Apprenticeship Learning

Science Education in the 17th Century

Highly effective but not very efficient

Mentor

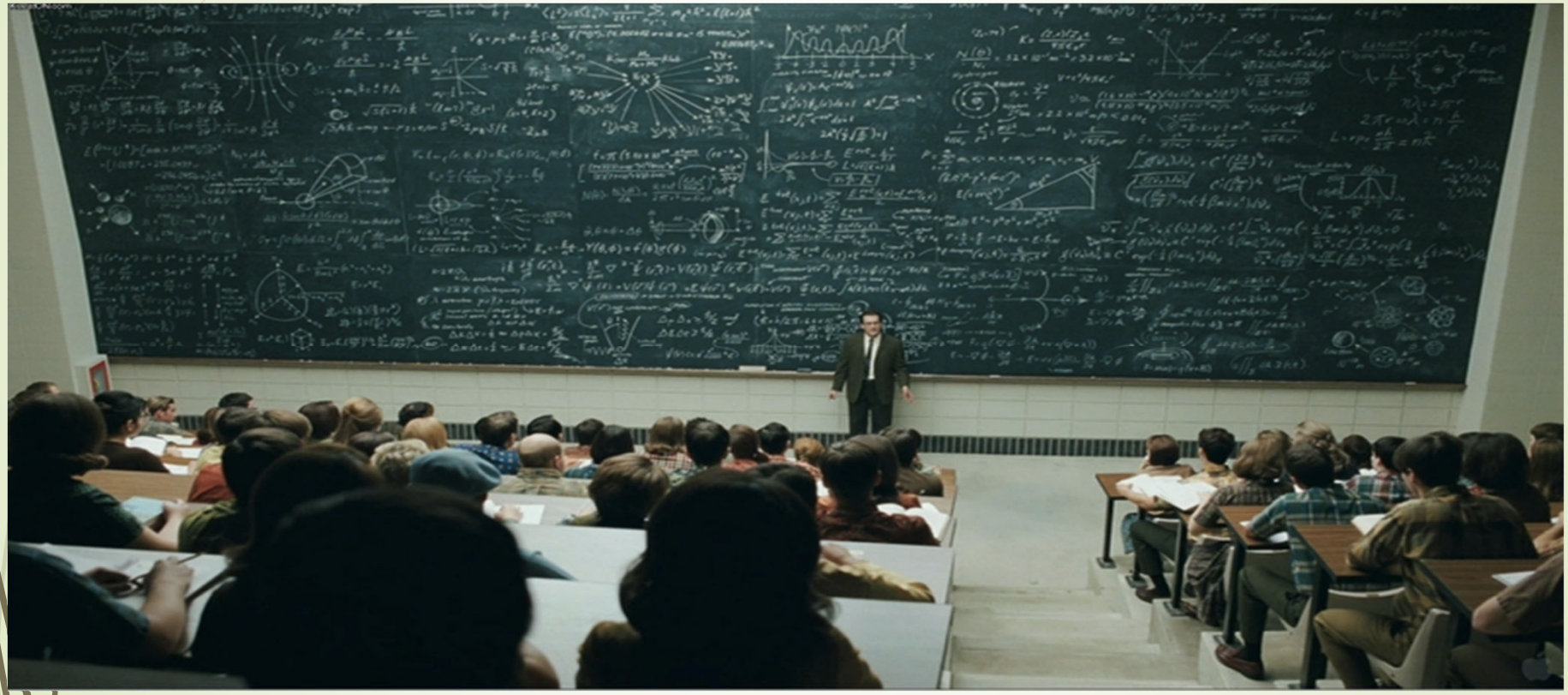
Galileo: "Father" of Modern Science

Apprentice

Viviani: Galileo's Apprentice

Science Education in the 20th Century

Highly efficient but not as effective



Science Education in the 21st Century

Critical Thinking

Synthesizing content across disciplines in the application of novel solutions to authentic problems

Collaboration

Scientists work in teams to solve complex problems

Competencies

Emphasized over content

Creativity

Creating new scientific products rather than "consuming" content information

How is Research Incorporated into Medical School Applications?

- Experience/Activities Section of the AMCAS Application
  - Up to 15 entries describing work or extracurricular activities (700 characters)
  - Up to 3 entries highlighted as most meaningful (1375 more characters)

Indicate the total number of hours that you spent completing this work experience or activity during the date range that you indicate. If this is a repeated experience, enter the total number of hours for each date range you provide. Indicate the total number of hours you anticipate completing for this experience in the future, if applicable.

Experience Type (see above list):	
Experience Name:	
Organization Name:	
Country:	City:
Contact Name:	Contact Title:
Contact's Phone Number:	Contact's E-mail Address:

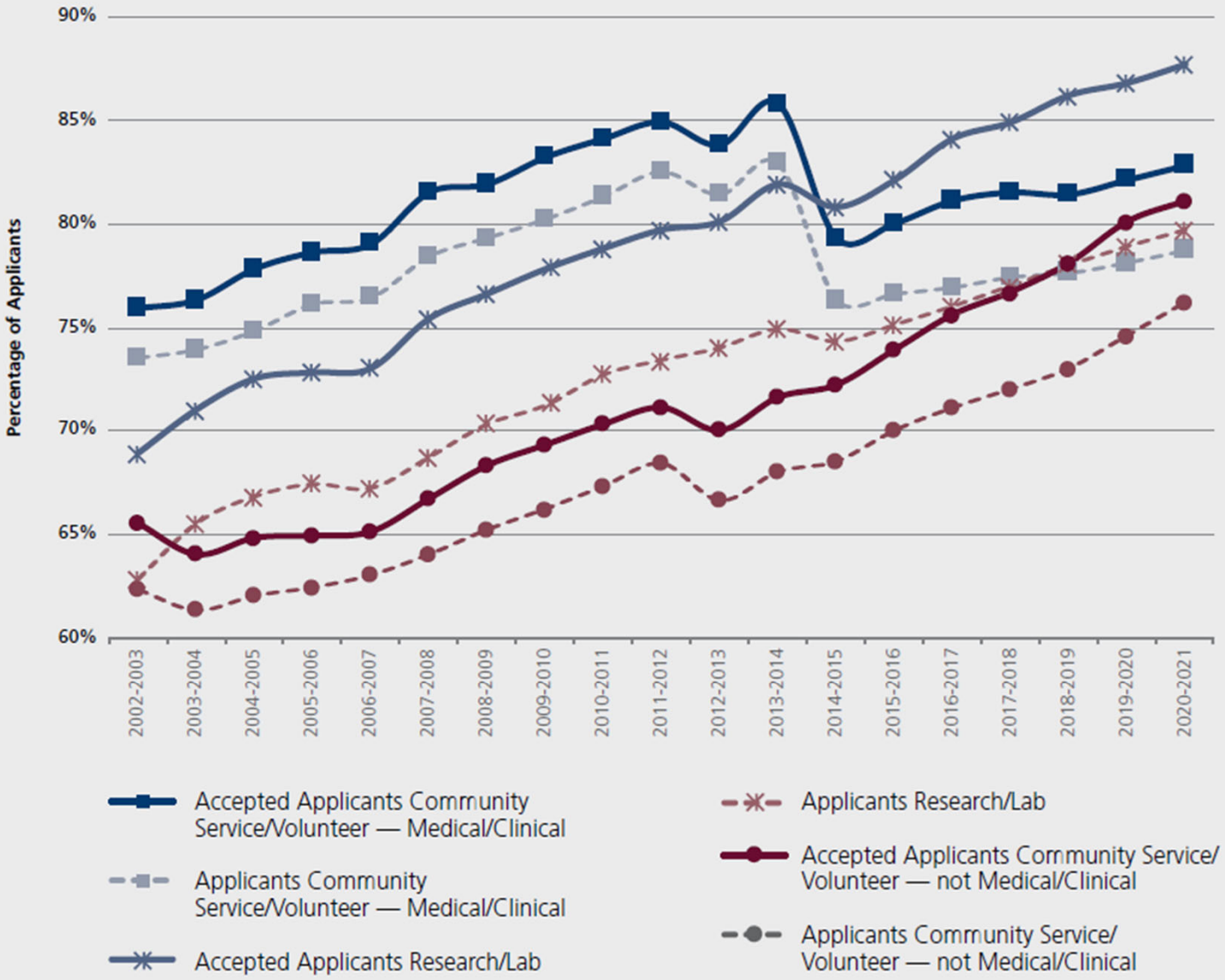
Completed Start Date:	Completed End Date:	Completed Hours:
Repeated?	Yes	No
Anticipated Hours?	Yes	No
Anticipated Start Date: (if yes above)	Anticipated End Date (if yes above)	Anticipated Hours (if yes above)
Experience Description **(700 Characters)**		
This is one of my most meaningful experiences:	Yes	No
Most Meaningful Experience Summary **(1325 Characters)**		

Experience Categories

- Artistic Endeavors
- Community Service/Volunteer – Medical/Clinical
- Community Service/Volunteer – Not Medical/Clinical
- Conferences Attended
- Extracurricular Activities
- Hobbies
- Honors/Awards/Recognition
- Intercollegiate Athletics
- Leadership – Not Listed Elsewhere
- Military Service
- Other
- Paid Employment – Medical/Clinical
- Paid Employment – Not Medical/Clinical
- Physician Shadowing/Clinical Observation
- Presentations/Posters
- Publications
- Research/Lab
- Teaching/Tutoring/Teaching Assistant

Trends in Experience

Figure 9.5. Percentage of AMCAS applicants and accepted applicants reporting selected experiences, 2002-2003 through 2020-2021.



Source: AAMC Data Warehouse: Applicant Matriculant Data File.

Key Points

- Research experience in some form is important
- Critical for some schools: e.g. UU and Stanford
- Critical for MD/PhD programs
- Types of experiences
  - Course-based research: e.g. AREs
  - Summer undergraduate research
  - Products are important
    - SURF presentations
    - Conference presentations
    - Peer-reviewed publications

Questions?

Pre-Med Research Experience

Mark Pershouse

Director of Pre-Medical Sciences

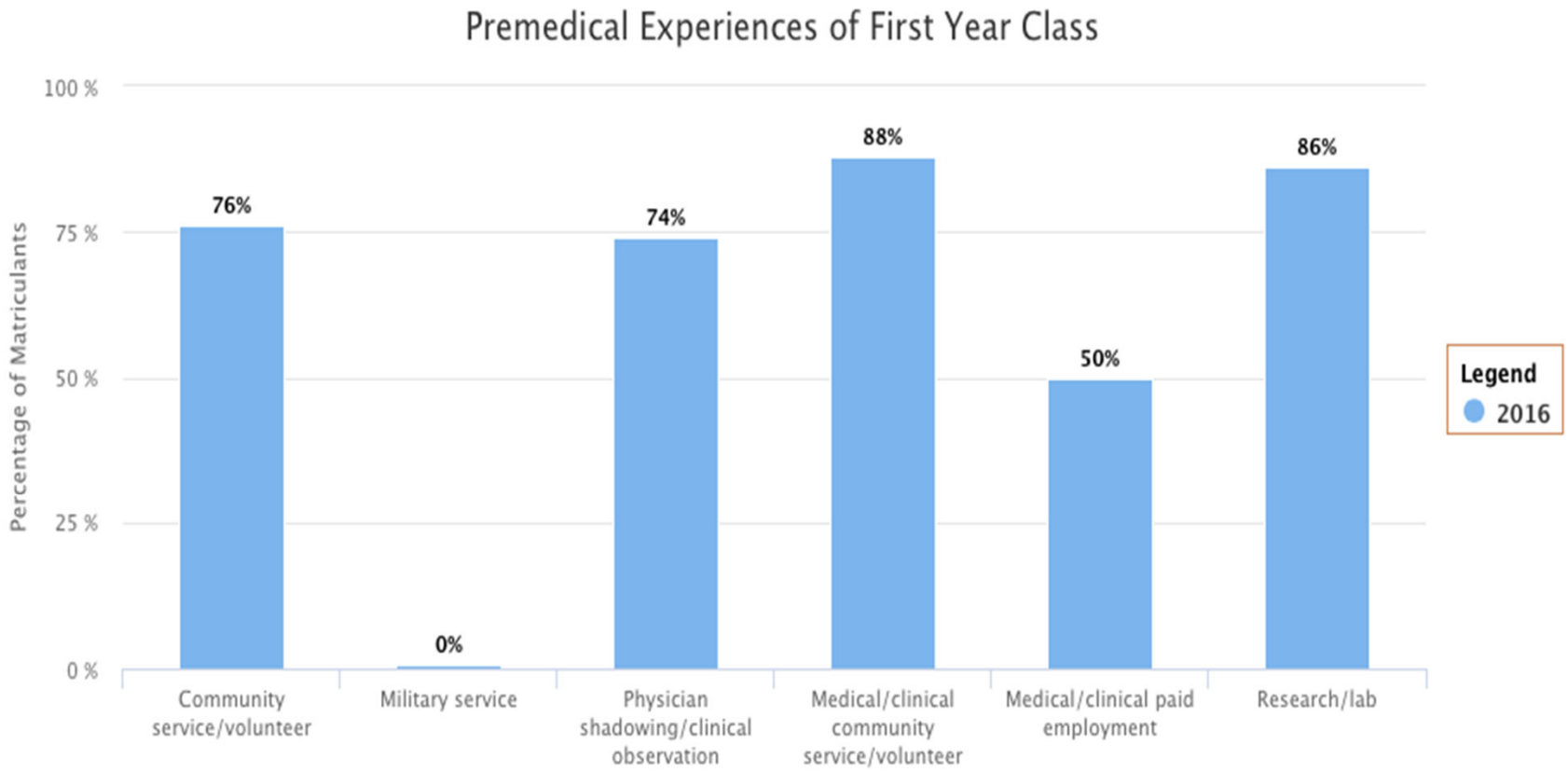
University of Montana

Reasons to do undergraduate research

- Get a good(better) letter of evaluation
- Get experience discerning anecdotal data from significant data, a valuable skill for any career
- Many admissions officers are scientists as well
  - Any connection during interviews is a good thing– common ground, conversation starters
- The practice of medicine has elements of the scientific method embedded in it. (sGOT; liver ruleouts)
- Undergraduate research may be a requirement for admission to medical school (competitive edge)

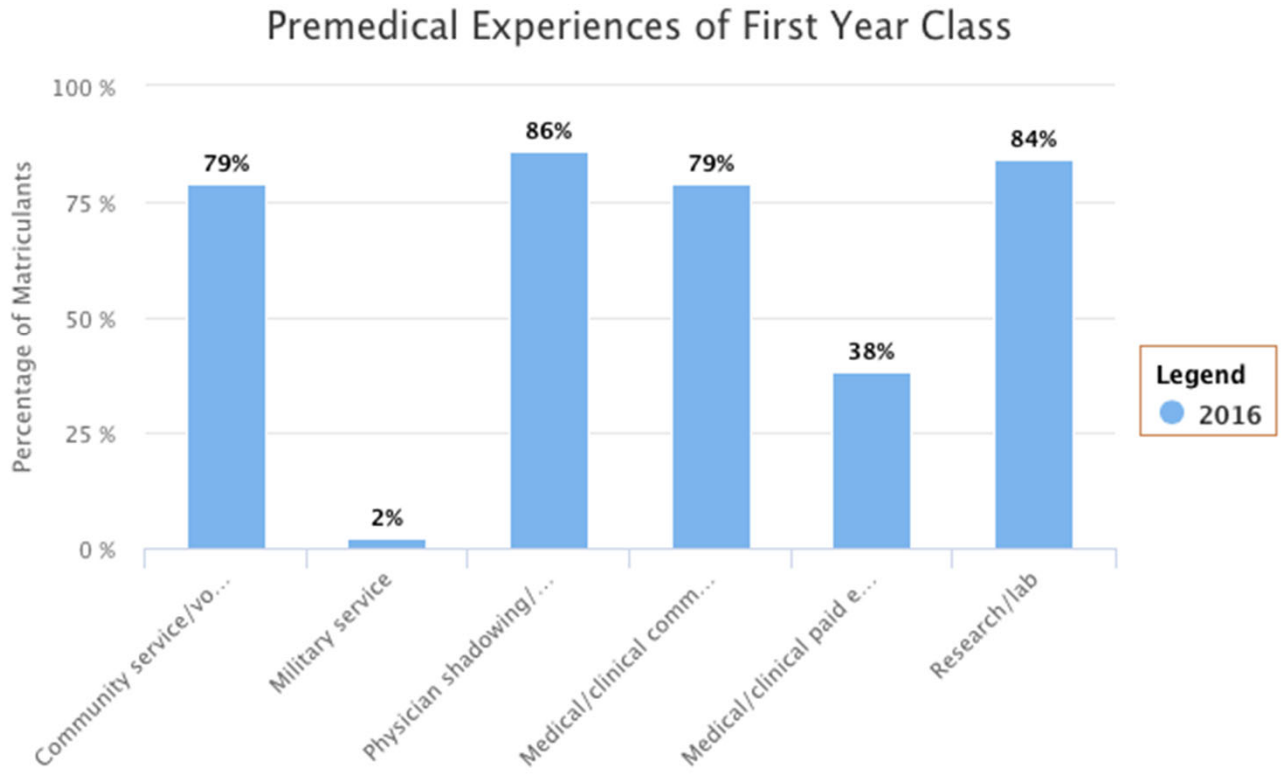
Albany

Premedical Experience



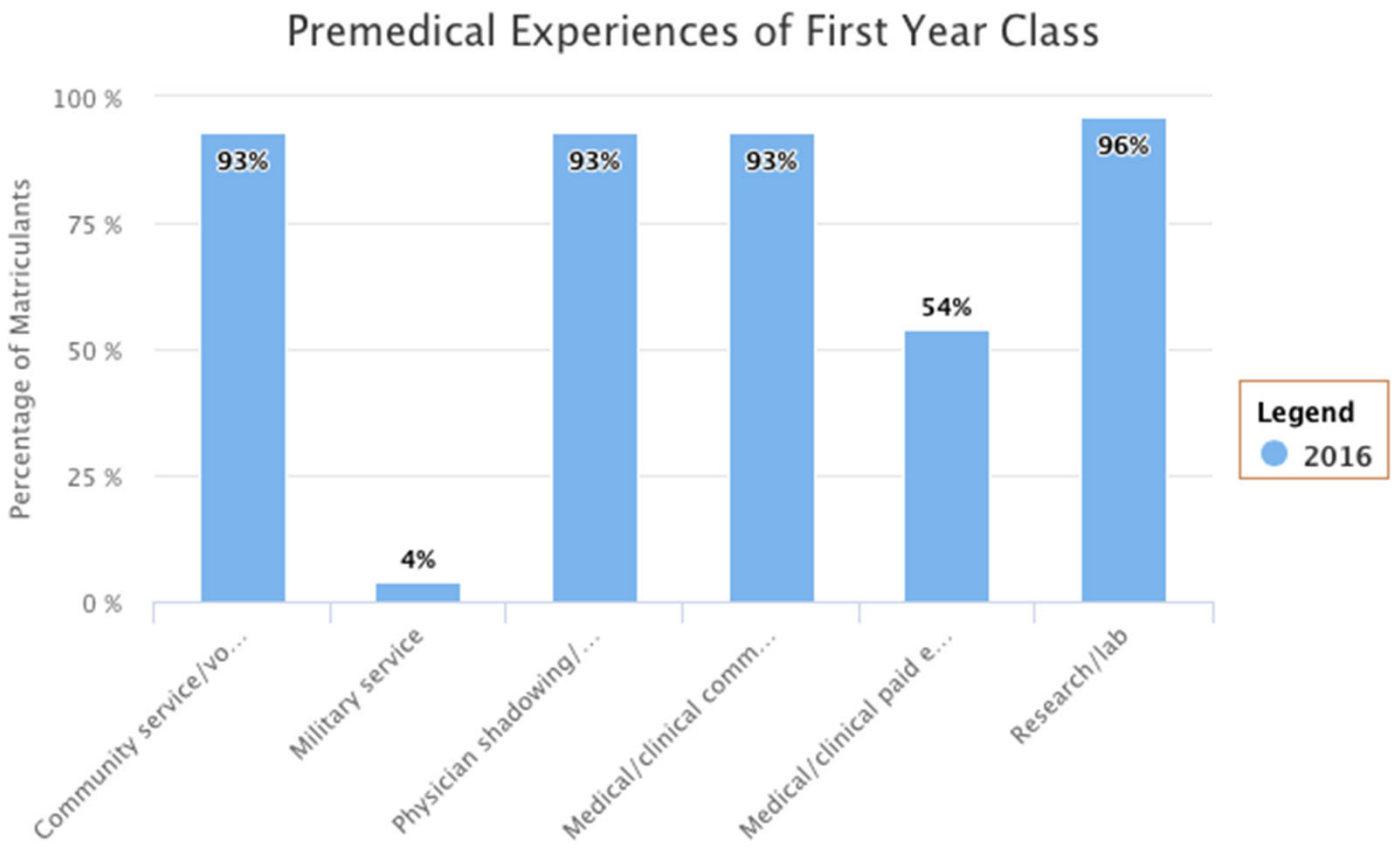
West Virginia

Premedical Experience

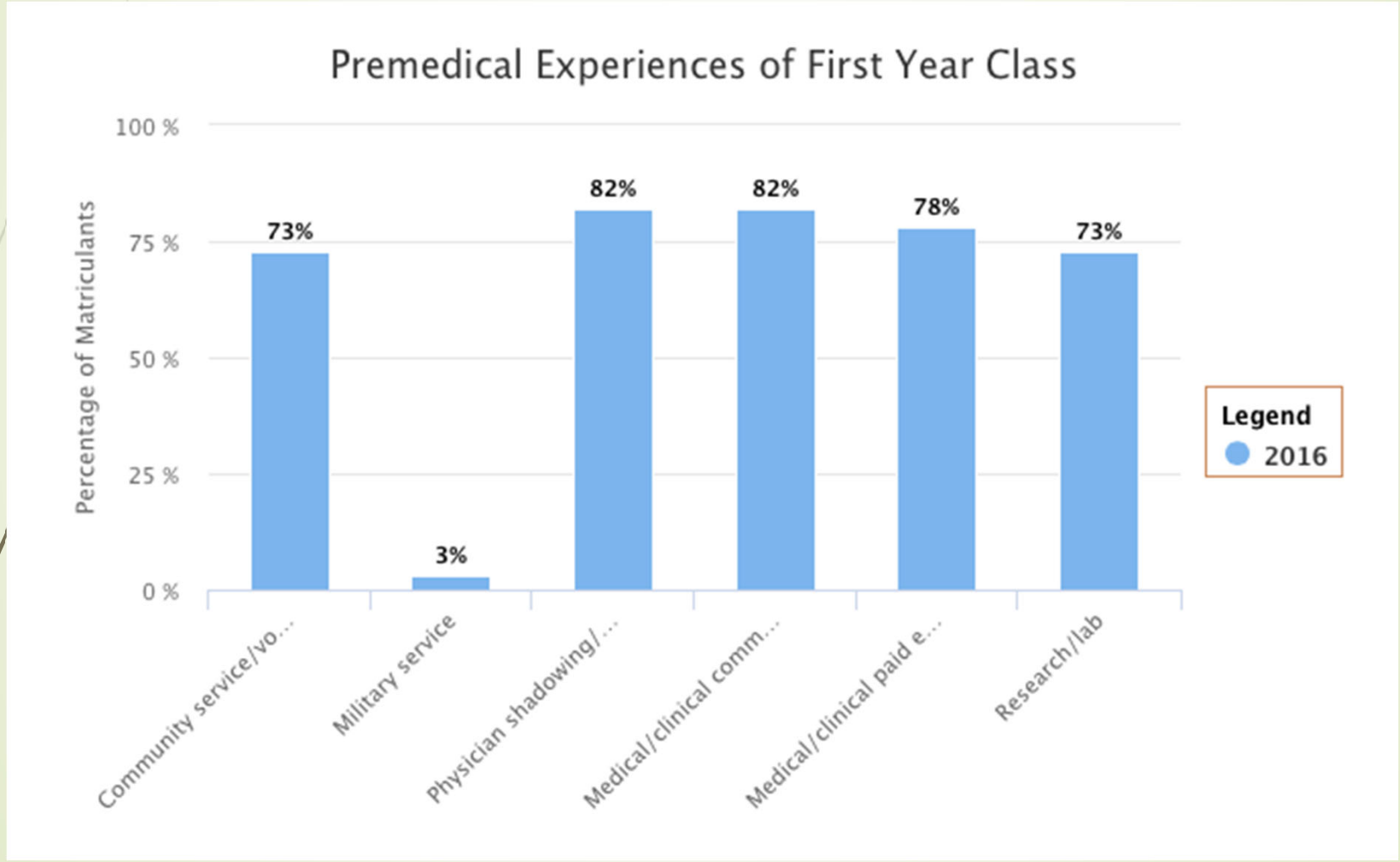


Utah

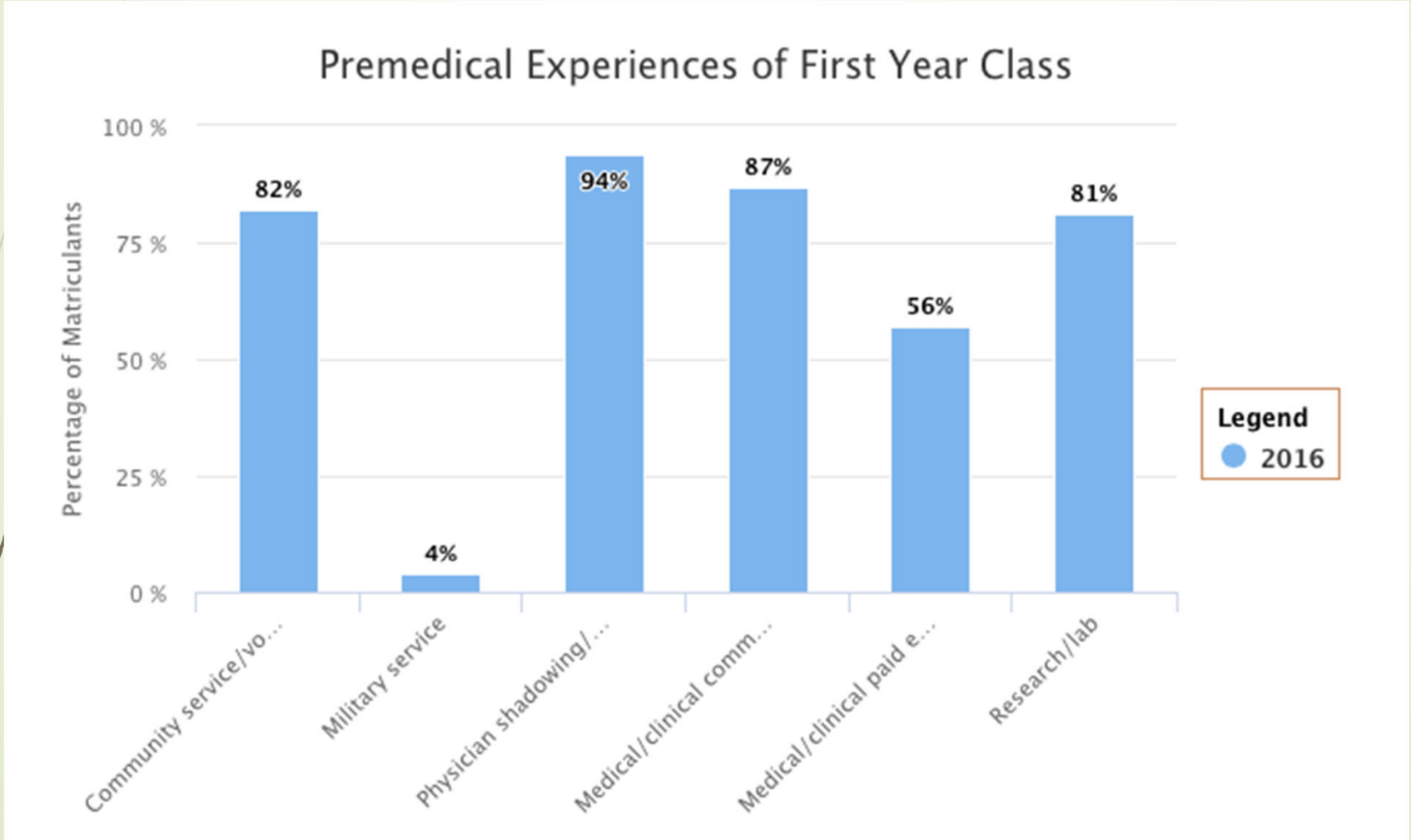
Premedical Experience



North Dakota



Univ. Washington



Reasons research may not be necessary

- You know what is involved in a clinical trial
- You understand discernment
- You have had statistics
- You understand the scientific method
- You already have 6 great letters

Letter Example-Research Mentor

I have known Jethro since Spring of 2009. He approached me initially because of his interest in the work I am doing in partnership with physicians on the Ipso Facto Indian Reservation and he expressed an interest in joining my lab. He offered to volunteer several hours per week and that relationship has grown now to include his own independent project in my laboratory.

Jethro is a very pleasant, hard-working student with a very positive attitude. He is very persistent, methodical, and skilled at communication. His work on lab projects has been exemplary and has helped to advance the goals of the laboratory. This fall, he helped to reestablish order in our database and clinical sample storage systems. He performed well mastering several techniques new to him. These included isolation of genomic DNA from human blood samples, quantitation and aliquoting of DNA at various concentrations, PCR, allele specific restriction digests, capillary electrophoresis. When the instructions that I gave left room for some decision-making, he took the initiative and made good choices. It is very easy to develop trust in his abilities in a short time. His work has contributed to one presentation at a National meeting so far and his work will be submitted to a high impact journal as part of a large multi-institutional study of the pharmacogenetics of a tribal population.

Research Opportunities at UM (examples)

Dr. Nick Natale

- Field of Study:anticancer drug discovery, anticonvulsant screening, diabetes
- Email: nicholas.natale@umontana.edu
- Phone Number: 243-4132
- Office Location: Skaggs 477B
- For more information please reference the website;
- http://health.umt.edu/biomed/people/default.php?ID=1215

Dr. Mark Pershouse

- Field of Study: genetics of cancer, cancer in medically-underserved populations
- Email: mark.pershouse@mso.umt.edu
- Phone Number: 243-4769
- Office Location: Skaggs 282
- For more information please reference the website;
- http://health.umt.edu/biomed/people/faculty.php?ID=1347

- **Dr. Scott Wetzel**
- Field of Study: activation and subset differentiation of $CD4^+$ T lymphocytes.
- Email: scott.wetzel@umontana.edu
- Phone Number: 243-2168
- Office Location: Clapp Bldg. 216
- For more information please reference the website;
- http://hs.umt.edu/dbs/people/default.php?s=Wetzel
-
- **Dr. Steve Lodmell**
- Field of Study: viral RNA structure and function
- Email: stephen.lodmell@umontana.edu
- Phone Number: 243-4304
- Office Location: CHCB (Clapp) 202
- For more information please reference the website;
- **http://hs.umt.edu/dbs/people/default.php?s=Lodmell**
-
- **Dr. Scott Samuels**
- Field of Study:
- Email: samuels@mso.umt.edu
- Phone Number: 243-6145
- Office Location: CHCB (Clapp) 207
- For more information please reference the website;
- http://hs.umt.edu/dbs/people/default.php?s=Samuels

- **Dr. Orion Berryman**
- Field of Study: Organic chemistry and molecular recognition
- Email: orion.berryman@umontana.edu
- Phone Number: 243-6805
- Office Location: Chemistry 009
- For more information please reference his website;
- http://www.cas.umt.edu/casweb/faculty/FacultyDetails.cfm?id=2056
-
- **Dr. Klara Briknarova**
- Field of Study: Structural biology, biomolecular nuclear magnetic resonance (NMR)
- spectroscopy, protein structure, function, and dynamics.
- Email: klara.briknarova@umontana.edu
- Phone Number: 243-4408
- Office Location: Chemistry 111
- For more information please reference her website;
- http://www.cas.umt.edu/chemistry/facultyDetails.cfm?id=926

- **Dr. Sarah Certel**
- Field of Study: Behavioral neurobiology, developmental genetics, cell biology
- Email: sarah.certel@mso.umt.edu
- Phone Number: 243-6425
- Office Location: Skaggs Building 393
- For more information please reference her website;
- http://www.cas.umt.edu/casweb/faculty/FacultyDetails.cfm?id=1576
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How to Join a Research Lab

- Identify faculty with interests similar to yours
  - This is contingent upon having UG research on your campus
  - If you don't look, into summer research opportunities

https://www.aamc.org/members/great/61052/great_summerlinks.html

http://www.pathwaystoscience.org/programs.aspx?descriptorhub=SummerResearch_Summer%20Research%20Opportunity

- Stop by their lab/office to talk
- Set up an appointment by email
- Offer to volunteer for a defined period as a trial
- Do well
  - Be punctual
  - Be professional
  - Be imaginative
  - Take some (measured) initiative
  - Give them your best effort
  - Have fun

What you should expect

- Publications-in the best of cases
- National Meeting presentations-certainly
- Regional Meeting presentations-always
- Course credit-if you need it
- Senior Honor's Thesis-Yes
- A better understanding of research and the mindset of many admissions committee members

Take Home Message

- Become a professional shopper for your patients
- Get a better letter
- Learn the Scientific Method
- Find common ground with interviewers

REU and Others

- https://www.nsf.gov/crssprgm/reu/
- NSF funds a large number of research opportunities for undergraduate students through its REU Sites program. An REU Site consists of a group of ten or so undergraduates who work in the research programs of the host institution. Each student is associated with a specific research project, where he/she works closely with the faculty and other researchers. Students are granted stipends and, in many cases, assistance with housing and travel. Undergraduate students supported with NSF funds must be citizens or permanent residents of the United States or its possessions. An REU Site may be at either a US or foreign location.

EuroScholars

- https://euroscholars.eu/

SURF/SURP

SURF

The Summer Undergraduate Research Fellowships (SURF) program is one of the "crown jewels" of Caltech. Since 1979, SURF students have had the opportunity to conduct research under the guidance of experienced mentors working at the frontier of their fields.

SURF is modeled on the grant-seeking process:

- Students collaborate with a potential mentor to define and develop a project
- Applicants write research proposals as part of the application process
- Faculty review the proposals and recommend awards
- Students carry out the work over a 10-week period during the summer
- At the conclusion of the program, students submit a technical paper and give an oral presentation at one of several SURF Seminar Days, symposia modeled on a professional technical meeting.

In 2020, Fellows will receive a $6,420 award for the ten-week period.