

HEALTH CARE AND HUMAN SERVICES POLICY, RESEARCH, AND CONSULTING - WITH REAL-WORLD PERSPECTIVE.

Retention Rates: NHSC vs non-NHSC Providers

NAC NHSC Meeting

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Purpose of the Study

- ▶ Examine short- and long-term retention of providers in the Loan Repayment Program (LRP) and the Scholarship Program (SP) under the National Health Services Corps (NHSC)
- ▶ Unlike previous studies, examine retention of non-physician providers as well as physicians
- ▶ Compare NHSC participant retention with retention of non-NHSC providers in the same areas
- ▶ Review and synthesize the methodologies and metrics used in NHSC and other programs to evaluate the retention rate of NHSC providers in high need areas
- ▶ Quantitative analysis to measure the causal effect of LRP and SP on enrollment in the NHSC workforce and retention of participants in health care shortage areas

Main Findings

- ▶ About 49% of NHSC Primary Care (PC) participants were located in the same HPSA one year after obligation completion and 82% were located in any HPSA
 - ▶ by the 6th year after obligation, 35% were located in same HPSA and 72% in any HPSA
- ▶ Non-participant PC retention in HPSAs is higher, but difference is much bigger for retention in same HPSA than retention in any HPSA
 - ▶ most of the differences in the two groups' retention is explained by NHSC participation
- ▶ Much of the geographic mobility of participants is from one HPSA to another
 - ▶ after initially higher mobility, NHSC participants have better retention in HPSAs
 - ▶ more likely to relocate to non-HPSA in same county or to another non-HPSA county
- ▶ Retention rises with age and local characteristics, but differences by gender, discipline, and Census division are small
 - ▶ providers select into HPSAs based on their preferences for serving underserved populations
- ▶ Findings are consistent with a model predicting higher non-participant retention in HPSAs due to self-selection into HPSAs without financial inducement
 - ▶ Despite lower retention, model predicts NHSC programs increase provider-years in HPSAs

Today's Agenda

- ▶ Data and Descriptive Summary Statistics
- ▶ Retention of NHSC Participants in HPSAs
- ▶ Conceptual Framework - An Economic Model of Location Choice
- ▶ Regression Analysis
- ▶ Summary of Findings
- ▶ Model Simulations
- ▶ Current Work

Data Came from Multiple Sources

- ▶ HRSA's NHSC Administrative Files
 - Contains information on all entrants in NSHC over the 2000-2013 period
- ▶ Optum Corporation's Provider 360 (P360) File
 - A proprietary dataset that includes most providers in the nation
- ▶ Medicare Provider Data (2005-2011)
 - Includes all providers who billed Medicare between 2005 & 2011
- ▶ HRSA's comprehensive list of HPSA designations as of January 2014

The First Analytic File Merges NHSC, P360 and Medicare Data

▶ Steps:

- ▶ Using name, birthdate, gender and selected other variables, we matched NHSC administrative file with P360 data
- ▶ About 18,500 of the 22,703 NHSC participants uniquely matched to P360
- ▶ This match gives us participants' NPIs as well as other important information including zipcode in 2013
 - ▶ We identified the NPI for about 17,900 NHSC participants
- ▶ The merged P360-NHSC file was then merged with the Medicare Provider file by NPI
 - ▶ This file contains annual information on over 1 million non-NHSC providers as well as on 8,973 NHSC alumni
 - ▶ Importantly, it allows us to track the annual locations (zipcodes) for each year individuals are in the Medicare Provider data (2005-2011)

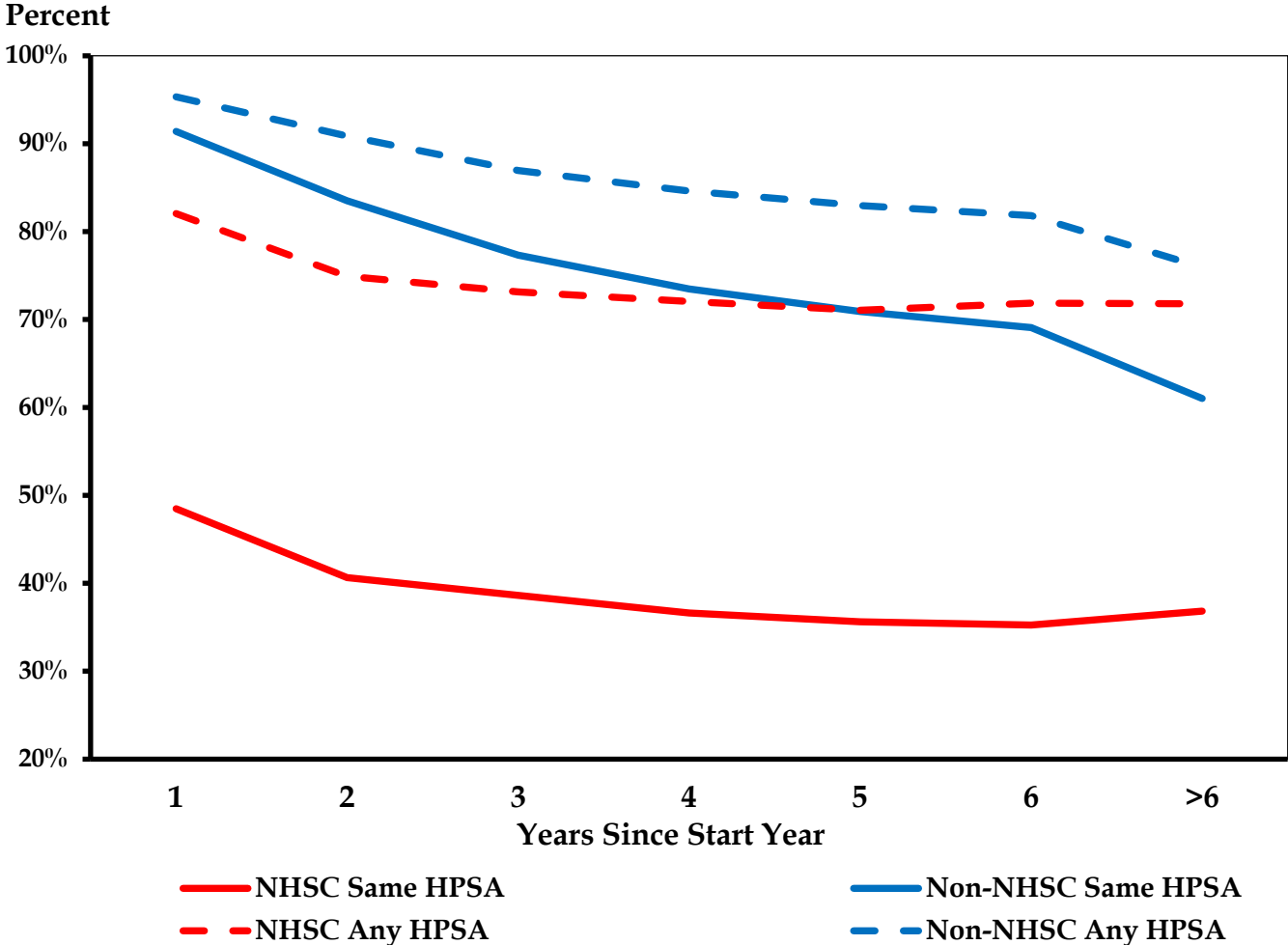
The Second Analytic File Allows Tracking of Most NHSC Participants from End of Program to 2013

- ▶ Although 18,500 NHSC participants were identified in P360, only about 17,900 NHSC participants were found to have NPIs
 - ▶ Of those with an NPI, 8,973 alumni were found in Medicare Provider data
- ▶ However,
 - ▶ NHSC file provides the participants' location while in the program through end of 2011
 - ▶ and P360 data give us their location as of December 2013
- ▶ This file allows us to track retention of about 18,500 NHSC participants at two points in time:
 - ▶ the year of program termination
 - ▶ and December 2013

Today's Agenda

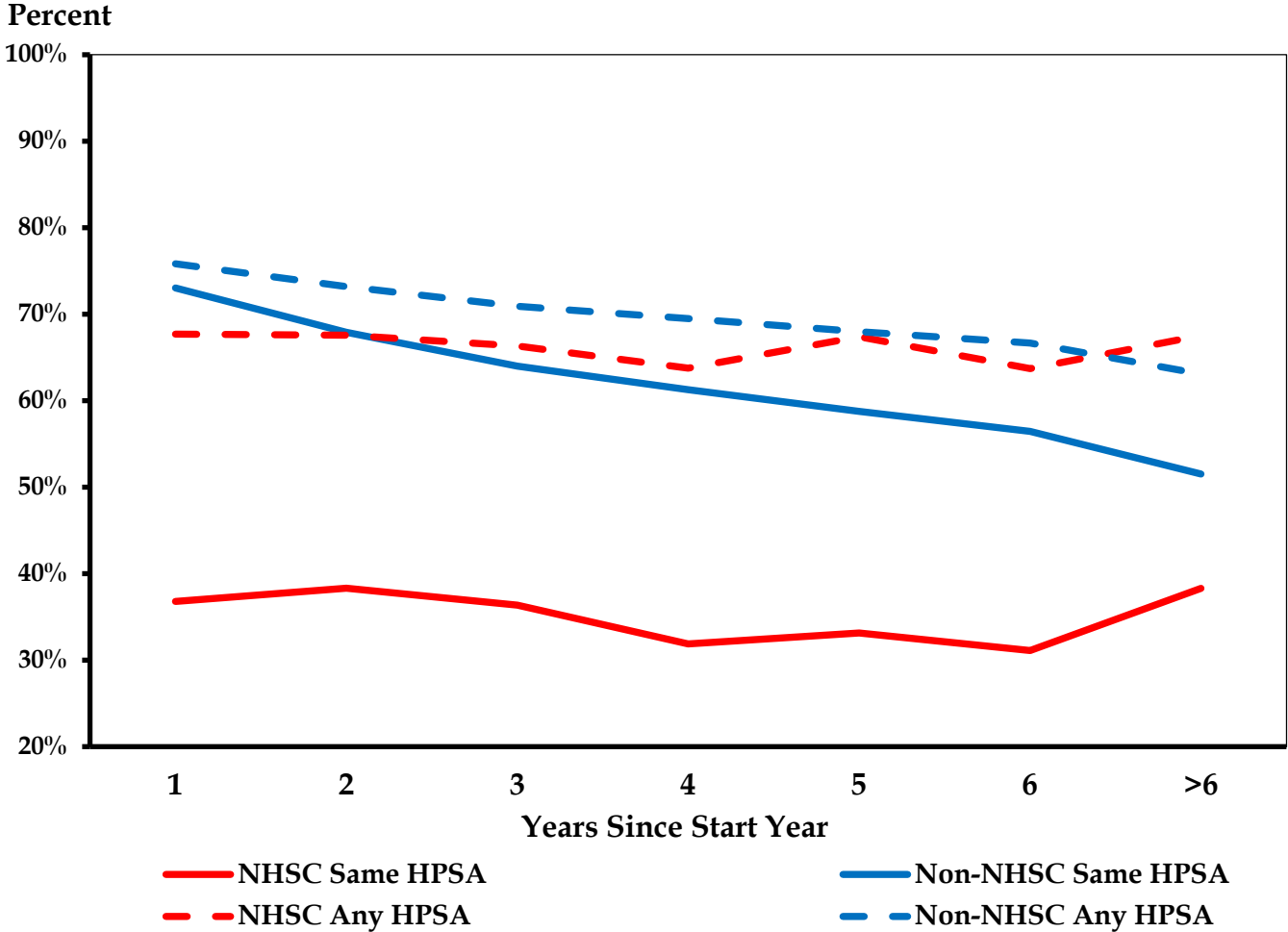
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Retention Profiles of Participants and Non-Participants in HPSA's - Primary Care



NOTE: These rates are based on the samples of participants and non-participants, as defined in the first analytic dataset

Retention Profiles of Participants and Non-Participants in HPSA's - Mental Health



NOTE: These rates are based on the samples of participants and non-participants, as defined in the first analytic dataset

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The Economic Model Helps Interpret the Migration Patterns of NHSC Participants

- ▶ We specified and simulated a formal economic model of individual geographic location decisions
 - we apply it in the case of LRP
- ▶ The model accomplishes three broad objectives:
 - isolates the key factors influencing location decisions
 - explains why some individuals locate in areas that others shun
 - explains when geographic mobility is high or low
- ▶ The general model of location decisions is modified to account for the essential features of the NHSC program
 - model predicts that HPSA retention depends crucially on the way NHSC selects participants
 - simulations gives sharp predictions about how HPSA retention of participants compares with HPSA retention of non-participants

General Theory of Location Choices

► Individuals:

- In any period an individual will calculate the utility of each location and choose the location offering the highest utility
- Utility of each location depends on three factors:
 - pecuniary factors: wages in the location and NHSC incentives (LRP, SP)
 - non-pecuniary factors: preference for each location
 - An individual's preference for a location depends on the value the individual places on factors such as climate, environment and local amenities
 - Preferences for each location vary across individuals ('preference heterogeneity')
 - random shocks to location utility
 - they are uncorrelated with preferences and follow a probability distribution

► Cohorts:

- Fraction choosing to locate or remain in a location
 - depends on distribution of preferences and distribution of random shocks
 - increases with average preference for the location

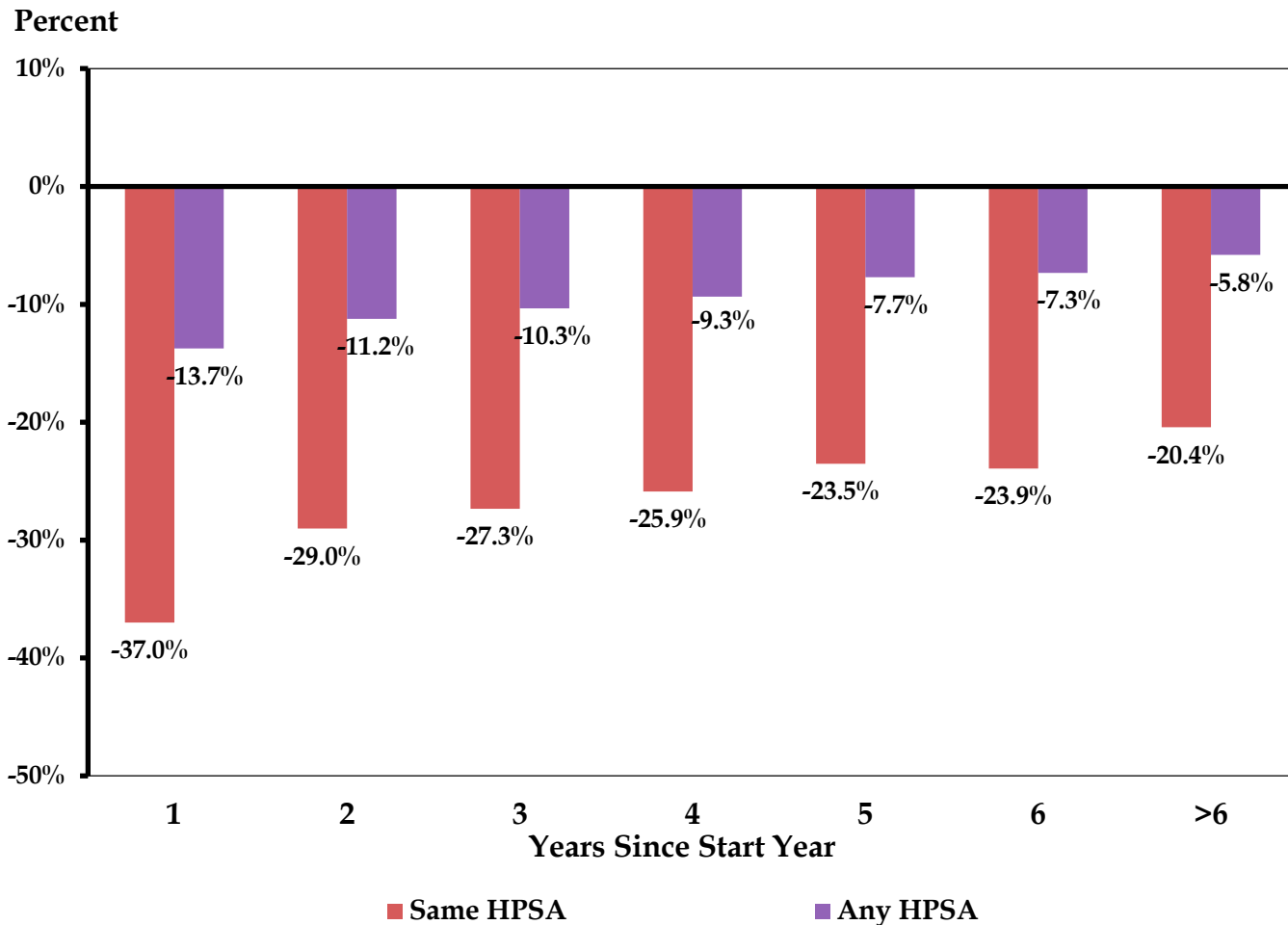
Key Insights from the Model and Simulations

- ▶ Providers locate in a HPSA if utility of a HPSA exceeds utility of a non-HPSA location
 - providers' preferences for HPSA's are lower than their average preferences for non-HPSA's
- ▶ Providers going to HPSAs have higher preferences for HPSAs than all other providers
 - on average, non-participants in HPSAs have even higher preferences than participants - as they locate there w/o LRP or SP
- ▶ NHSC programs increase:
 - pecuniary value of a HPSA location to individuals eligible for NHSC
 - number of providers locating in a HPSA (in most circumstances)
 - person-years in the location (both while in program and afterwards)
- ▶ As non-participants have higher preferences, non-participant retention is higher than that of participants after program completion
 - **Special case:** if selection into NHSC is based solely on preferences → participants are the same people who would have served in HPSA otherwise
 - so, participants' retention is the same as that of non-participants
- ▶ If NHSC acceptance is **not** based only on preferences, participant retention is **lower** than non-participant retention
 - this means the program is **effective**, as it increases the person-years in HPSAs!
 - effect is higher when correlation b/w program selection and taste for HPSAs is lower

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Differences in the Participants' Retention Probability Relative to Non-Participants (PC)

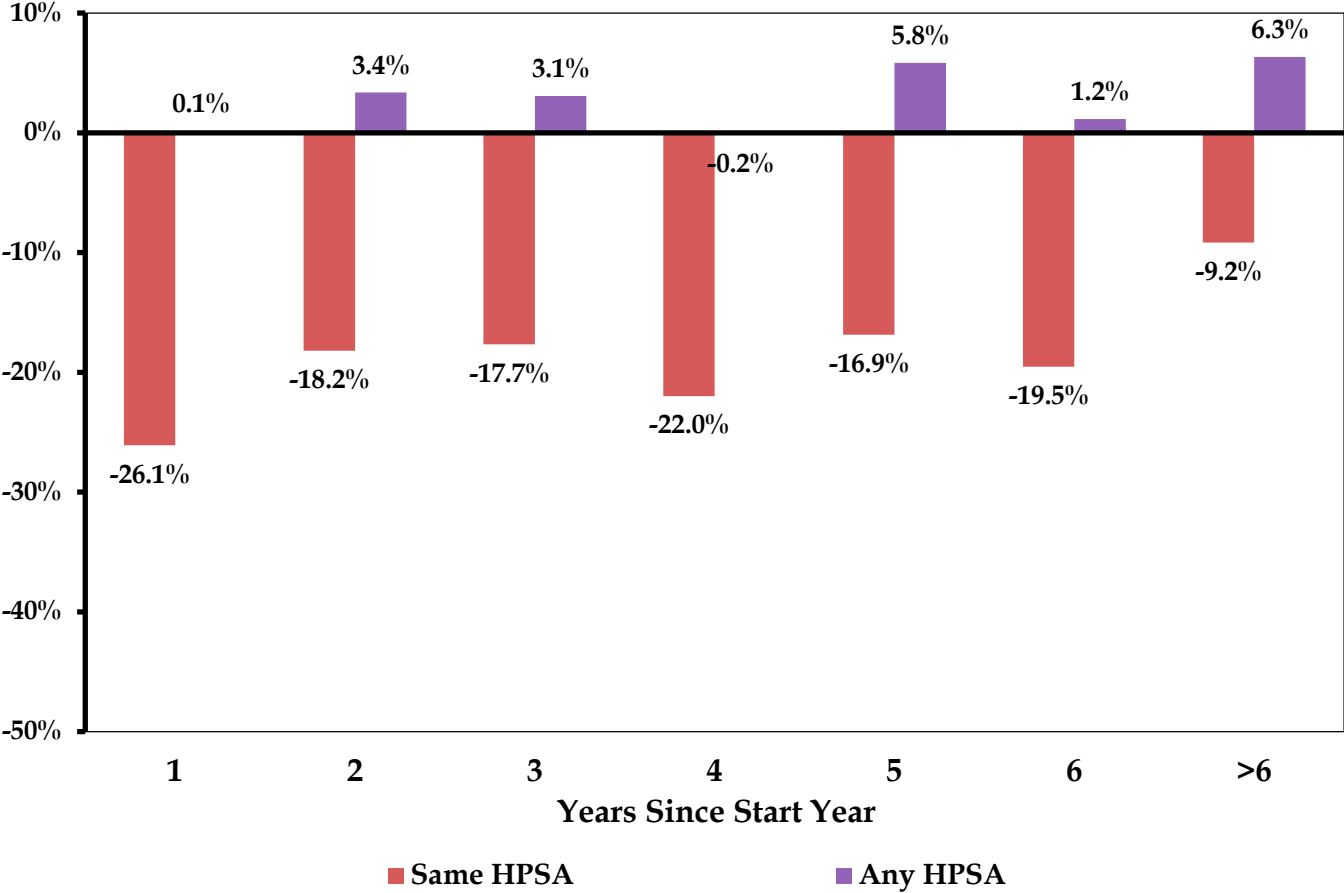


NOTE: These are obtained by estimating regression models of HPSA retention as a function of:

- NHSC participation
- Age group
- Gender
- Provider type
- Census division
- Year cohort
- Local characteristics

Differences in the Participants' Retention Probability Relative to Non-Participants (MH)

Percent



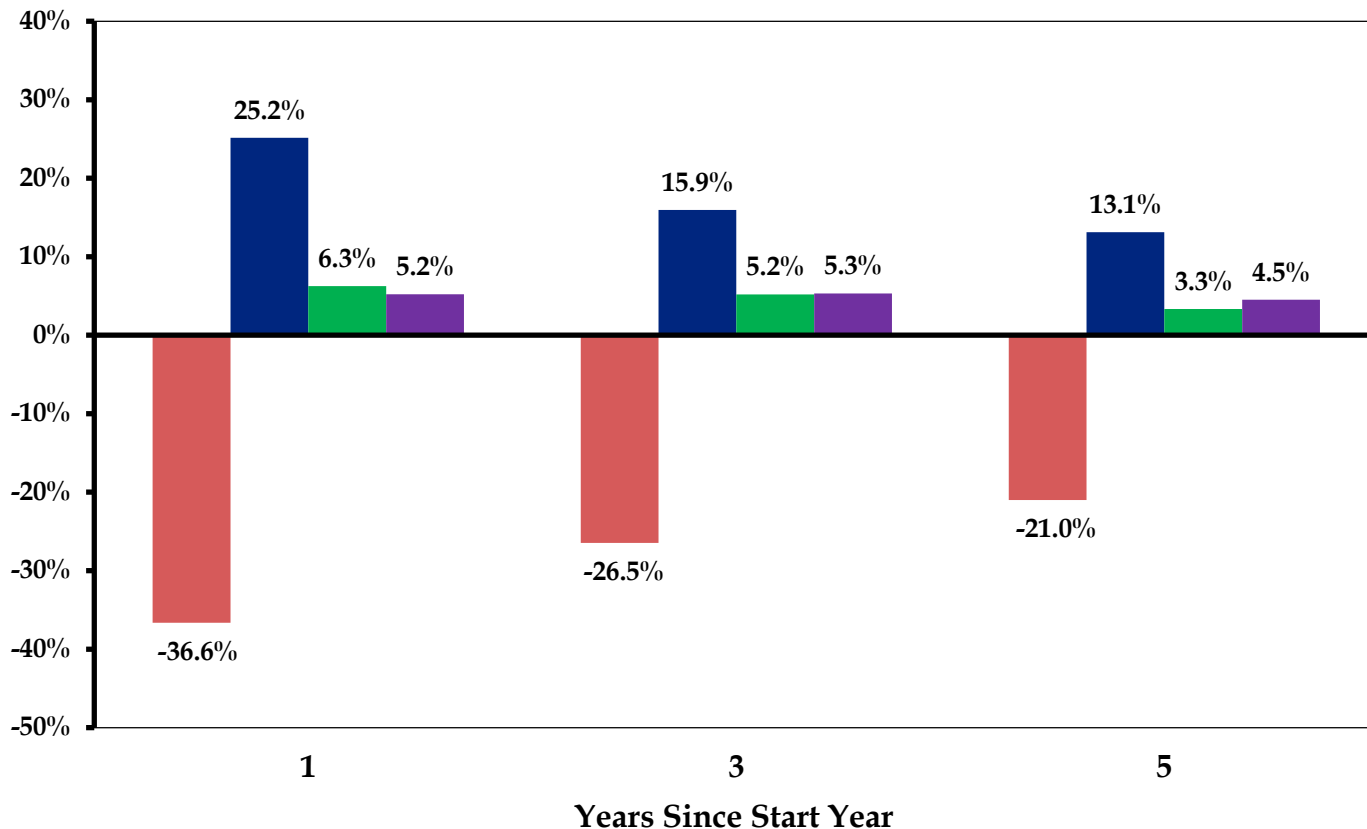
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- NHSC participation
- Age group
- Gender
- Provider type
- Census division
- Year cohort
- Local characteristics

'Any HPSA' estimates are not statistically different from zero.

Differences in the Participants' Migration Probabilities Relative to Non-Participants (PC)

Percent



NOTE: These are obtained by estimating multinomial logit models of location choice as a function of:

- NHSC participation
- Age group
- Gender
- Provider type
- Census division
- Year cohort
- Local characteristics

The model allows for the four possible location choices shown in the figure.

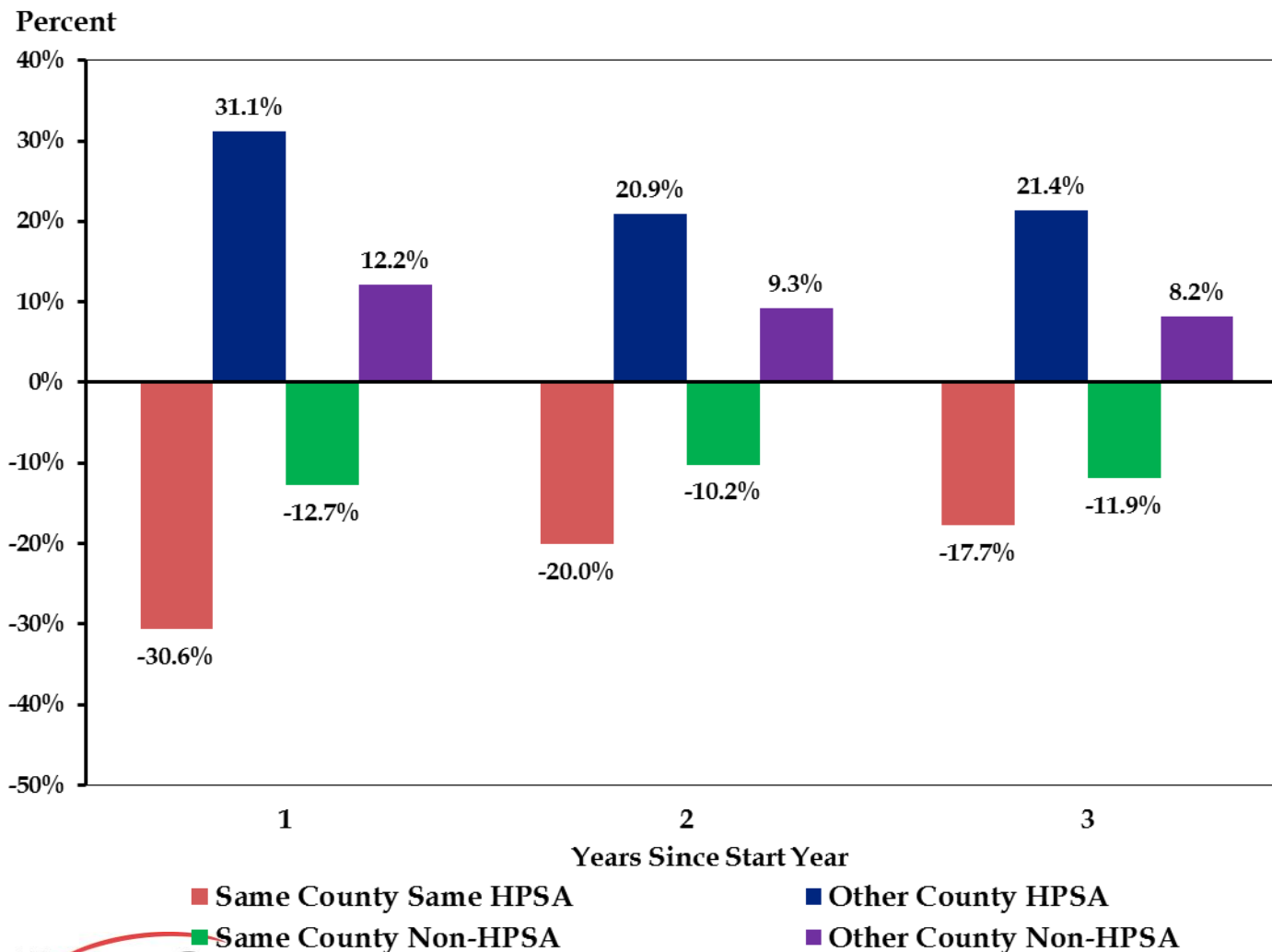
Same County Same HPSA

Other County HPSA

Same County Non-HPSA

Other County Non-HPSA

Differences in the Participants' Migration Probabilities Relative to Non-Participants (MH)



NOTE: These are obtained by estimating multinomial logit models of location choice as a function of:

- NHSC participation
- Age group
- Gender
- Provider type
- Census division
- Year cohort
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The model allows for the four possible location choices shown in the figure.

The 'Same County Non-HPSA' estimates are not statistically different from zero.

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Summary of Findings

- ▶ About 49% of NHSC Primary Care (PC) participants were located in the same HPSA one year after obligation completion and 82% were located in any HPSA
- ▶ By the 6th year after obligation, 35% were located in same HPSA and 72% in any HPSA
- ▶ Non-participant PC retention in HPSAs is higher, but difference is much bigger for retention in same HPSA than retention in any HPSA
 - ▶ Same HPSA: 91% (1st year) to 69% (6th year)
 - ▶ Any HPSA: 95% (1st year) to 82% (6th year)
- ▶ Findings indicate that much of the geographic mobility of participants after program completion is from one HPSA to another
- ▶ Convergence of retention rates over longer run implies that after initially higher mobility, NHSC participants have better retention in HPSAs than non-participants
- ▶ Participants only slightly more likely than non-participants to relocate within a county to a non-HPSA zipcode or to relocate to a non-HPSA county

Summary of Findings (Cont'd)

- ▶ Controlling for demographic characteristics, cohort, calendar year, and local area economic characteristics reduces the mean retention differences shown above
 - ▶ Same HPSA: -37% (1st year) to -21% (6th year)
 - ▶ Any HPSA: -11% (1st year) to -8% (6th year)
- ▶ Retention rises significantly with age, but differences by gender, discipline, and Census division are small
- ▶ Retention is significantly related to zipcode-level economic characteristics such as the poverty rate
 - ▶ effects suggest providers select into underserved areas based on strength of their preferences for serving underserved populations
- ▶ Findings consistent with an economic model predicting higher non-participant retention in HPSAs due to their self-selection into HPSAs w/o financial inducement
 - ▶ Despite lower retention, model predicts that NHSC programs increase total provider-years in HPSAs
- ▶ Findings also consistent with results from previous studies

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Simulations with Two Locations and No Program (N = 20,000, 2 locations)

Variable or Distribution Parameter	Simulation Set 1	Simulation Set 2
Location 1 Wage	30,000	30,000
Location 2 Wage	30,000	30,000
Mean Preference for Location 1	-10,000	-10,000
Mean Preference for Location 2	0	0
Standard Deviation of Preferences	7,500	7,500
Standard Deviation of Random Shocks	1,000	2,000

Outcomes	Simulation Set 1	Simulation Set 2
% Choosing Location 1 in Period 1	0.177	0.185
% Retained in Location 1 in Period 2	0.902	0.826
% Moving from Location 2 to 1 in Period 2	0.022	0.037
Average Preference Location 1 in Period 1	5,300	4,417

Simulations with NHSC Program

- ▶ Preference and random shock distributions are as before
- ▶ Location 1 is assumed to be the HPSA & location 2 is the non-HPSA
- ▶ 10,000 are assumed to have outstanding loans: eligible to apply
- ▶ NHSC rank-orders applicants and accepts half of them
- ▶ This simulation has 4 possible groups of individuals:
 - Group 1 - apply and get accepted
 - Group 2 - apply and get rejected
 - Group 3 - have outstanding loans but do not apply
 - Group 4 - no outstanding loans → not eligible to apply
- ▶ Outcomes are simulated for parameter sets 1 and 2
- ▶ Three scenarios for each parameter set based on values of the correlation ρ ranging from 0 to 0.894

Person-Years of Service in Each Location

	Location 1 (HPSA)			Location 2 (Non-HPSA)		
	Period 1	Period 2	Total	Period 1	Period 2	Total
Simulation Set 1						
No Program	3,534	3,549	7,083	16,466	16,451	32,917
Scenario 1	4,284	3,549	7,833	15,716	16,451	32,167
Scenario 2	4,163	3,549	7,712	15,837	16,451	32,288
Scenario 3	3,917	3,549	7,466	16,083	16,451	32,534
Simulation Set 2						
No Program	3,703	3,653	7,356	16,297	16,347	32,644
Scenario 1	4,406	3,653	8,059	15,594	16,347	31,941
Scenario 2	4,290	3,653	7,943	15,710	16,347	32,057
Scenario 3	4,068	3,653	7,721	15,932	16,347	32,279

	Group					Overall	Group					Overall	Group					Overall
	1	2	4	2 & 4	1		2	4	2 & 4	1	2		4	2 & 4				
	Scenario 1: $\rho = 0$						Scenario 2: $\rho = 0.447$						Scenario 3: $\rho = 0.894$					
% Choose 1, Per 1	1.00	0.58	0.18	0.18	0.22	1.00	0.51	0.18	0.23	0.41	1.00	0.37	0.18	0.21	0.20			
% Retain in 1, Per 2	0.55	0.82	0.83	0.83	0.72	0.63	0.78	0.83	0.82	0.74	0.77	0.67	0.83	0.81	0.78			
% Move from 2 to 1		0.18	0.04	0.04	0.03	0.00	0.15	0.04	0.05	0.03	0.00	0.12	0.04	0.05	0.03			
Avg Pref	1,012	1,068	-9,979	-9,979	-10,008	2,426	-347	-9,979	-8,620	-10,008	4,697	-2,619	-9,979	-8,940	-10,008			
Avg Pref 1, Per 1	1,012	4,274	4,476	4,476	3,152	2,426	3,039	4,476	4,273	3,421	4,697	185	4,476	3,871	3,928			

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Questions and Approach

- ▶ 1.) Have retention patterns of NHSC participants in HPSAs changed in recent years?
- ▶ 2.) What are the retention patterns in Indian Health Service and are they different from NHSC?
- ▶ 3.) How do retention patterns of funded and unfunded NHSC participants differ?
- ▶ Our approach relies on evaluating retention patterns of participants in HPSAs and comparing them with those of non-participants
- ▶ Additional provider-years generated by NHSC in HPSAs indicates success
 - Hard to measure as some participants practice in HPSAs even without program
 - Data on unfunded participants may permit estimation of program causal effect
 - Arguably, funded and non-funded participants are similar across unobservable characteristics that are correlated with their decision to remain in a HPSA
 - A comparison of funded and unfunded participants will yield an accurate estimate of how many additional providers the program attracted and retained in HPSAs over and above the number of providers who would have served there without the program

Back-Up Slides

Using the First Analytical File, We Accomplished a Number of Important Tasks

- ▶ Crosswalk of zipcodes to HPSA status
 - ▶ Using HRSA data on HPSA status (as of Dec 31, 2013) we were able to determine whether a provider's zipcode is:
 - ▶ part of a single-county HPSA, Census tract or Census division HPSA
 - ▶ associated with a facility HPSA
 - ▶ We also determined HPSA types: primary care, mental or dental
- ▶ Mapping of the detailed health care occupation of each non-NHSC participant into the corresponding NHSC discipline
 - ▶ This ensures a consistent classification of providers from both groups
- ▶ Calculated distances between zipcode centroids to determine distance of providers' moves over the years

Distribution of non-NHSC Providers from Medicare Data (Mental Health)

Discipline	Non-NHSC Providers	Percent
Physician	9,034	46.8
Health Service Psychologist	4,426	22.9
Licensed Clinical Social Worker	4,848	25.1
Licensed Professional Counselor	130	0.7
Marriage and Family Therapist	2	0.0
Nurse Practitioner	864	4.5
TOTAL	19,304	100

Note: The population of non-participants was constructed by retaining:

- Providers with disciplines from the list of NHSC disciplines
- Providers working in HPSAs where at least one NHSC provider was observed

	Non-NHSC	Percent
Age (at Entry)	51.7	--
Gender		
Males	9,427	48.8
Females	9,877	51.2
TOTAL	19,304	100

The non-participants sample was constructed using the first analytic file (i.e., using Medicare, P360 and NHSC data)

Retention of NHSC Participants as of 2013 - Mental Health (2nd Analytic Dataset)

Year of Exit from NHSC	HPSA and same county	HPSA and other county	Non-HPSA and same county	Non-HPSA and other county	Total matched in P360 data
2000	16	15	3	4	38
	42.1%	39.5%	7.9%	10.5%	
2001	19	13	2	8	42
	45.2%	31.0%	4.8%	19.0%	
2002	19	20	3	9	51
	37.3%	39.2%	5.9%	17.6%	
2003	41	30	5	21	97
	42.3%	30.9%	5.2%	21.6%	
2004	68	60	14	28	170
	40.0%	35.3%	8.2%	16.5%	
2005	69	58	18	25	170
	40.6%	34.1%	10.6%	14.7%	
2006	107	67	11	28	213
	50.2%	31.5%	5.2%	13.1%	
2007	83	79	16	35	213
	39.0%	37.1%	7.5%	16.4%	
2008	72	76	18	25	191
	37.7%	39.8%	9.4%	13.1%	
2009	81	62	24	25	192
	42.2%	32.3%	12.5%	13.0%	
2010	111	89	26	27	253
	43.9%	35.2%	10.3%	10.7%	
2011	289	195	71	76	631
	45.8%	30.9%	11.3%	12.0%	
2012	398	285	71	108	862
	46.2%	33.1%	8.2%	12.5%	
Total	1,373	1,049	282	419	3,123
	44.0%	33.6%	9.0%	13.4%	

Retention of NHSC Participants as of 2013 - Dental Health (2nd Analytic Dataset)

Year of Exit from NHSC	HPSA and same county	HPSA and other county	Non-HPSA and same county	Non-HPSA and other county	Total matched in P360 data
2000	9	10	3	3	25
	36.0%	40.0%	12.0%	12.0%	
2001	11	12	4	10	37
	29.7%	32.4%	10.8%	27.0%	
2002	13	14	5	11	43
	30.2%	32.6%	11.6%	25.6%	
2003	19	16	11	17	63
	30.2%	25.4%	17.5%	27.0%	
2004	30	27	9	23	89
	33.7%	30.3%	10.1%	25.8%	
2005	22	38	13	22	95
	23.2%	40.0%	13.7%	23.2%	
2006	30	44	18	16	108
	27.8%	40.7%	16.7%	14.8%	
2007	21	31	9	25	86
	24.4%	36.0%	10.5%	29.1%	
2008	19	22	9	13	63
	30.2%	34.9%	14.3%	20.6%	
2009	22	26	10	24	82
	26.8%	31.7%	12.2%	29.3%	
2010	29	27	9	14	79
	36.7%	34.2%	11.4%	17.7%	
2011	66	53	16	32	167
	39.5%	31.7%	9.6%	19.2%	
2012	96	82	12	28	218
	44.0%	37.6%	5.5%	12.8%	
Total	387	402	128	238	1,155
	33.5%	34.8%	11.1%	20.6%	

Simulating the Model without NHSC Program

- ▶ Assume a cohort of 20,000
- ▶ Each individual chooses between 2 locations in each of two time periods based on local area wages, tastes and random shocks to each period's location decision
- ▶ The distribution of the taste factors (the θ_j):
 - Each θ_j is distributed normally with mean (μ_j) and a standard deviation (σ_θ)
- ▶ The distribution of the random shocks (the ε_j^t):
 - Each ε_j^t follows an extreme value distribution with a mean of 0 and a standard deviation (σ_ε)
- ▶ Each individual is assigned values of the θ_j 's and the ε_j^t 's by drawing randomly from these distributions
- ▶ Compute each individual's location decision in each period

Model Implications

- ▶ Individuals with strong preferences for a particular location are more likely to choose that location
- ▶ Low (or negative) preference for a location can be overcome if wages are high enough
- ▶ Given preferences for each location, an individual's propensity to move is determined by the random shocks
 - if wages were stable and random shocks did not exist, an individual would select her best location in the first period and never move
- ▶ Aggregate (population average) probabilities of choosing a location depend on both how preferences and random shocks are distributed in the population
- ▶ We may show that, all else constant:
 - a smaller value of standard deviation of random shocks reduces the probability of an individual move and increases expected time in the initial location
 - -> the smaller is the frequency of moves in a cohort of individuals
 - a smaller average preference results in a smaller fraction choosing or remaining in a location
 - higher current or future pay increases fraction choosing to locate and remain in a location
 - a larger standard deviation of preferences in population decreases the impact of wage changes

Retention of NHSC Participants as of 2013 - Primary Care (2nd Analytic Dataset)

Year of Exit from NHSC	HPSA and same county	HPSA and other county	Non-HPSA and same county	Non-HPSA and other county	Total matched in P360 data
2000	35 23.18%	54 35.76%	23 15.23%	39 25.83%	151
2001	34 24.29%	48 34.29%	15 10.71%	43 30.71%	140
2002	36 24.49%	65 44.22%	11 7.48%	35 23.81%	147
2003	79 33.91%	88 37.77%	23 9.87%	43 18.45%	233
2004	149 33.11%	158 35.11%	50 11.11%	93 20.67%	450
2005	196 35.70%	205 37.34%	45 8.20%	103 18.76%	549
2006	216 37.37%	188 32.53%	57 9.86%	117 20.24%	578
2007	184 37.02%	170 34.21%	49 9.86%	94 18.91%	497
2008	188 39.09%	162 33.68%	42 8.73%	89 18.50%	481
2009	184 39.91%	158 34.27%	45 9.76%	74 16.05%	461
2010	229 40.18%	195 34.21%	56 9.82%	90 15.79%	570
2011	499 41.00%	418 34.35%	128 10.52%	172 14.13%	1217
2012	640 43.90%	524 35.94%	131 8.98%	163 11.18%	1458
Total	2,669 38.50%	2,433 35.10%	675 9.74%	1,155 16.66%	6,932

NHSC Providers in Medicare Data Resemble the Overall NHSC Providers

Discipline	All NHSC Providers	NHSC in Medicare
Allopathic Physician	4,465	2,960
Chiropractor	14	10
Certified Nurse Midwife	582	227
Dentist	2,508	36
Health Service Psychologist	1,768	597
Licensed Clinical Social Worker	2,208	635
Licensed Prof Counselor	1,988	66
Marriage and Family Therapist	348	14
Nurse Practitioner	3,735	1,836
Osteopathic Physician	1,382	1,010
Pharmacist	26	0
Physician Assistant	3,115	1,483
Psychiatric Nurse Specialist	81	44
Registered Dental Hygienist	483	19
TOTAL	22,703	8,937

	All NHSC Providers	NHSC in Medicare
Age (at Entry)	36.9	37.7
Gender		
Males	6,820	3,249
Females	15,883	5,688
HPSA Type		
Primary Care	12,452	6,985
Mental Health	7,260	1,897
Dental	2,991	55
TOTAL	22,703	8,973

Distribution of non-NHSC Providers from Medicare Data (Primary Care)

Discipline	Non-NHSC Providers	Percent
Physician	168,620	83.1
Certified Nurse Midwife	572	0.3
Dentist	5,409	0.6
Nurse Practitioner	24,632	12.1
Physician Assistant	9,175	4.5
TOTAL	202,999	100

	Non-NHSC	Percent
Age (at Entry)	45.8	--
Gender		
Males	130,046	64.1
Females	72,953	35.9
TOTAL	202,999	100

Note: The population of non-participants was constructed by retaining:

- Providers with disciplines from the list of NHSC disciplines
- Providers working in HPSAs where at least one NHSC provider was observed

The non-participants sample was constructed using the first analytic file (i.e., using Medicare, P360 and NHSC data)