



The Educational Consequences of the Digital Divide

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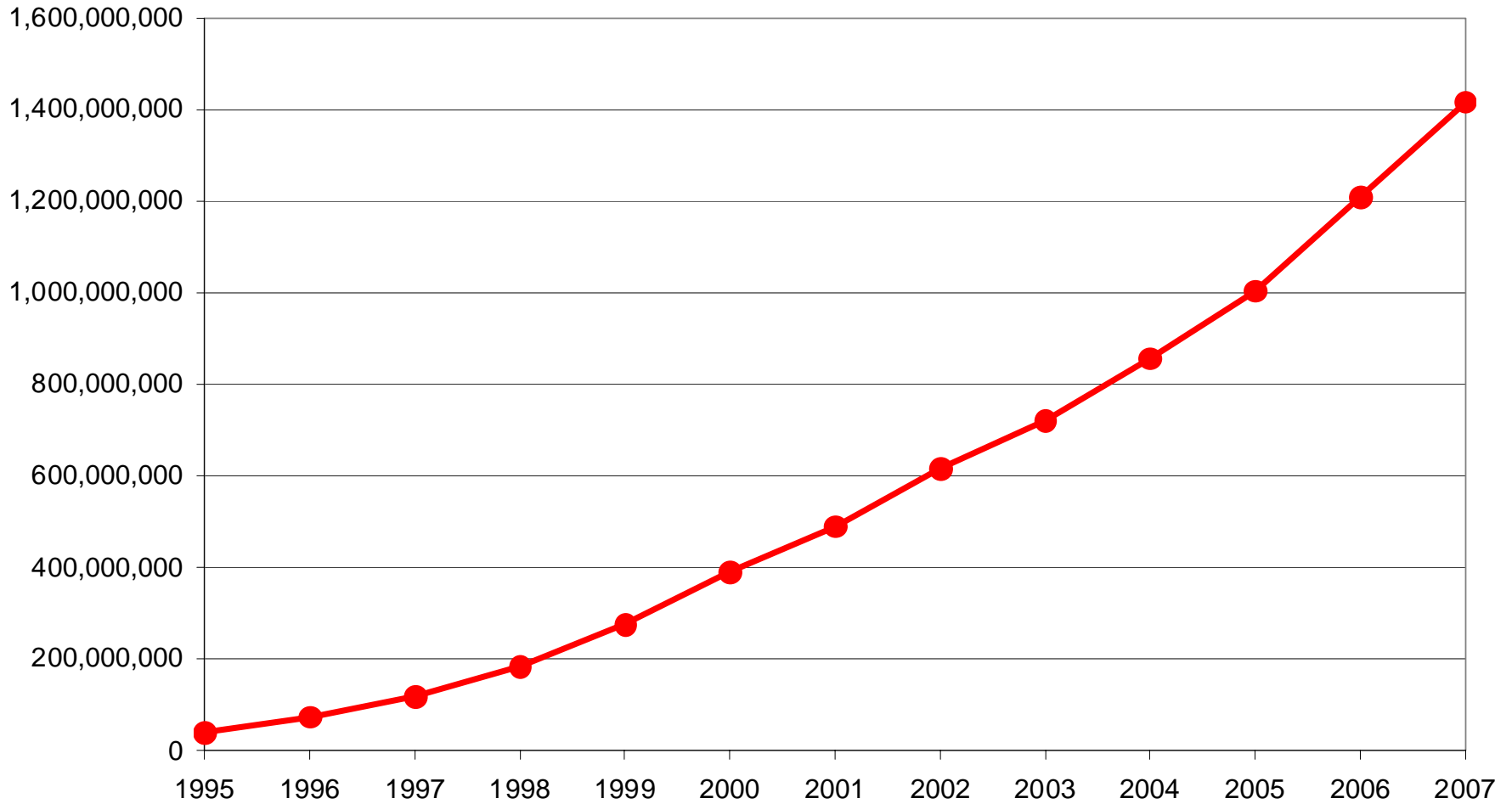


Increasing Worldwide Use of Technology

- 40 million people in the world used the Internet in 1995
- Rapid increase in the use of technology

Number of Internet Users Worldwide

International Telecommunications Union (1995-2007)



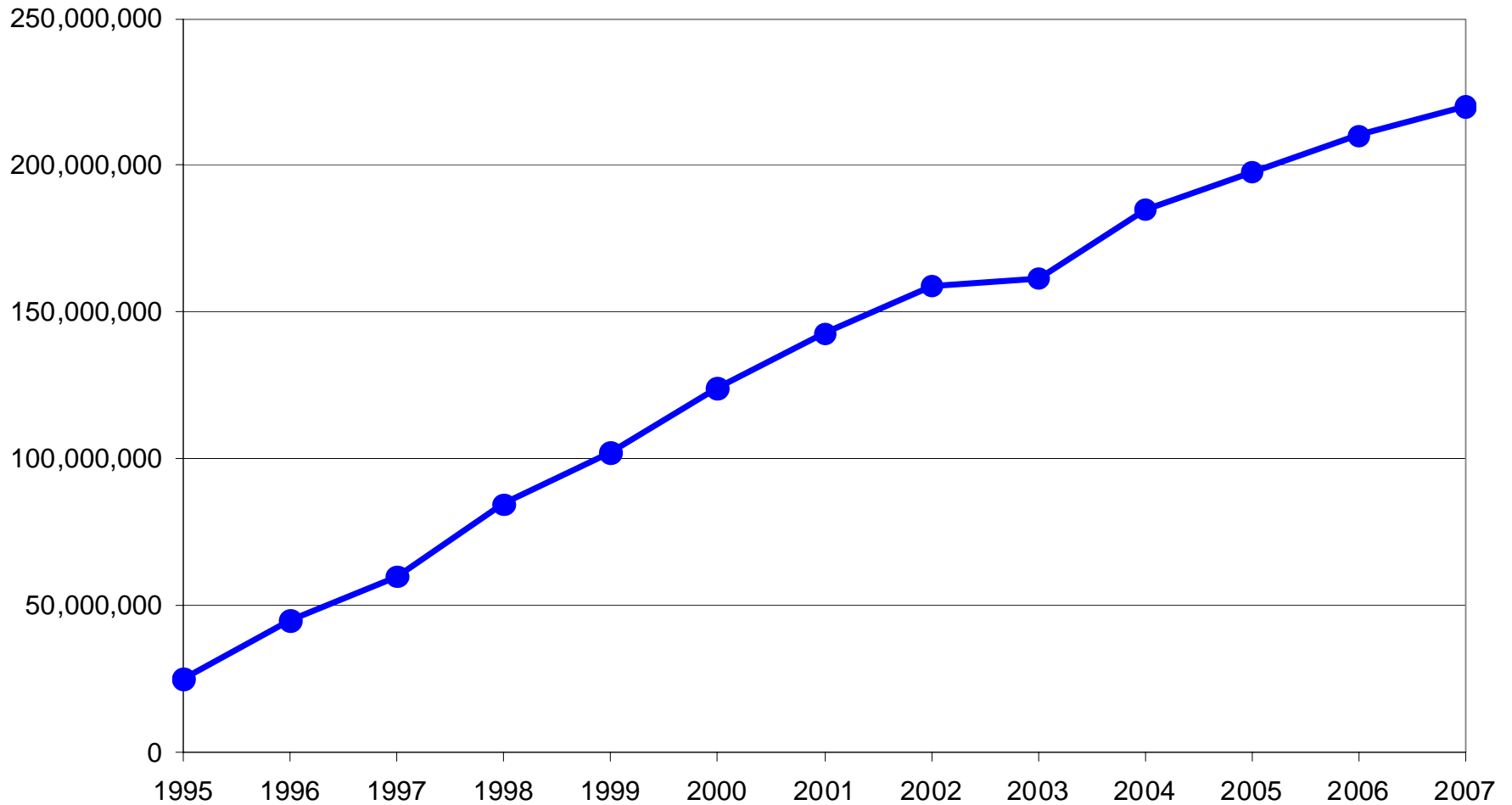


Increasing Use of Technology in the United States

- 25 million people used the Internet in the United States in 1995
- Rapid increase in the use of computers, the Internet and broadband

Number of Internet Users in the United States

International Telecommunications Union (1995-2007)



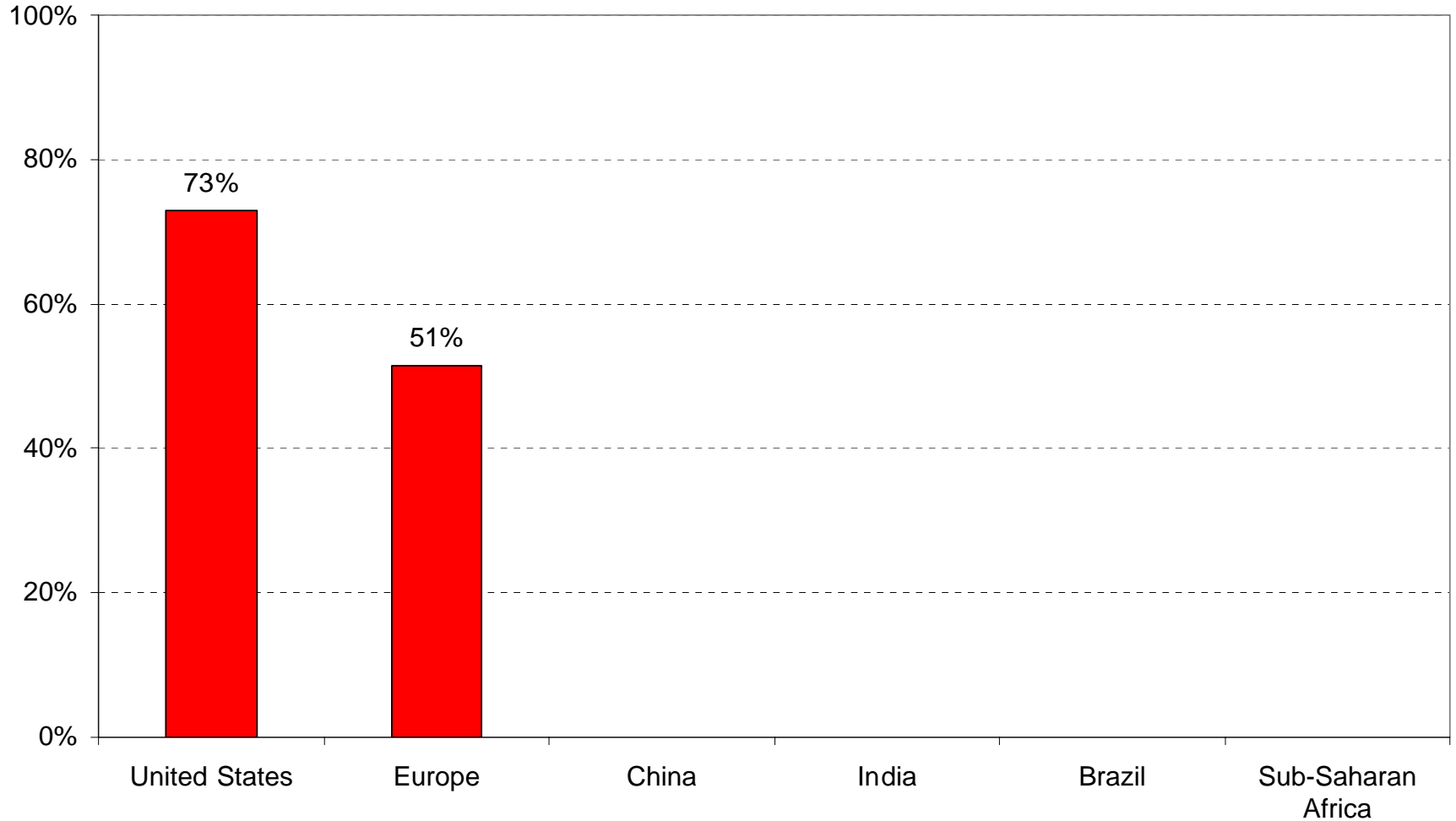


The Global Digital Divide

- But, 5 billion people or 78 percent of the world's population does not use the Internet
- Large disparities in access to technology across regions and countries in the world

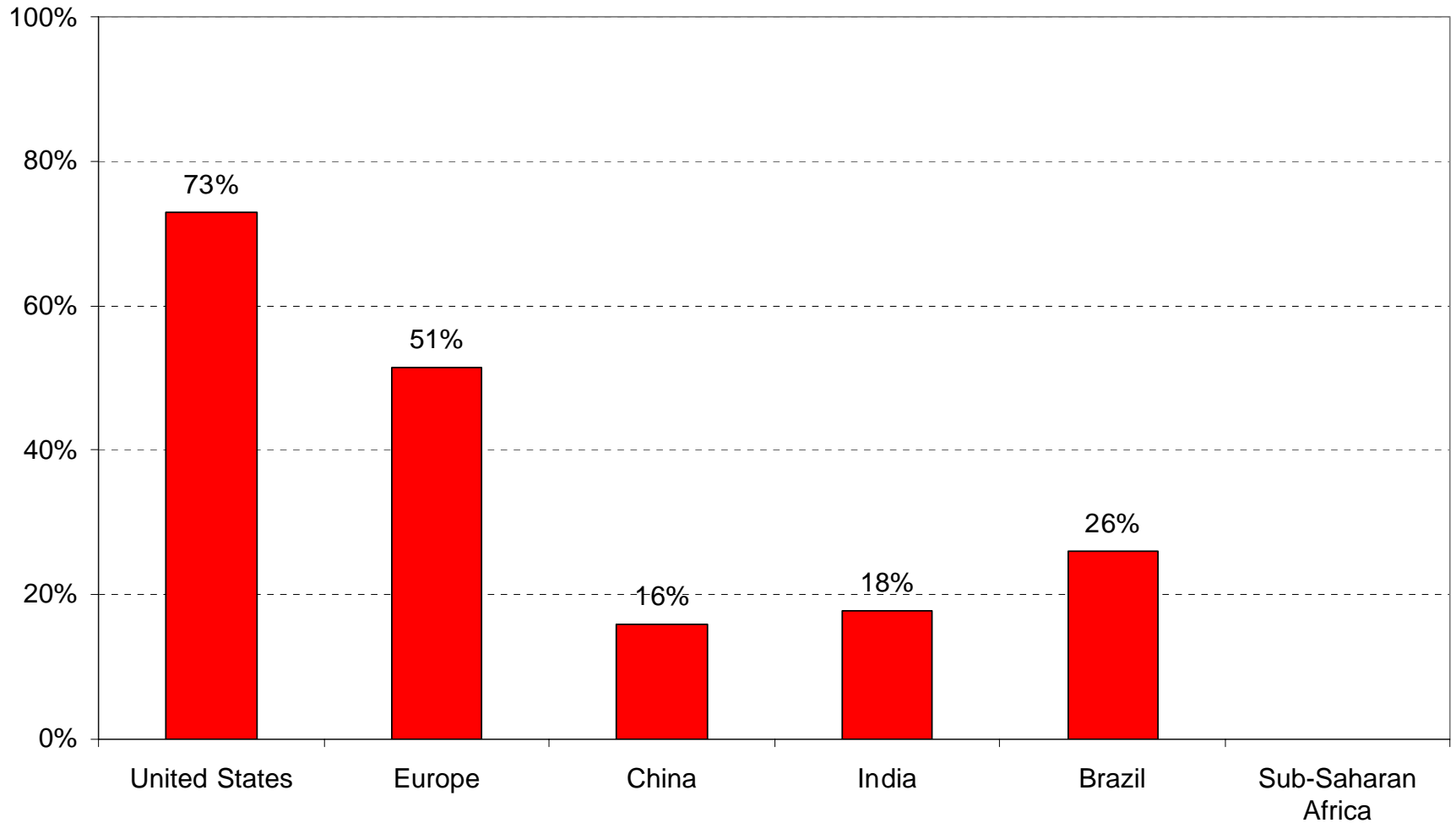
Internet Use by Country

International Telecommunications Union (2007)



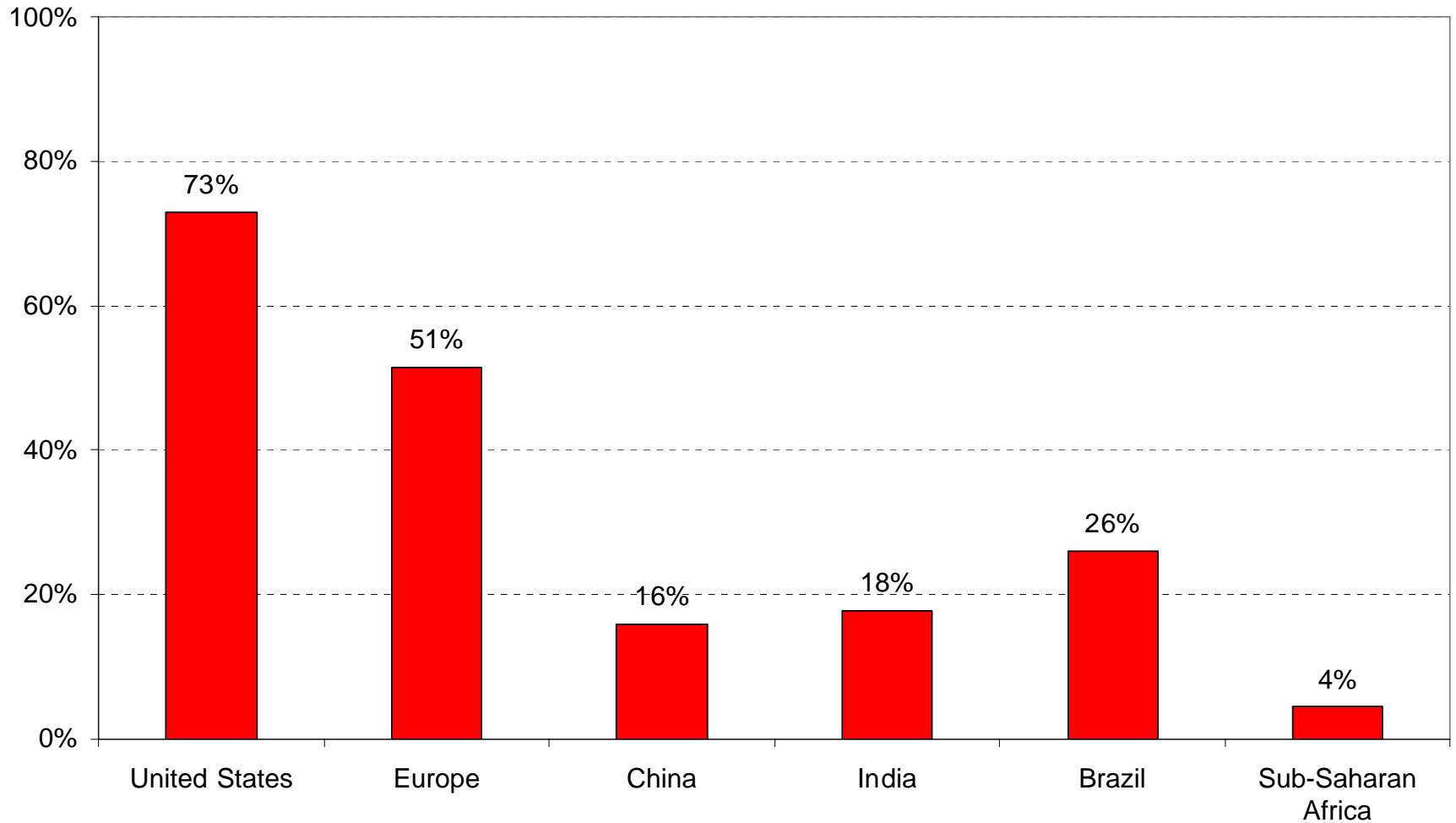
Internet Use by Country

International Telecommunications Union (2007)



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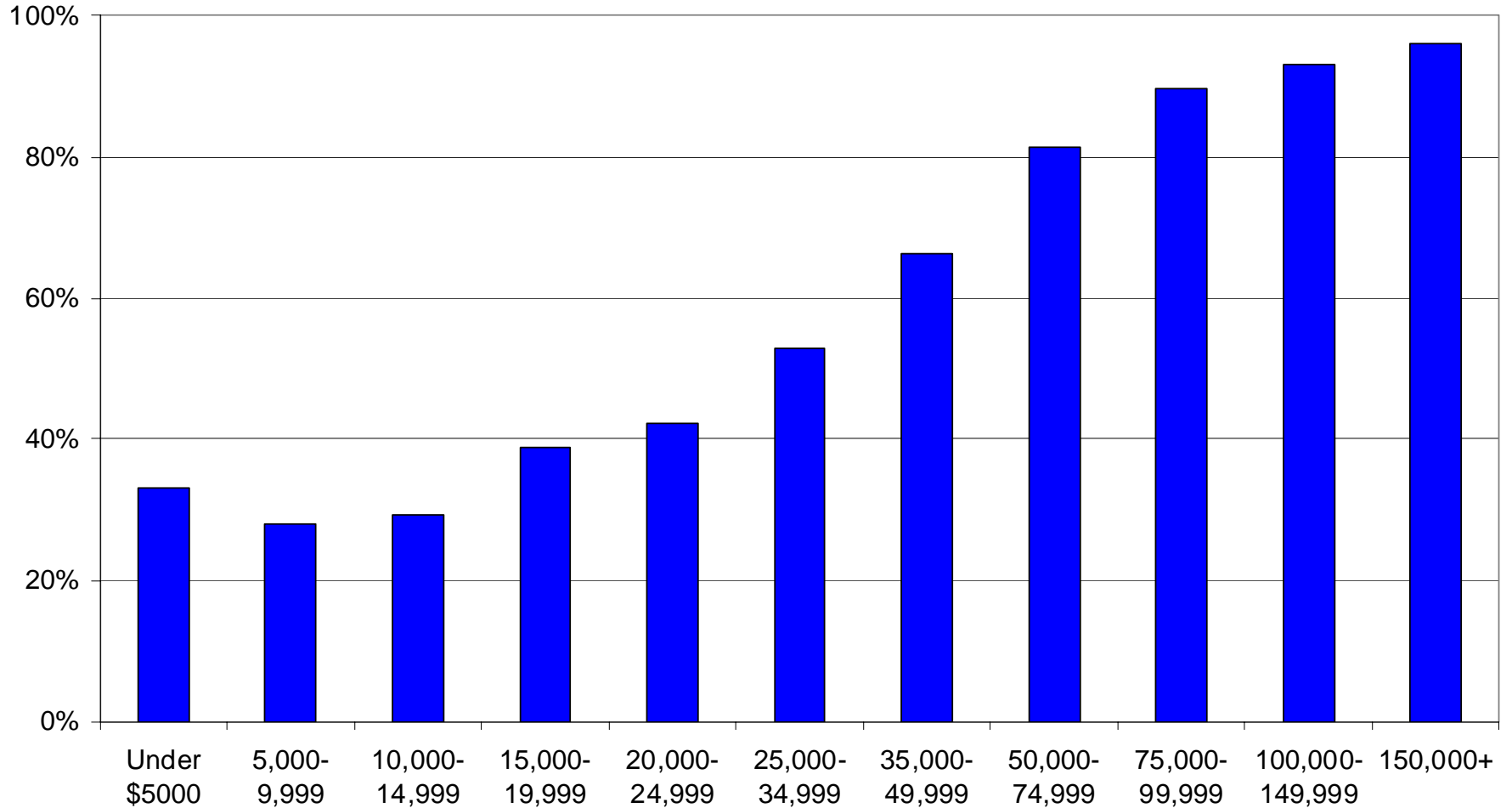


The U.S. Digital Divide

- 100 million people or 1/3 of the U.S. population do not have access to the Internet at home
- 15 million or 30 percent of school-age children do not have access to the Internet at home
- Large disparities in access to technology by income and race
- Generally reflects broader economic inequality

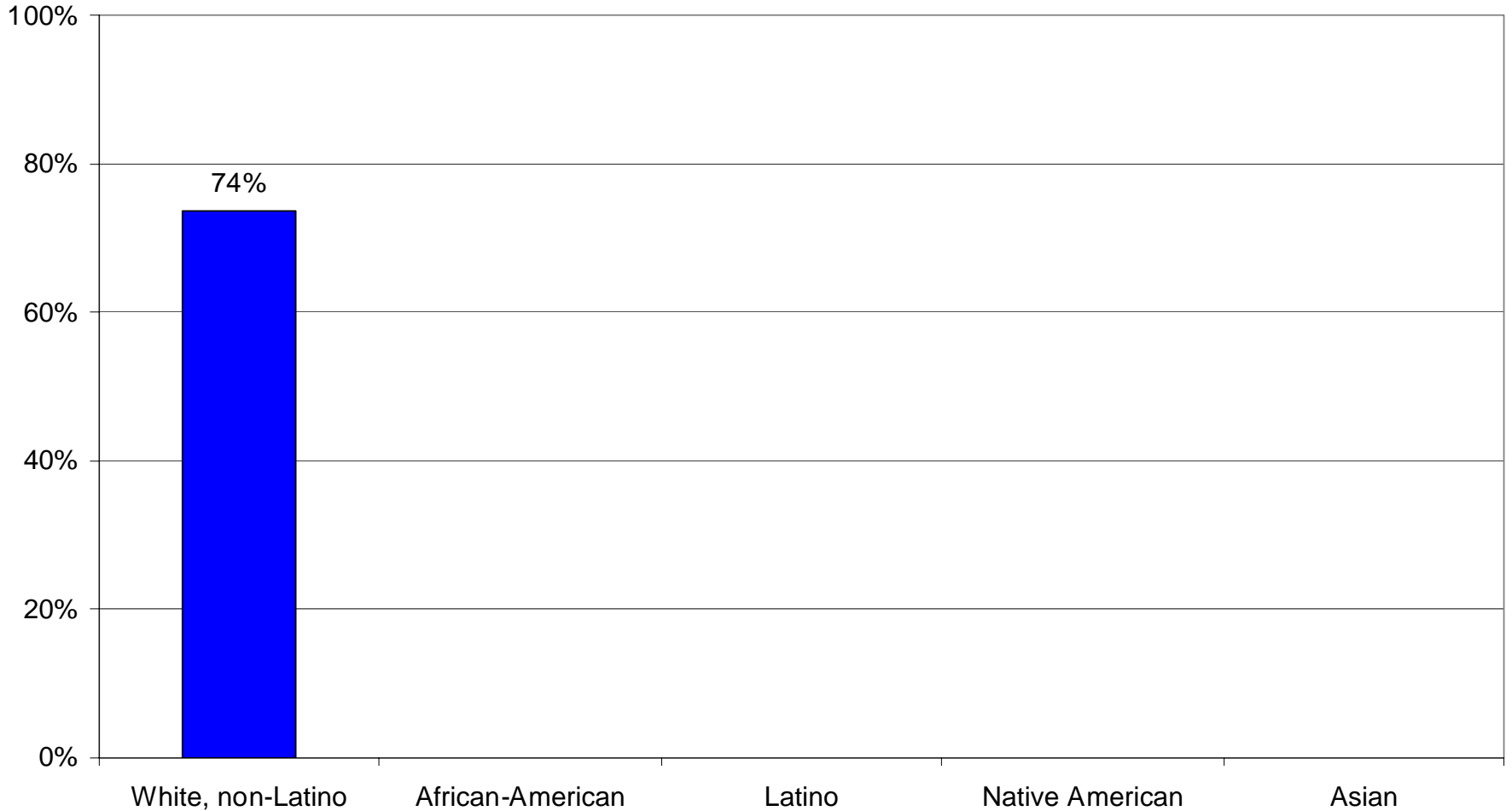
Home Internet Access by Income Level

Current Population Survey (2007)



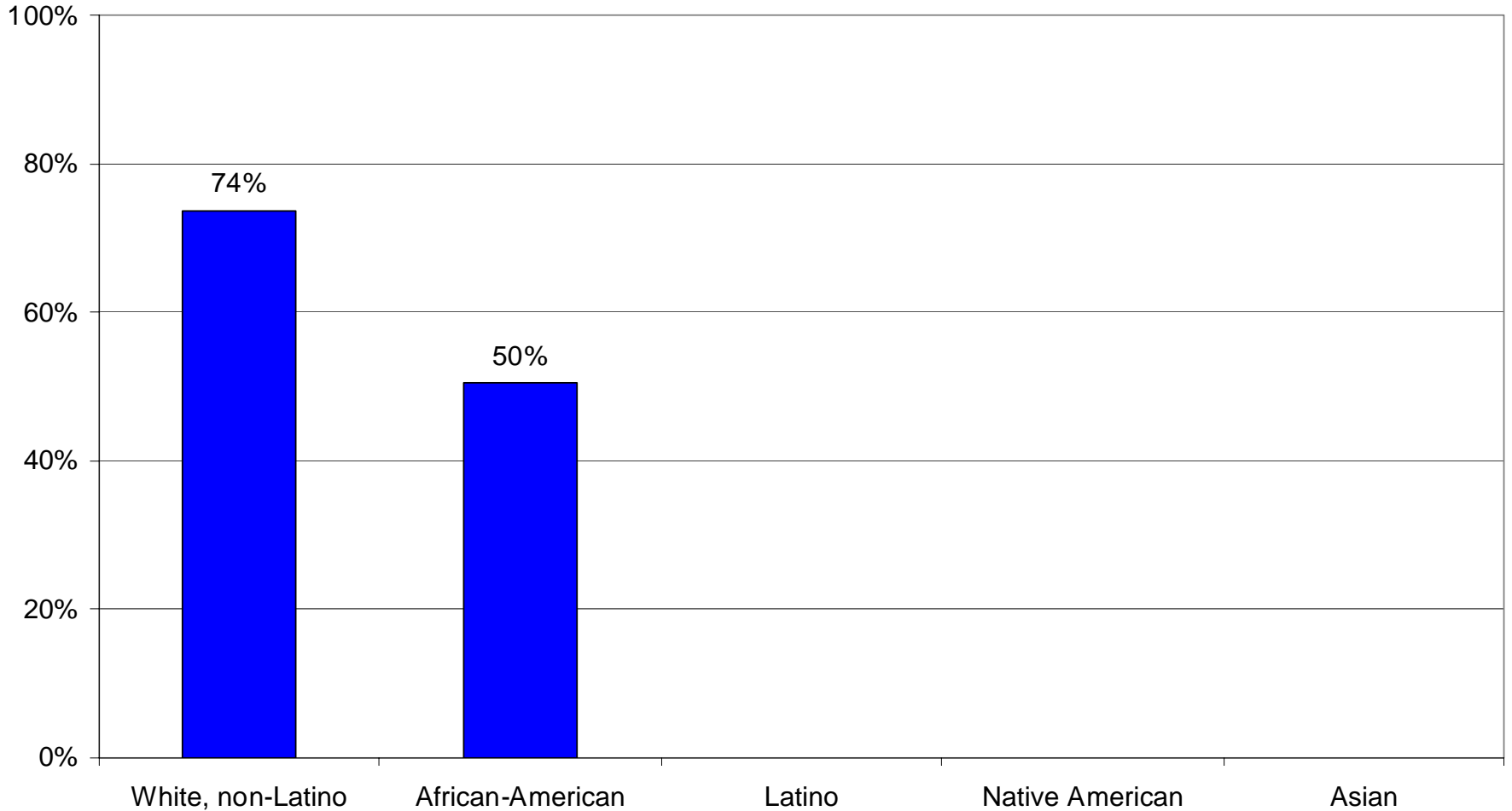
Home Internet Access by Race/Ethnicity

Current Population Survey (2007)



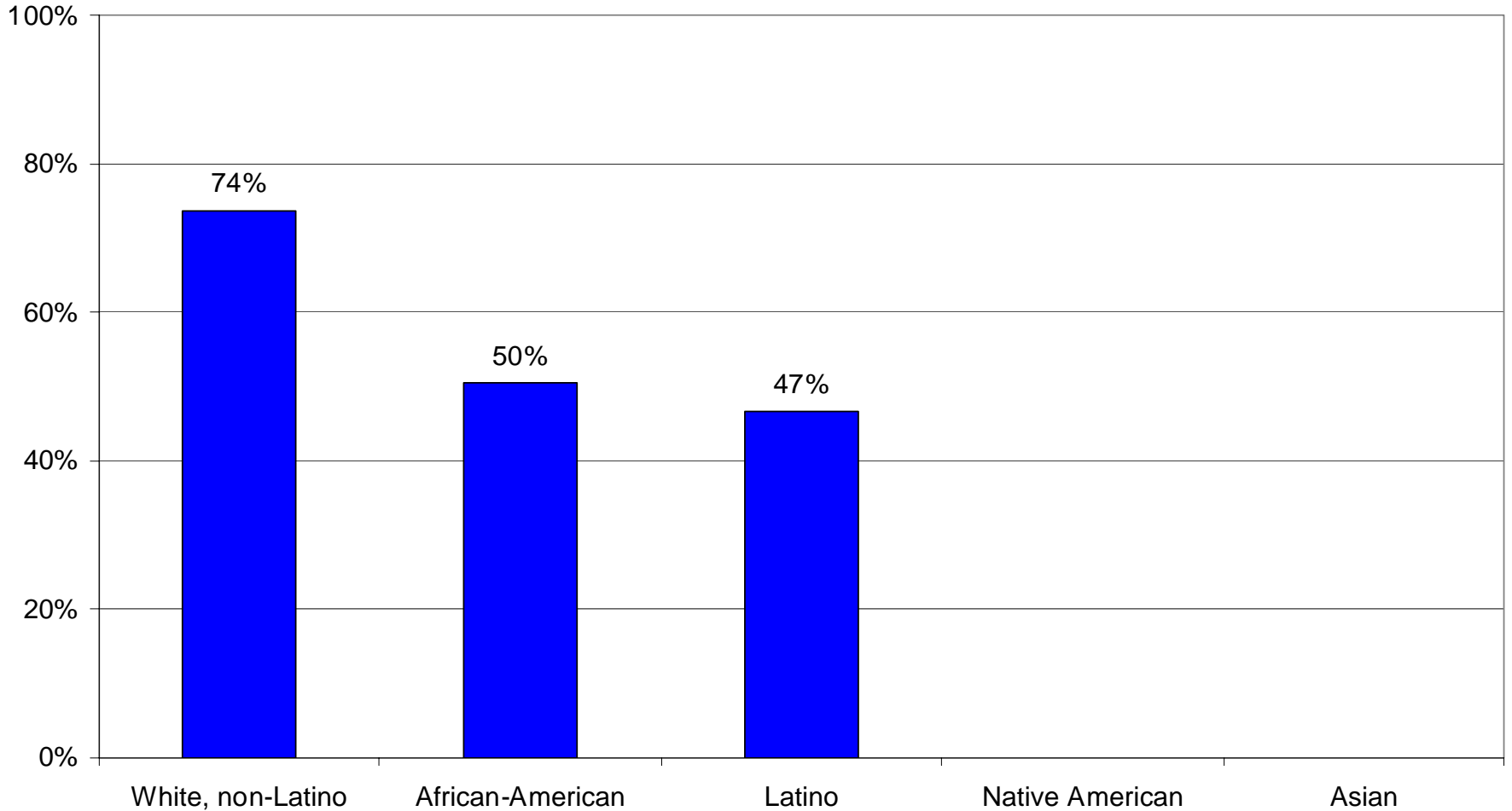
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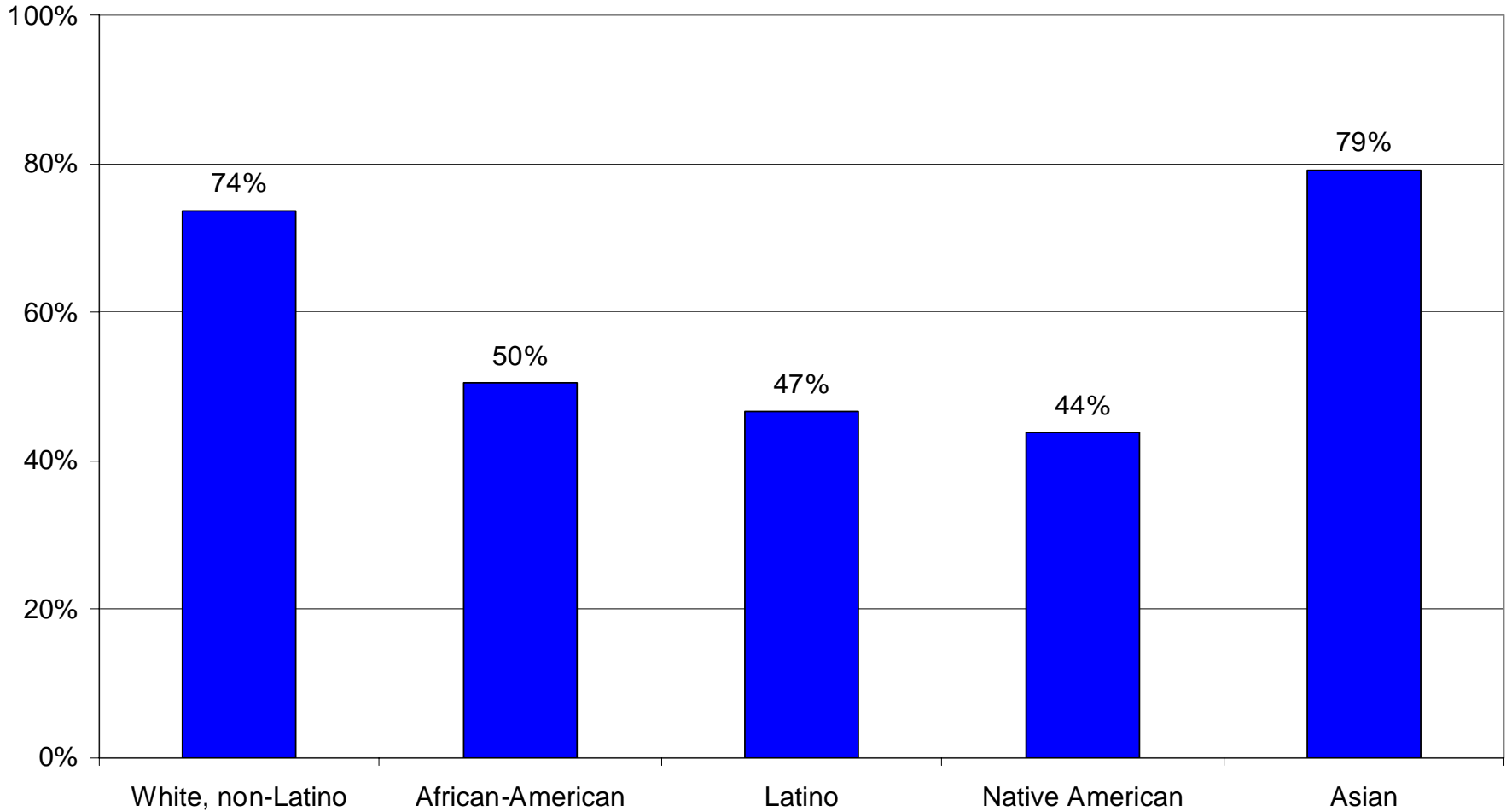
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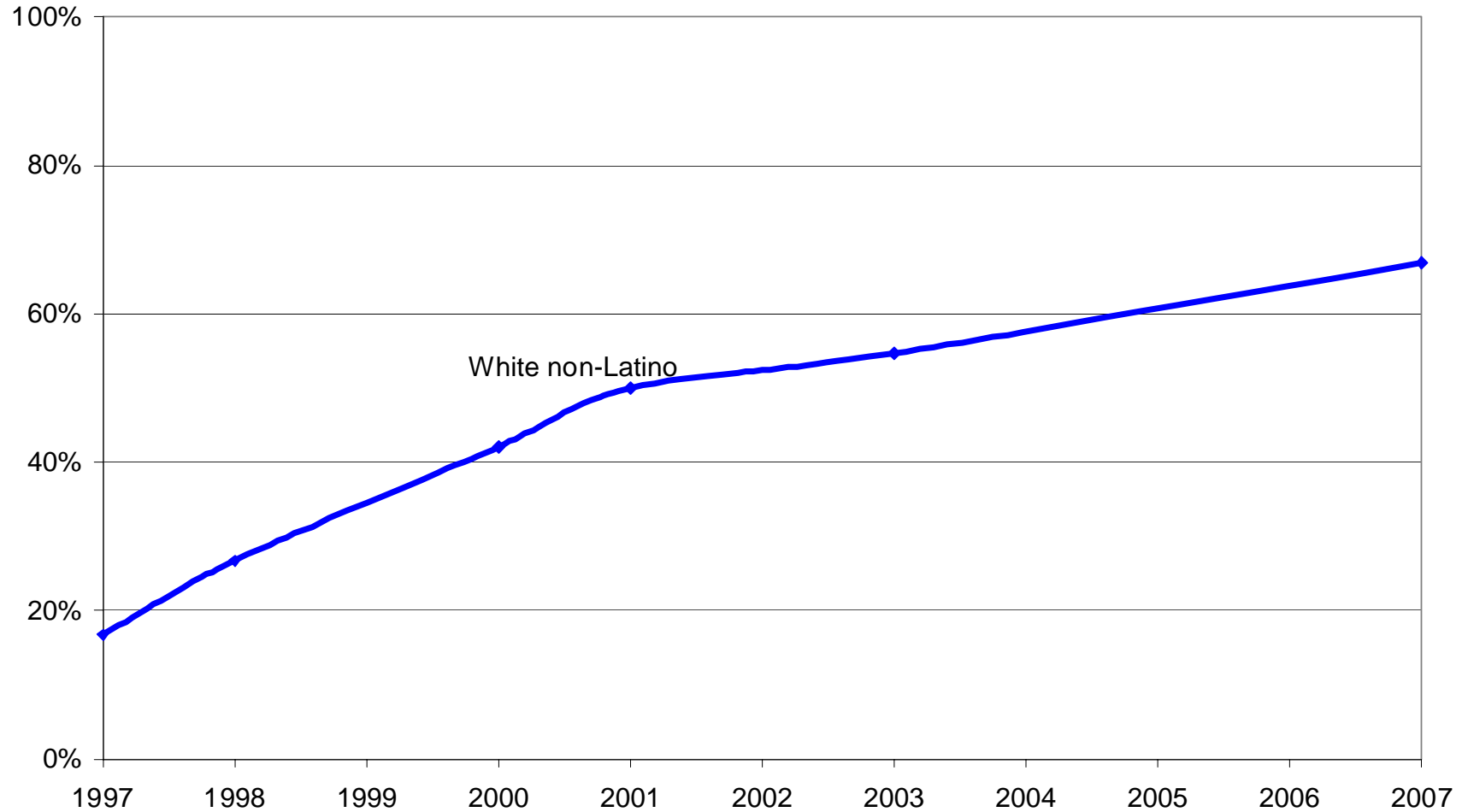
Home Internet Access by Race/Ethnicity

Current Population Survey (2007)



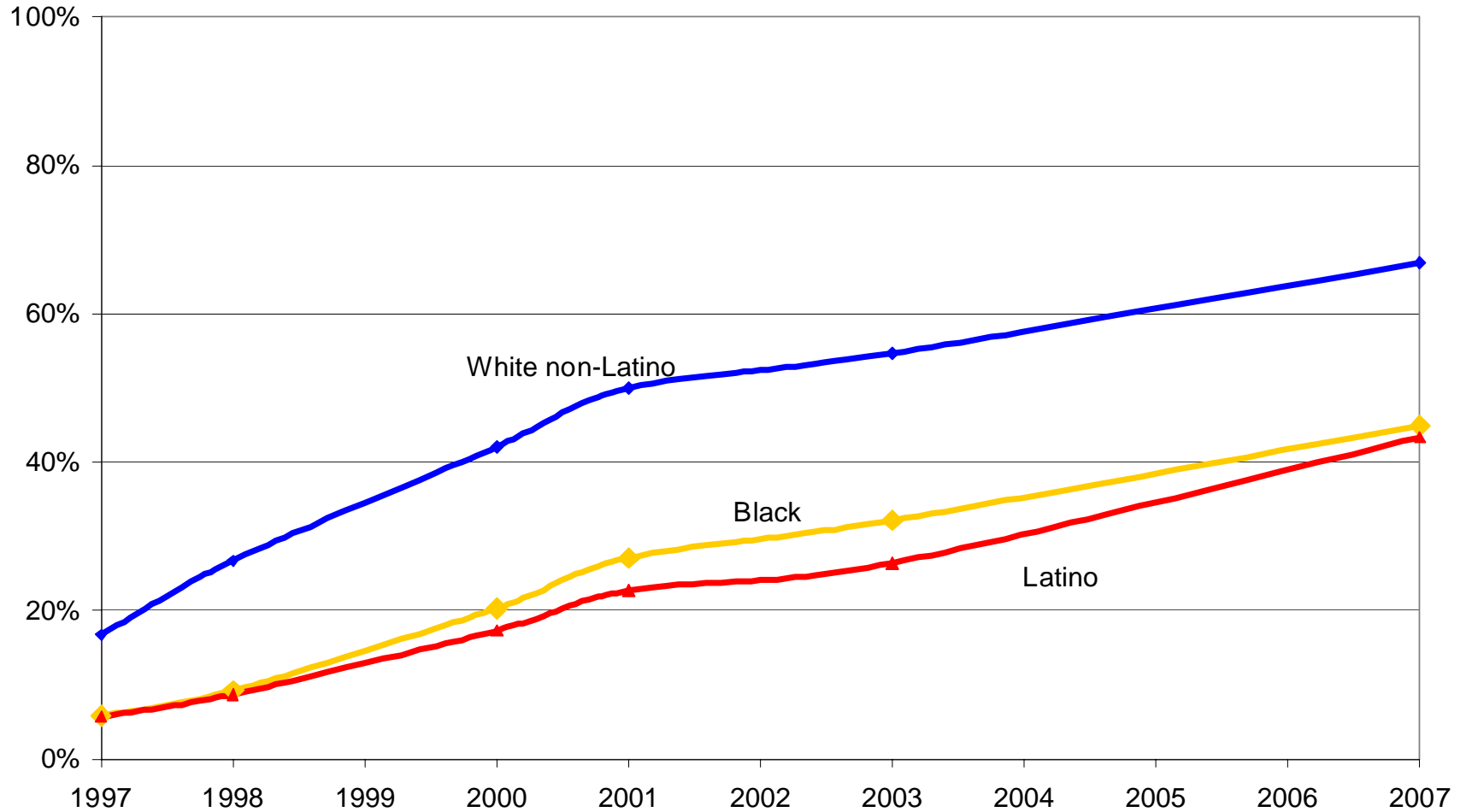
Home Internet Use (Ages 18+) by Race/Ethnicity

Current Population Survey (1997-2007)



Home Internet Use (Ages 18+) by Race/Ethnicity

Current Population Survey (1997-2007)





Causes of the Global Digital Divide

- Examined computer and Internet use for more than 150 countries over the past decade
- Explanations for low rates of technology penetration rates in developing countries
 - Income disparities
 - Telephone density
 - Quality of legal institutions
 - Human capital
 - Favorable: younger population



Causes of the U.S. Digital Divide

- Examined computer and Internet access at home using individual-level data from the U.S. Census Bureau and Bureau of Labor Statistics
- Explanations for low rates of home computer and Internet access among African-Americans and Latinos
 - Income differences
 - Educational differences
 - Language barriers for Latinos



Why Do We Care?

- Education
- Labor market
- Communications and networking
- Political engagement
- Consumers
- Health information
- Community involvement
- Government
- Emergency information

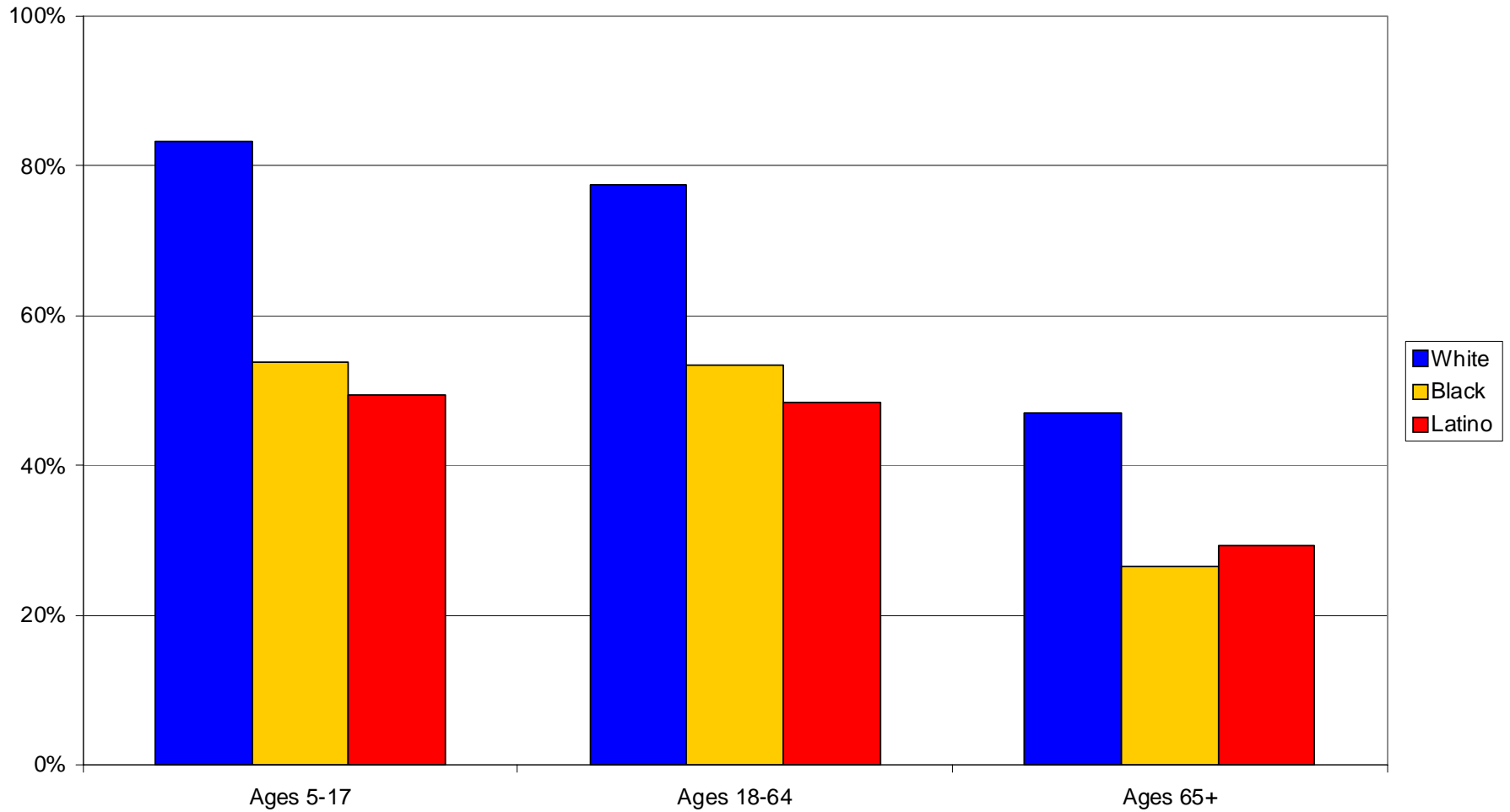


Technology and Education

- Computers and Internet access in schools
 - Nearly all instructional classrooms in U.S. public schools have computers with Internet access
 - More than one instructional computer for every four schoolchildren.
 - Roughly \$2 billion is spent per year on the E-rate program
- Increasing reliance on computers and the Internet for:
 - Classroom instruction, delivering educational content, completing homework assignments, and communicating with parents
 - Teacher's expectations for homework

Home Internet Access Rates

Current Population Survey (2007)





Educational Consequences

- Disparities in access to home computers may have implications for educational inequality.
- Some families may be constrained in purchasing computers for schoolchildren by:
 - Cost
 - Information on importance for education
 - Technical information



Are Home Computers Useful for Students?

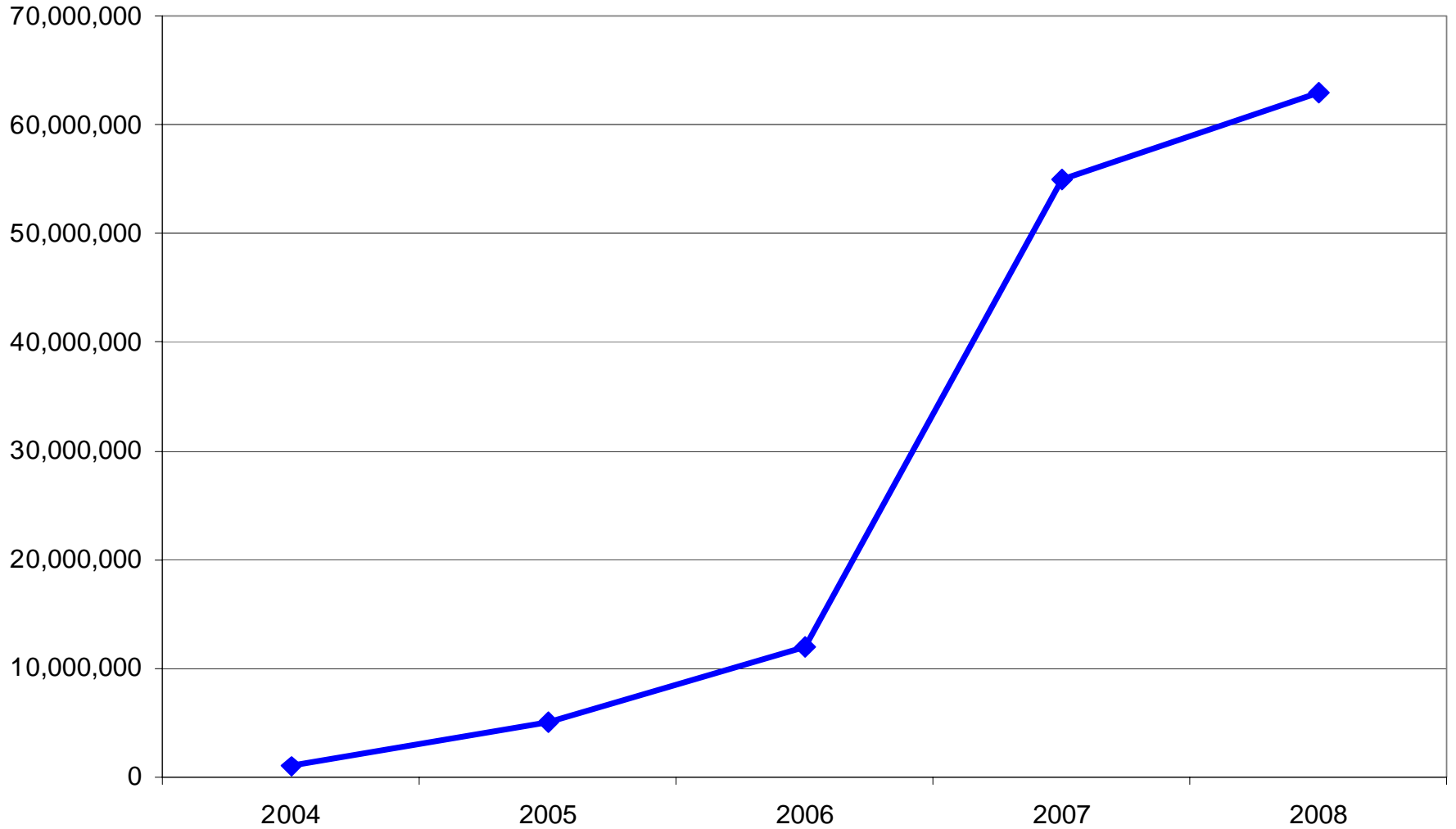
- Useful for completing school assignments
- Educational software and Internet sites
- Provides a “hook” for learning
- Keeps children off the streets
- But, computers and the Internet provide a distraction (e.g. games, social networking, entertainment, and email)
- Emphasizes presentation over content
- Facilitates plagiarism
- Previous research provides mixed evidence on the effects



Most Common Uses of Home Computers

- School assignments (93%)
- Internet (87%)
- Email (79%)
- Games (73%)
- Word processing (71%)
- Graphics and design (46%)
- Spreadsheets and databases (22%)

Number of Facebook Users



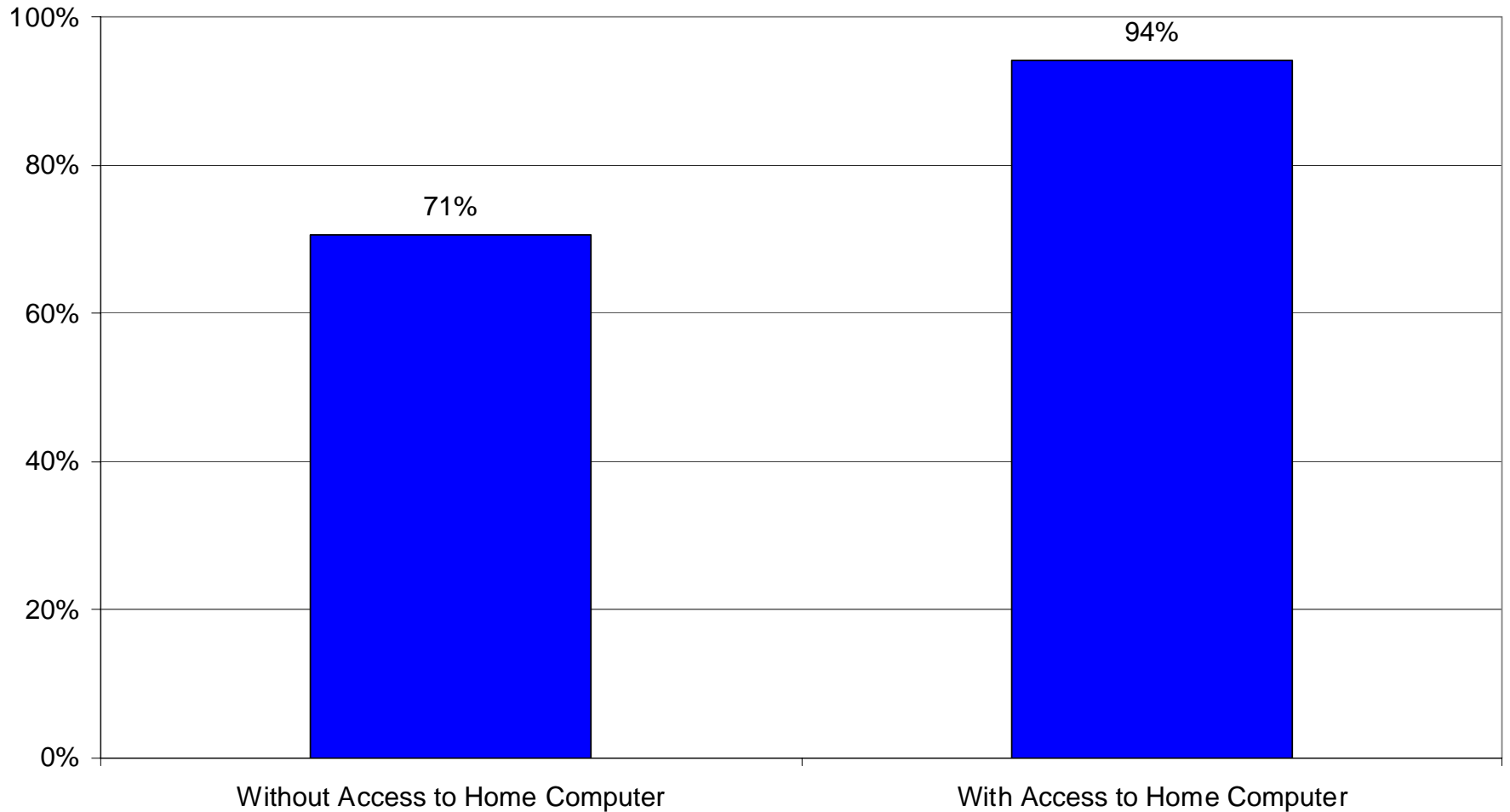


Educational Outcomes and Computer Ownership

- Examined computer ownership and educational outcomes among teenagers in the United States
- Does having access to a home computer improve educational outcomes among teenagers?
 - Graduation
 - Grades
 - Suspension

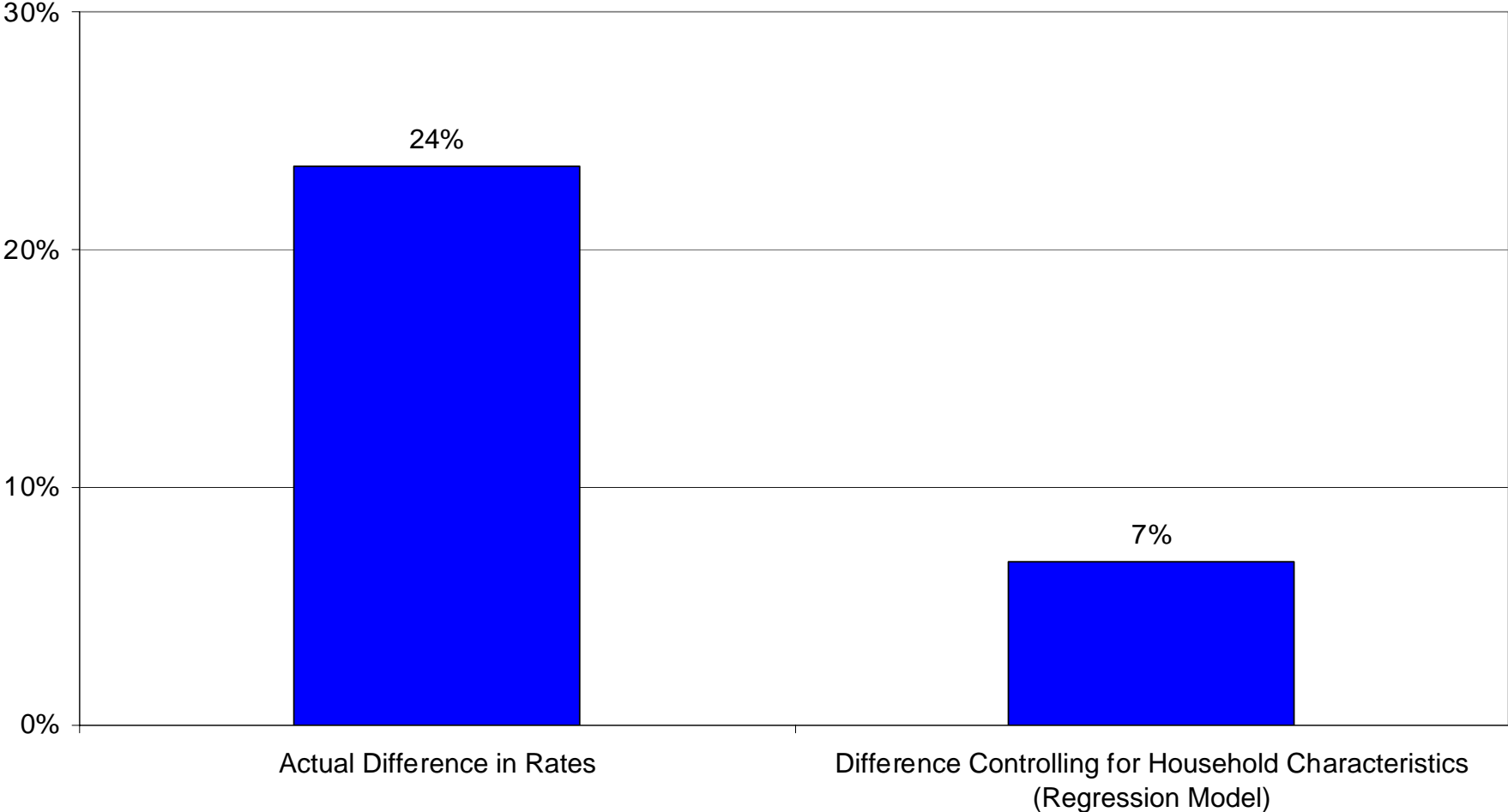
High School Graduation by Computer Ownership

National Longitudinal Survey of Youth (1997-02)



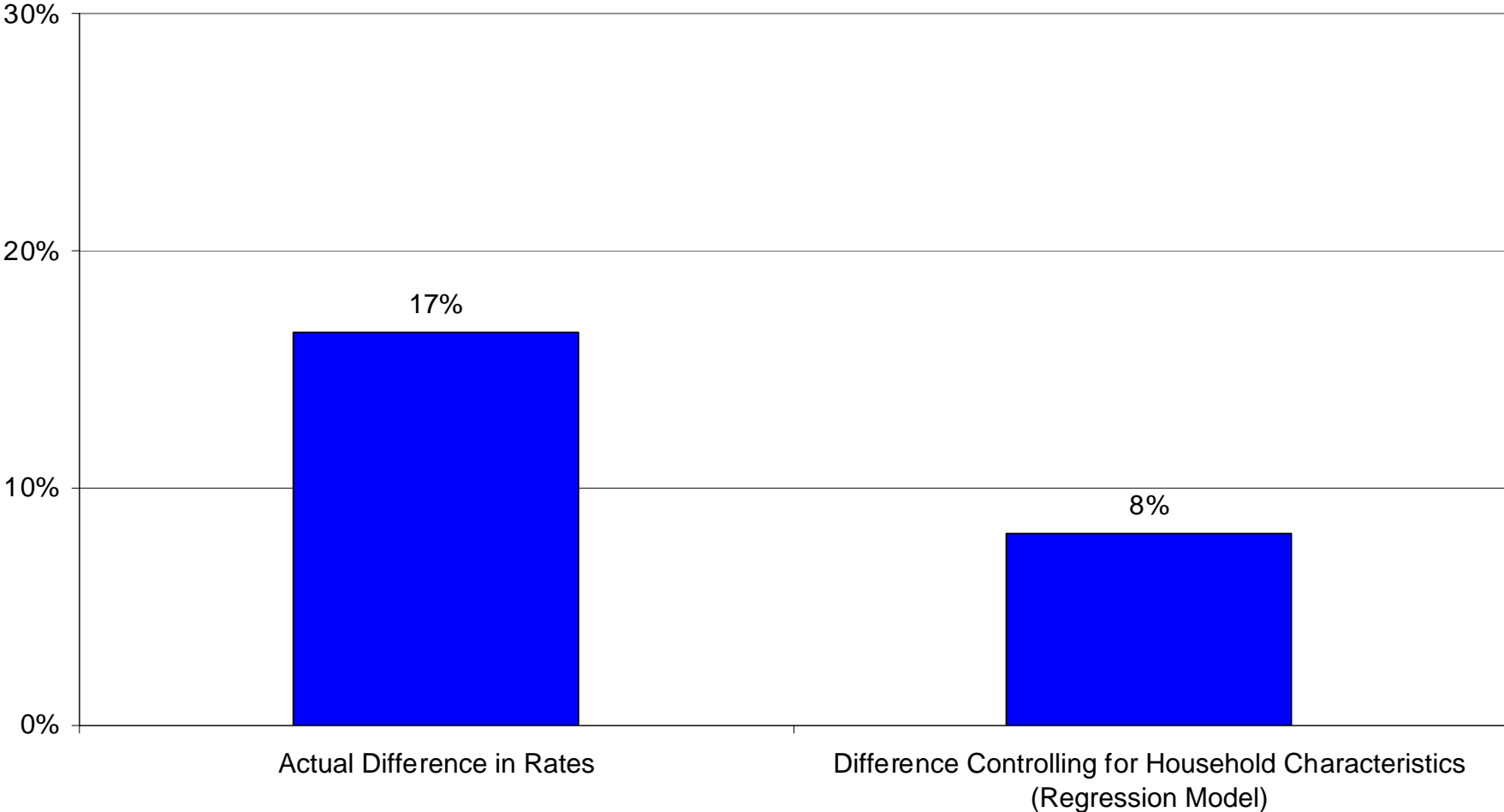
Difference in High School Graduation Rates

National Longitudinal Survey of Youth (1997-02)



Difference in High School Graduation Rates

Current Population Survey (2000-04)





Additional Outcomes

- Having a home computer:
 - Increases grade point average by 0.2 points (4.0 scale)
 - Decreases school suspension rate by 25 percent
 - Some evidence that computers decrease criminal activities
- Reality check
 - Cable television
 - Dictionary at home
 - Future computer



Experimental Research

- Statistical analyses in previous research control for family income, parental education and other factors
- But, computer ownership is chosen by families
- Families that purchase computers may be more concerned about their children's education than those that do not purchase computers creating a positive bias

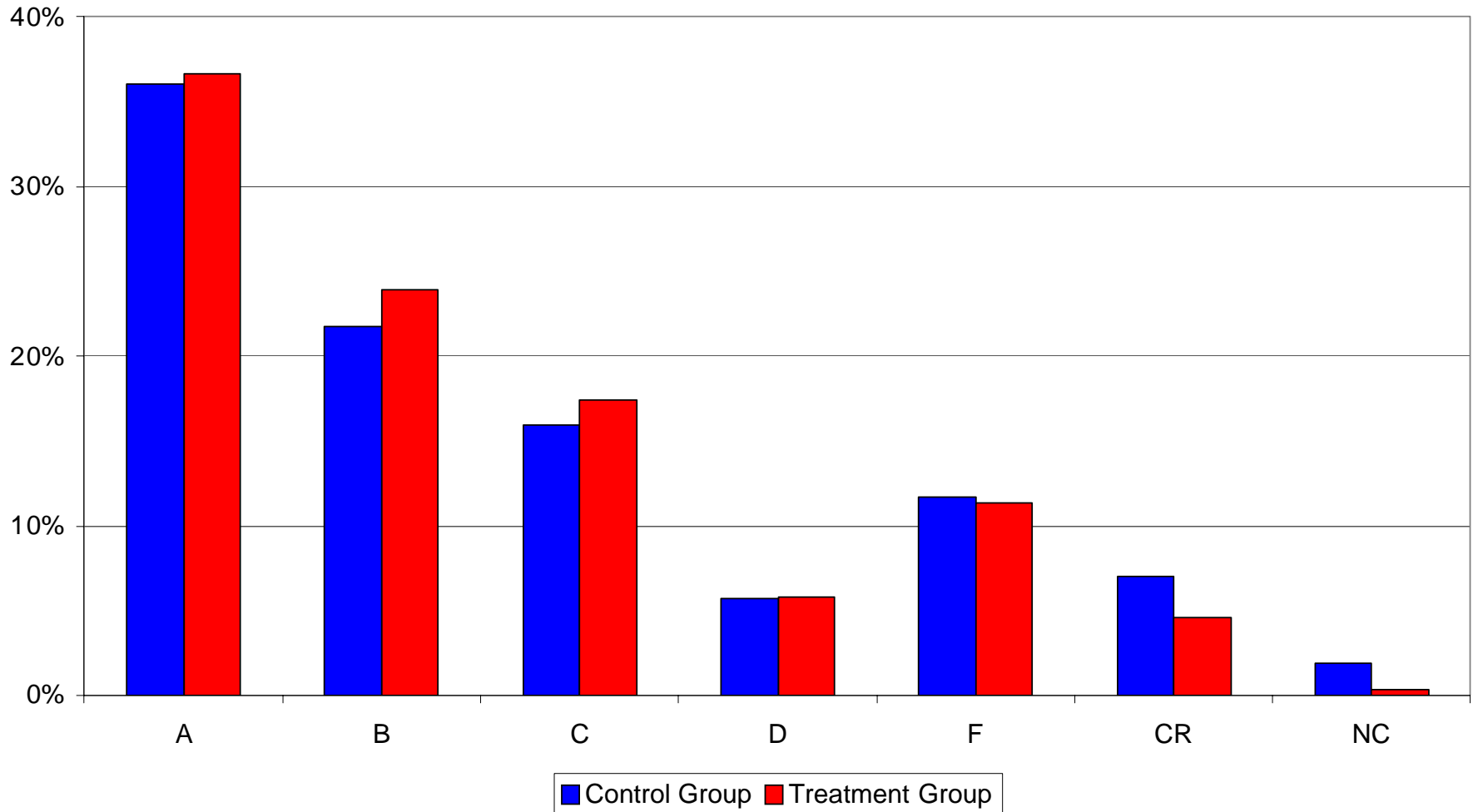


Computer Lottery Program

- Conducted the first field experiment involving the random provision of free computers to students.
- Computers were randomly given out to entering students receiving financial aid at a large community college in Northern California, Butte College.
- Computers for Classrooms provided free refurbished computers
- 286 students participated in the study with 141 students winning free computers and 145 students being assigned to the control group.
- All students were followed for two years (2006-08).
- Key question: Does having a home computer improve educational outcomes among low-income students?

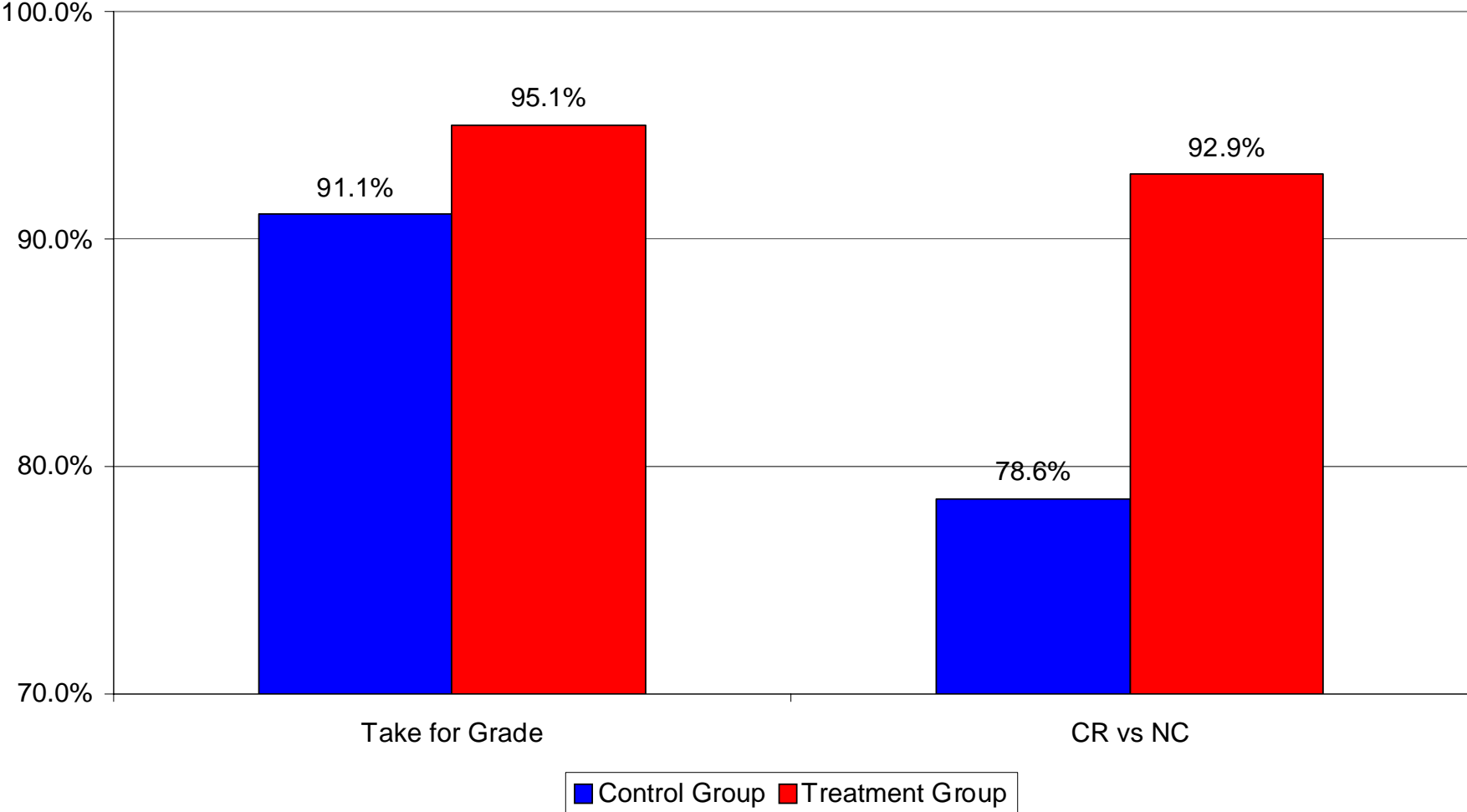
Grade Distribution for Study Participants

Butte College Administrative Data (2006-08)



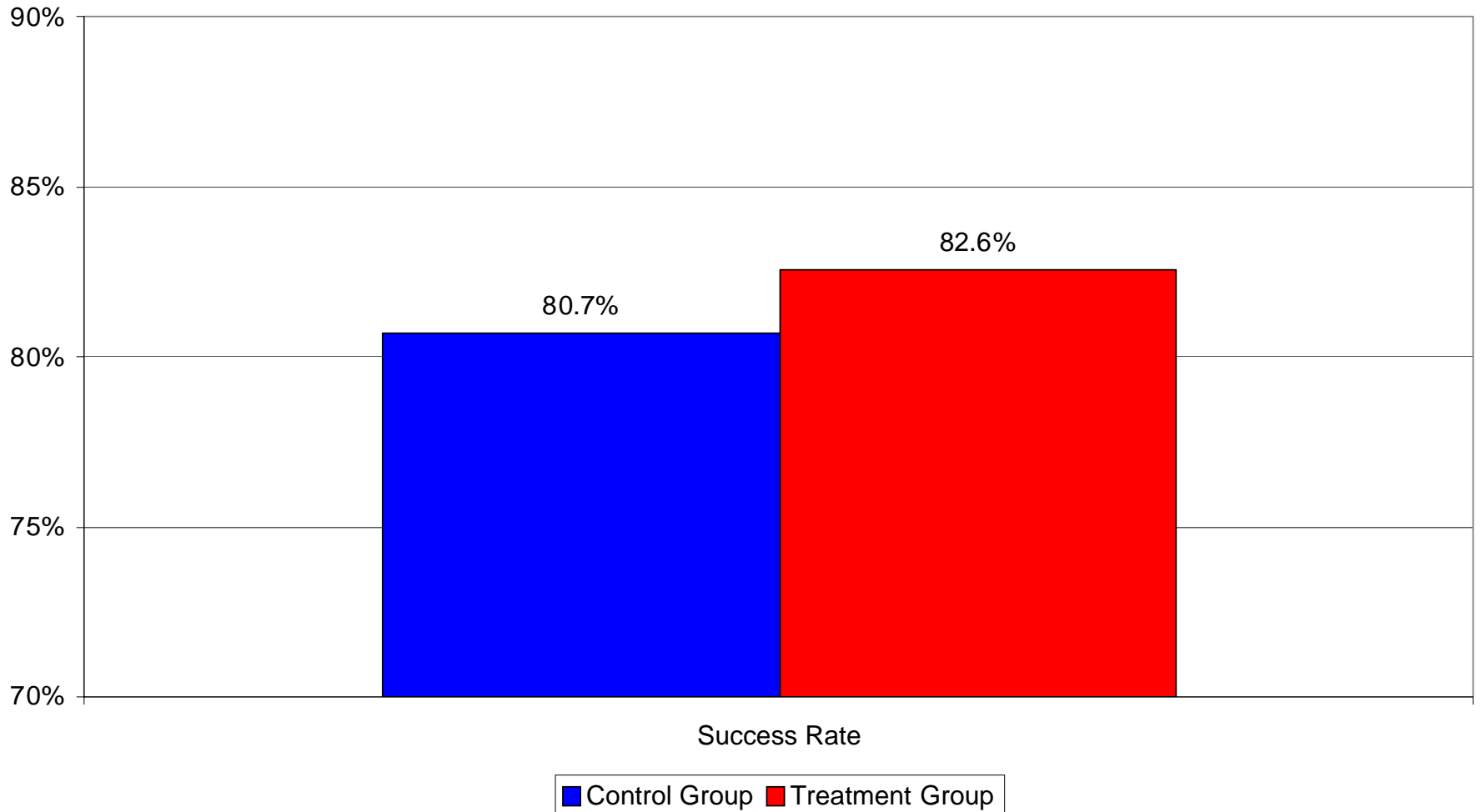
Students Taking Courses for Grades and CR vs. NC

Butte College Administrative Data (2006-08)



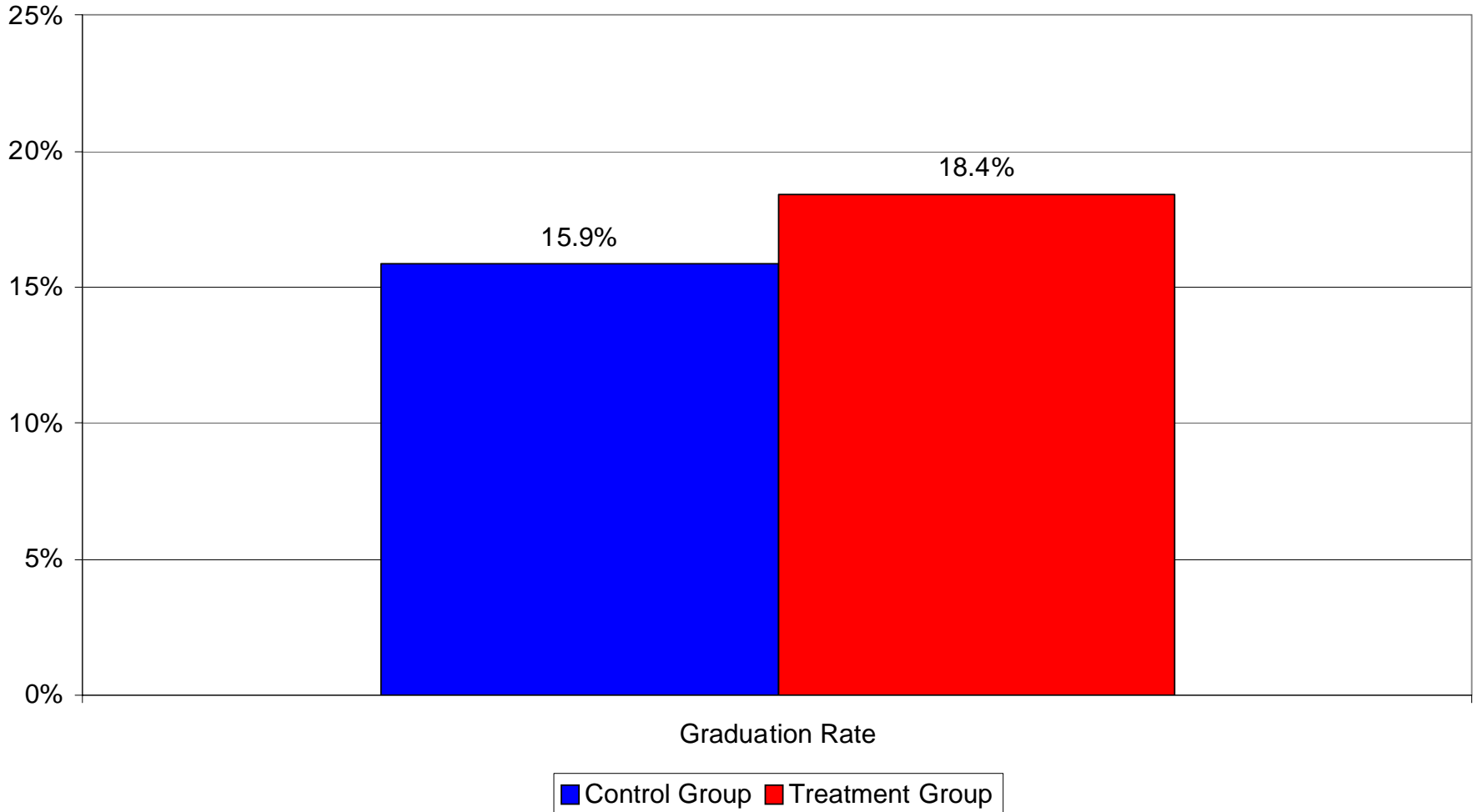
Course Success Rate

Butte College Administrative Data (2006-08)



Graduation Rates

Butte College Administrative Data (2006-08)





Minority Students

- Minority students winning free computers

Course success rate

11% higher

Graduation rate

15% higher

- No difference by gender



What Explains Positive Effects?

- Students winning free computers reported using computers more in total and for school
- Used more times in the day
- Reported having better computer skills
- Students living farther from campus benefitted more from winning a free computer



What Potentially Dampens the Effects?

- Overall students reported using for games, networking and other entertainment an average of nearly 3 hours per week
- Students winning free computers reported using computers more for games and entertainment (potentially dampening positive effects)
- Some evidence that non-gamers had positive effects, but no evidence of positive effects for gamers



New Research

- Chico Unified School District – 6-9th graders
- Computer Assisted Instruction in Brazil
- Maine's one-to-one laptop program



Conclusions

- Is there a Digital Divide in the U.S.?
 - Only half of African-Americans and Latinos have Internet access
 - Commerce Department's change from "Falling Through the Net" to "A Nation Online" in 2002 was premature
- Should we care about it?
 - Difference in consumer preferences or disparity in educational resources?
 - Non-experimental research and experimental research
 - Increasing importance? -- digitizing content, parental information, communication, teacher expectations
- Concerns
 - Experimental research shows more modest effects (more research)
 - Need to be careful with non-productive uses of computers
 - Technology may not be "Great Leveler" for educational inequality



Policy Conclusions

- Need to address financial, informational and technical constraints that limit investment in personal computers
- Policy implications: tax breaks, IDAs for educational computer purchases, and computer donation programs
- Refurbishing programs have a lot of potential
 - 15 million school-age children with no computers
 - Retired computers usually hauled off for recycling materials
 - \$2-4 per computer, but worth \$200-400
 - Environmental benefits