

# THE GRADUATE SCHOOL AS AN AGENT OF PROGRAMMATIC CHANGE:

## Ph.D. COMPLETION AT DUKE UNIVERSITY

### CGS Annual Meeting 2007

12/12/2007



Duke University Graduate School

# Faculty consensus on Graduate School goals and policies in early 1990's:

- ◆ Duke departments and programs should admit Ph.D. students based on their potential for highest quality scholarship rather than primarily to meet service needs of departments or faculty.
- ◆ Duke should provide adequate funding and minimize service requirements so that Ph.D. students can have time to be students and complete the degree in a reasonable period of time.

# Faculty consensus on Graduate School goals and policies in early 1990's:

- ◆ All aspects of the Graduate School should be as transparent as possible to faculty and students.
- ◆ The Graduate School should be a major reservoir of information to permit administration, faculty, and students to assess the relative quality of departments and programs over time. The Graduate School should collect and publish data on student quality, progress to degree, job placements.
- ◆ The Graduate School should base allocation of funds to departments on rational criteria that provide incentives for improvements in quality of graduate programs.



# How does one assess Ph.D. program quality?

- Faculty reputation rankings
- External reviews by respected scholars
- Program selectivity and yield
- Input measures for students: Undergraduate institution, GPA, GRE
- Ability to win competitive merit fellowships
- Quality of Ph.D. placements
- High completion rates; low time to degree
- Research productivity: publications, citations

# THE GRADUATE SCHOOL COLLECTS DATA -- *A STUDY OF Ph.D. COMPLETION AT DUKE:*

Ph.D. cohorts from Fall 1991 through Fall 1995 were examined for each Duke degree granting program for

- ◆ % Completion (as of Fall 2004)
- ◆ Patterns of withdrawal from Ph.D. program
- ◆ Median Time to Degree
- ◆ Effect of Variables such as GRE scores, GPA, Race, Gender, and Merit Fellowship selection



# EFFECT OF GPA/GRE SCORES, J.B. DUKE FELLOWSHIP SELECTION, RACE, AND GENDER ON Ph.D. COMPLETION RATES (1991-95 Cohorts)

| <u>Type of Matriculant</u> | <u>Biol Sci</u> | <u>Phys Sci/<br/>Eng'g</u> | <u>Human/<br/>Soc Sci</u> | <u>Grad Sch</u> |
|----------------------------|-----------------|----------------------------|---------------------------|-----------------|
| All matriculants           | 73%             | 60%                        | 61%                       | 64%             |
| Low GPA (3.2-)             | 75%             | 60%                        | 60%                       | 63%             |
| High GPA (3.7+)            | 71%             | 65%                        | 60%                       | 64%             |
| Low GRE-V (590-)           | 75%             | 60%                        | 60%                       | 64%             |
| High GRE-V (710+)          | 65%             | 59%                        | 59%                       | 60%             |
| Low GRE-Q (590-)           | 70%             | ---                        | 60%                       | 63%             |
| High GRE-Q (710+)          | 72%             | 60%                        | 64%                       | 64%             |
| J.B.Duke Fellows           | 79%             | 70%                        | 69%                       | 73%             |
| African-American           | 83%             | 23%                        | 73%                       | 64%             |
| Males                      | 76%             | 60%                        | 62%                       | 65%             |
| Females                    | 67%             | 59%                        | 60%                       | 62%             |



## CONCLUSIONS (1):

- High GRE (V and Q) and high GPAs do not correlate well with Ph.D. completion in any field.

***---This conclusion should not have been surprising (but it was to many faculty) because the ability to complete the long course of Ph.D. study obviously involves many factors.***



# SOME FACTORS BELIEVED TO INFLUENCE SUCCESS IN GRADUATE STUDY

- ◆ Ability to Reason & Think Critically\*
- ◆ Knowledge of Subject Matter\*\*
- ◆ Creativity
- ◆ Motivation
- ◆ Persistence
- ◆ Ability to learn and function independently—  
understanding difference between undergraduate and  
graduate education
- ◆ Research ability
- ◆ Interpersonal & Communication (\*) Skills
- ◆ Financial Support
- ◆ Family & Personal Circumstances
- ◆ Perceived Opportunities for Employment
- ◆ Features of Graduate Experience (e.g., “fit” with faculty  
interests and program expectations, mentoring,  
integration into discipline and program)

## CONCLUSIONS (2):

- Duke faculty CAN pick students who are more likely to complete than the general population based on a close and critical reading of all application materials. In all fields, J.B.Duke fellowship awardees complete significantly more than others with similar high GRE scores and GPA's.



## CONCLUSIONS (3):

- CAREFUL SELECTION, TARGETED FELLOWSHIP SUPPORT AND GOOD MENTORING DO WORK: Duke's African-American Ph.D. students complete the degree at higher rates than the general population (and even the JB Duke scholars) in all fields except the Physical Sciences and Engineering (where the numbers are very low).



# INTERVENTIONS TO IMPROVE Ph.D. COMPLETION RATE AT DUKE AFTER 1995: BETTER INFORMED SELECTION BY FACULTY

- Reduce emphasis on GRE scores and GPA's – data show poor correlation with completion as Duke uses them
- Carefully read entire application: Emphasize demonstrated research experience
- Interview students before admitting them – campus visits and/or by telephone with international students



# INTERVENTIONS TO IMPROVE Ph.D. COMPLETION RATE AT DUKE AFTER 1995: BETTER INFORMED SELECTION BY STUDENTS (and FACULTY)

- Exchange information to learn “fit” rather than just sell program
- Transparency: Put on Web all Duke data on placement, time to degree, completion rates in each program – student should know what (s)he is getting into before undertaking Ph.D. study at Duke



## INTERVENTIONS TO IMPROVE Ph.D. COMPLETION RATE AT DUKE AFTER 1995: IMPROVED PROGRAMS

- Require structured teaching experiences for graduate TA's where career-appropriate
- Graduate school workshops in pedagogy and uses of instructional technology; expanded PFF program; Pathways to the Professoriate
- Field-specific symposia to introduce career options to Ph.D. students



# INTERVENTIONS TO IMPROVE Ph.D. COMPLETION RATE AT DUKE AFTER 1995: IMPROVED STUDENT FUNDING MECHANISMS

- Instituted 5-6 year funding guarantee in all A&S units; generally support to degree in sciences
- Sharply reduced student teaching loads; more fellowship in early years – Lab Science departments brought closer to Biomedical Sciences funding model
- Competitive summer research support introduced
- Changed the way funds for Ph.D. student support are allocated to A&S departments



# Allocation Formula for A&S Depts

- FTE are allocated to departments according to a set of criteria which provide positive incentives to improve graduate education in that department



# Allocation Formula for A&S Depts

- Departments compete for a fixed pool of FTE's available in each division
- *Factors used to determine FTE allocation:*
  - ◆ Number of graduate faculty in dept
  - ◆ Number of faculty supervising Ph.D.s
  - ◆ Relative Ph.D. completion rate
  - ◆ Student quality: number of competitive merit fellowship recipients
  - ◆ Number of Ph.D. students in years 1-5 (or 6) supported on external funds



# EFFECT OF INTERVENTIONS ON COMPLETION

12/12/2007



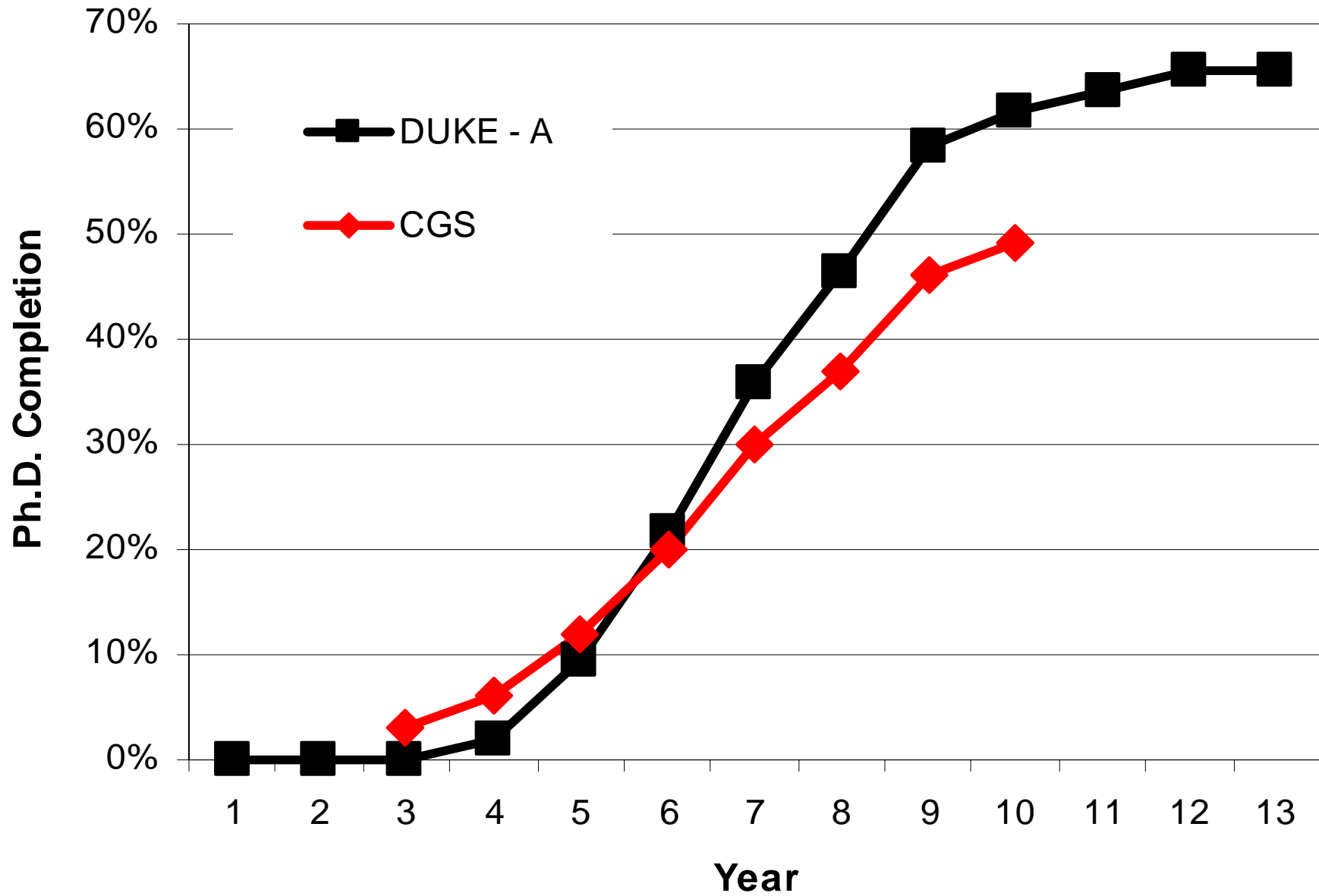
Duke University Graduate School

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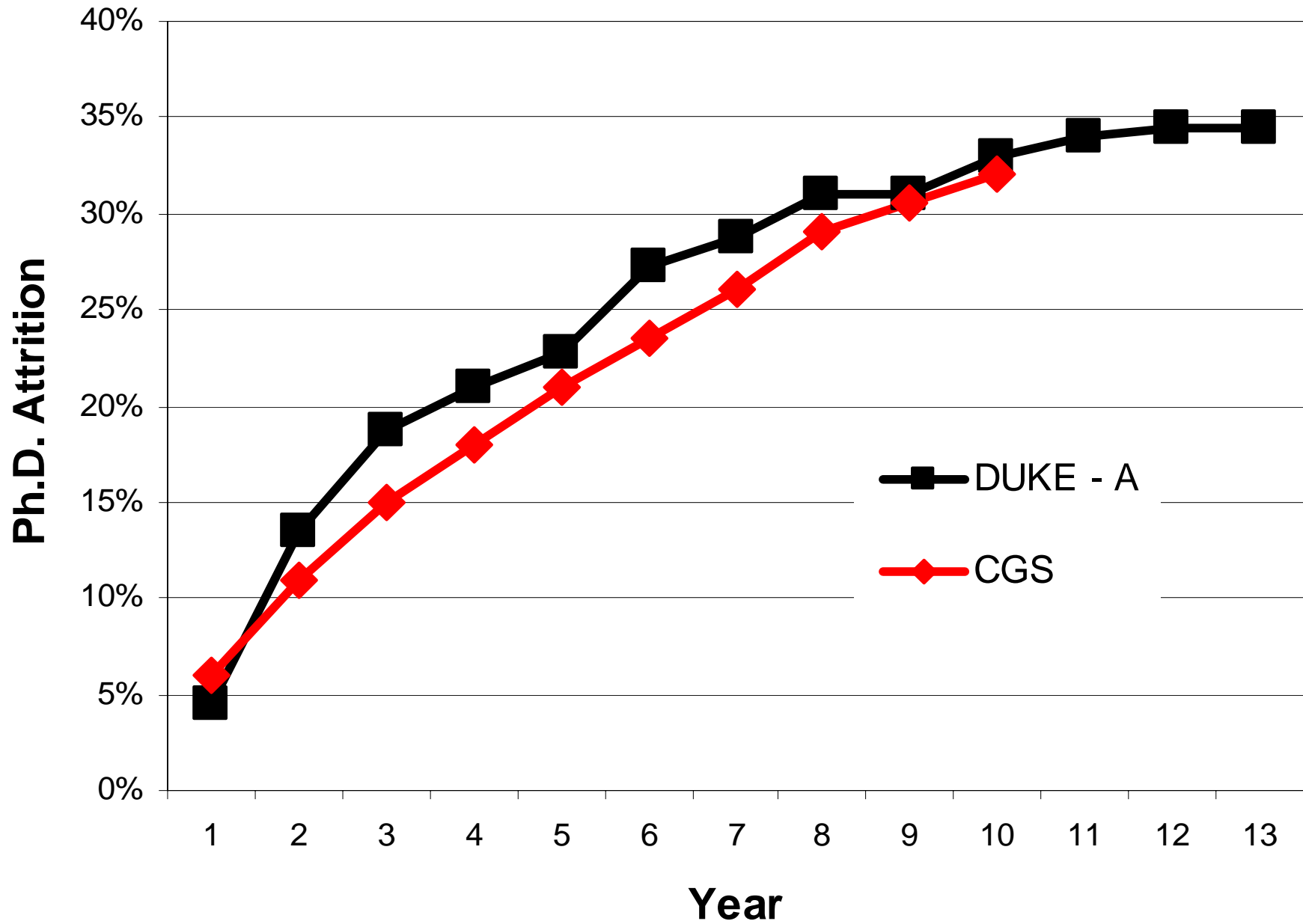
## DUKE vs. CGS: Cohorts A at 10 Years

| <b>DUKE vs. CGS: Cohorts A at 10 Years</b> |  |  |              |            |             |            |              |            |
|--|--|--|--------------|------------|-------------|------------|--------------|------------|
|  |  |  |              |            |             |            |              |            |
|  |  |  | % Completion |            | % Attrition |            | % Continuing |            |
|  |  |  | <u>Duke</u>  | <u>CGS</u> | <u>Duke</u> | <u>CGS</u> | <u>Duke</u>  | <u>CGS</u> |
|  |  |  |              |            |             |            |              |            |
| <b>Social Sciences</b>                     |  |  | 61           | 56         | 37          | 27         | 2            | 17         |
| <b>Humanities</b>                          |  |  | 62           | 49         | 33          | 31         | 5            | 20         |
| <b>Physical Sciences</b>                   |  |  | 61           | 55         | 38          | 37         | 1            | 8          |
| <b>Biological Sciences</b>                 |  |  | 74           | 63         | 26          | 26         | 1            | 11         |
| <b>Engineering</b>                         |  |  | 62           | 64         | 38          | 27         | 0            | 9          |
|  |  |  |              |            |             |            |              |            |

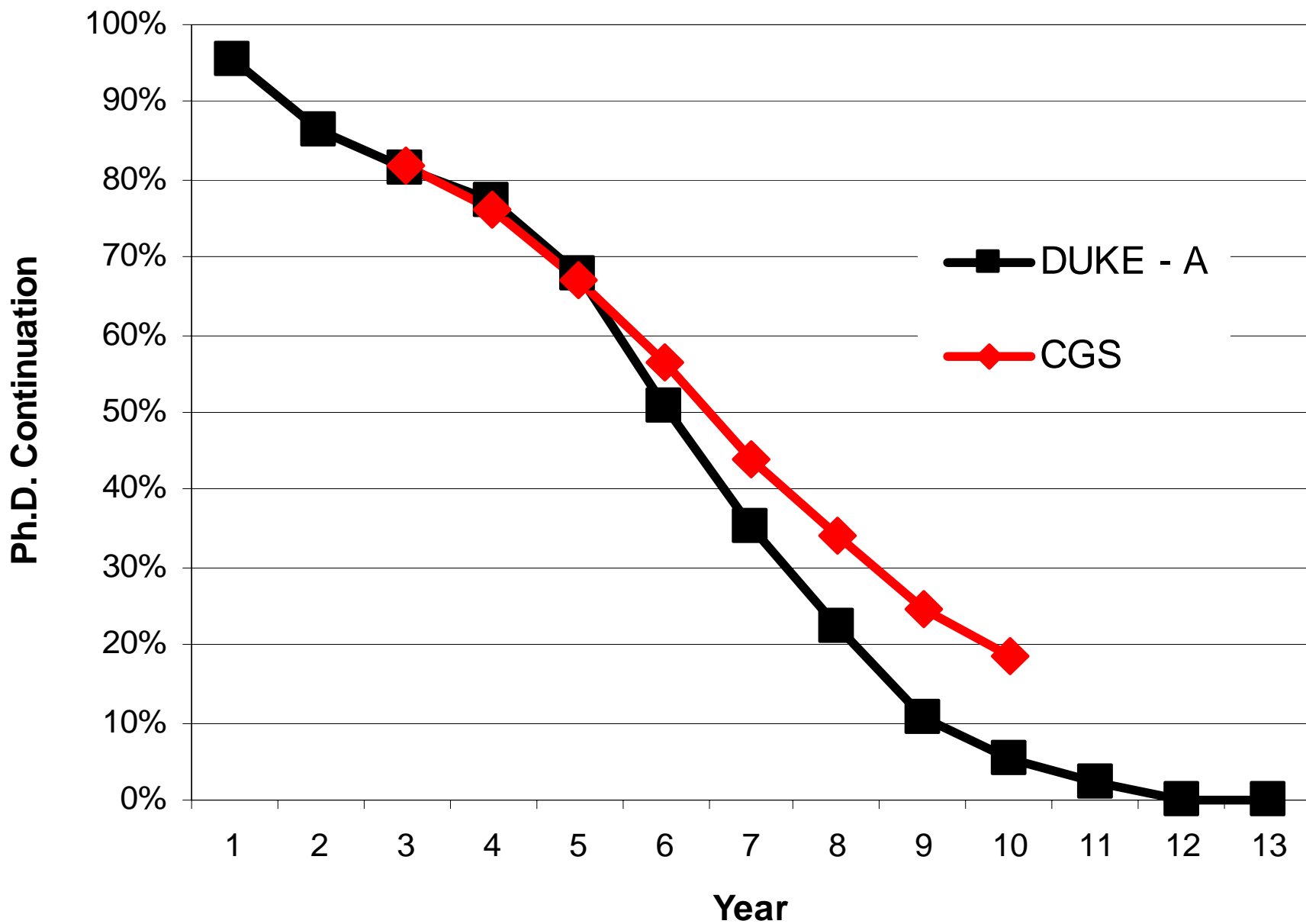
# HUMANITIES: Ph.D. COMPLETION



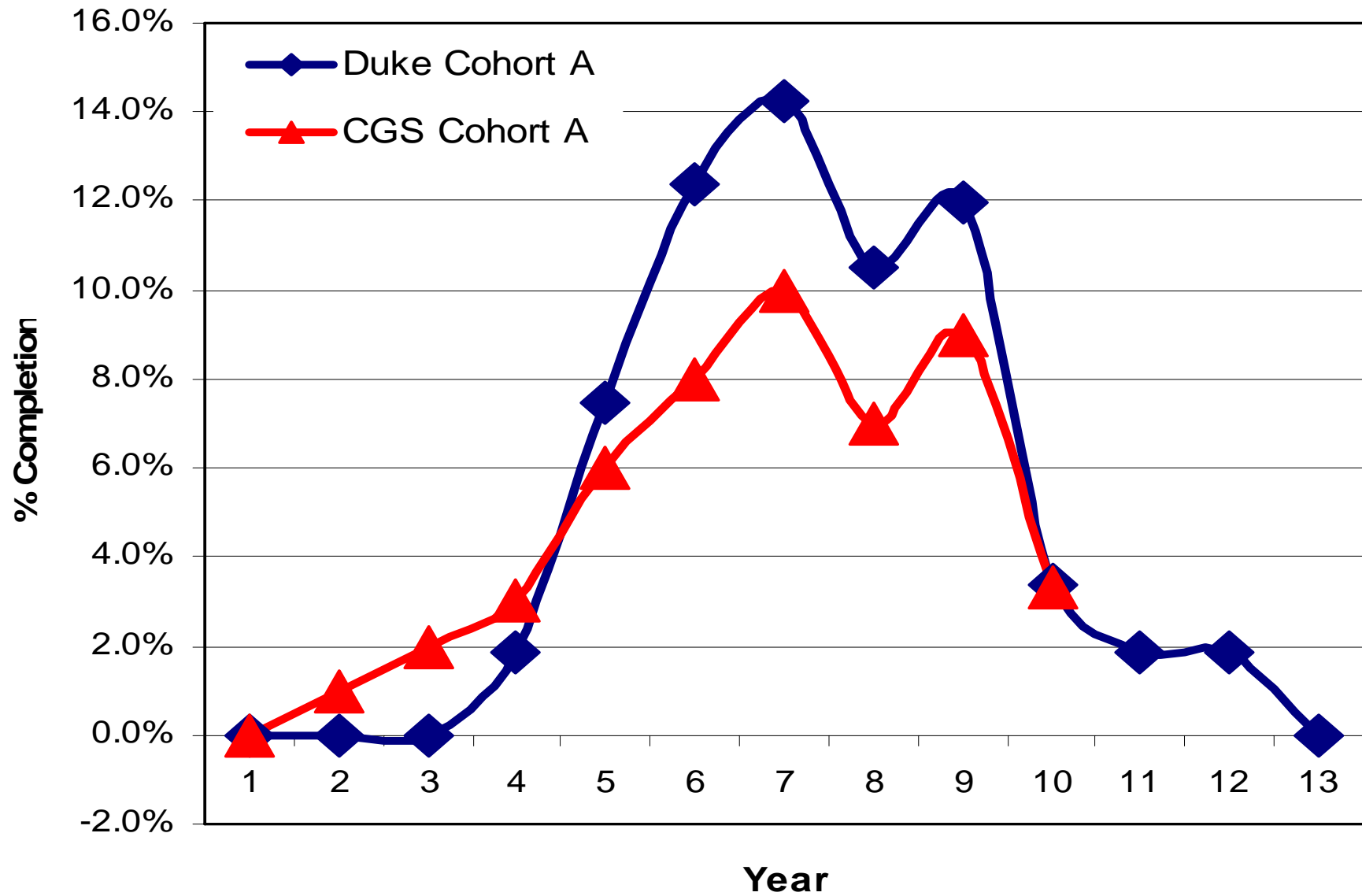
# HUMANITIES: Ph.D. ATTRITION



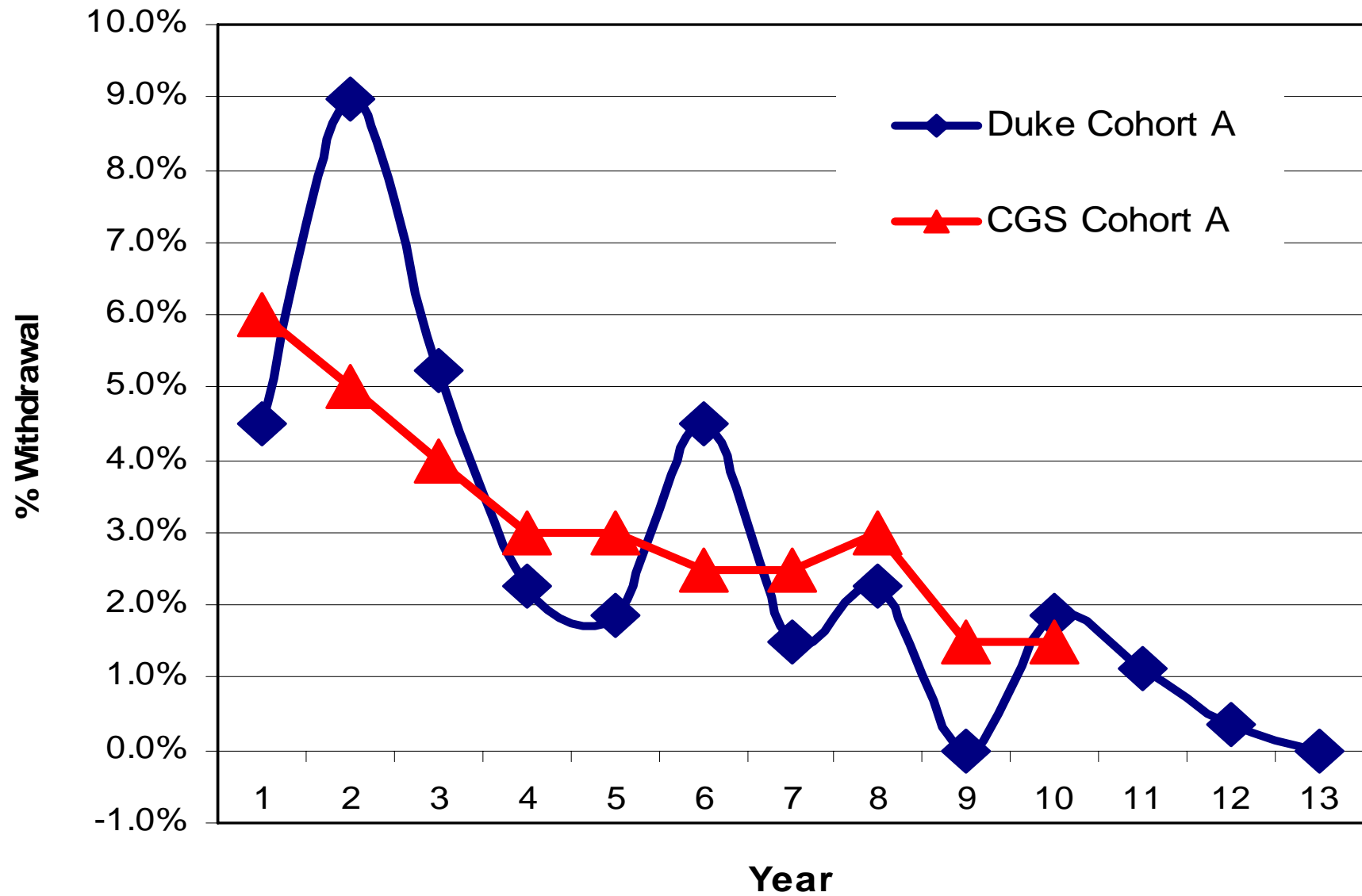
# HUMANITIES: Ph.D. CONTINUATION



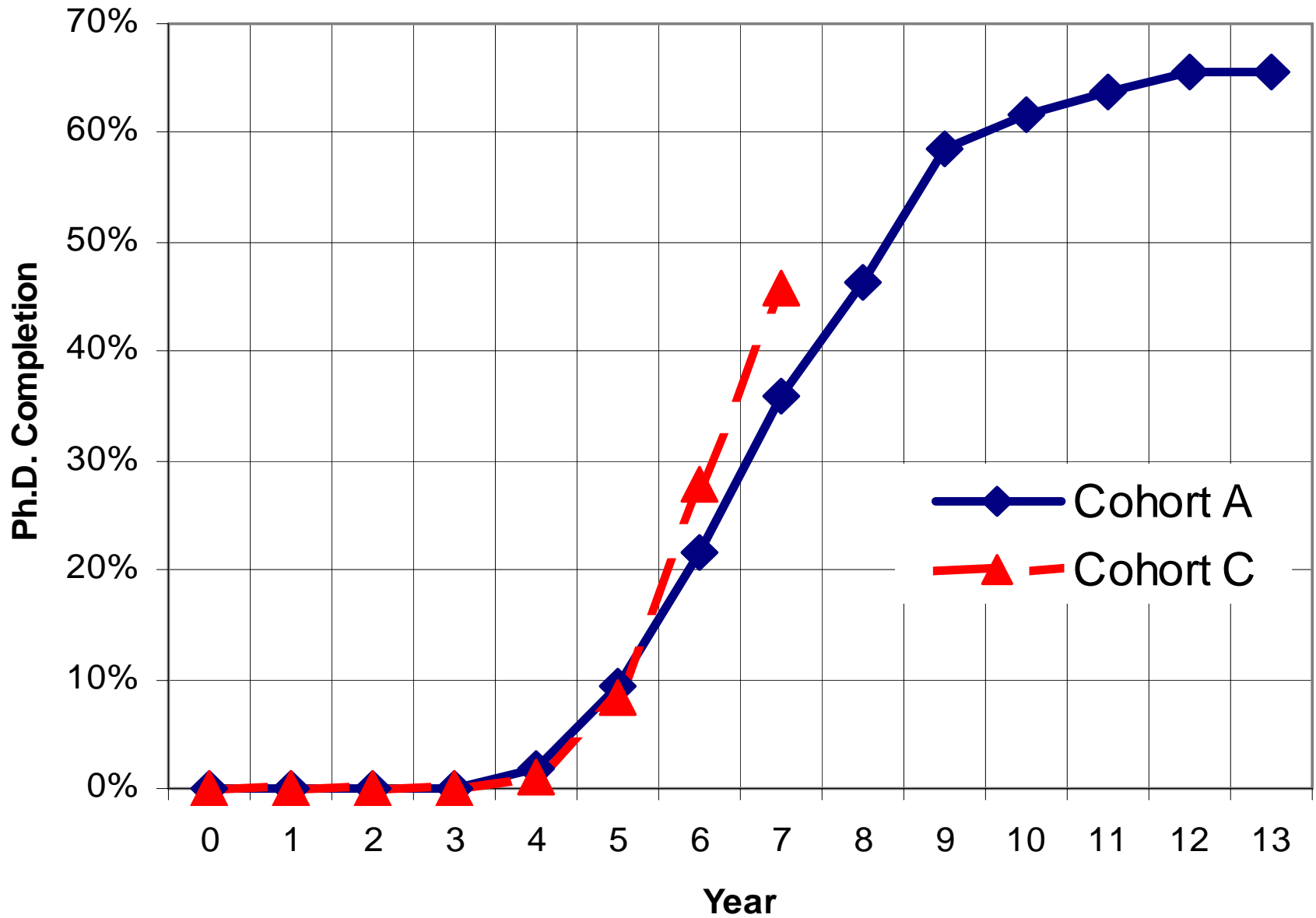
## Humanities: Annual Rate of Completion of Ph.D. Program



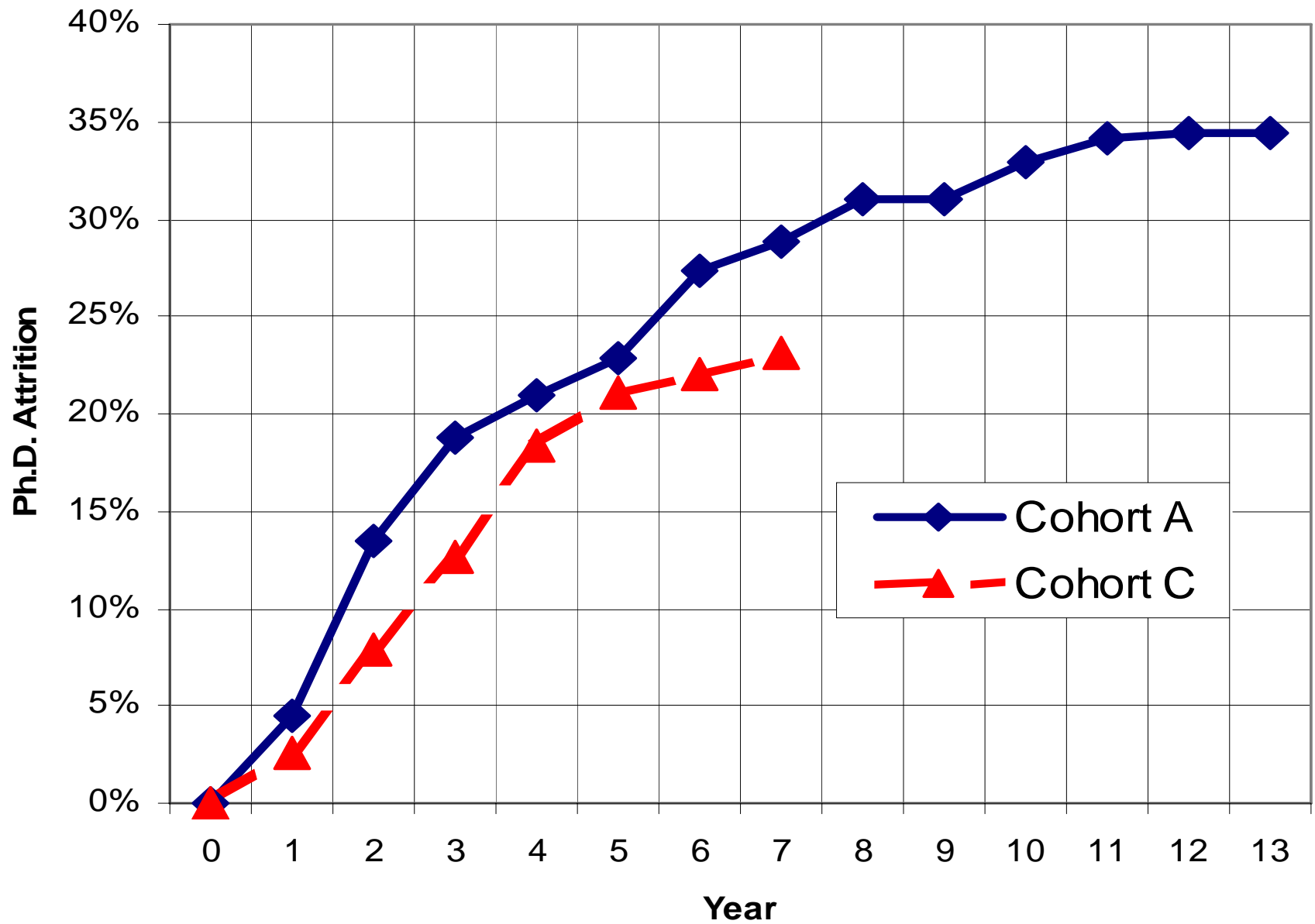
## Humanities: Annual Rate of Attrition from Ph.D. Program



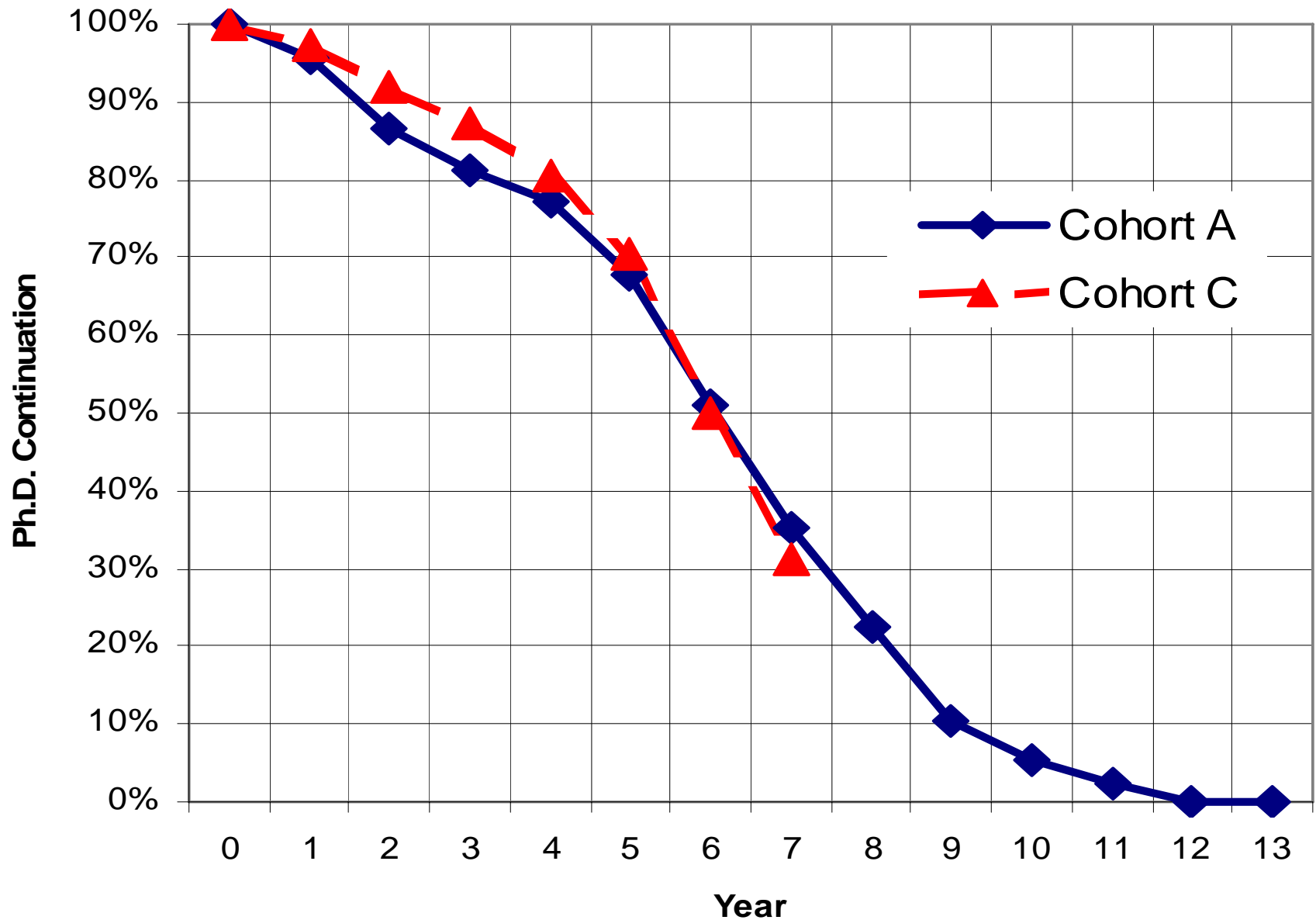
# HUMANITIES: DUKE University Ph.D. Completion Rates for Cohorts A and C



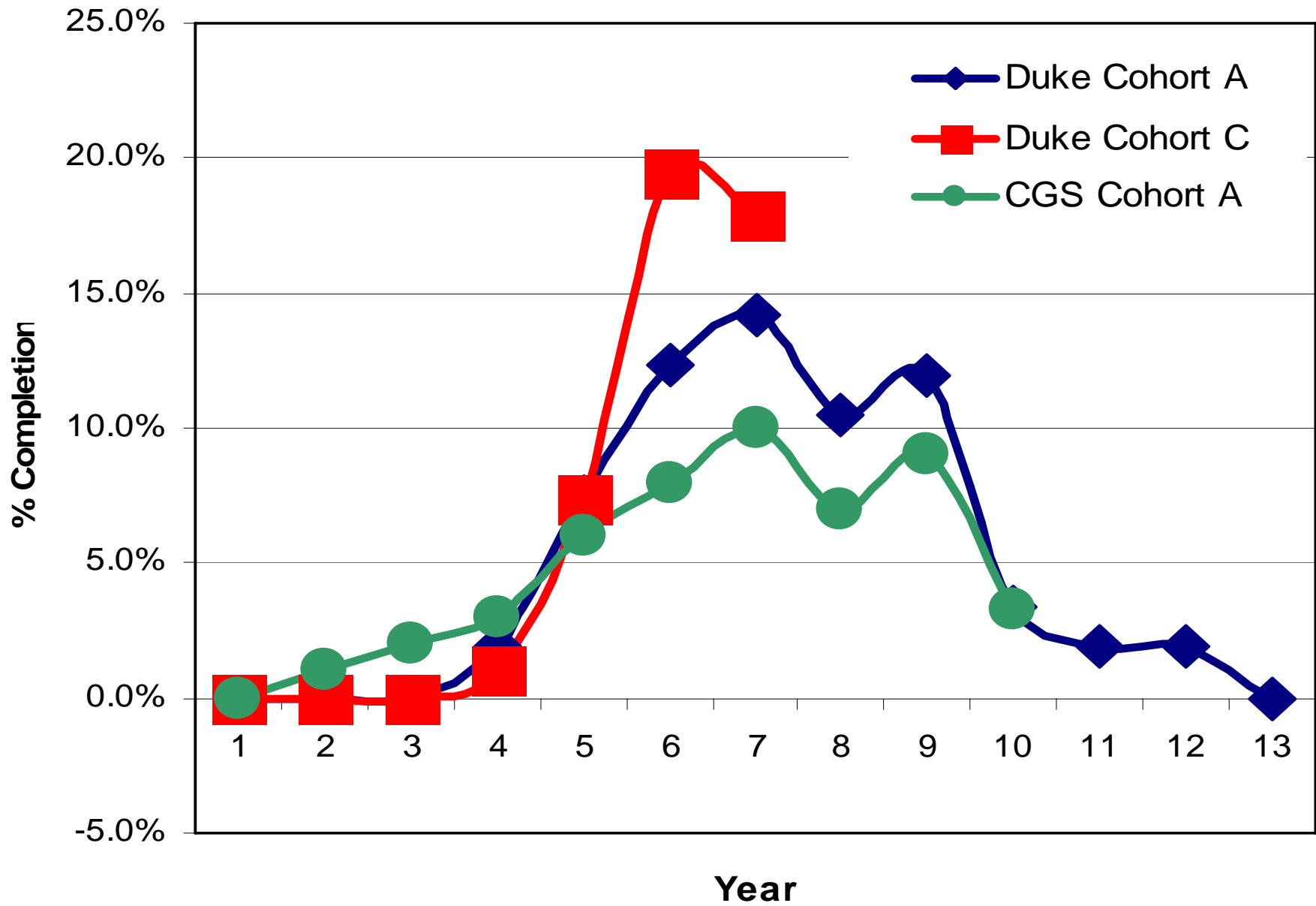
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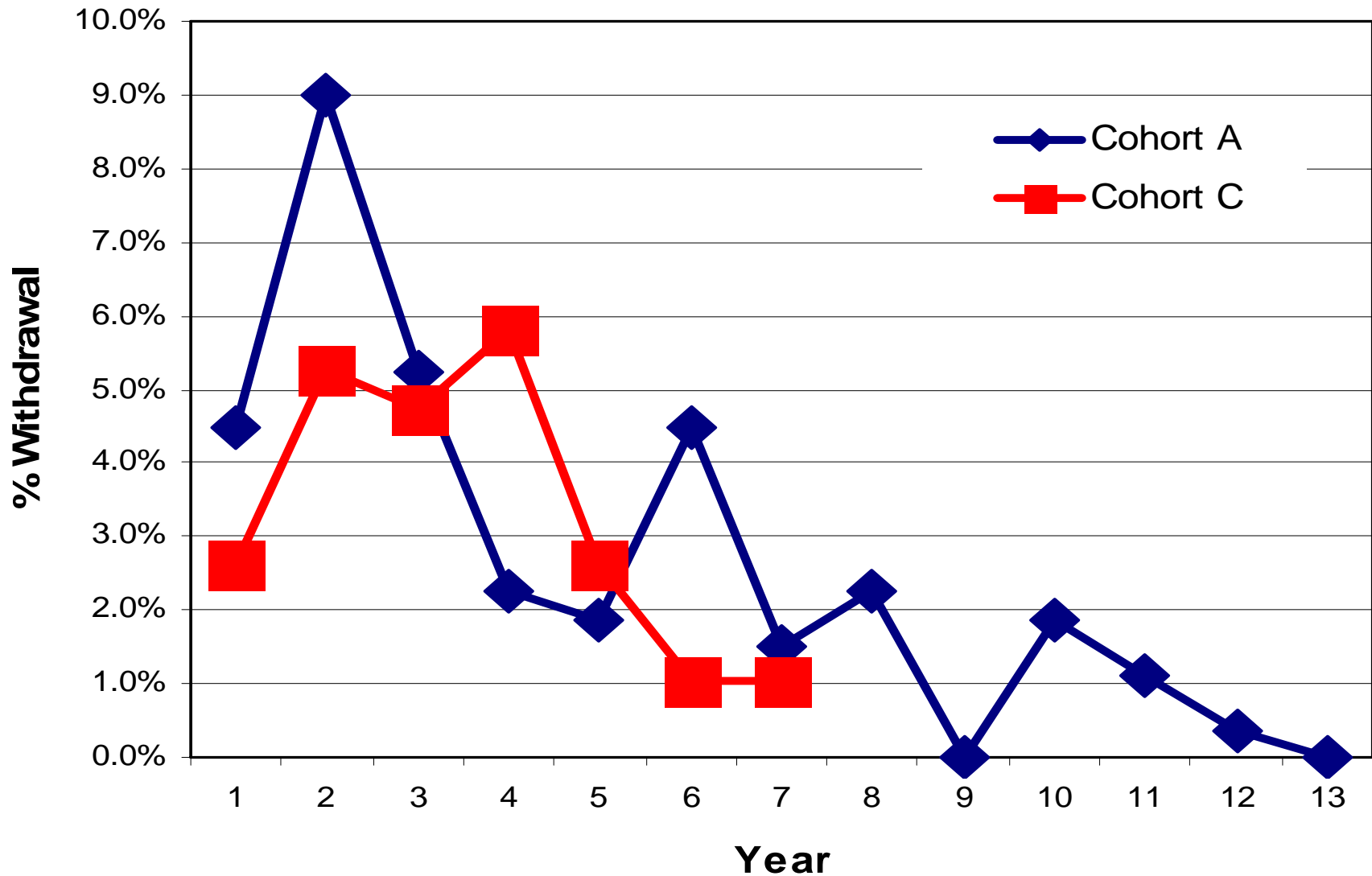
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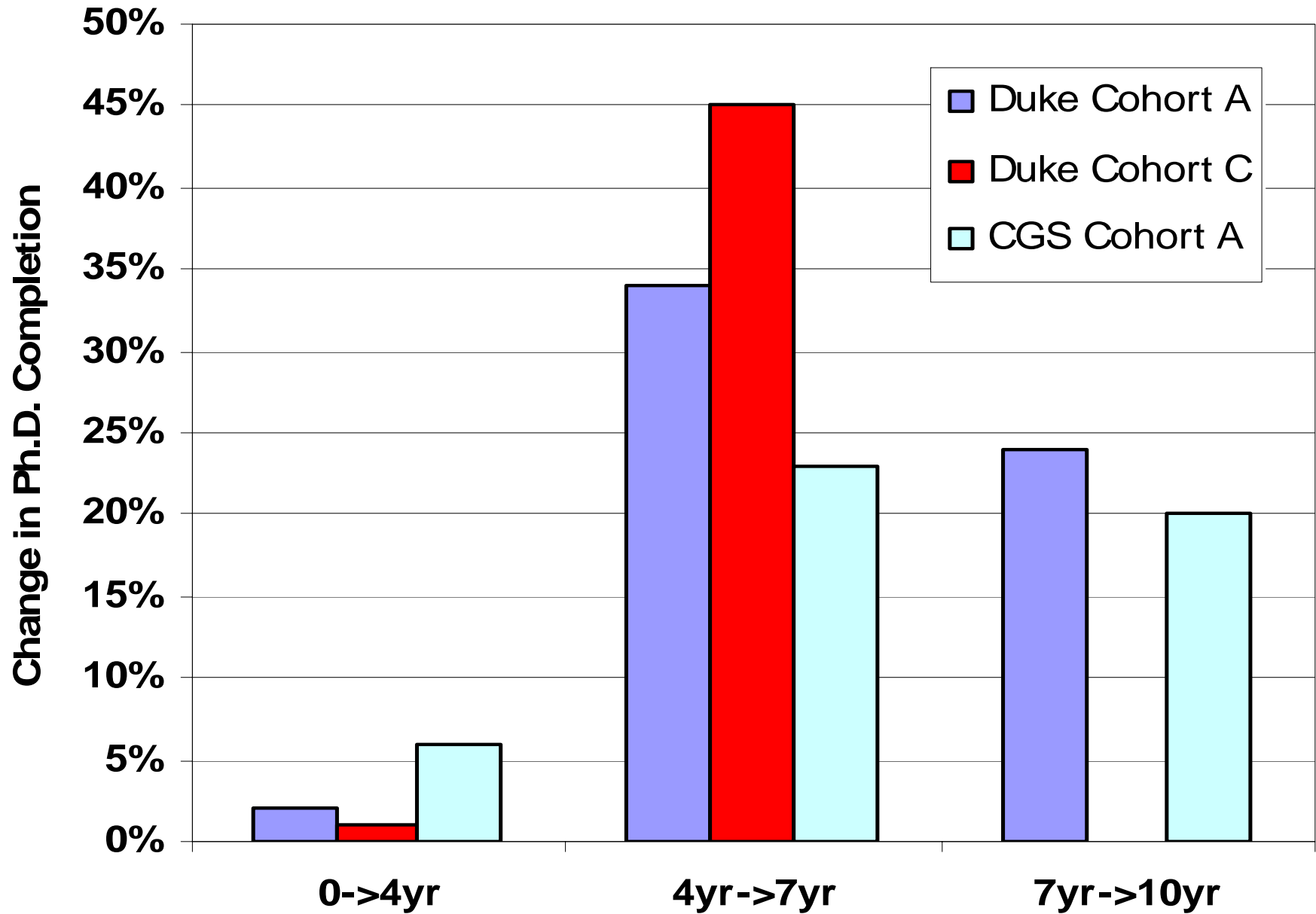
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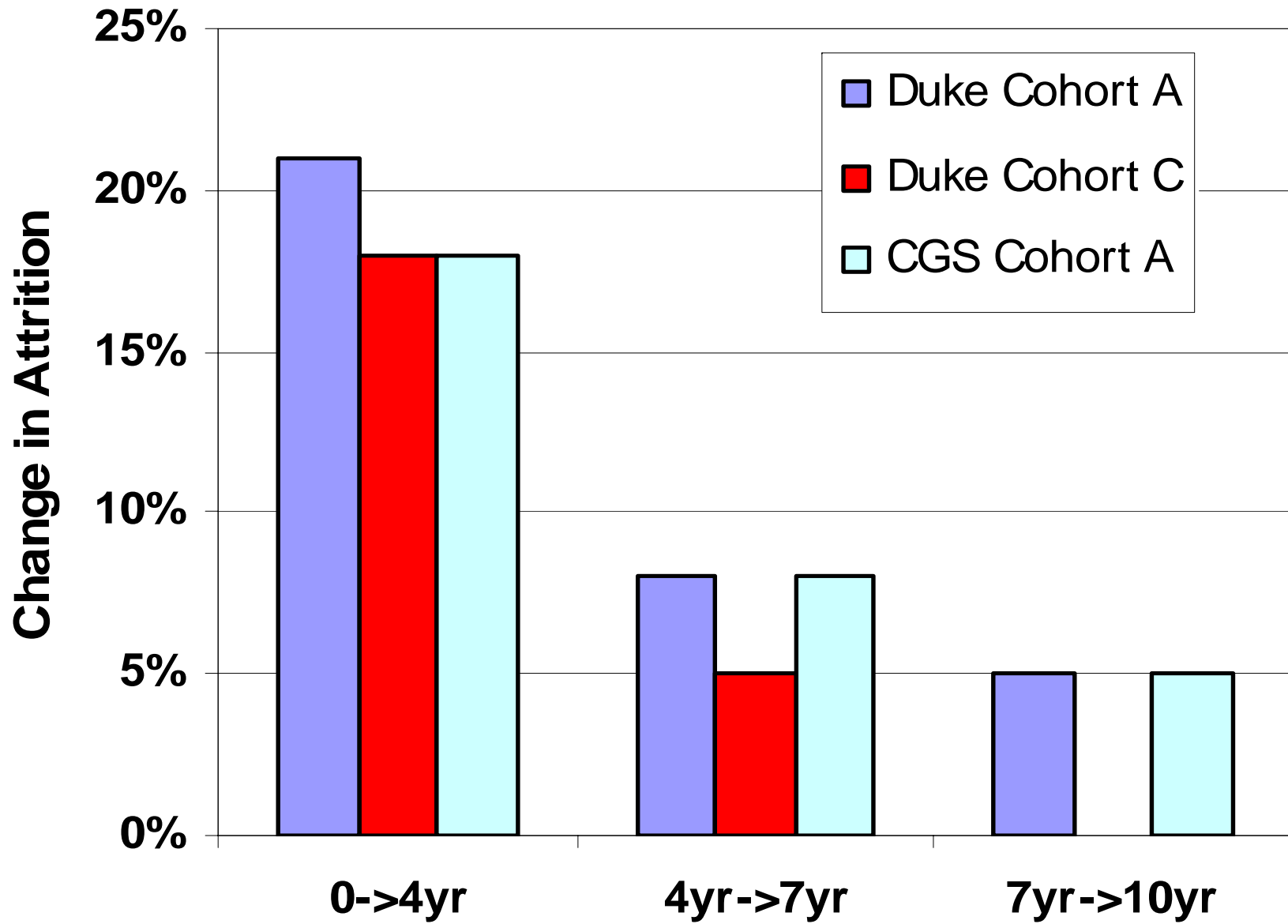
# Humanities: Annual Rate of Attrition from Ph.D. Program for Duke Cohorts A and C



## HUMANITIES Ph.D. COMPLETION: DUKE vs. CGS DATA



# HUMANITIES Ph.D. ATTRITION: DUKE vs. CGS DATA



# Increased 7 Yr. Completion, Reduced Attrition in Humanities

| <u>Program</u>    | <u>Matrics</u> | <b>1992-1994 Cohorts</b> |                  |              | <b>1998-2000 Cohorts</b> |             |                  |              |
|-------------------|----------------|--------------------------|------------------|--------------|--------------------------|-------------|------------------|--------------|
|                   |                | <u>%PhD</u>              | <u>%Withdraw</u> | <u>%Cont</u> | <u>Matrics</u>           | <u>%PhD</u> | <u>%Withdraw</u> | <u>%Cont</u> |
| History           | 55             | 24%                      | 24%              | 53%          | 30                       | 33%         | 37%              | 16%          |
| Religion          | 44             | 43%                      | 18%              | 39%          | 38                       | 50%         | 11%              | 39%          |
| English           | 40             | 37%                      | 33%              | 30%          | 23                       | 43%         | 22%              | 35%          |
| Romance Studies   | 31             | 32%                      | 39%              | 29%          | 24                       | 21%         | 25%              | 54%          |
| Literature        | 27             | 48%                      | 11%              | 41%          | 24                       | 46%         | 21%              | 33%          |
| Music             | 17             | 35%                      | 47%              | 18%          | 17                       | 65%         | 18%              | 18%          |
| Classics          | 15             | 40%                      | 53%              | 7%           | 10                       | 50%         | 50%              | 0%           |
| Philosophy        | 12             | 50%                      | 17%              | 33%          | 11                       | 64%         | 27%              | 9%           |
| Other Small       | 26             | 23%                      | 38%              | 18%          | 13                       | 31%         | 15%              | 54%          |
| <b>HUMANITIES</b> | <b>267</b>     | <b>35%</b>               | <b>29%</b>       | <b>36%</b>   | <b>190</b>               | <b>46%</b>  | <b>23%</b>       | <b>31%</b>   |

## Increased 7 Yr. Completion, Reduced Attrition in Social Sciences - - ECONOMICS UNCHANGED

| <u>Program</u>         | 1992-1994 Cohorts |             |                  |              |  | 1998-2000 Cohorts |             |                  |              |  |
|------------------------|-------------------|-------------|------------------|--------------|--|-------------------|-------------|------------------|--------------|--|
|                        | <u>Matrics</u>    | <u>%PhD</u> | <u>%Withdrew</u> | <u>%Cont</u> |  | <u>Matrics</u>    | <u>%PhD</u> | <u>%Withdrew</u> | <u>%Cont</u> |  |
| Economics              | 69                | 55%         | 41%              | 4%           |  | 55                | 56%         | 40%              | 4%           |  |
| Psychology             | 41                | 78%         | 15%              | 7%           |  | 31                | 74%         | 13%              | 13%          |  |
| Political Science      | 37                | 24%         | 32%              | 43%          |  | 41                | 56%         | 22%              | 22%          |  |
| Sociology              | 24                | 25%         | 50%              | 25%          |  | 25                | 52%         | 44%              | 4%           |  |
| Business               | 21                | 71%         | 29%              | 0%           |  | 26                | 88%         | 8%               | 4%           |  |
| Cult Anthropology      | 19                | 42%         | 42%              | 16%          |  | 14                | 43%         | 29%              | 29%          |  |
| <b>SOCIAL SCIENCES</b> | <b>211</b>        | <b>51%</b>  | <b>34%</b>       | <b>15%</b>   |  | <b>192</b>        | <b>63%</b>  | <b>27%</b>       | <b>10%</b>   |  |

# Relatively Little Change at 7 Yr. in STEM Fields---

## Improvement in High TA Programs, but ENV and EOS Get Worse

| <u>Program</u>          | 1992-1994 Cohorts |             |                  |              |  | 1998-2000 Cohorts |             |                  |              |  |
|-------------------------|-------------------|-------------|------------------|--------------|--|-------------------|-------------|------------------|--------------|--|
|                         | <u>Matrics</u>    | <u>%PhD</u> | <u>%Withdrew</u> | <u>%Cont</u> |  | <u>Matrics</u>    | <u>%PhD</u> | <u>%Withdrew</u> | <u>%Cont</u> |  |
| Biomedical Sciences     | 177               | 67%         | 21%              | 18%          |  | 176               | 66%         | 23%              | 17%          |  |
| A&S Biology             | 74                | 53%         | 36%              | 12%          |  | 58                | 71%         | 22%              | 7%           |  |
| Environment             | 32                | 75%         | 19%              | 6%           |  | 34                | 50%         | 38%              | 12%          |  |
| <b>BIOLOGICAL SCIEN</b> | <b>273</b>        | <b>64%</b>  | <b>25%</b>       | <b>11%</b>   |  | <b>278</b>        | <b>63%</b>  | <b>27%</b>       | <b>10%</b>   |  |
| Chemistry               | 51                | 65%         | 31%              | 4%           |  | 63                | 75%         | 22%              | 3%           |  |
| Physics                 | 41                | 62%         | 35%              | 3%           |  | 40                | 58%         | 35%              | 7%           |  |
| Computer Science        | 37                | 51%         | 43%              | 5%           |  | 48                | 48%         | 46%              | 6%           |  |
| Math                    | 22                | 45%         | 50%              | 5%           |  | 30                | 60%         | 27%              | 13%          |  |
| Statistics              | 18                | 78%         | 22%              | 0%           |  | 19                | 79%         | 21%              | 0%           |  |
| Earth & Ocean Sci       | 15                | 53%         | 47%              | 0%           |  | 11                | 45%         | 55%              | 0%           |  |
| <b>PHYSICAL SCIENCE</b> | <b>184</b>        | <b>60%</b>  | <b>36%</b>       | <b>4%</b>    |  | <b>211</b>        | <b>62%</b>  | <b>32%</b>       | <b>6%</b>    |  |
| Biomedical Engineerin   | 41                | 75%         | 15%              | 10%          |  | 47                | 81%         | 13%              | 6%           |  |
| Mechanical Engineeri    | 47                | 62%         | 36%              | 2%           |  | 34                | 65%         | 15%              | 21%          |  |
| Electrical & Computel   | 38                | 53%         | 42%              | 5%           |  | 68                | 50%         | 44%              | 6%           |  |
| Civil & Environmental   | 34                | 35%         | 62%              | 3%           |  | 26                | 31%         | 65%              | 4%           |  |
| <b>ENGINEERING</b>      | <b>160</b>        | <b>58%</b>  | <b>37%</b>       | <b>5%</b>    |  | <b>175</b>        | <b>58%</b>  | <b>33%</b>       | <b>9%</b>    |  |

## 7 Year Completion Rate Increases for Graduate School

| <u>Program</u> | <u>Matrics</u> | <u>1992-1994 Cohorts</u> |                  |              | <u>1998-2000 Cohorts</u> |             |                  |              |
|----------------|----------------|--------------------------|------------------|--------------|--------------------------|-------------|------------------|--------------|
|                |                | <u>%PhD</u>              | <u>%Withdrew</u> | <u>%Cont</u> | <u>Matrics</u>           | <u>%PhD</u> | <u>%Withdrew</u> | <u>%Cont</u> |
| GRAD SCHOOL    | 1095           | 53%                      | 31%              | 16%          | 1046                     | 59%         | 28%              | 13%          |

# Data Can Lead to Change:

- Based on the results from Duke's completion data project, Engineering agreed that allocations for its departmental Ph.D. programs would be based on A&S factors and students given 1<sup>st</sup> year fellowships. Attrition has been reduced markedly.
- ***Reallocation of funds seen as fair by departments and programs – even when funding reduced.***
- Graduate School accepted as “honest broker” and catalyst for programmatic improvement: orientation, best practices, teacher training, research ethics, faculty mentoring, diversity, etc. “Now I realize why we need a Graduate School!”

