



INSTITUTE FOR DEFENSE ANALYSES

**Analysis of DoD Accession Alternatives  
for Military Physicians  
(Conference Brief)**

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#### About This Publication

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## **Executive Summary**

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The Uniformed Services University School of Medicine (USU SoM) is one of four sources of Active Duty military physicians. The sources vary in their extent of education assistance and years of obligated service. This presentation discusses the results of research performed by the Institute for Defense Analyses (IDA) to estimate the effect of accessing through the USU SoM on years served on Active Duty. Descriptive survival analysis shows that USU SoM graduates serve an average of six years longer than other Active Duty physicians over the first 18 years of their careers. (We selected an 18-year timeframe due to the scope of available data.) However, some of the six-year difference is likely due to selection into the USU SoM of individuals who were already planning to serve long careers. IDA used a two-stage estimation strategy to isolate the causal effect of accessing through USU, finding that USU SoM accessions would serve an average of 2.25 fewer years if they accessed otherwise.





# Analysis of DoD Accession Alternatives for Military Physicians

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# We seek to evaluate physician accession sources

DoD has four sources of military physicians:

- Uniformed Services University (USU)

- Health Professions Scholarship Program (HPSP)

- Financial Assistance Program (FAP)

- Direct accession

USU asked IDA to estimate the costs and benefits associated with each accession method

This presentation focuses on estimating the relative benefit of USU in terms of years served



# Accession sources focus on education assistance

USU – Attend the DoD medical school on active duty

No tuition or fees

7-year service obligation\*

HPSP – Attend U.S. medical school as inactive reserve

DoD pays tuition, fees, stipend, and bonus

1-year obligation per year participated\* (typically 4)

FAP – Attend civilian residency on IRR\*

DoD pays stipend, bonus, and other costs, if any

1-year obligation plus 1 per year participated

Direct accession – Join as staff physician

Minimum 2 years

\*Post Graduate Medical Education (GME)

\*IRR: Individual Ready Reserve

# The typical physician career has many stages

4 years of medical school

1 year internship

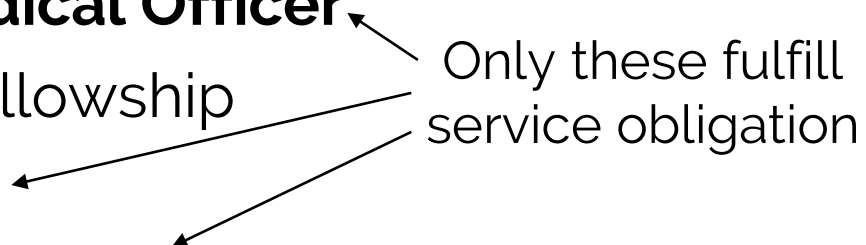
**0 to 4 years as General Medical Officer**

2 to 6 years of residency/fellowship

**0+ years as staff physician**

**0+ years in administrative/leadership roles**

Only these fulfill  
service obligation



O-1 while in medical school, O-3 upon graduation

O-6, if attained, typically 18 to 22 years after graduation

# We have useful data

Monthly observations of all military physicians, 2000–2018

Features include:

- Occupation (e.g., anesthesiologist)

- Pay grade

- Deployment status

- Home of record state

- USU graduate (by merge with USU census)

Years served is right-censored for physicians still serving as of Dec 2018

Survival analysis will account for right-censorship

# Our analysis is restricted to the first 18 physician years

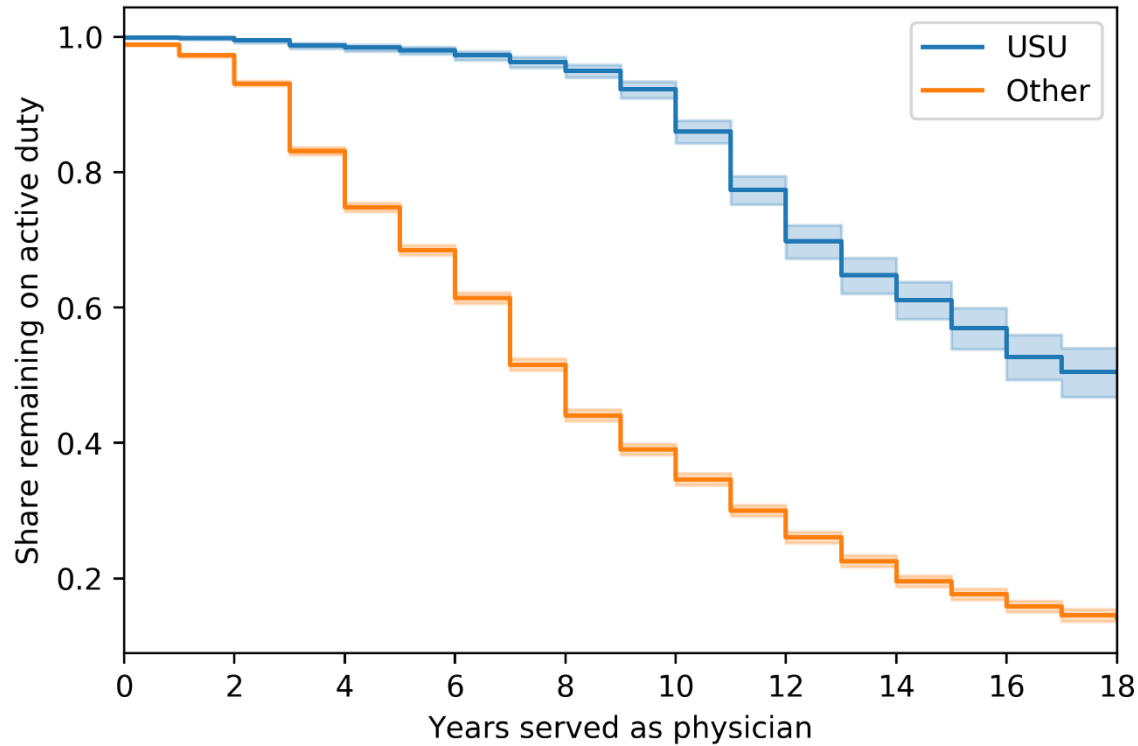
We restrict our data to individuals first observed as a physician Feb 2000 or later

We cannot observe beyond the 18-year span of our data

We observe mid-career physicians at the start of our data, but we don't know when they became a physician

We expect post-2000 accessions to be most relevant for evaluating current accession sources

# We can construct a survival curve



In their first 18 years as a physician

The mean USU graduate serves 14.94 years

The mean other physician serves 8.93 years

# Estimating a causal effect is not so easy

The prior results do not answer the causal question:  
How does USU attendance affect career outcomes?

We may expect people who choose to attend USU to  
have greater preference for a longer military career

These people would have had longer careers even if  
attending USU wasn't an option

That is, taste for service biases upward the estimated  
effect of USU attendance

# We propose an instrument

Consider the share of a state's students that attend medical school out-of-state

We posit this share to be:

1. positively correlated with USU attendance
2. not otherwise correlated with years served

Obtained matriculation data by state of matriculant, medical school, and year for 1998–2018 from AAMC\*

1998 shares are most plausibly exogenous and are extremely correlated with shares over all years ( $r=0.97$ )

\*AAMC: Association of American Medical Colleges

# We estimate in two stages

1. Regress USU attendance on out-of-state share
2. Regress years served on predicted values from step 1

Second stage must be a survival model

First stage must be linear for predicted values to yield consistent estimates\*

\* Joshua D. Angrist and Jörn-Steffen Pischke, *Mostly Harmless Econometrics* (Princeton: Princeton University Press, 2009), pp. 190-192.



# Preliminary analysis is promising

First stage shows our instrument is relevant

A 1%-point higher out-of-state share is associated with a 0.24%-point increase in USU attendance  
t-stat > 22; F-stat > 491

Second stage shows USU attendance matters

Graduating from USU causes a physician to be 58% less likely to leave in a given period

# Preliminary analysis has some addressable flaws

Some observable features may be confounders in the first and/or second stage—we should control for them

We expect the USU effect to vary by year of service—we should estimate a vector of proportions, not just one

Proportional hazards model offers only relative values—we should estimate a baseline and measure effects in years

Standard errors do not capture uncertainty in predicted values—we should estimate them by bootstrapping

# First stage is robust to controls

All controls measured at first month as physician

Dummies: citizenship origin, ethnicity, race, sex, and service

Numeric: age, prior years of service, year

First stage is robust to controls:

A 1%-point higher out-of-state share is associated  
with a 0.26%-point increase in USU attendance

t-stat > 21; F-stat > 445

# Second stage is a neural network

We use the survival loss function of Gensheimer and Narasimhan\*

The output for a given observation is a vector of hazards, one for each year

We include 3 hidden layers, each with 128 densely connected neurons and a SELU\*\* activation function

Further work will explore robustness to different numbers/sizes of layers and other hyperparameters

\*<https://github.com/MGensheimer/nnet-survival>

\*\*SELU: Scaled Exponential Linear Unit

# Improved analysis shows USU attendance matters

For each individual in the data we can predict years served after attending and not attending USU

The difference is the estimated USU treatment effect

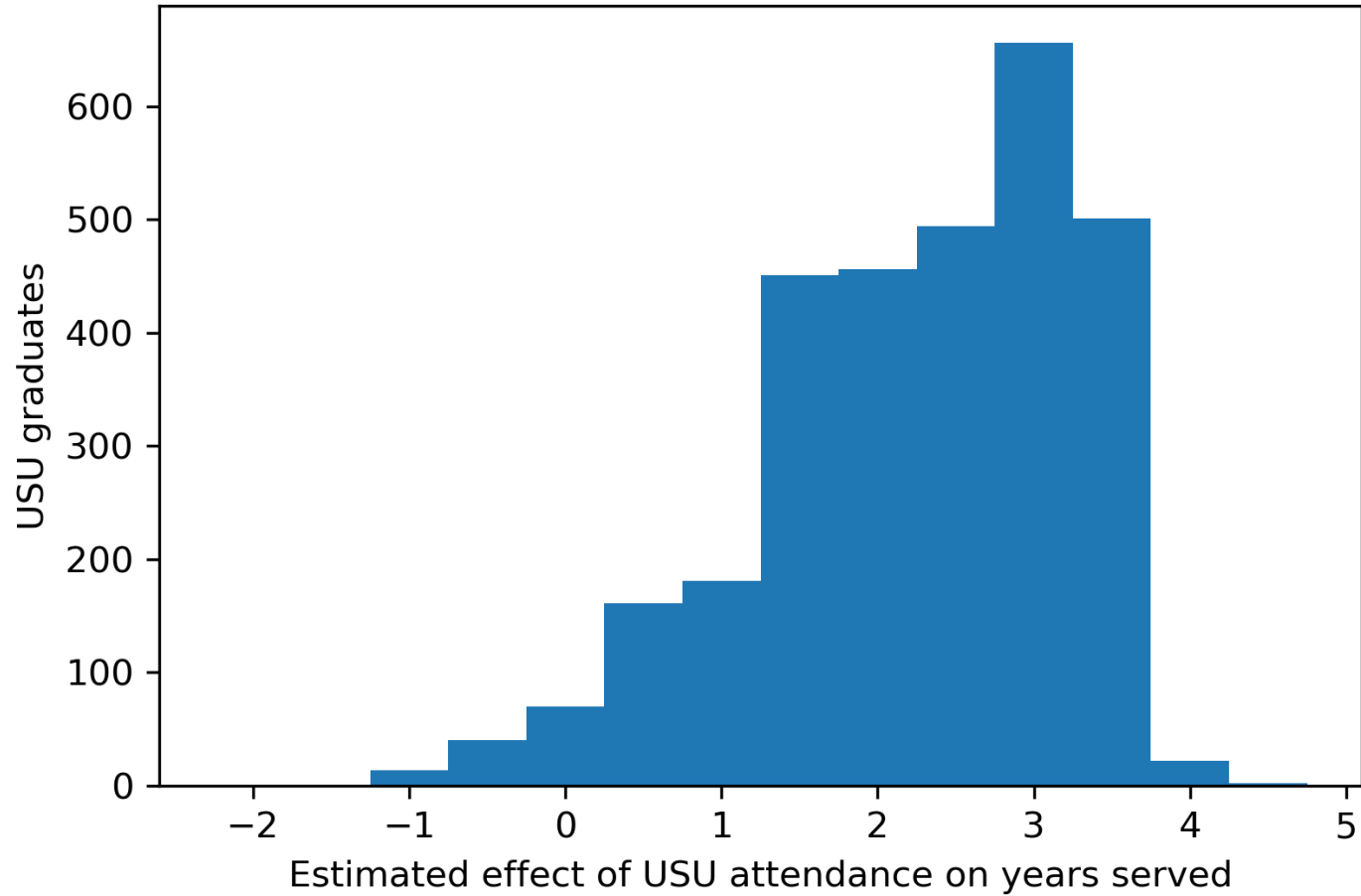
The mean of the differences over all USU graduates is the estimated LATT\*

We estimate a LATT of 2.25 years

We estimate a 95% confidence interval of [0.94, 3.61]

\*Local Average Treatment effect on Treated compliers

# Treatment effect varies, but is predominantly positive



# Summary

We estimate the causal effect of attending USU on physicians' years served

We use an instrumental variable (share attending medical school out-of-state) and neural network survival model

We estimate that a USU graduate would have served 2.25 fewer years on average if they accessed otherwise

This causal effect explains about 38% of USU graduates' greater years served





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