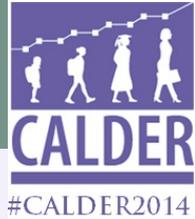




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Knocking on the Door to the Teaching Profession? Understanding the Front End of the Teacher Pipeline*

Dan Goldhaber¹, John Krieg², Roddy Theobald³

Center for Education Data & Research (www.cedr.us)

¹University of Washington Bothell, ²Western Washington University, ³University of Washington Seattle

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Working paper available at: [http://www.cedr.us/papers/working/CEDR%20WP%202013-2%20\(7.12.2013\).pdf](http://www.cedr.us/papers/working/CEDR%20WP%202013-2%20(7.12.2013).pdf)

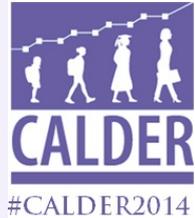


Student Teaching Project

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- This is part of a larger project linking student teaching experiences to workforce outcomes
- We collected data on interns who completed student teaching and received a teaching credential from universities that supply about one third of all new teachers in the state
 - Importantly, we observe interns who are *not* hired into the public teaching workforce
 - These data are linked to comprehensive data on the schools where interns did their student teaching and (if they enter the workforce) the schools where they begin teaching
 - We also have comprehensive individual-level data about each intern *and* the teacher who supervised each student teaching assignment

Examining the Front End of the Teacher Pipeline



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- “Policymakers and practitioners alike increasingly tout clinical experiences as a key component—even ‘the most important’ component of—preservice teacher preparation” (Anderson and Stillman, 2012)
- Teacher training programs have also come under increased scrutiny (e.g., NCTQ rankings) in recent years
- Existing research on the impact of pre-service experiences on teacher mobility and effectiveness focuses exclusively on teachers **who are already in the workforce**
- However, this misses a large subset of the sample of teacher training program graduates
 - Roughly twice as many teachers are produced by training institutions than are hired into public schools (Ingersoll, 2001)
 - In our sample, about 35% of teacher training graduates do not enter the WA state public teaching workforce during the years of our study



Motivations for Examining the Front End of the Teacher Pipeline

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- There are (at least) two consequences to ignoring teacher training program graduates who do **not** enter the workforce
 - Existing research has not investigated the experiences and characteristics that are correlated with the probability of getting a teaching job: something prospective teachers are very likely to care about!
 - Research that estimates the impact of pre-service experiences on workforce outcomes may suffer from sample selection bias if interns with different experiences and characteristics are more or less likely to enter the workforce

The Questions... and (Quick) Answers

1. What factors are correlated with entry into different workforce outcomes?

- More likely to enter into non-teaching roles: older interns, male interns, and interns endorsed in elementary ed (relative to STEM)
- More likely to become private school teachers: interns endorsed in elementary ed (relative to STEM and special education)

2. What factors are correlated with the timing and probability of entry into the public teaching workforce?

- More likely to enter the workforce, all else equal: younger interns; white interns; interns endorsed in STEM, special education, or ELL; interns who did their student teaching in suburban schools and schools with high teacher turnover
- Not correlated with workforce entry: cooperating teacher characteristics (including VAM estimates); intern licensure exam scores; undergraduate GPA

3. What factors are correlated with the probability of interns being hired into the same school where they did their student teaching?

- More likely to be hired by internship school: non-white interns (particularly in schools with many minority students); interns at schools with high teacher turnover; interns with higher licensure exam scores

Do Pre-Service Experiences Influence Teacher Mobility and Effectiveness?

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- A small literature (Boyd et al., 2009; Goldhaber et al., 2013; Koedel et al., 2012; Mihaly et al., 2013; Goldhaber & Cowen, 2013) examines the “impact” of teacher training programs on teacher mobility and effectiveness
 - There is disagreement in the literature about the magnitude of teacher training program effects
- An emerging literature (Boyd et al. 2008; Ronfeldt 2012; Ronfeldt et al. 2013) focuses on student teaching experiences
 - **Boyd et al. (2008):** Teachers who identify similarities between their student teaching experience and first-year classroom experiences tend to have larger student achievement gains
 - **Ronfeldt (2012):** Teachers who do their student teaching in “easier-to-staff schools” are more effective and stay in the workforce longer
 - **Ronfeldt et al. (2013):** Methods coursework and practice teaching have positive impact on preparedness and retention

Our Data: Teacher Training Interns

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- Six Washington state universities provided data on interns from their teaching training programs who completed student teaching in Washington state public schools, spanning a large range of internships years
 - This is a convenience sample of WA state training institutions
 - These universities graduate roughly one third of the teachers who enter the Washington state teaching workforce each year
 - Each institution offers more than one program
- Our final dataset contains the characteristics of each intern's student teaching school and—if the intern is hired into the workforce—the characteristics of the school where the intern first gets a classroom teaching position

Our Data: Individual Characteristics

- Our data cover a large range (98-09) of internship years
- Individual intern data include age, gender, race, and the endorsement area(s) on the intern's credential
- Subsets of interns can be linked to other variables:
 - Licensure exam (WEST-B) scores
 - Undergraduate GPA
 - Cooperating teacher's value-added estimate
- Our final dataset contains 8080 interns who completed student teaching by the end of the 2008-09 school year

Observed Employment Outcomes

- We observe four different potential employment outcomes for each intern
 - Employment as public school teacher
 - Employment as public school non-teacher
 - Employment as private school teacher
 - Not observed employed in a public or private school
- Some interns transition between these employment outcomes
 - But, in our exploratory analysis, we define employment outcome as each intern's first position (in public schools), or private school if the intern only appears in the private school data

Selected Summary Statistics: Individual Characteristics

	Public teaching	Private teaching	Public non-teaching	Not observed hired
FULL SAMPLE (N=8080)	N = 5218	N = 271	N = 185	N = 2406
Intern characteristics				
Age	27.96** (7.66)	27.60* (7.53)	30.18 (9.37)	29.06 (9.01)
Male	23.78%	14.02%**	34.05%**	22.98%
Non-white	8.80%	9.50%	8.11%	9.80%
Intern endorsement area				
STEM	13.97%**	6.27%	2.16%**	8.40%
Special education	13.11%**	0.37%**	6.49%	6.57%
ELL	5.39%	4.06%	5.41%	4.36%
Elementary	63.53%**	81.55%**	57.84%**	67.87%
Other	37.01%*	21.03%**	48.11%**	34.50%
WEST-B SAMPLE (N=4575)	N=2837	N=173	N=107	N=1458
Avg. WEST-B Score	272.14** (11.68)	272.18 (11.14)	267.03** (11.98)	270.75 (11.68)
GPA SAMPLE (N=4535)	N=2983	N=145	N=105	N=1302
Undergraduate GPA	3.21 (1.06)	3.46* (0.66)	3.29 (0.73)	3.24 (1.02)

*Significance levels for two-sided t-test relative to last column. *p<.05; **p<.01.

Internship School Characteristics

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- We also observe data on the characteristics of each intern's internship (student teaching) school
 - E.g., aggregated student characteristics, state test passing rates
- We calculate the **stay ratio** of each school as the average proportion of non-retirement age teachers who return to the school the following year (over a five year period)
 - Ronfeldt (2012) shows that this variable is correlated with other measures of school functionality, such as administrative quality, staff support, student behavior, and teacher safety
- We also calculate the number of prior interns that each school has hosted (observed), as well as the number of new (to the school) teachers hired by each school the following year

Selected Summary Statistics: Internship School Characteristics

	Public teaching	Private teaching	Public non-teaching	Not observed hired
FULL SAMPLE (N=8080)	N = 5218	N = 271	N = 185	N = 2406
Internship school characteristics				
Percent minority students	21.04** (17.46)	21.07 (15.49)	22.03 (16.47)	22.74 (17.88)
Percent FRL students	34.35** (20.61)	35.54 (19.72)	37.67 (19.44)	37.91 (20.64)
Standardized Avg. Passing Rate	0.28** (0.83)	0.32 (0.85)	0.26 (0.81)	0.22 (0.84)
Standardized Stay Ratio	-0.20** (0.60)	-0.20* (0.67)	-0.14 (0.71)	-0.12 (0.66)
Number prior observed interns	7.68** (12.13)	11.42* (15.75)	10.74 (18.39)	9.34 (13.53)
Number new teachers hired next year	1.21** (1.54)	0.88 (1.24)	1.01 (1.31)	0.93 (1.29)

*Significance levels for two-sided t-test relative to last column. *p<.05; **p<.01.

Cooperating Teacher Characteristics

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- Finally, we collect data on each intern's cooperating teacher
 - E.g., age, experience in the state, gender, degree level
- We create indicators for whether each intern shares the same gender or endorsement area as his or her cooperating teacher
- We also calculate the number of prior interns each cooperating teacher has supervised (observed)

Selected Summary Statistics: Cooperating Teacher Characteristics

	Public teaching	Private teaching	Public non-teaching	Not observed hired
FULL SAMPLE (N=8080)	N = 5218	N = 271	N = 185	N = 2406
Cooperating teacher characteristics				
Age	44.95* (9.70)	45.10 (10.05)	44.30 (9.77)	45.49 (9.81)
Experience	15.02 (8.59)	15.16 (9.13)	14.54 (8.23)	15.15 (8.74)
Number prior observed interns	0.38** (0.93)	0.66* (1.17)	0.46 (1.01)	0.51 (1.12)
Male	23.34%	13.28%**	32.43%**	22.32%
Master's degree	60.94%*	60.15%	56.22%	63.42%
Gender match	71.90%	81.18%**	73.51%	73.65%
Endorsement match	77.27%	75.65%	75.14%	79.14%

*Significance levels for two-sided t-test relative to last column. *p<.05; **p<.01.

Modeling Entry Into the Public Teaching Workforce

- We next restrict our attention to public school hiring and model entry into the public teaching workforce
- This raises three related issues
 1. For interns we observe as hired, there is considerable heterogeneity in the time from graduation to first job
 2. Our data are right-censored; i.e., some interns we observe as “not hired” may be hired after our last year of teacher observations
 3. Many interns never become K-12 teachers and never would become K-12 teachers even in the absence of censoring
- Issues 1 and 2 violate the assumptions of logit models, while issue 3 violates the assumptions of hazard models

Split Population Models

- Split-population models simultaneously estimate the impact of covariates on the timing and probability of an event
 - They explicitly account for the possibility that some individuals have a hazard of zero; i.e. those interns who will never have a public K-12 job, either because they choose not to pursue a job or because they will never be hired
- A split-population formulation of job placement is “stylized” because it assumes that interns make a one-time decision whether or not to pursue a teaching position (Swaim and Podgursky, 1994)
 - This rules out intentional delays to entering the teacher workforce
 - BUT a single-population survival analysis approach makes the even less realistic assumption that all interns who complete student teaching decide to pursue and will ultimately receive a teaching job.

What Does Seem to Matter for Hiring (All Else Equal)?

- **Endorsement area**
 - Interns endorsed in STEM, special education, and ELL are more likely to be hired, and are hired more quickly, than interns endorsed in elementary ed
- **Age**
 - An intern entering the job market at age 38 is 2.8 percentage points less likely to be hired after 1 year, and 4.6 percentage points less likely after 5 years, than an intern entering the job market at age 28 (the mean)
- **Race**
 - A non-white intern is 1.2 percentage points less likely to be hired after 1 year, and 5.6 percentage points less likely after 5 years, than a white intern
- **Internship school**
 - Interns who do their student teaching in schools with more teaching turnover (lower stay ratio) are more likely to be hired
 - This raises the possibility of selection bias in Ronfeldt (2012)
- **Cooperating Teacher Prior Intern Experience**
 - Interns with cooperating teachers who have supervised more interns in the past are less likely to be hired

Non-white finding

- Race/ethnicity findings are puzzling; contrary to rhetoric about diversifying the teacher workforce and existing empirical evidence (Boyd et al., 2011)
- We dig deeper and find that non-white interns are less likely to be hired, all else equal, regardless of:
 - Training institution
 - Internship school geographic location (with the exception of the eastern half of the state)
 - Individual race/ethnicity (only Asian and American Indian are statistically significant, but all are negative relative to white)
 - Inclusion of internship district-by-year fixed effects
 - Controls for academic proficiency (credential exam score and GPA)
- It is not clear if this is driven by preferences of hiring employees or prospective teachers

What Does Not Seem to Matter for Hiring?

- **Measures of academic proficiency**
 - We do not observe any correlation between licensure exam score or intern GPA and the probability or timing of hire
- **Cooperating teacher characteristics**
 - No observable cooperating teacher characteristics (other than prior experience with interns) are correlated with the probability or timing of hire
 - For cooperating teachers with VAM estimates, there is a positive but not statistically significant correlation between cooperating teacher VAM and probability of hire

Hiring Into Internship School

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- 15.4% of interns hired into public schools are hired into the same school where they did their student teaching
- We estimate logit models predicting hiring into internship school (relative to hiring into another public school)
 - We limit the data to interns who student taught at a school that hired at least one new (to the school) teacher the following year
- Interns who share an endorsement area with their cooperating teacher are more likely to be hired into their internship school, as are interns with higher credential exam scores

Conclusions

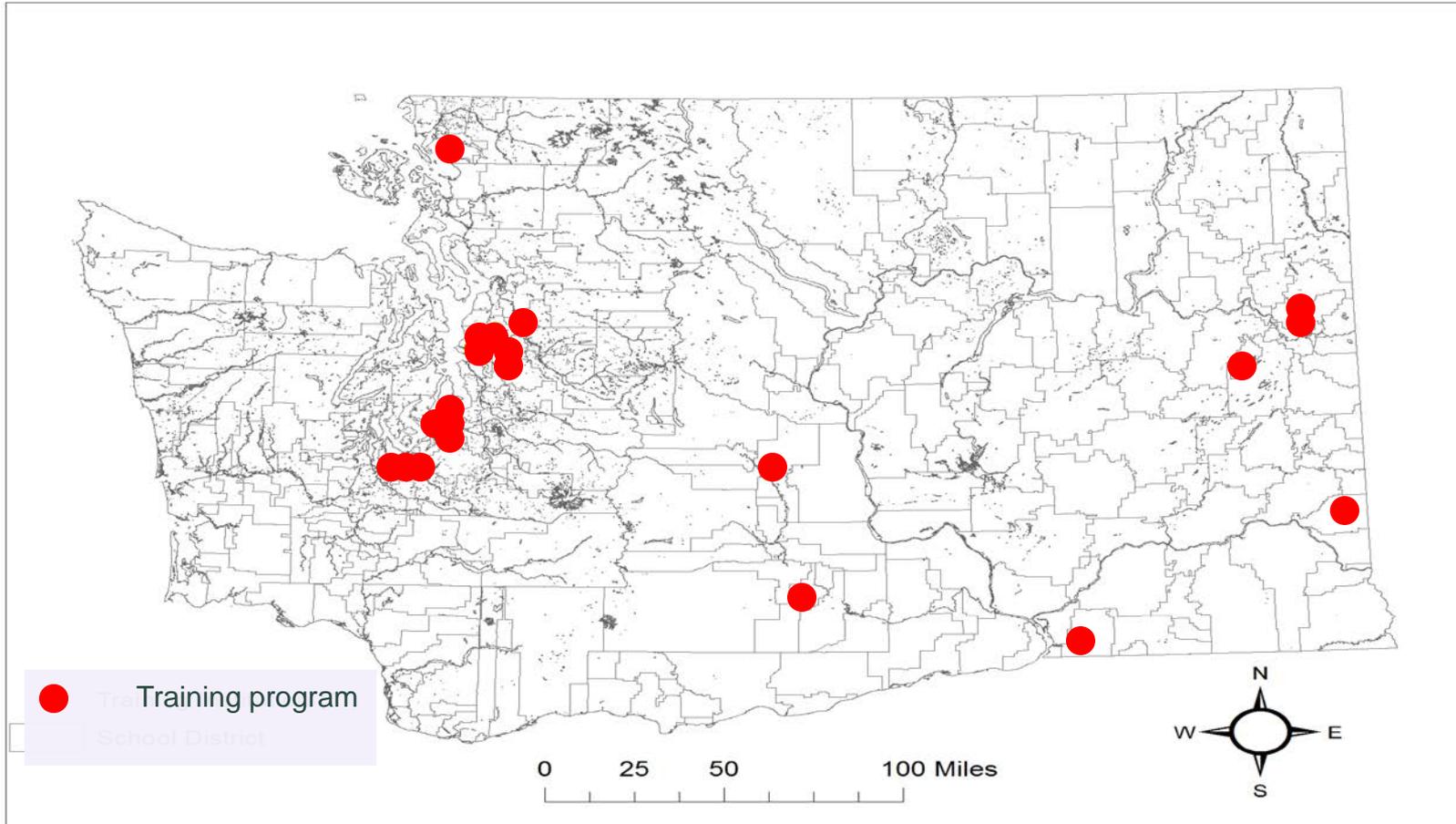
- Intern endorsement area clearly matters in terms of job prospects
- High credential exam scores are not predictive of hiring in general, but are predictive of hiring into one's internship school
 - These test scores may be correlated with attributes observable through student teaching, but perhaps not through the general job application process (schools generally do not ask for these scores)
- The negative correlation between prior experience of cooperating teachers supervising interns and probability of hire may merit further investigation

Next steps

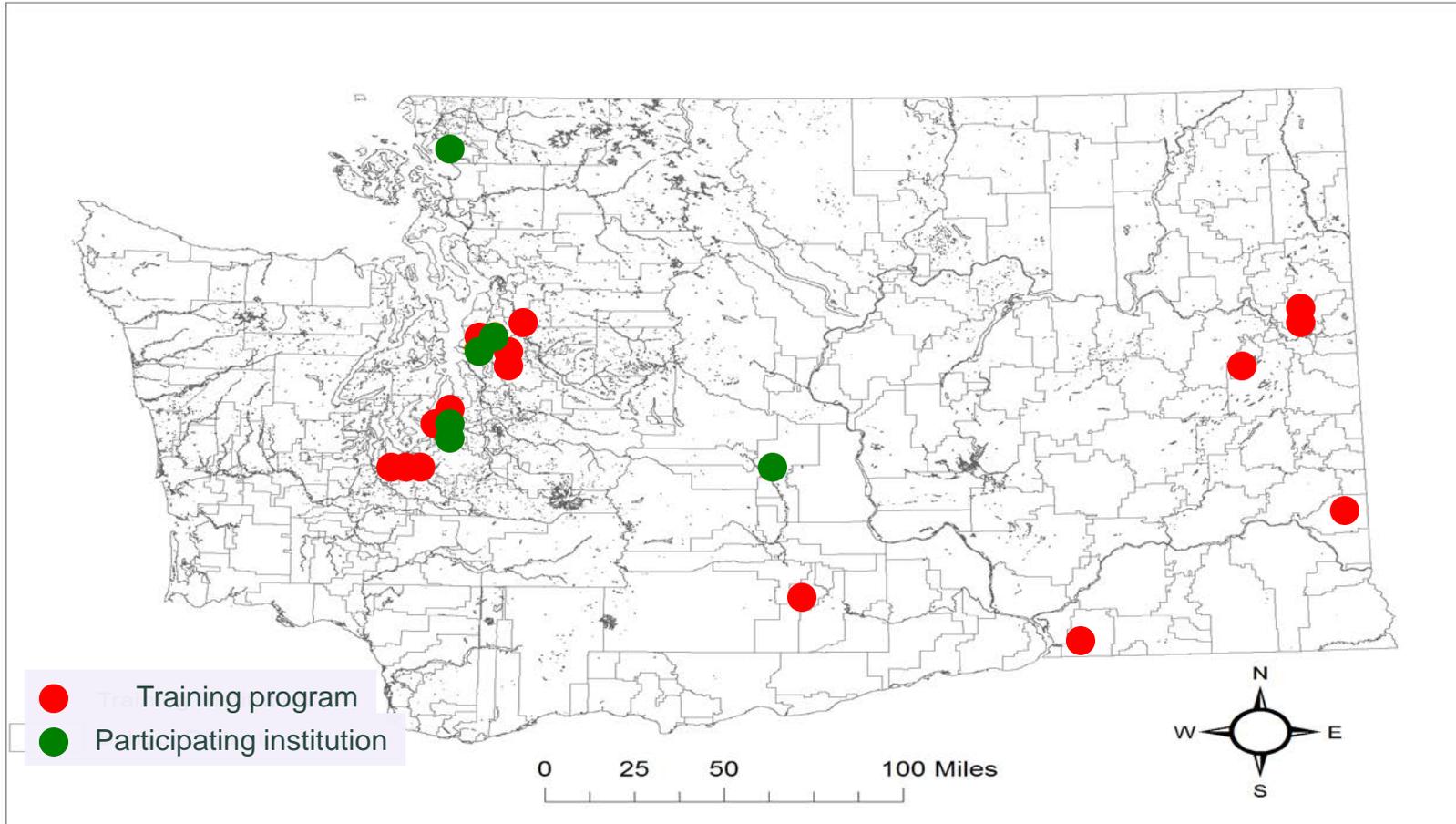
- Investigate location of interns' first teaching job relative to internship schools and training institutions
 - Preliminary evidence suggests that the “draw to home” phenomenon (Boyd et al., 2005; Reiningger, 2012) may be driven by internship school location, not by teacher training location
- Investigate the “mismatch” between the internship school characteristics and first school characteristics of hired teachers
 - Teachers tend to do their student teaching at schools with fewer disadvantaged students than the schools where they get their first jobs
 - Could this mismatch have consequences for teacher career paths and effectiveness?

Backup Slides

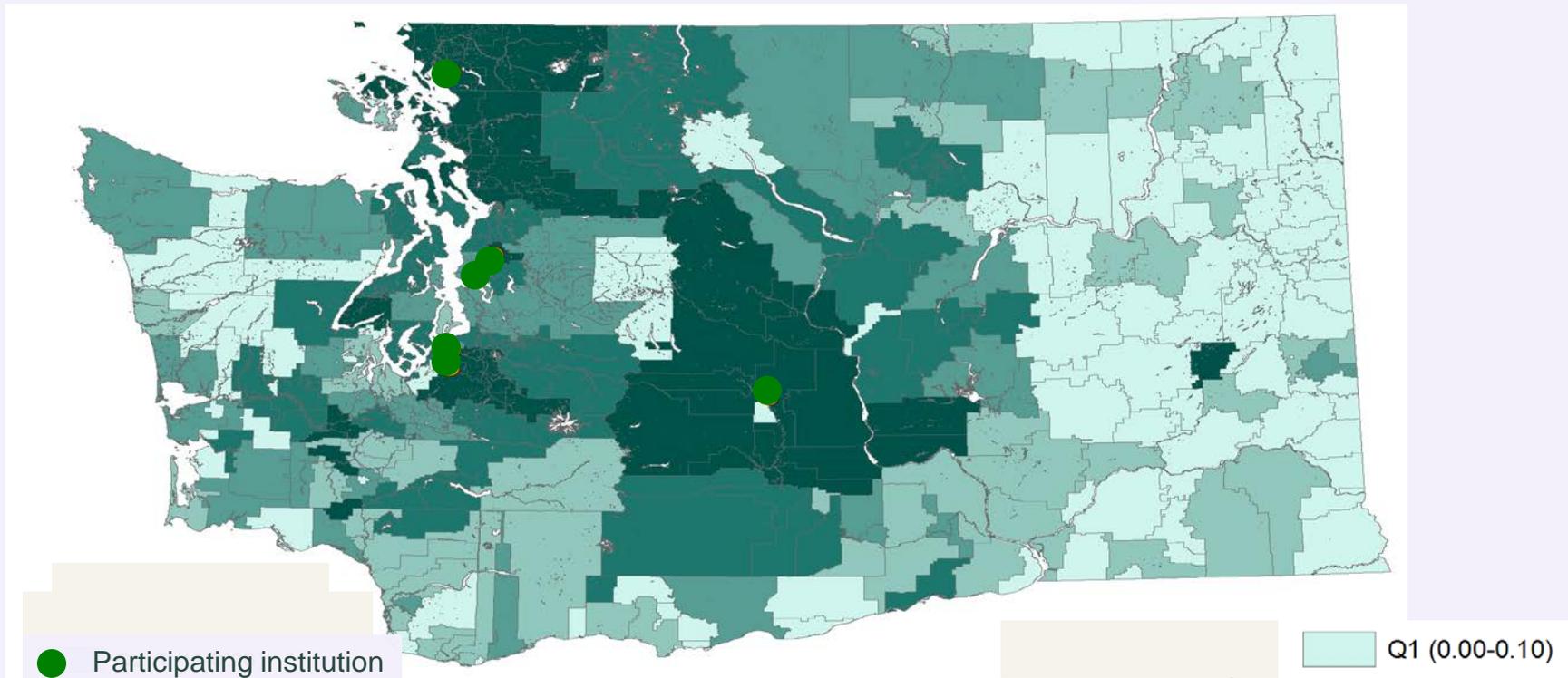
Washington State Teacher Training Programs



Participating Institutions



Proportion of Teachers From Participating Institutions



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Teacher Training Programs

Offer bachelors program

Central Washington University
Pacific Lutheran University
University of Washington-Seattle
Western Washington University

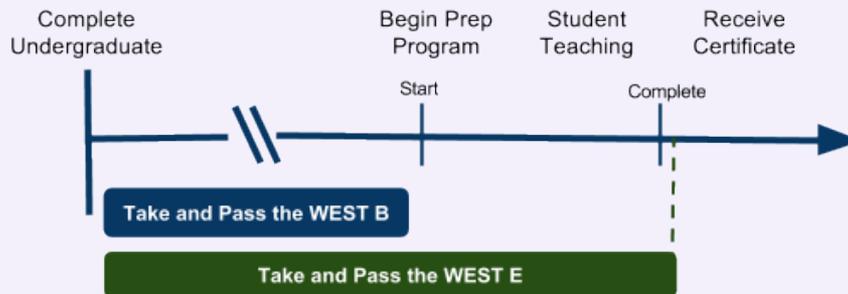
Bachelors Degree + Teaching Certificate



Offer certificate-only program

Pacific Lutheran University
University of Washington-Bothell
University of Washington-Seattle
University of Washington-Tacoma
Western Washington University

Teaching Certificate Only



Offer masters program

Central Washington University
Pacific Lutheran University
University of Washington-Bothell
University of Washington-Seattle
University of Washington-Tacoma
Western Washington University

Masters Degree + Certificate

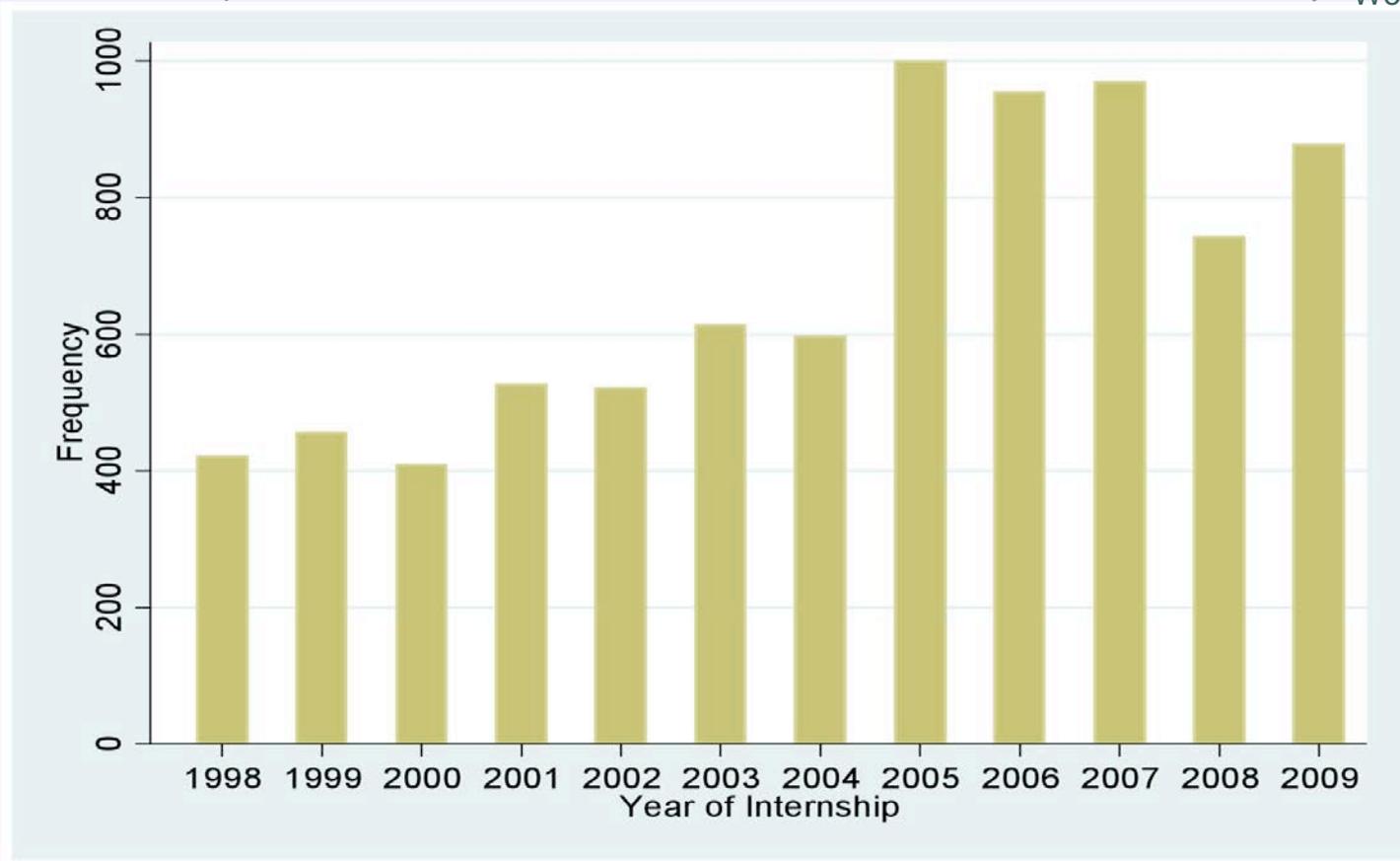
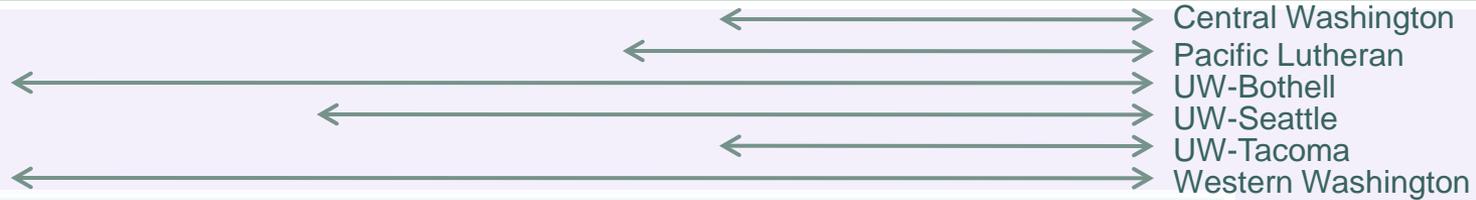


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Characteristics by Institution Type

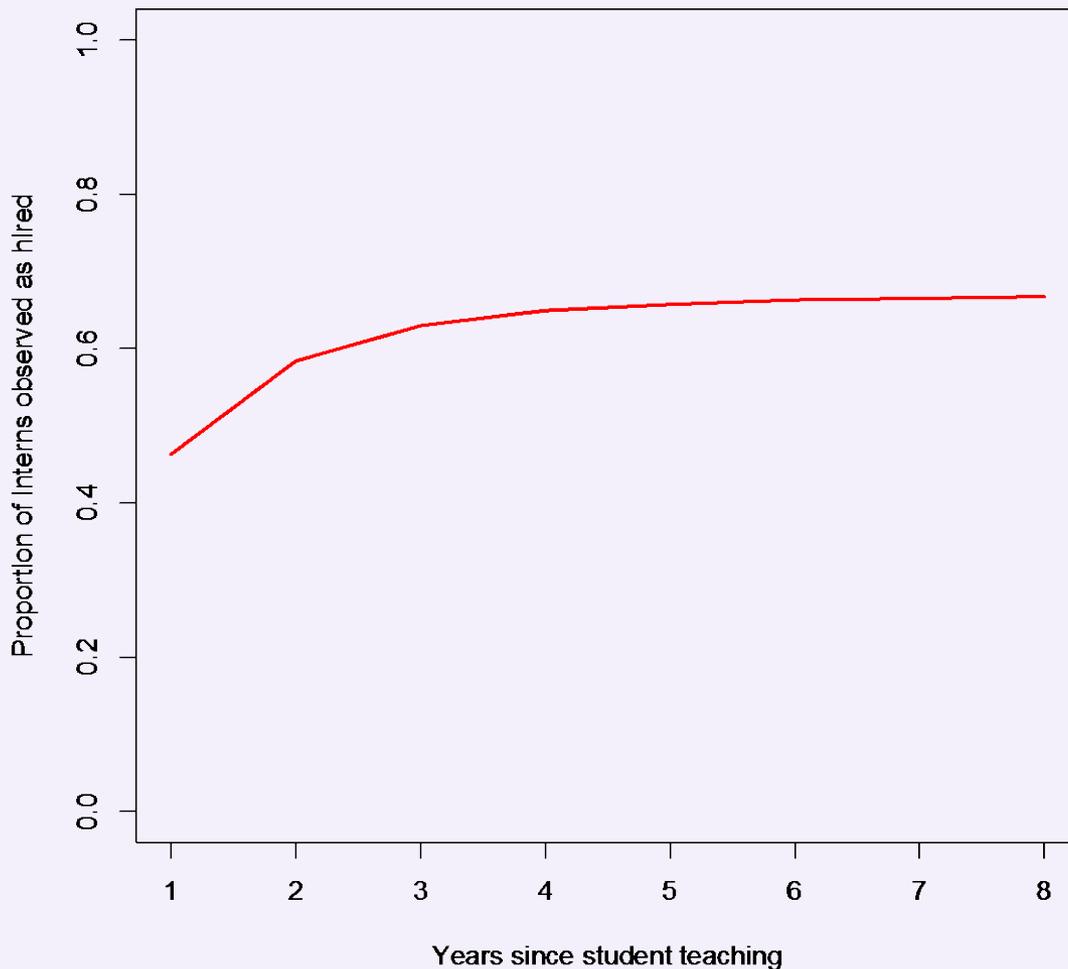
2005-06 through 2007-08	Participating Institutions	Non-participating Institutions	Out-of-State Institutions
Number of institutions	6	14	?
Number of new teachers	2180	2745	966
Average new teachers / year	121	65	?
Average teacher age at first hire	30.5	30.9	30.4
% math teachers	7.8%	6.3%*	8.1%
% science teachers	8.6%	9.2%	10.2%
% English teachers	18.4%	20.6%	12.6%*
% social studies teachers	9.9%	10.7%	9.2%
% elementary teachers	56.7%	62.0%*	30.7%*
% special ed teachers	14.3%	10.5%*	8.2%*
*p < .05 from t-test, compared to left column			

Internships by Year



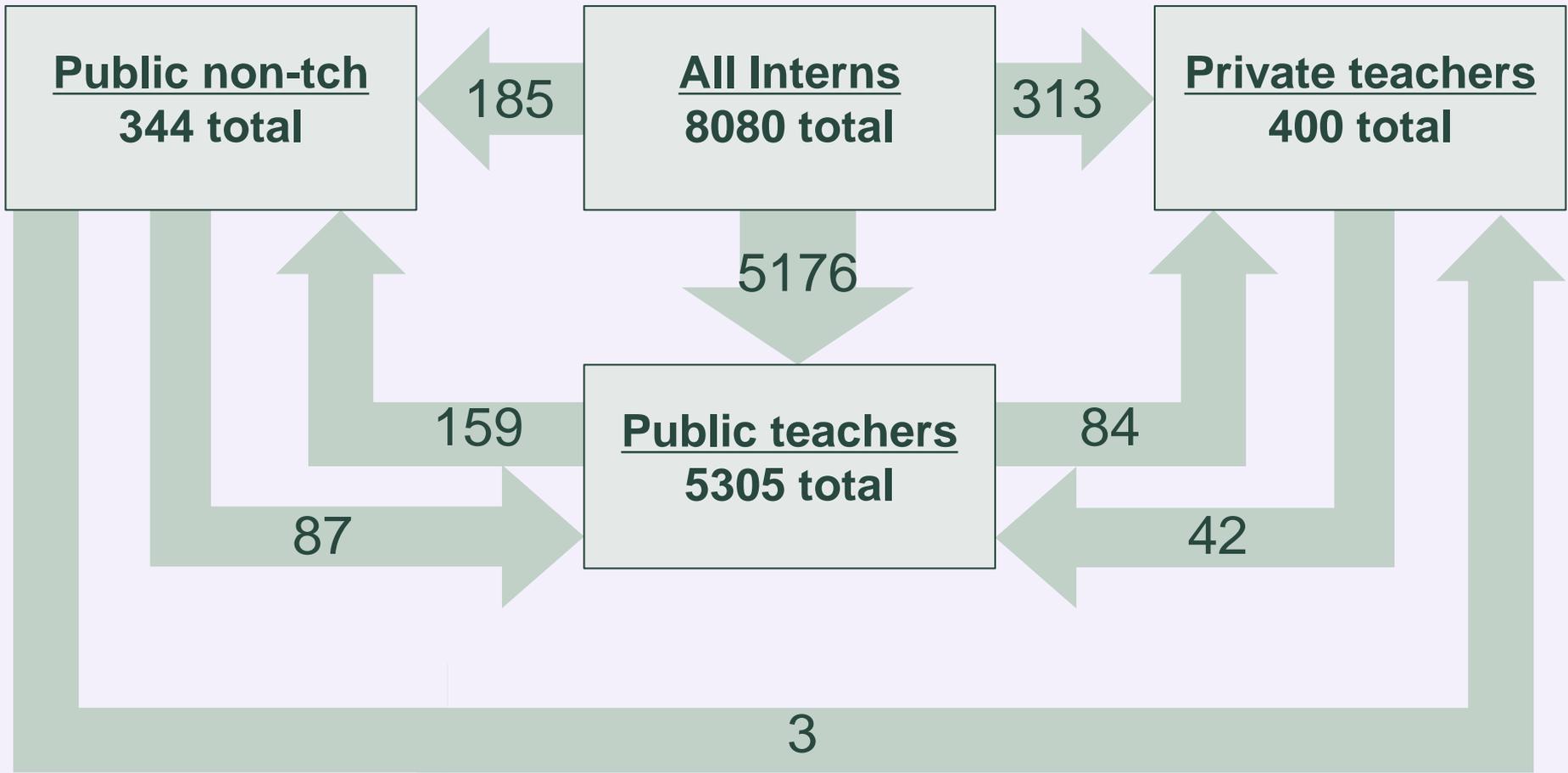
Time to First Teaching Job for Hired Interns

Cumulative proportion of interns observed as hired



Observed Intern Employment

31 Transitions



Not observed hired
2406 total

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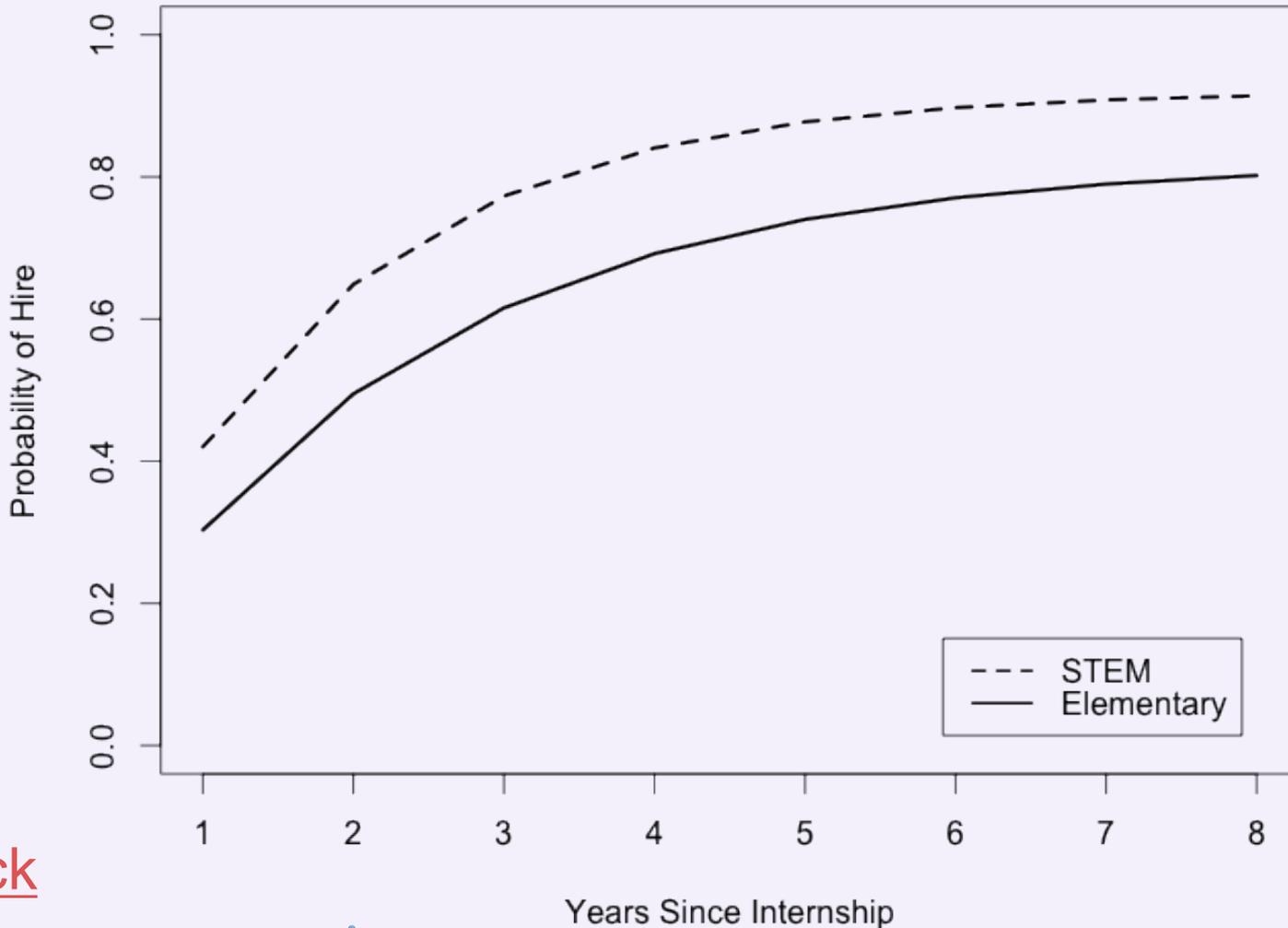
Split Population Models: A Primer

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- Split population models are designed to make inferences about two **latent** variables (NOT observed for all interns)
 - $Y_i^* = 1$ if intern i will eventually be hired
 - $T_i^* =$ time to hire for intern i (defined only if $Y_i^* = 1$)
- **Goal:** estimate the marginal effect of observed covariates \mathbf{Z}_i on:
 - $\Pr(Y_i^* = 1 \mid \mathbf{Z}_i)$: probability of eventual hire, modeled as logit
 - $\Pr(T_i^* = t_i \mid Y_i^* = 1, \mathbf{Z}_i)$: probability of time to hire, *given* eventual hire, modeled as exponential hazard
- We use the following **observed** variables:
 - $Y_i = 1$ if intern i is **observed** to be hired
 - $T_i = 1$ **observed** time to hire (if $Y_i = 1$) OR time to censoring (if $Y_i = 0$)
- The probabilities involving the latent variables can be expressed in terms of the observed variables, which allows us to derive and maximize the observed data likelihood (see paper for details)

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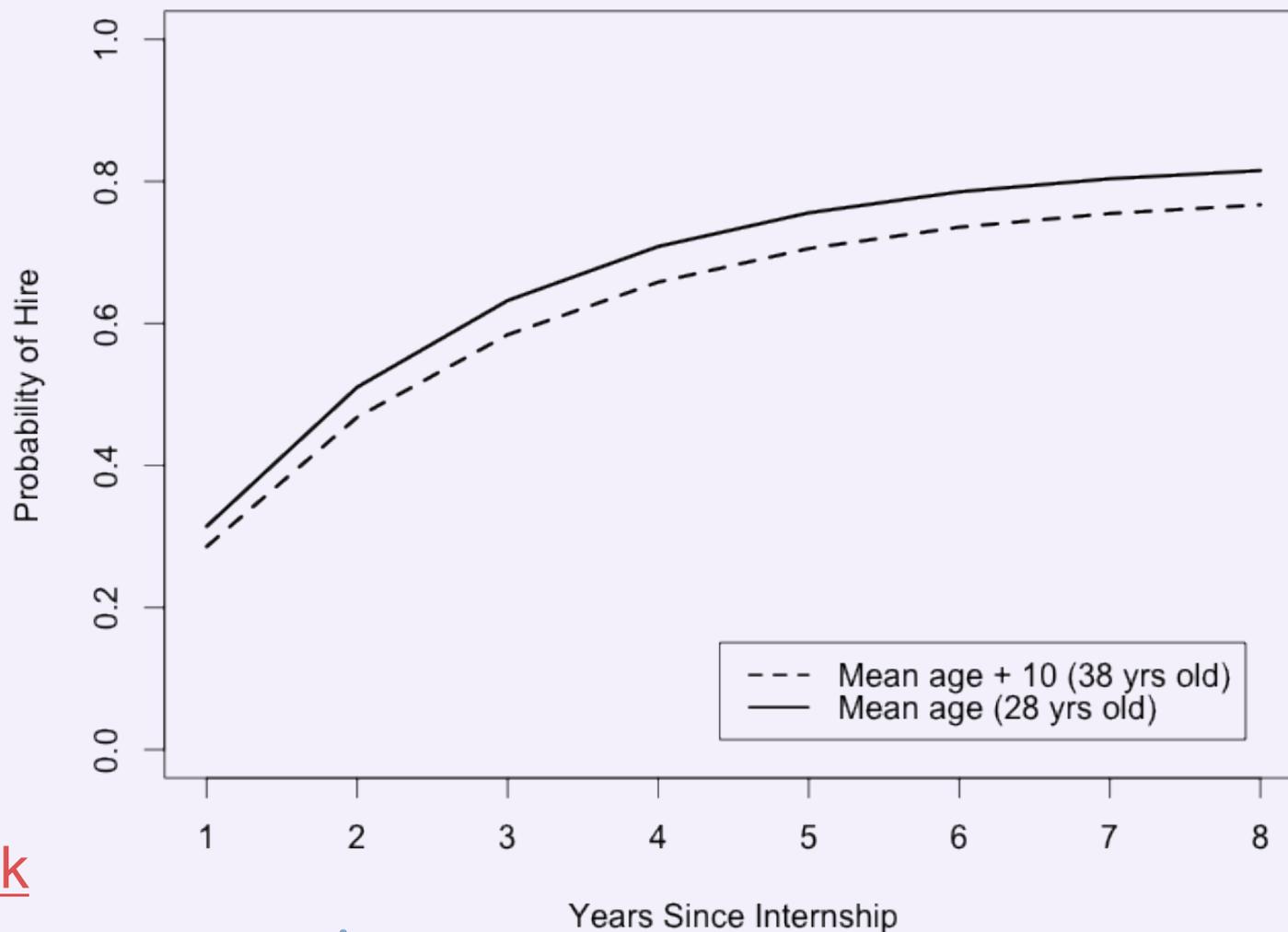
Time to Hire: STEM vs. Elementary Ed Interns



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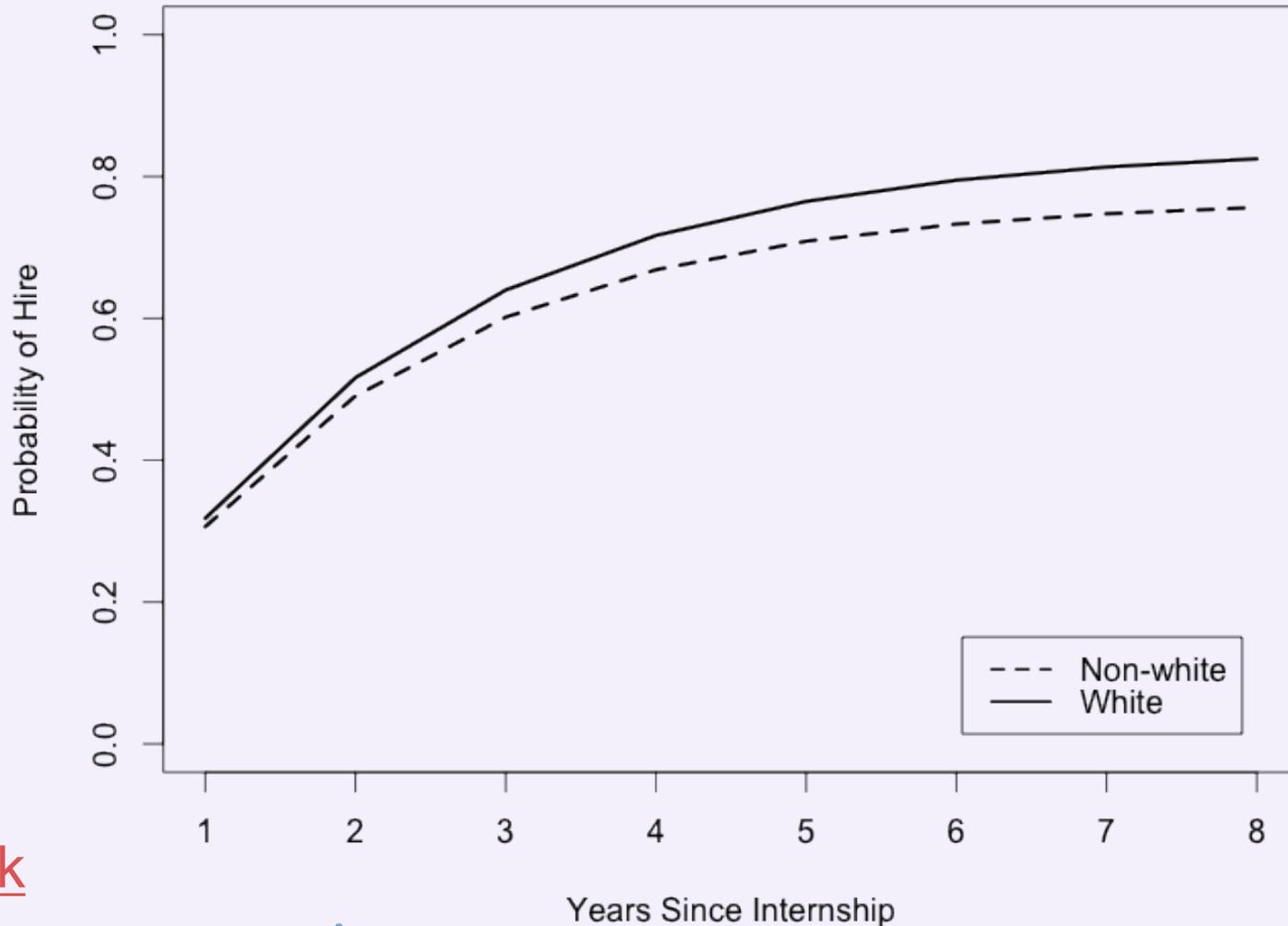


Time to Hire: 28-year-old vs. 38-year-old Interns



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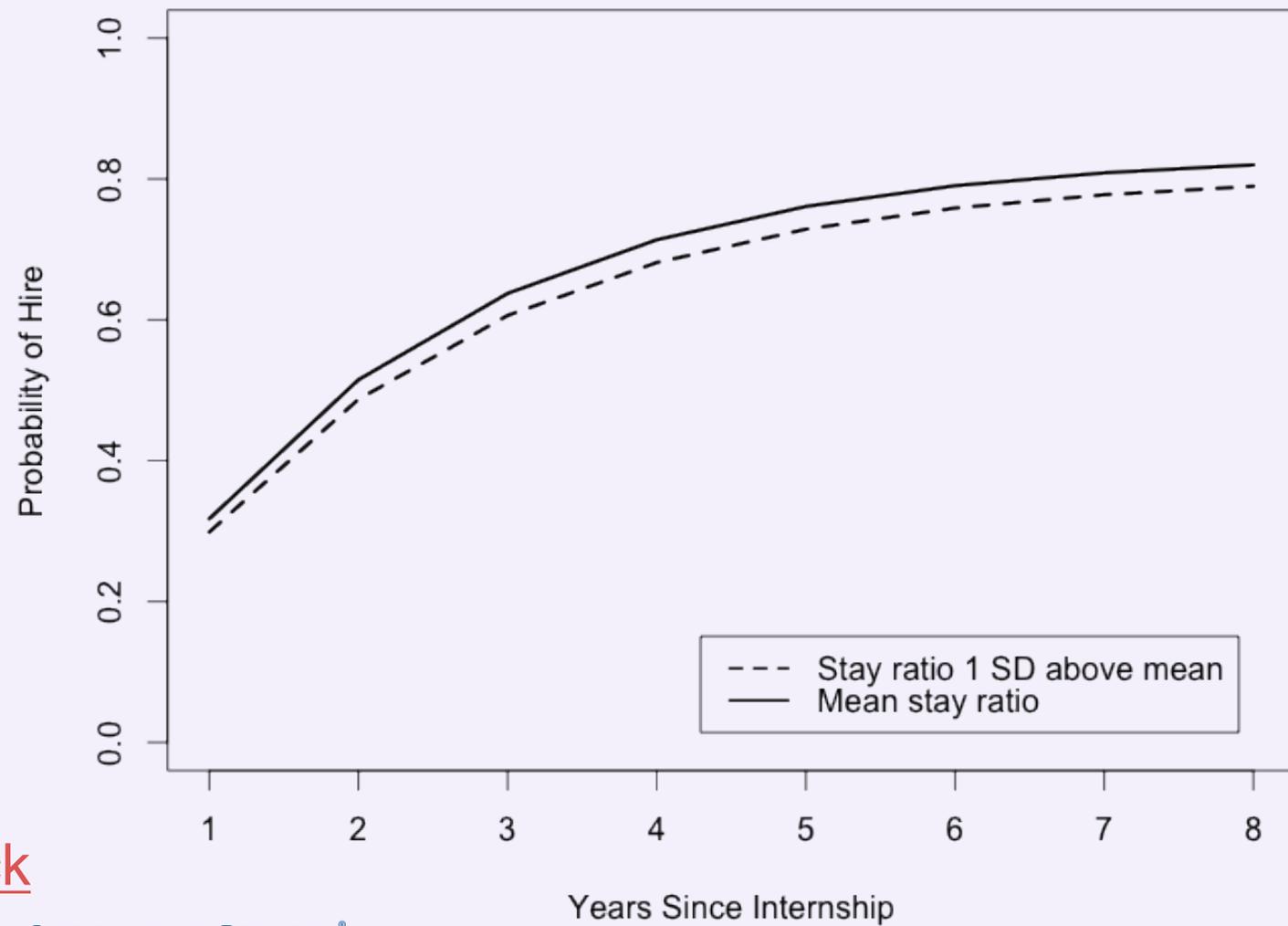
Time to Hire: Non-White vs. White Interns



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Time to Hire: Mean Internship School Stay Ratio vs. One SD Higher

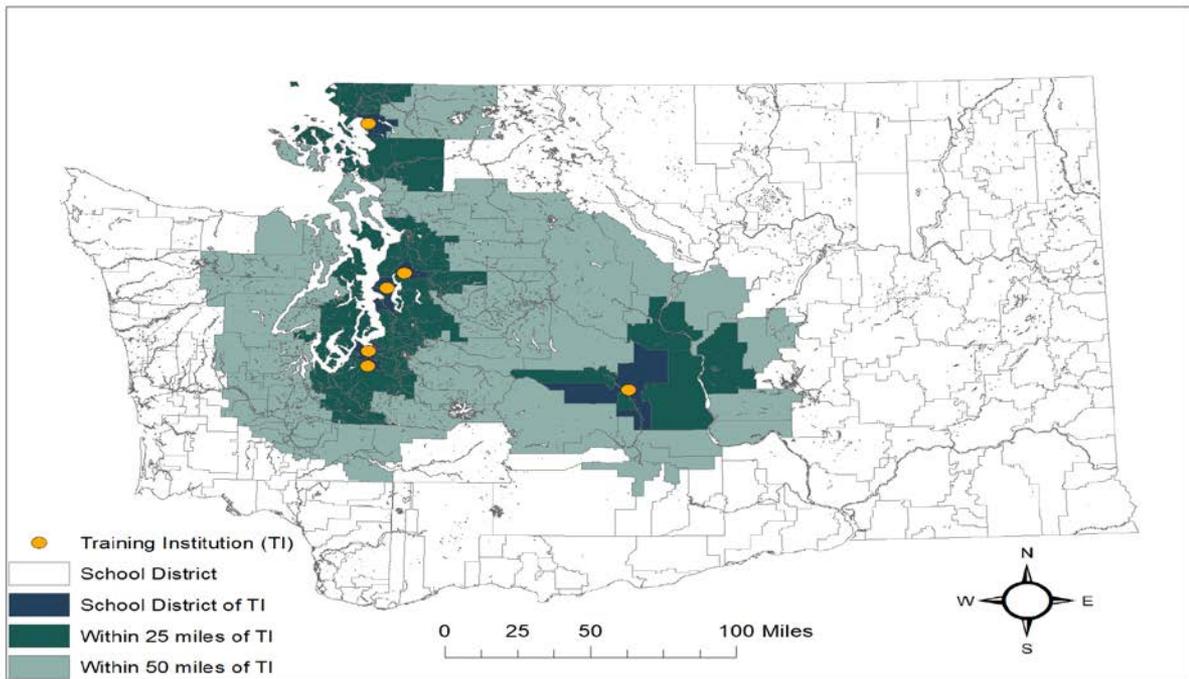


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Ronfeldt (2012) Findings

- Ronfeldt (2012) finds that interns who do their student teaching at schools with low teacher turnover (high stay ratios) are more effective, all else equal
- We find that these interns are also less likely to enter the workforce in the first place, perhaps because schools with higher teacher turnover have more slots to hire their own student teachers
- This means that there are two competing explanations for Ronfeldt's findings:
 1. Student teaching at a school with low teacher turnover (i.e., more stable schools) has a positive effect on teacher effectiveness
 2. Since interns from schools with low teacher turnover are less likely to be hired, only the most effective interns from these student teaching schools enter the workforce (**selection bias**)

Location of First Teaching Job (Hired Interns Only)



Intern's First Teaching Job	Training Institution	Student Teaching
Same school as...		15.4%
Same district as...	8.1%	38.6%
Within 25 miles of...	35.2%	73.5%
Within 50 miles of...	46.3%	83.4%

Selected Summary Statistics: Internship School and First Job School Characteristics for Hired Interns

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	State Averages	Internship School (N = 5269)	First Job School (N = 5269)
Percent American Indian Students	3.52* (8.95)	2.42 (3.67)	3.13* (7.22)
Percent Asian Students	7.06* (8.22)	9.85 (8.89)	10.06 (9.28)
Percent Black Students	5.43* (9.07)	6.25 (8.97)	6.57 (9.53)
Percent Hispanic Students	13.60* (17.75)	12.51 (14.66)	16.18* (19.45)
Percent White Students	67.46 (24.70)	67.66 (20.26)	63.15* (23.83)
Percent FRL Students	39.93* (22.73)	34.40 (20.62)	39.35* (24.27)
Standardized Passing Rate, Math	0.11*	0.31	0.12*
Standardized Passing Rate, Reading	0.08*	0.25	0.05*
Standardized "Stay Ratio" (state)	-0.02	-0.03	-0.21*

*p < .05 from t-test, compared to middle column

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Existing Research on the Front End of the Teacher Pipeline

- Teachers prefer to teach close to where they grew up and where they went to college (Boyd et al., 2005; Reininger, 2012)
- Extensive research compares prospective teachers to the overall population of college graduates
 - Most studies (Bacolod, 2007; Boyd et al. 2007; Goldhaber and Liu, 2003; Hanushek and Pace, 1995; Ingersoll and Perda, 2010; Podgursky et al., 2004) have found that teachers come from the lower end of the performance distribution
 - However, this situation may be changing (Goldhaber and Walch, 2014)
- There is disagreement about whether a strong academic record **does** (Boyd et al., 2013) or **does not** (Ballou, 1996) help a prospective teacher's job prospects
- Engel et al. (2013) and Boyd et al. (2013) both find that prospective teachers prefer schools with fewer disadvantaged students