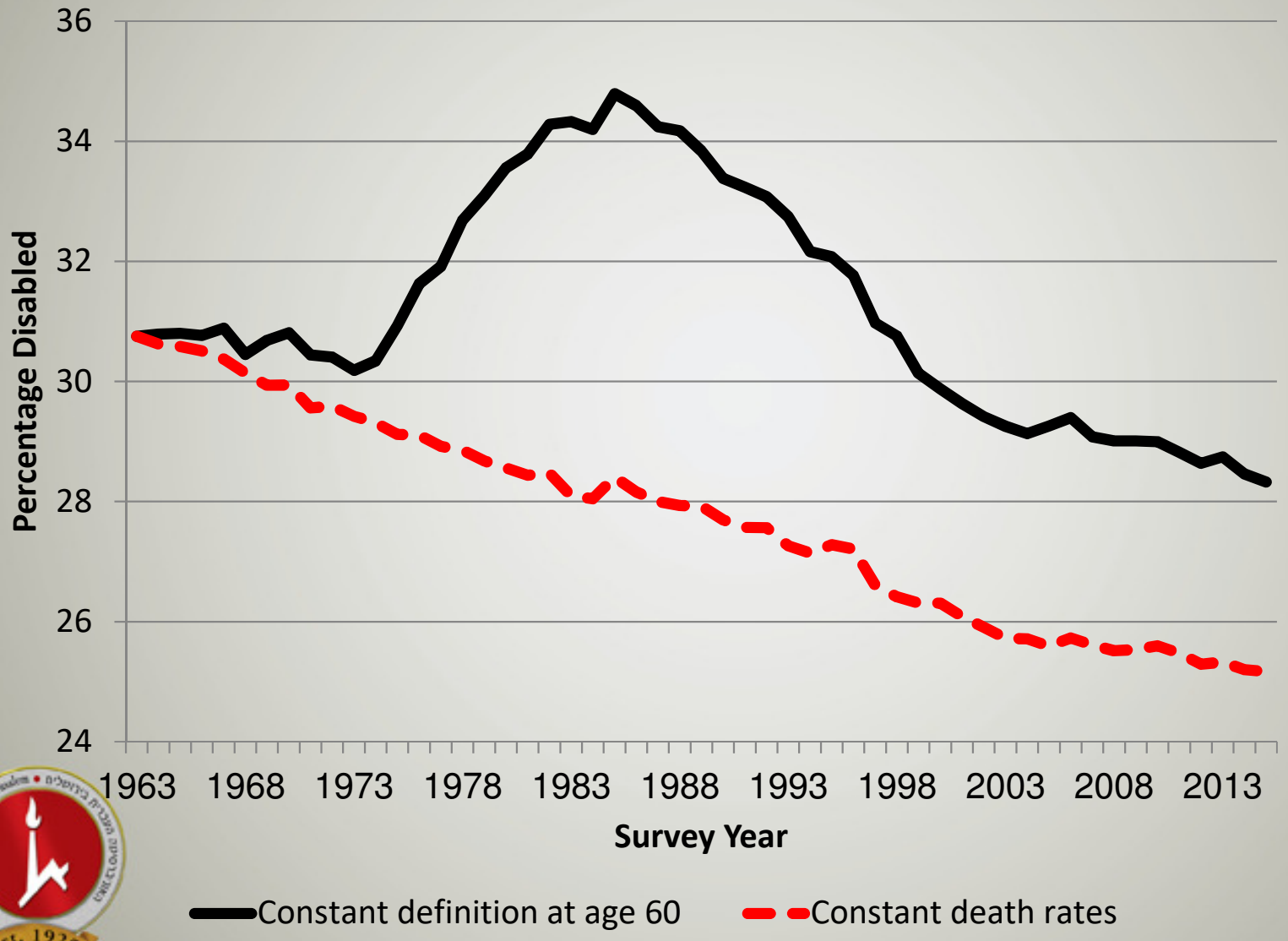
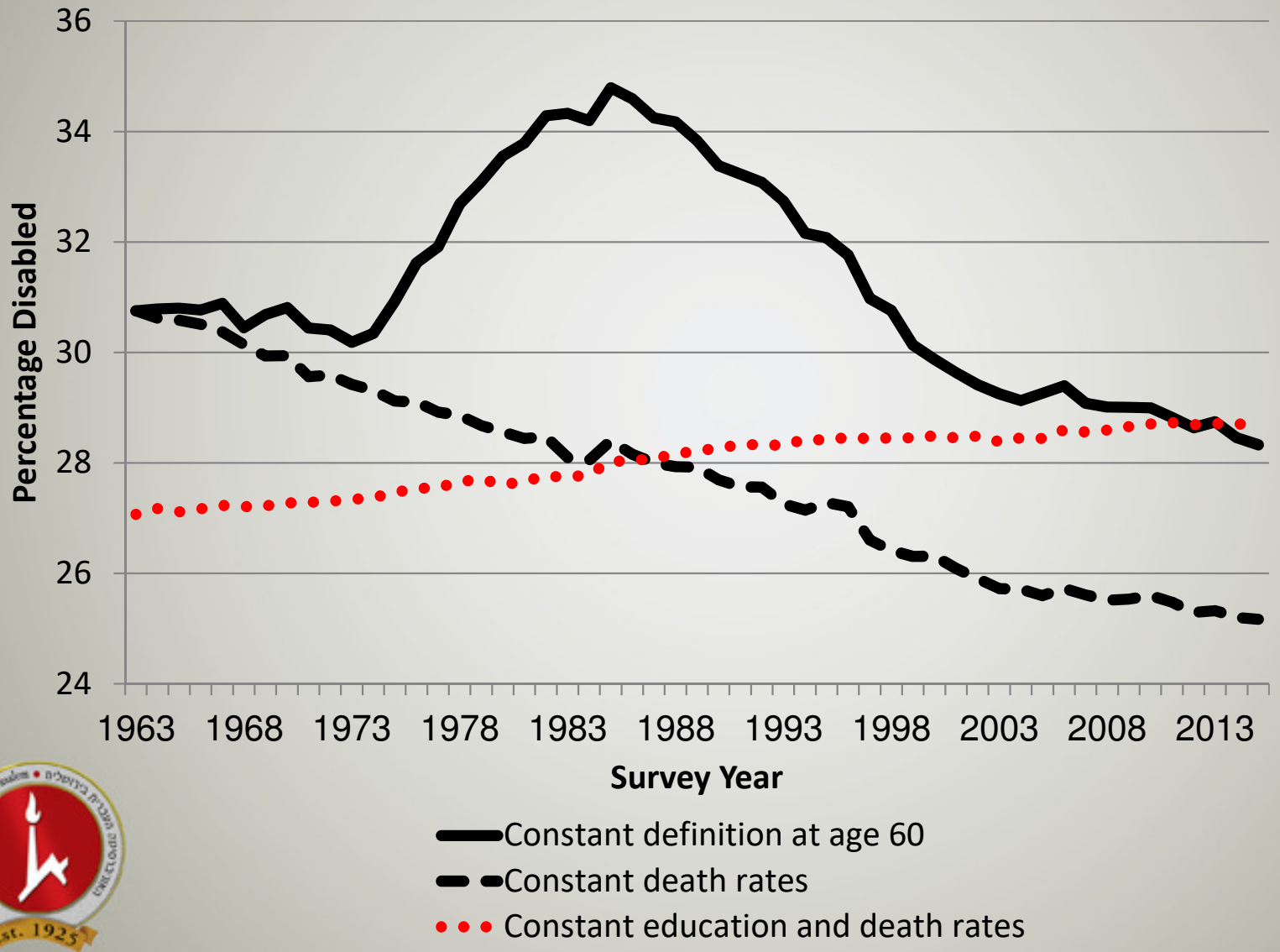


Fig. 2d. Simulation of the percentage disabled among men at age 60 with 9-12 years of education, United States 1963-2015



Conclusions: Men

- The percentage of men aged 50-84 with any limitation of activity was slightly lower in 2015 than it was in 1963.
- H1: The decline in mortality from heart disease and stroke is correlated with the rise in disability in the 1970s.
- H2: If educational levels had not increased, then the percentage of women disabled at age 50-84 would not have declined in the 1980s and 1990s.

Frequently Asked Questions

- Are you allowed to combine different outcome variables in one analysis?
- Wouldn't it be possible to replace the macro-level variables in the model with any other macro-level variable that shows similar trends?
- Aren't trends in mortality from heart disease and stroke strongly correlated?

Combining outcome variables

- Combining samples with different outcome variables in one longitudinal analysis is an option when:
- The outcome variables are different measures for the same phenomenon.
- If trends in the different measures are a function of the same correlates.
- The statistical model fits the data.

Other Macro-level Variables

- There may be other macro-level variables which explain major trends as well.
- In theory, this is also true for individual-level characteristics.
- If there is such a macro-level variable, I did not find it yet.
- Trends in this macro-level variable would be strongly correlated with trends in mortality from heart disease and stroke.

Co-linearity

- Trends in death rates from heart disease and stroke are correlated (r=0.97).
- Co-linearity inflates the standard deviation of coefficients.
- On the other hand, a very large sample size has the opposite effect.
- Are 1,445,626 respondents enough?
- To be on the safe side, I looked at their combined effect.