The James A. Baker III Institute for Public Policy
and the Baker Institute Health Policy Forum
Rice University

National Healthcare Reform: Policy Options and Imperatives

James A. Baker III Hall
Rice University, Houston, Texas

Friday, February 23, 2007
Opening Remarks at 8:30 am
Closing Remarks at 3:30 pm

Conference Presentation

Socioeconomic Disparities in Health: The Role of Self-Management

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For more information about the Baker Insitute Health Policy Forum: www.bakerinstitute.org.

Summary: Socioeconomic Disparities in Health:
The Role of Self-Management

This talk discusses the role of self-treatment regimens for chronic diseases and their relative efficacy in explaining health disparities, following Goldman and Smith (http://www.pnas.org/cgi/reprint/99/16/10929). In recent years, there has been renewed interest in why people of lower socioeconomic status (SES) have worse health outcomes. No matter which measures of SES (income, wealth or education) are used, the evidence that this association is large and pervasive across a variety of health outcomes such as mortality or morbidity is abundant. However, considerable debate remains about why the relation arises. The traditional arguments—that the less well-to-do have access to less- or lower-quality medical care or exhibit a stronger pattern of deleterious personal behaviors such as smoking and excess drinking—are seen as incomplete. Recently, some intriguing theories have arisen that emphasize long-term impacts of early childhood, inter-uterine environmental factors, or the cumulative effects of prolonged exposures to individual stressful events. While these may be important reasons for part of the SES health relationship, we investigate here another mechanism—the ability of individuals across different SES levels to comply with and maintain complex health regimens that are often prescribed to deal effectively with severe health problems.

Many efficacious therapies now hold considerable promise in either delaying disease progression or mitigating health consequences. However, the treatment regimens often require high-quality and persistent patient self-management on a daily basis, and not all patients are equally adept at complying. In clinical practice, adherence rates can be as low as 20 percent although the rate varies with complexity and duration of therapy. Compliance requires an understanding of medical necessity and an ability to select the most appropriate regimens. It also requires a willingness to internalize the future costs of incomplete compliance. Since education serves as a proxy for many of these personal traits, schooling may play a key role in explaining health outcomes for those with chronic illness, but this link has not been fully explored.

This talk investigates the role of adherence to self-treatment regimens in creating and maintaining a steep gradient between an individual's education and his or her health. We place special emphasis on the treatments for two diseases—HIV and insulin-dependent diabetes. Both represent diseases where recommended treatments are potentially highly efficacious. However, they represent very different patient populations, and they differ in the role of patient judgment. New antiretroviral therapies have been shown to reduce mortality in HIV+ patients. While much more effective than previous methods of treating HIV, these treatments are complex—often involving more than two dozen pills, tablets or capsules a day where the timing and order in which one takes these pills must be carefully synchronized with meals and with one other.

Successful management of diabetes typically involves fewer medications than HIV, but it requires more judgment about the appropriate level of glucose-medication titration. Clinical trials consistently show that the complications from this disease can be avoided or deferred with tight glycemic control. This makes extensive self-management important, including frequent monitoring of blood glucose levels, balancing dosages with food intake and physical

activity, prevention and treatment of hypoglycemia, and regular consultation with health care providers.

Despite these differences in treatment, we show that both HIV and diabetes demonstrate large differences in adherence by education groups, and these differences affect overall health status. Further, we demonstrate that these differences are quite robust, appearing in both observational studies of patients with chronic illness and also in the regimented context of a randomized clinical trial. Most importantly, we demonstrate that these SES disparities can be altered through clinical interventions.

Socioeconomic Disparities in Health:

The Role of Self-Management

Dana Goldman

Mechanisms Underlying the Gradient

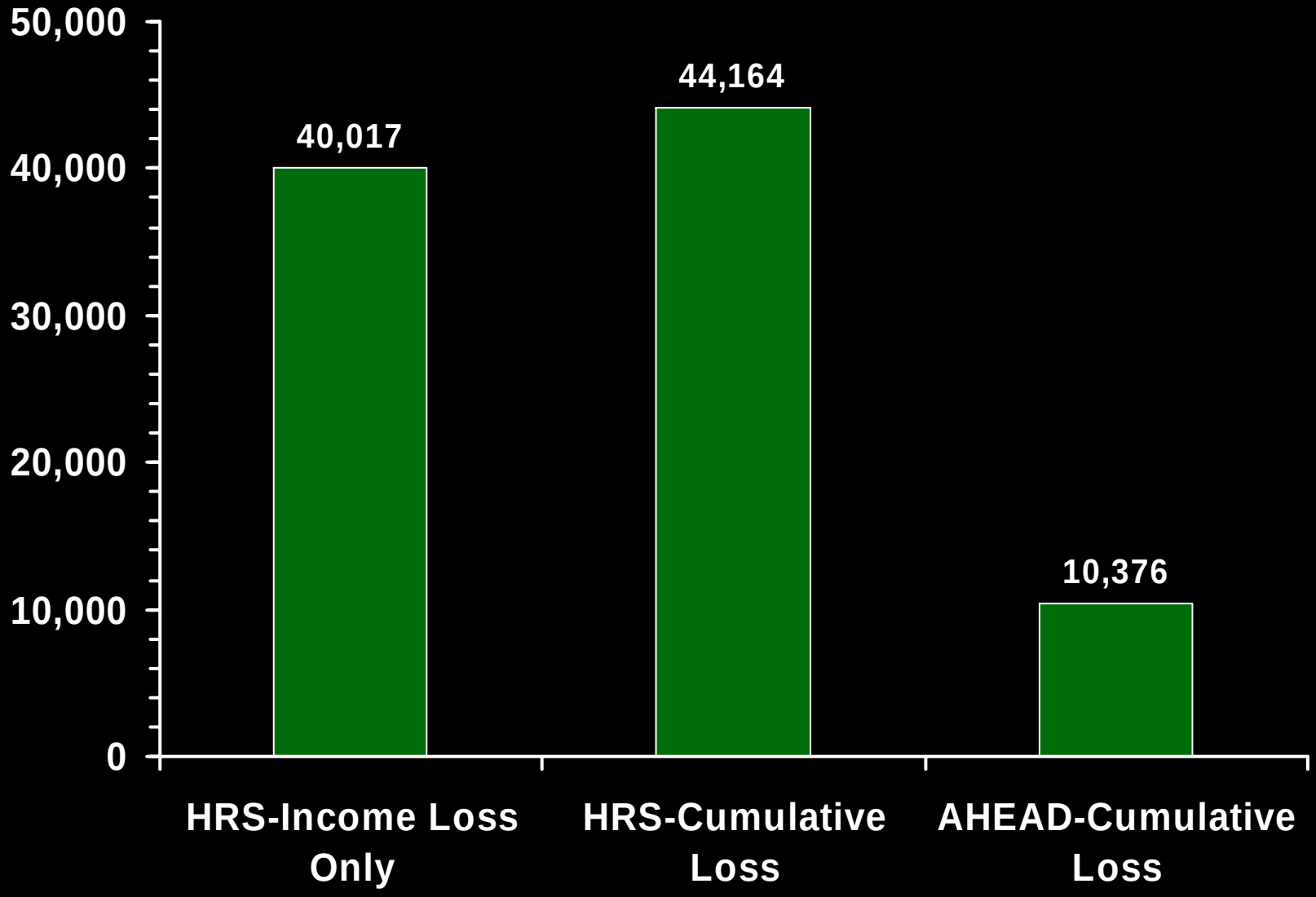
- **Biological**
  - Genes
  - Intra-uterine factors
  - Stress & allostatic load
- **Public health**
  - Environment
  - Deleterious behavior (smoking, diet, etc)
  - Limited access
- **Economic**
  - Reverse causation
  - Health leads to SES differences
- **Self-management**

Is Reverse Causation From Health to SES Important?

- **A simple investment story suggests reverse causation matters**
  - **Returns to education accumulate over a lifetime**
  - **Would someone pursue an advanced degree if life expectancy were 35 years?**
- **Poor health could lead to diminished economic prospects**
  - **Out-of-pocket expenses, labor supply, household income, and wealth**

Both stories lead to a positive correlation between education or income and health…

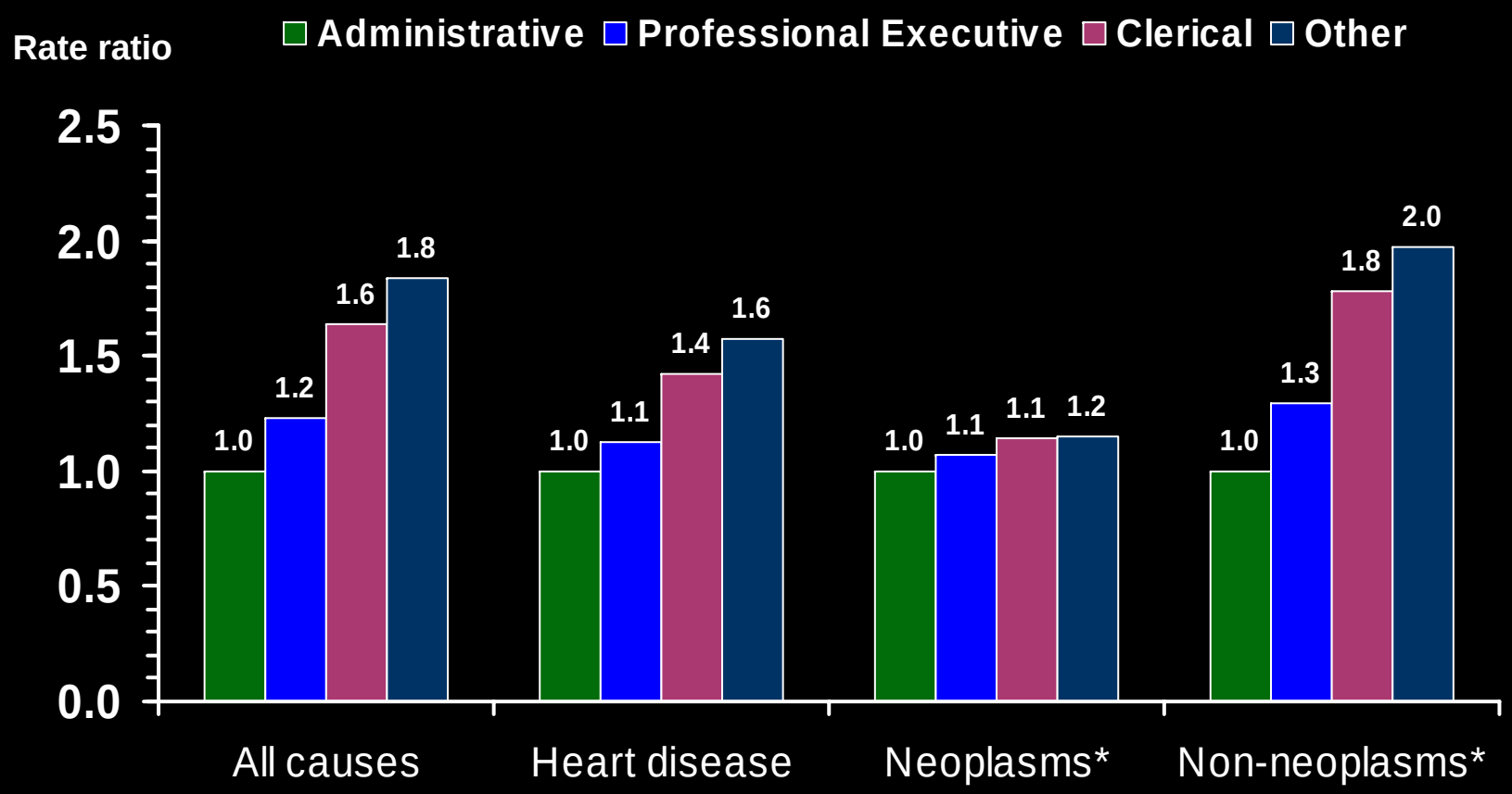
Effects Diminish With Age (At Least After Age 50)



Summary of the Evidence

- **Reverse causation (Health→SES) is important**
- **Diminishes after age 50**

Does Access Explain SES Gradients?

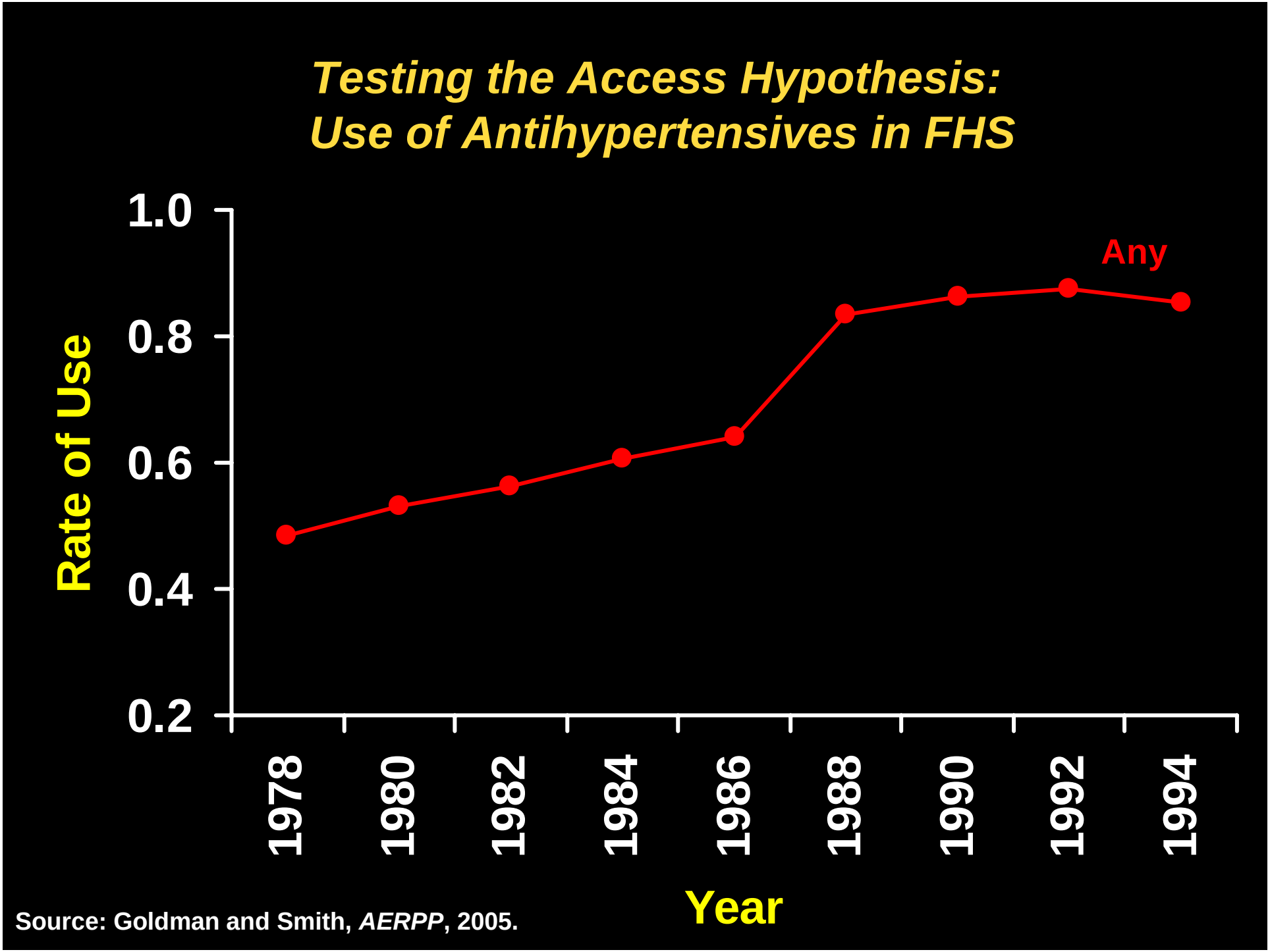


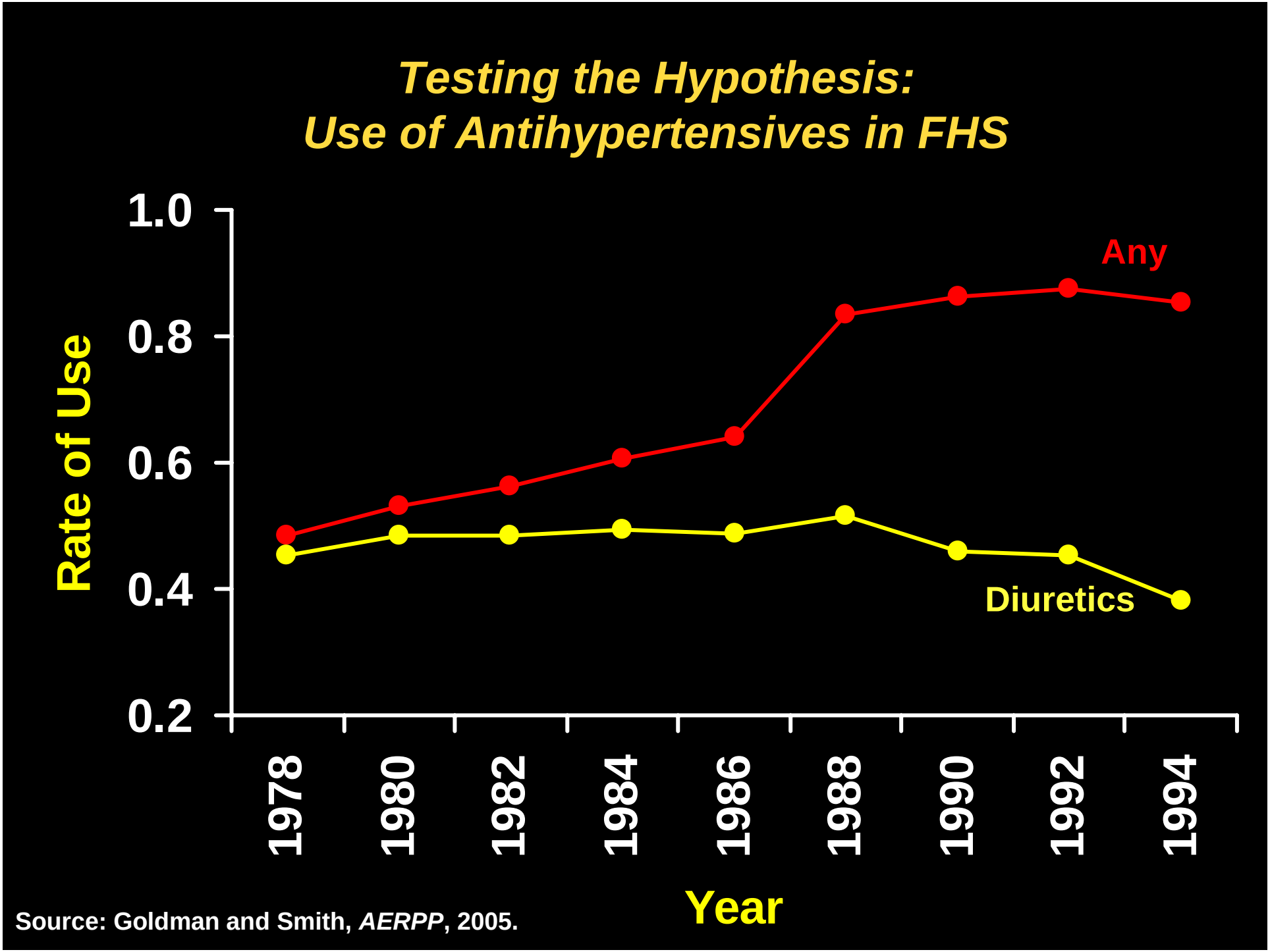
*Not related to smoking

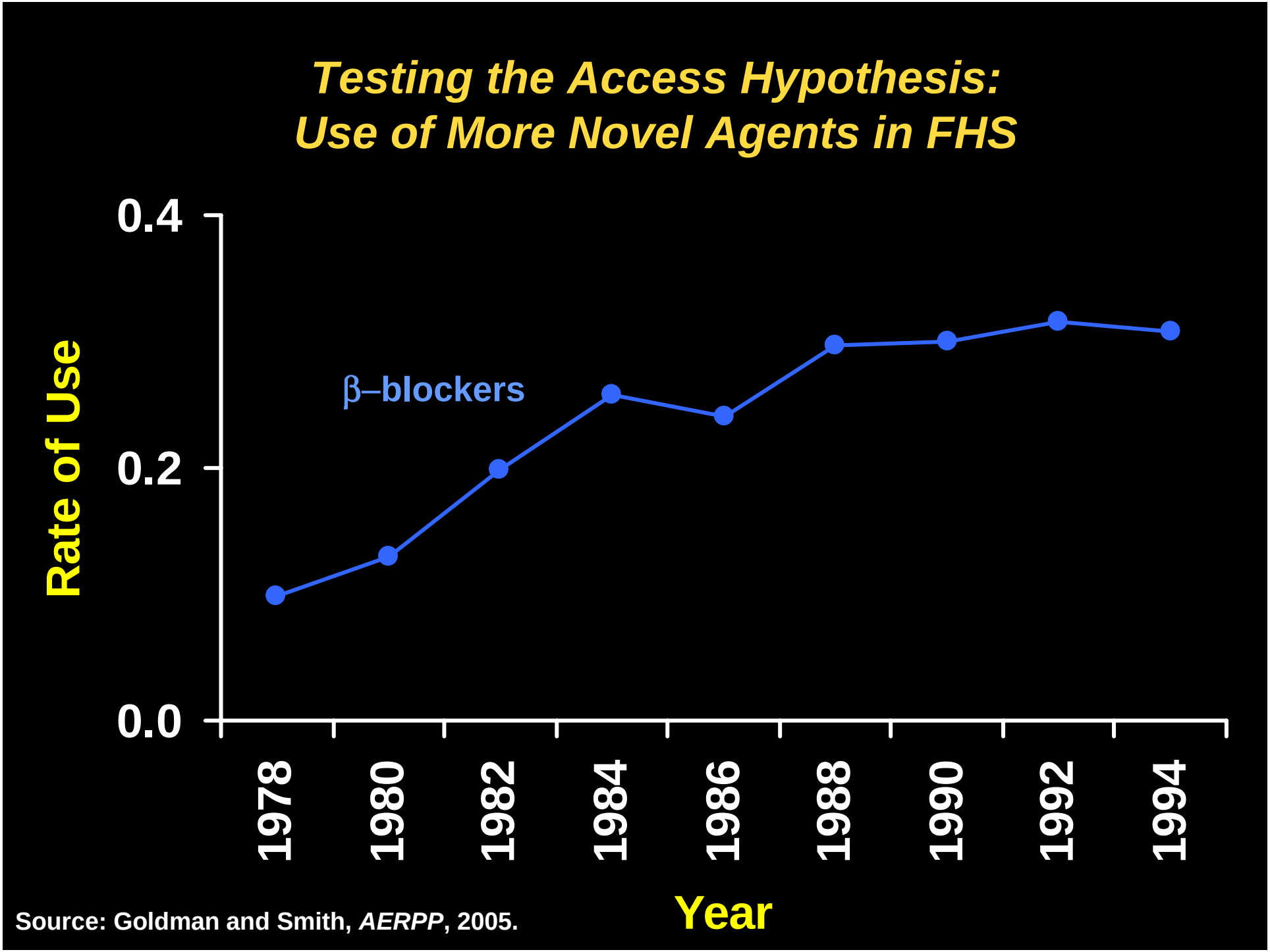
Source: C. van Rossum et al., "Employment Grade Differences in Cause Specific Mortality: Twenty-Five Year Follow Up of Civil Servants from the First Whitehall Study," *Journal of Epidemiology and Community Health*, 2000.

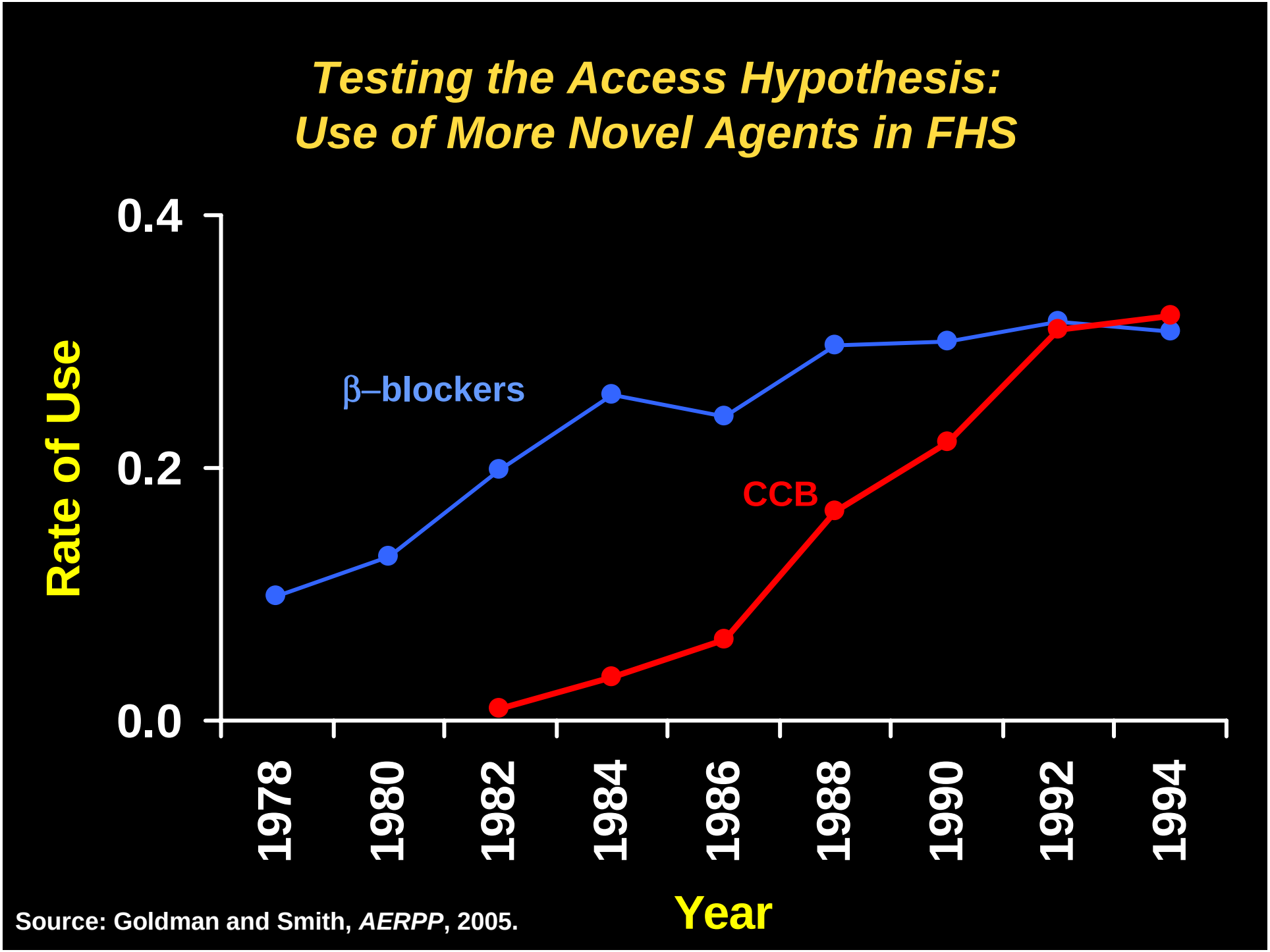
We Examined Access to Anti-Hypertensive Medication in 3 Important Surveys

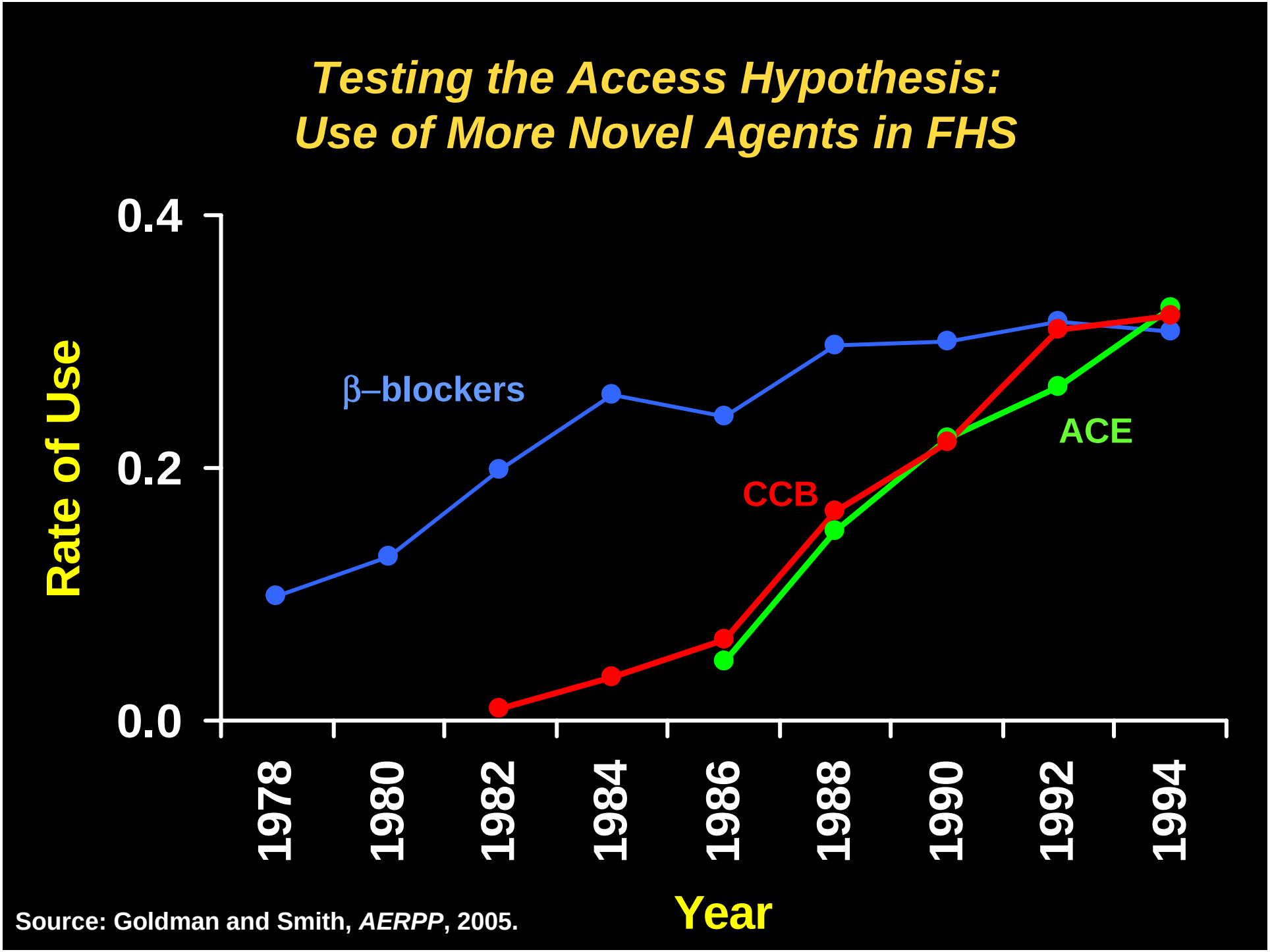
- **Framingham Heart Study (FHS)**
  - **5,029 white men and women ages 18-62 in 1948 in Framingham without heart disease at enrollment**
  - **Followed for fifty years with biennial medical exams**
- **National Ambulatory Medical Care Survey (NAMCS)**
  - **3,000 physicians reporting on up to 30 patient visits over a one week period**
  - **Data on diagnosis, symptoms, and medications since 1980**
  - **No SES measures**
- **National Health and Nutrition Survey (NHANES III)**
  - **Personal interviews and medical examinations for 33,994 people two months and older**
  - **Two nationally representative phases**
    - **Phase 1: 1988-1991**
    - **Phase 2: 1991-1994**


Testing the Access Hypothesis:
Use of Antihypertensives in FHS
Rate of Use
1.0
0.8
0.6
0.4
0.2
Any
1978
1980
1982
1984
1986
1988
1990
1992
1994
Year
Source: Goldman and Smith, AERPP, 2005.

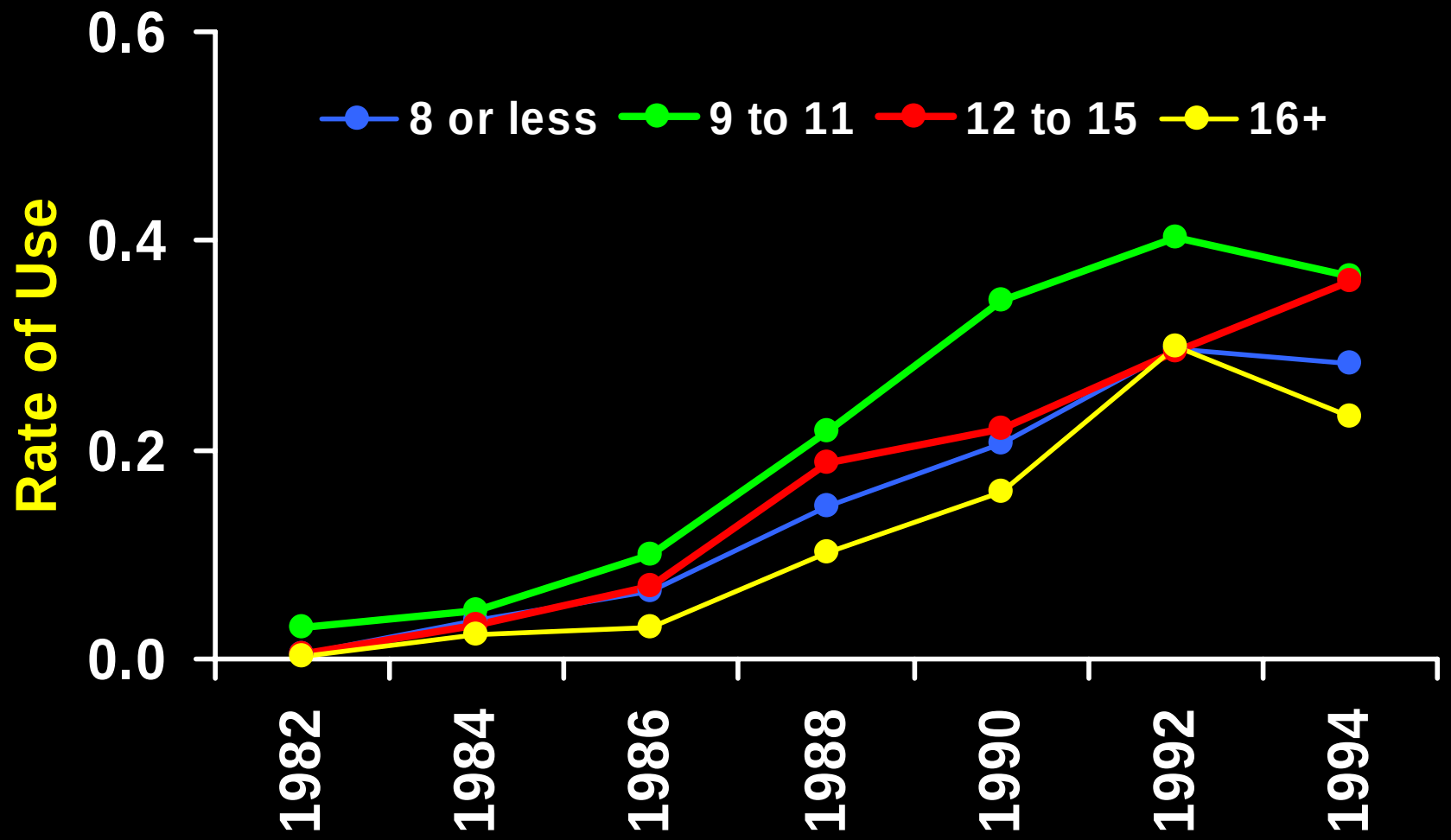

Testing the Hypothesis:
Use of Antihypertensives in FHS
Rate of Use
1.0
0.8
0.6
0.4
0.2
Any
Diuretics
1978
1980
1982
1984
1986
1988
1990
1992
1994
Year
Source: Goldman and Smith, AERPP, 2005.


Testing the Access Hypothesis:
Use of More Novel Agents in FHS
Rate of Use
0.4
0.2
0.0
β–blockers
1978
1980
1982
1984
1986
1988
1990
1992
1994
Year
Source: Goldman and Smith, AERPP, 2005.


Testing the Access Hypothesis:
Use of More Novel Agents in FHS
0.4
0.2
0.0
Rate of Use
β–blockers
CCB
1978
1980
1982
1984
1986
1988
1990
1992
1994
Year
Source: Goldman and Smith, AERPP, 2005.

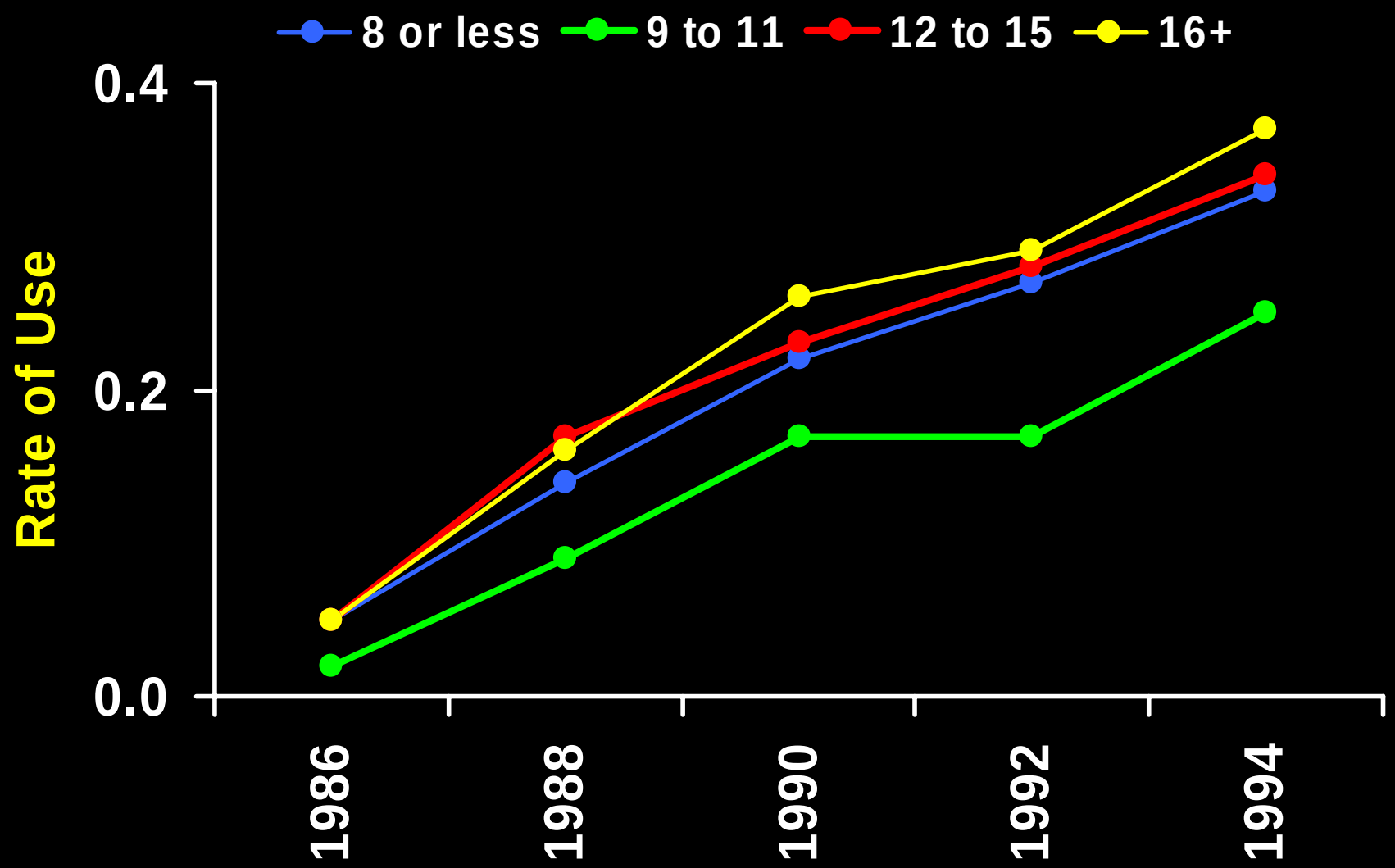

Testing the Access Hypothesis:
Use of More Novel Agents in FHS
Rate of Use
0.4
0.2
0.0
β–blockers
CCB
ACE
1978
1980
1982
1984
1986
1988
1990
1992
1994
Year
Source: Goldman and Smith, AERPP, 2005.

Testing the Access Hypothesis:
Calcium Channel Blockers by Education



Source: Goldman and Smith, *AERPP*, 2005.

Testing the Access Hypothesis:
ACE Inhibitors by Education



Source: Goldman and Smith, *AERPP*, 2005.

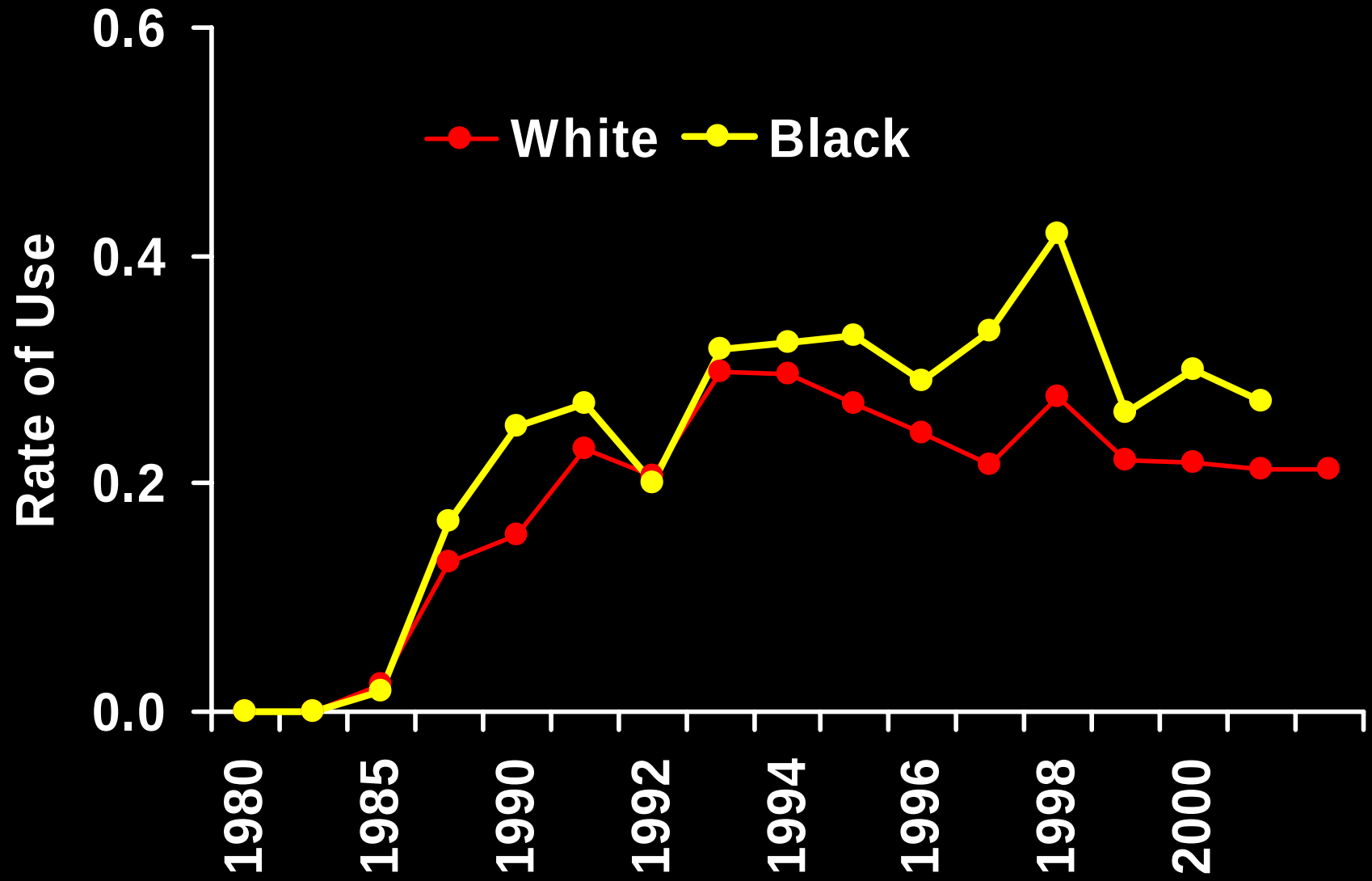
Differences in Adoption by Education

p-values for F-test of significance of education (includes time-quadratic interactions)

ACE Inhibitors	Calcium Channel Blockers	Beta Blockers	Diuretics	Any drug
0.87	0.37	0.38	0.04	0.39

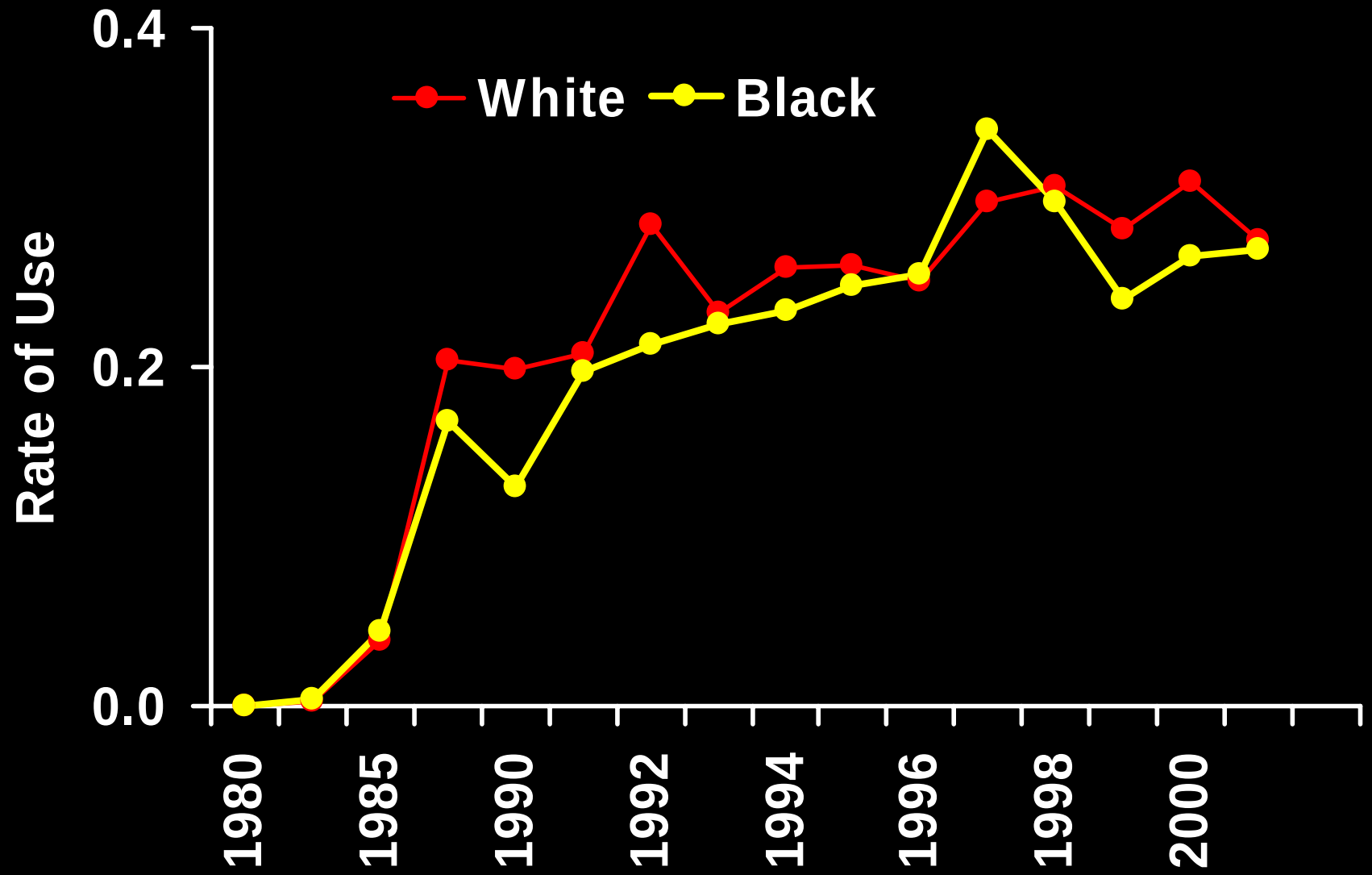
Source: Goldman and Smith, *AERPP*, 2005.

Testing the Access Hypothesis – NAMCS
Calcium Channel Blockers by Race



Source: Goldman and Smith, *AERPP*, 2005.

Testing the Hypothesis – NAMCS
ACE Inhibitors by Race

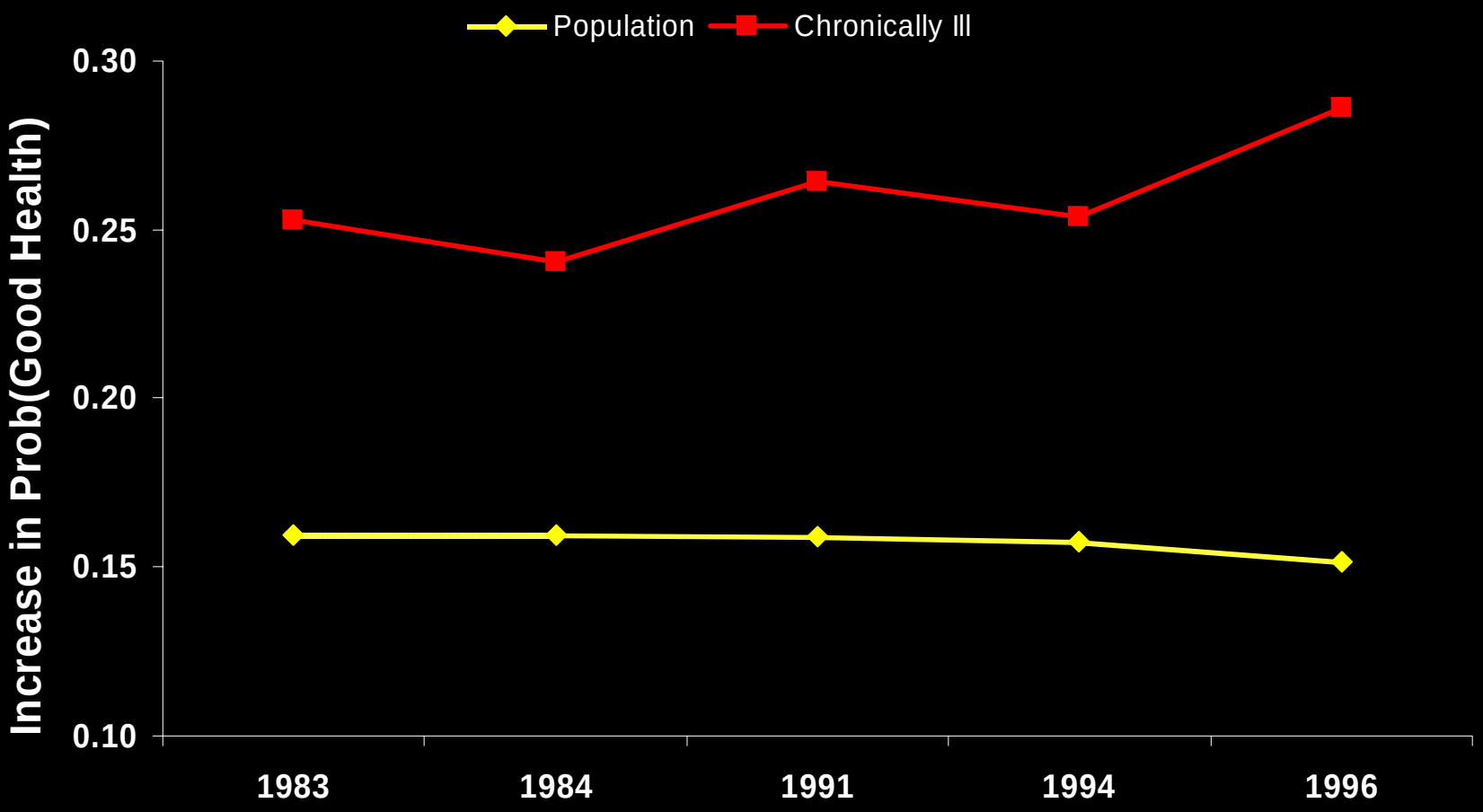


Source: Goldman and Smith, *AERPP*, 2005.

Summary of Access Analysis

- **No evidence of any differential adoption by education for new anti-hypertensives**
  - **Holds at individual and area level**
- **But…**
  - **Treatment is not that expensive or complicated**
  - **Short term risks are minimal**
- **What about other medical conditions?**

Another View of the Gradient



Note: Figure shows the absolute difference between college educated and those with less than high school in the probability of good health. Linear regressions run separately by year adjust for age, gender, and education in four categories. Data are from NHIS.

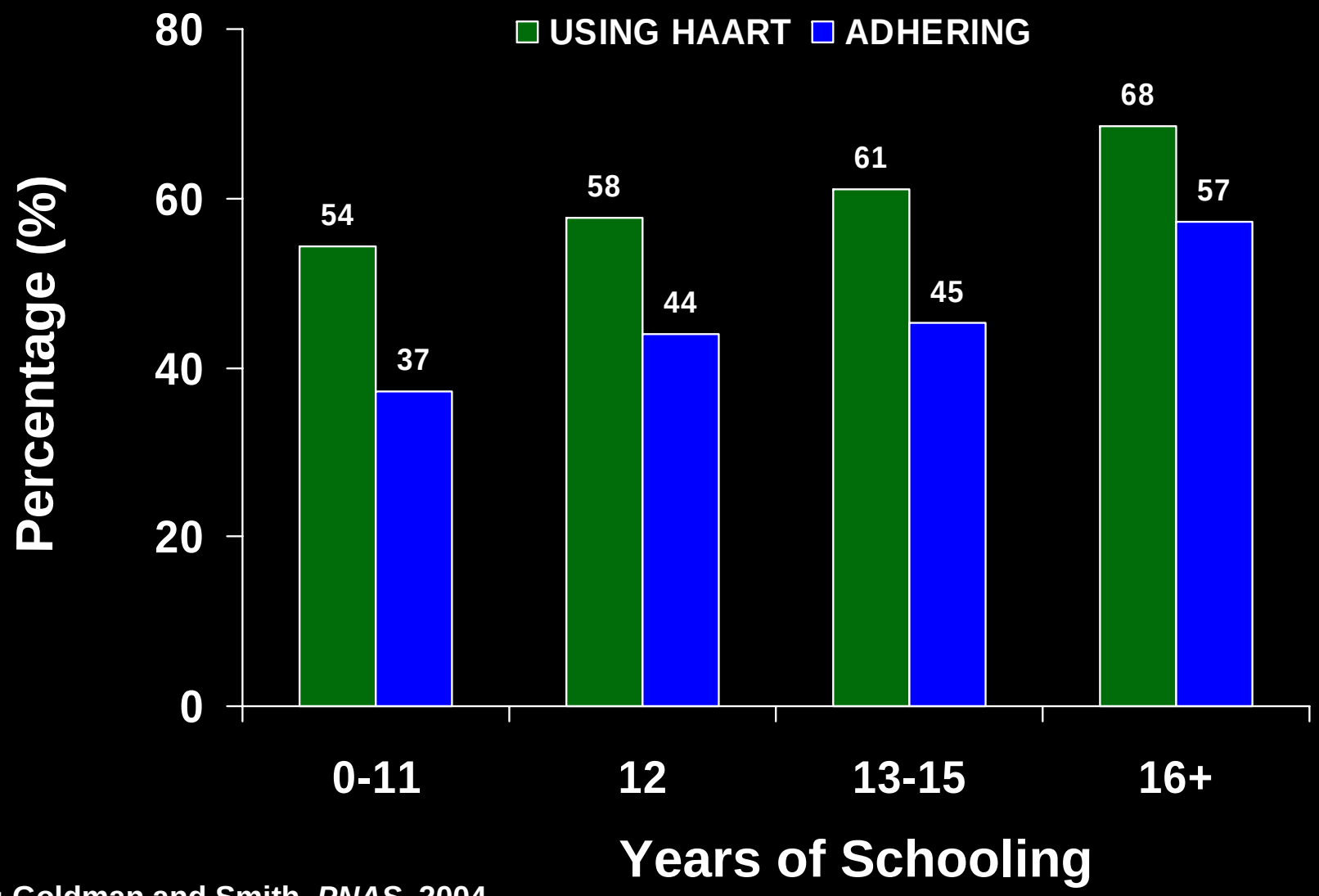
Can Adherence Help Explain Disparities for the Chronically-ill?

- **Efficacious treatments are often complicated**
- **Require an understanding of medical necessity**
- **Compliance with prescribed therapy can be as low as 20% in clinical practice**

HIV Provides a Good Test

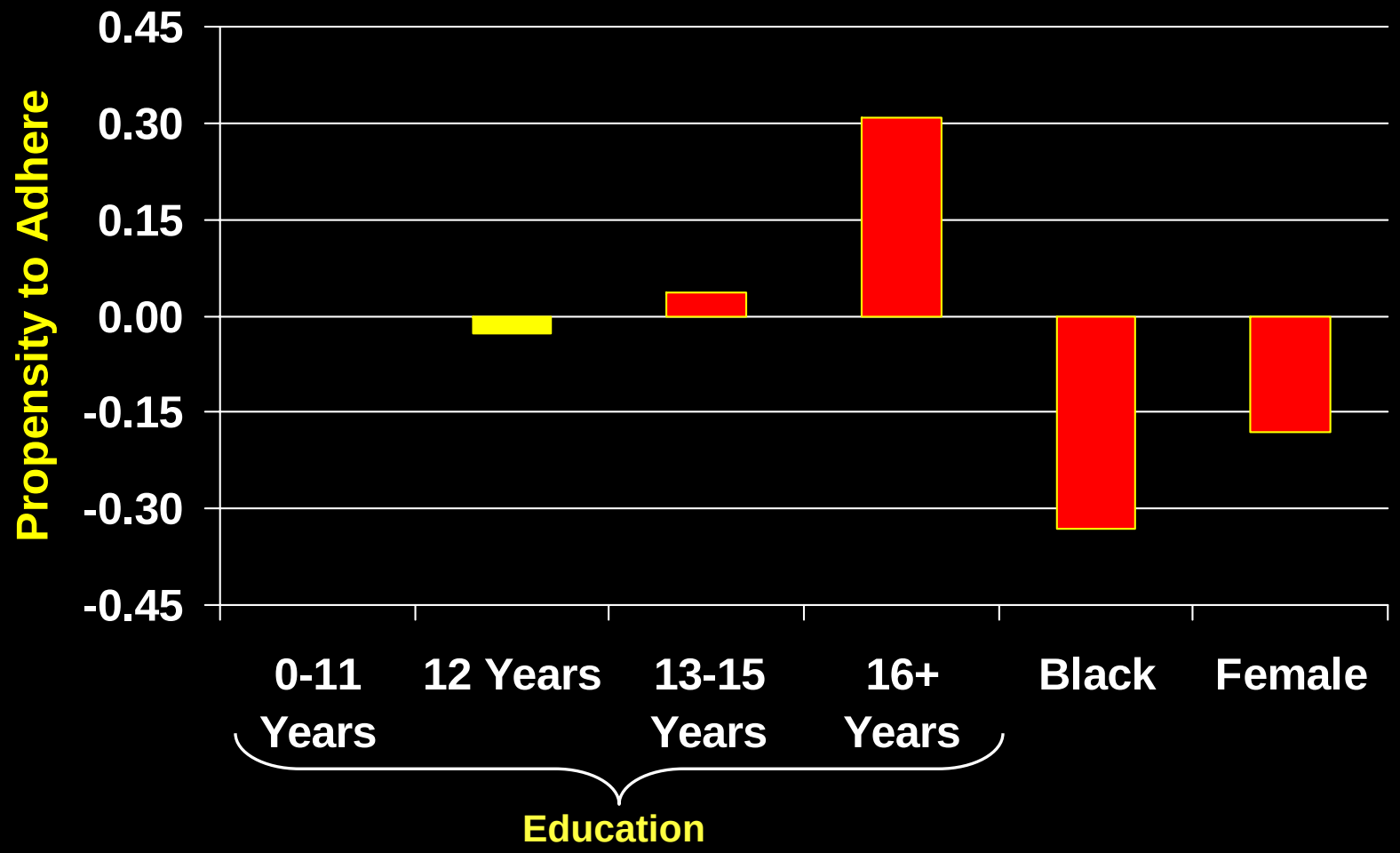
- **In the mid-1990's, highly-active anti-retroviral therapy was introduced**
- **Involved complicated treatment regimens**
  - **Often involves over two dozen pills daily**
  - **Medications must be carefully synchronized with meals and each other**

SES Gradient in HIV Treatment



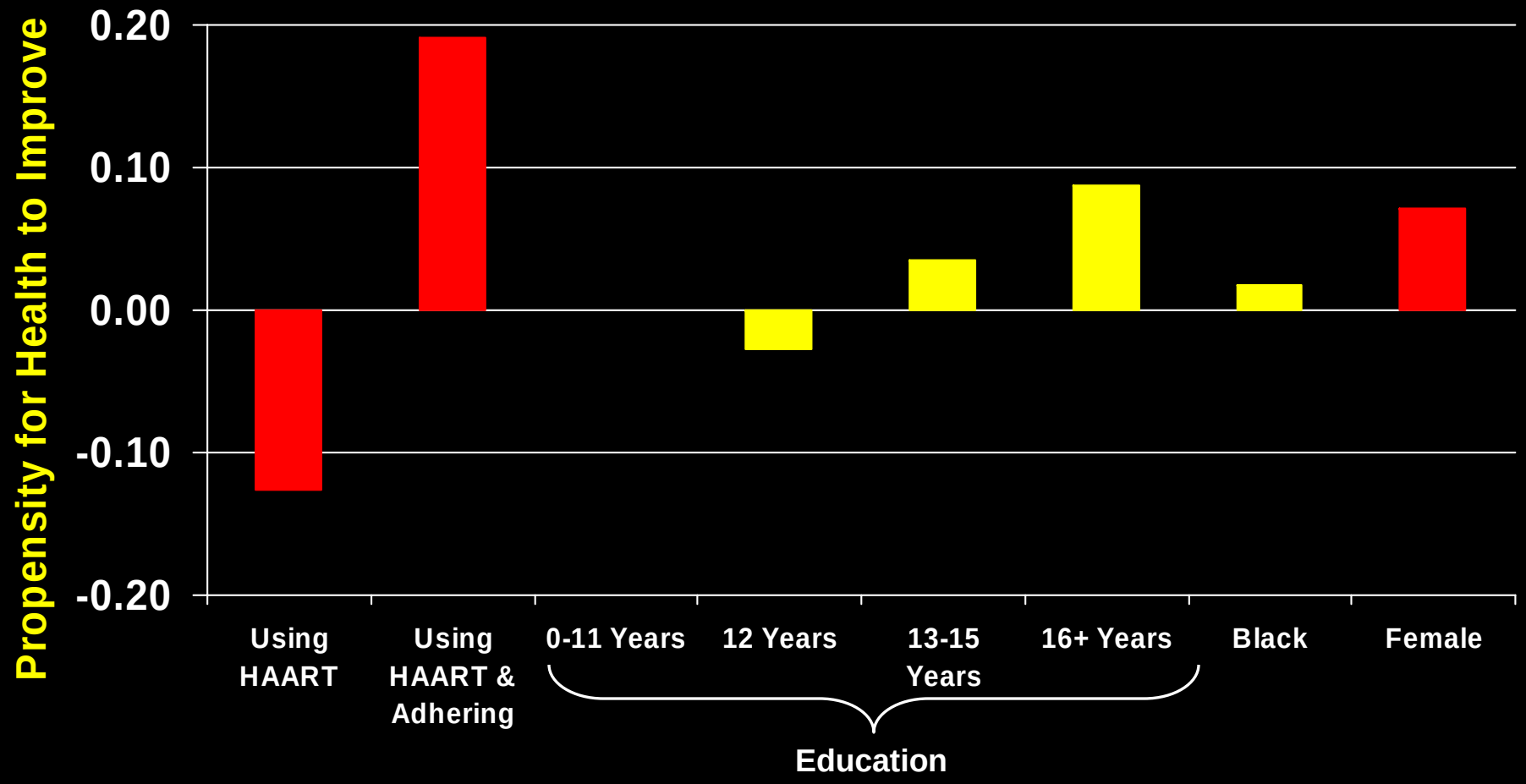
Source: Goldman and Smith, *PNAS*, 2004.

Education Matters as Much as Race and Sex for HIV Adherence



Note: Results are from a probit model explaining adherence by those receiving highly active antiretroviral therapy. Other regressors include age, date of diagnosis, exposure route, insurance, baseline CD4 count, baseline general health, income and census region. Graph shows the estimated coefficients from the index regression. Significant effects (p<0.10) are shown in red. Adherence means not missing any prescribed medication in the previous 7 days.

Adherence Explains Health Outcomes Among HIV Survivors

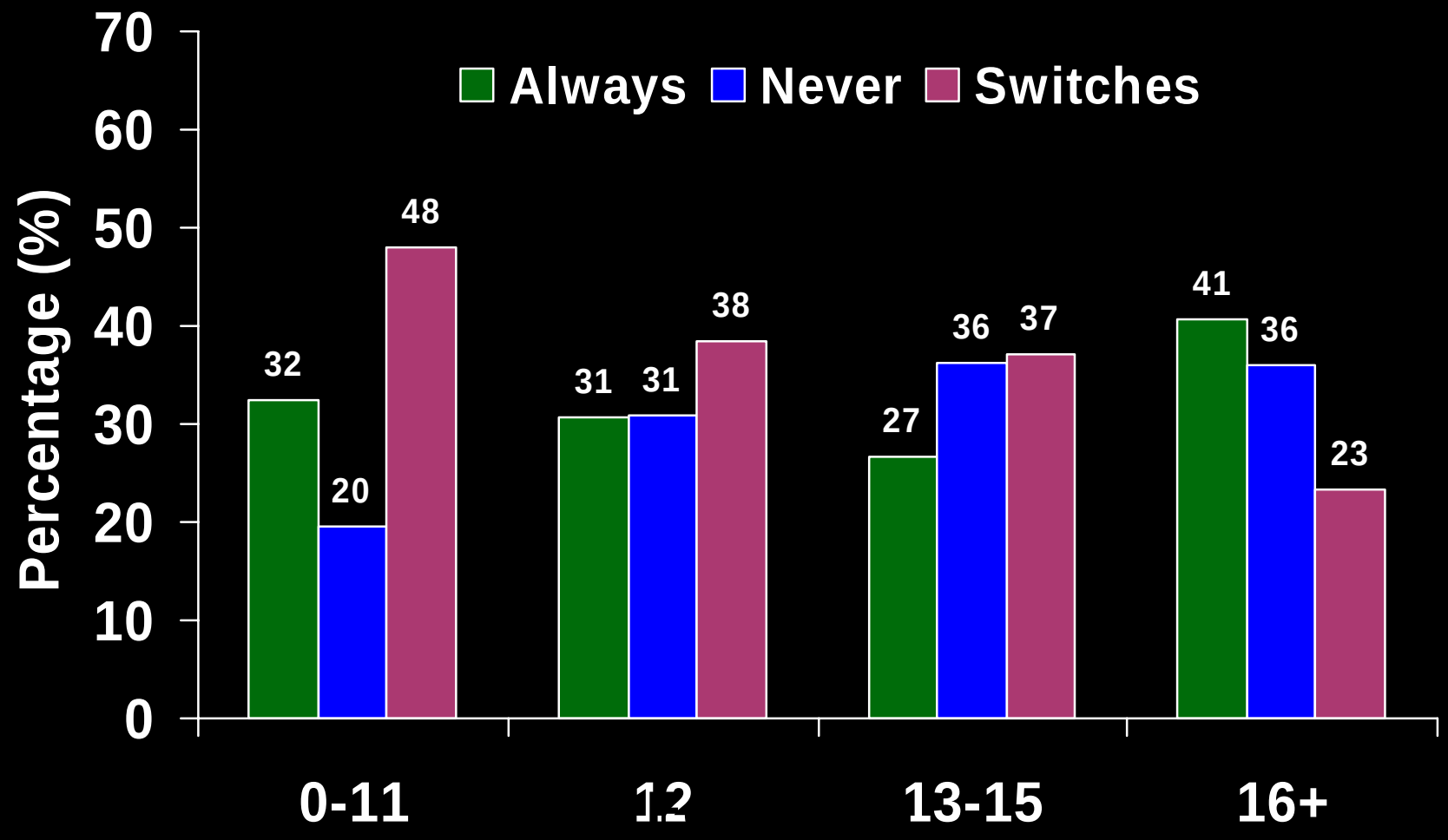


Note: Results are from an ordered probit explaining whether health improves, stays the same, or gets worse between wave 1 and wave 3. Other regressors include age, date of diagnosis, exposure route, insurance, baseline CD4 count, baseline general health, income and census region. Graph shows the estimated coefficients from the index regression. Significant effects ($p<0.10$) are shown in red.

Diabetes

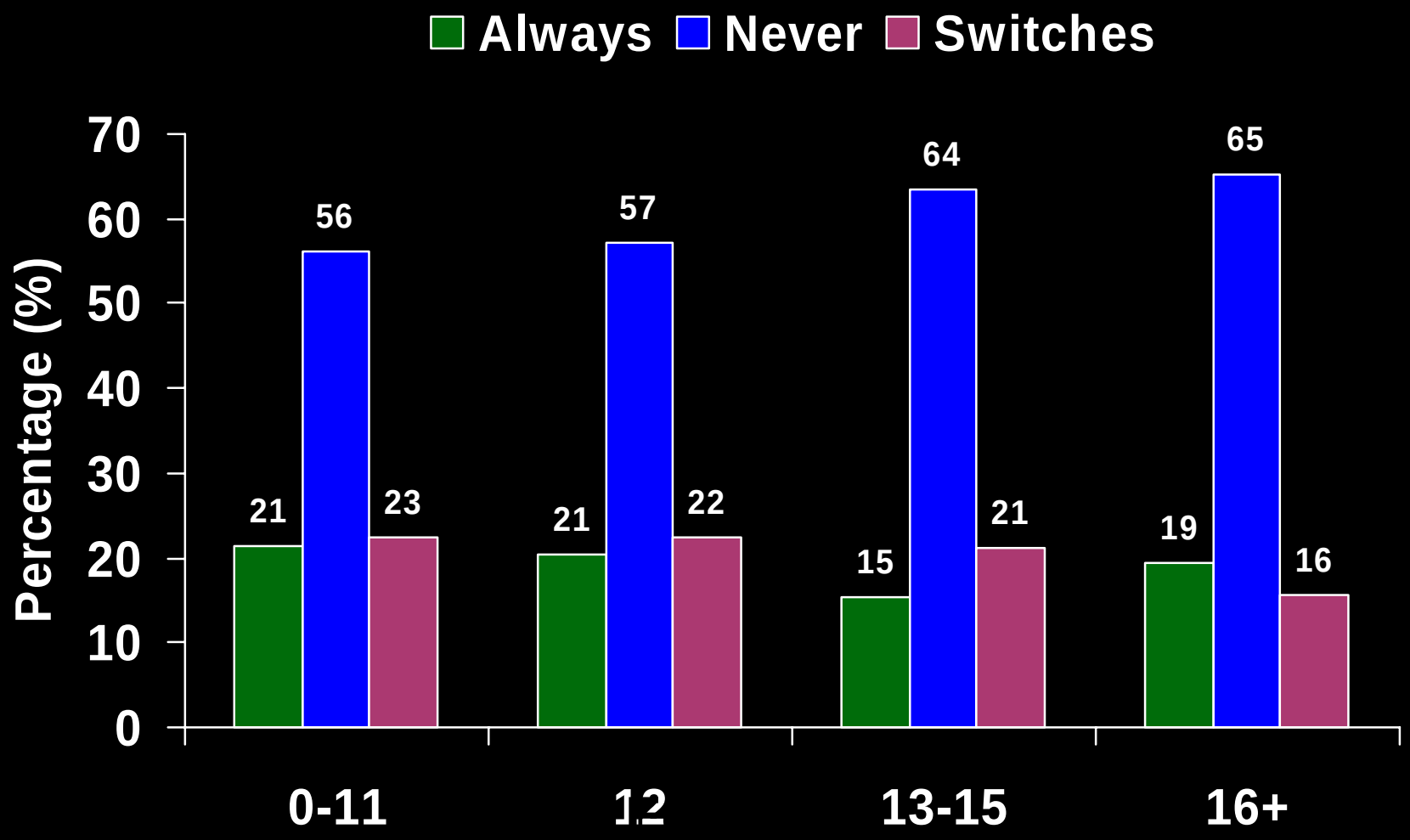
- **Prototype chronic illness**
- **Tight glycemic control is key to better outcomes for Type 1 and Type 2**
- **Requires patients to continually monitor levels of glucose-medication titration**

Use of Oral Medication for Type 2 Diabetes (Health and Retirement Study)



Source: Goldman and Smith, *PNAS*, 2004.

Less Educated Switch Taking Insulin More



Source: Goldman and Smith, *PNAS*, 2004.

We Classify Treatment Patterns as "Good" or "Poor"

- **Based on self-reports from 3 waves**
  - **"Good" treatments**
    - **Oral meds only, Insulin only, or both over all waves**
    - **Also includes those who added insulin to an oral medication regimen**
  - **"Poor" treatments**
    - **Patients who stopped oral meds or insulin**
    - **Patients who switched from one regime to another and then back again**

Note: Measurement error biases against finding an effect!

Predicting "Poor" Behavior

Variable	No WAIS	With WAIS
Years of Schooling:		
0-11 years	----	----
12 years	-0.24 **	-0.15
13-15 years	-0.28 *	-0.14
16+ years	-0.30 *	-0.07
Female	0.08	0.09
Black	0.11	0.01
Hispanic	0.01	-0.05
Married Waves 1 and 4	-0.08	-0.08
Married W1 Not Married W4	0.49	0.55 *
Not Married W1 and Married W4	0.07	0.08
Female & Married W1 & Not Married W4	-0.58	-0.60 *
Proxy Respondent	-0.27	-0.24
WAIS Score	----	-0.06 ***
WAIS Score missing	----	0.26

Note: Table shows results from probit regressions of poor behavior with and without Wechsler Adult Intelligence Score. Models also control for birth cohort. Education gradient disappears when WAIS is included.

"Poor" Behavior Worsens Health

Variable	Coefficient
"Poor" Behavior	-0.246 **
Years of Schooling:	
0-11 years	—
12 years	0.164
13-15 years	0.248 **
16 or more years	0.199
Female	0.099
Black	-0.229 **
Hispanic	-0.357 ***

Note: Table shows results from an ordered probit of whether general health got worse, stayed the same, or got better for diabetics between Wave 1 and Wave 4 in the HRS. Models also control for birth cohort and baseline health status. Negative values indicate a greater tendency to get worse between waves.

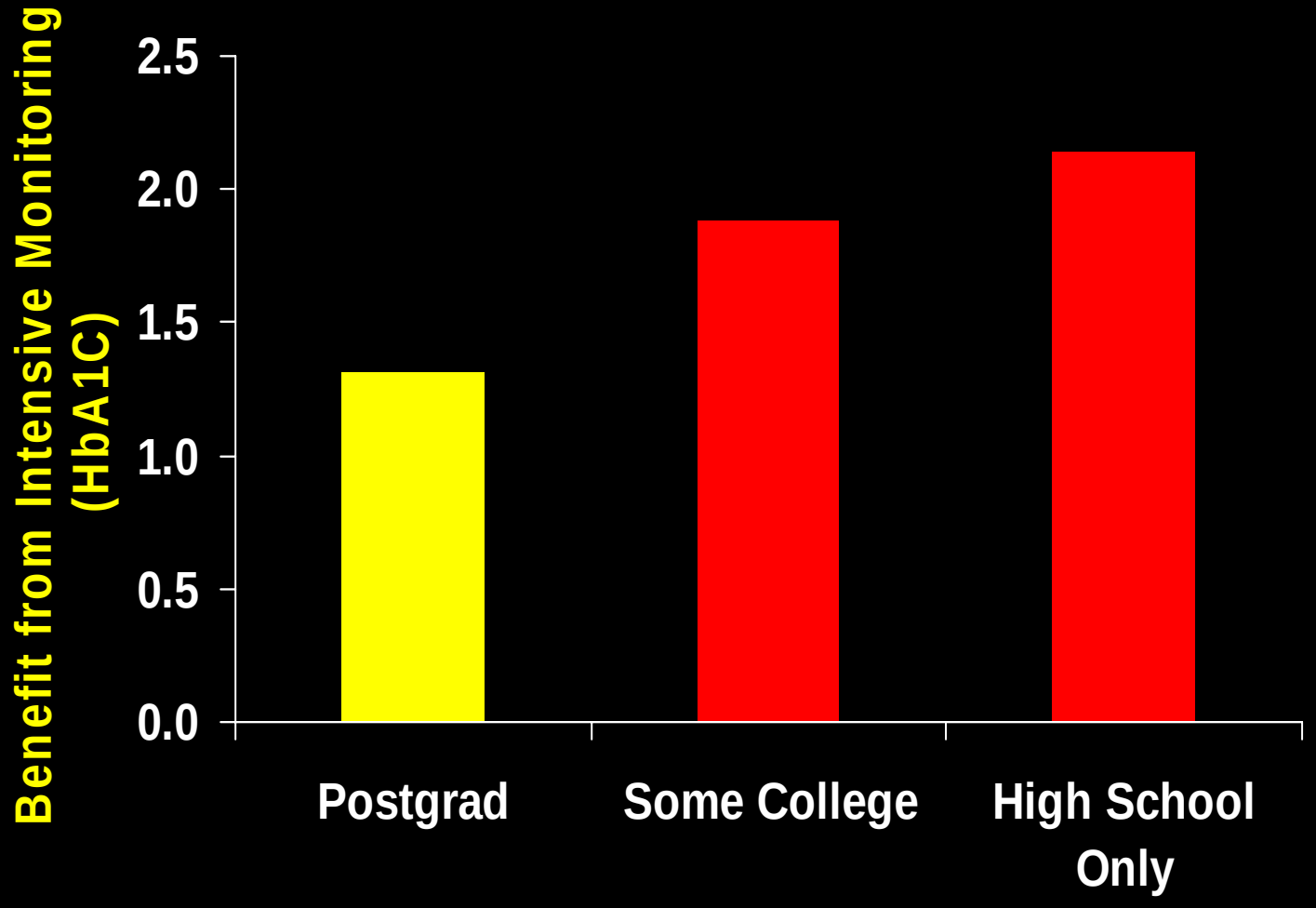
Summary of Results from HRS

- **Better educated more likely to maintain high quality treatment**
  - **Explained by higher-level reasoning**
  - **Marriage also confers benefit (for men only)**
- **High quality treatment leads to improved general health**

Diabetes Control and Complications Trial

- **Randomized prospective clinical trial from 1983 to 1989 for Type 1 diabetes**
- **Intensive treatment vs. standard care**
  - **Intensive treatment:**
    - **Insulin pump or 3x daily injections**
    - **Self-monitoring at least 4x daily**
    - **Weekly telephone contact; clinic visits every 3 months**
  - **Standard care:**
    - **1-2 injections per day**
    - **Daily self-monitoring**
    - **Clinic visits every 3 months**

Intensive Monitoring More Valuable for the Less-Educated



Note: Graph shows improvement in glycosolated hemoglobin in intensive treatment group relative to control group. Average follow-up period was 72 months. Results control for duration in study, gender, marital status, and age.

Conclusions

- **Education is a key predictor of adherence for HIV and diabetes patients**
- **Better adherence means better health**
- **Thus, self-management is an important determinant of SES health gradients for these populations**
- **SES health gradient not immutable**
  - **Intensive monitoring…?**

Questions?