Pre-Med Attrition: Exploring the Pre-Med Experience at OSU

by
Han Xue

A THESIS

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AN ABSTRACT OF THE THESIS OF

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Katherine McLaughlin

Pre-med attrition is the loss of students participating in academic pre-medical programs over time. Attrition in medical school has been the subject of many studies, but pre-med attrition is less researched, despite its relevance to the emergence and performance of future medical professionals. Interviewing former pre-med students who chose other paths and viewing their experiences through the lens of oral history facilitates the analysis of factors that play various roles in encouraging undergraduate students to both enter and exit the pre-med track. Changed and shaped by the perceptions of individual students, these factors range from social pressure and uncertainty about the future to intra-track competition and disillusionment with the realities of medical practice. Examining them from the perspective of pre-med students could provide knowledge on how to streamline the pre-med track, potentially improving the quality of health professional produced by medical schools.

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<u>Honors Baccalaureate of Science in Biology</u> project of Han Xue presented on June 5, 2020.

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I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

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Han Xue, Author

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1 Introduction

Entering the medical field can be a challenging and onerous task. This becomes all the more apparent as aspiring healthcare workers enter the pre-professional arenas of college and graduate school, assuming more personal and professional responsibility and testing their certainty in their life choices thus far. An interplay of social, financial, and assorted other issues can cause people to rethink their options during their time in university. As a result, many individuals (including myself), who begin their undergraduate years as pre-medical students change their minds along the way, opting for other career paths.

Attrition in medical school has been the subject of many studies, but pre-med attrition, as a whole, is a relatively less examined phenomenon. In 2013, a group of researchers conducted a critical review of literature on the topic on ERIC, JSTOR, PubMed, Scopus, ISI Web of Science, and PsycINFO, and through keyword searches, identified 1,168 articles that could potentially be relevant. Out of those 1,168 articles, only 19 were found to be suitably related to pre-med attrition to the point where they could be reasonably reviewed (Lin 2013). In more recent years, other pertinent studies have sprung up, from an examination of sex-based differences in pre-med attrition (Grace 2019) that found women to be more likely to experience burnout to an article on how undergraduate research experience can impact pre-med success and retention that ultimately found research experience helpful in medical school application (Vincent-Ruz 2017). Many of these are very specific, focusing on one particular aspect on pre-med attrition. However, broader, and potentially more comprehensive overviews are sparser on the ground, despite their relevance to the emergence and performance of medical professionals in the future.

This becomes increasingly important in light of the COVID-19 pandemic, at a time when healthcare professionals are in increasing demand and in equally increasing shortage. According

to a 2019 report published by the Association of American Medical Colleges (AAMC), there is a projected shortfall of 40,000 to 122,000 physicians over the next decade, with a shortage of 29,000 to 42,900 doctors in 2020 (Friedan 2020). The influx of new care workers simply cannot keep up with issues such as an aging population, a growing number of patients with chronic conditions due to increased survivorship with new technology and care methods, and the limited capacity of healthcare education (USC 2020). In order for problems like the former to be solved, problems like the latter must be solved first, and those solutions must begin before medical school, which is the point where most studies take place. Burnout in medical students and physicians is well-documented, but less visible are the losses the healthcare workforce takes in undergraduate years. It was estimated that less than half of all pre-med students end up applying to medical school (Leong-Kee 2016). Of those, approximately 50% of students who apply to medical school are accepted each year (Chen 2017). This means that less than a quarter of those who began as pre-med are ultimately accepted into medical school, which illustrates a multiphasic problem where initial recruitment is high, but losses are also high, with an unrealistic cutoff point for number of accepted medical students each year. All this, in a system that cannot supply enough physicians to meet demand.

Ultimately, this inefficient system can result in the loss of time and financial resources for those students who swap out (as well as an expenditure of educator effort and school resources that might be better utilized elsewhere), and both a direct and indirect loss of potential medical professionals for the world at large. This is not to say that students derive no benefit from their experiences in the pre-med track even if they choose to change paths; several of the students referred to later in this piece mentioned that they gained valuable knowledge and experience during their time in pre-med that has influenced their new career choices. Rather, it is

simply more efficient to start on a path that one will stay on, without the additional stress and potential financial burden of changing tracks in the middle of one's undergraduate years. The presence of additional students in the pre-med track who are unlikely to stay also adds a sense of stress, as those who might otherwise be likely to stick to the track perceive that there is greater competition and become uncertain if they can continue. Current pandemic conditions are only underscoring the need for confident and well-trained medical workers, and yet the environment meant to raise them can be unnecessarily hostile to their success. There are so few qualified medical professionals now that retired healthcare workers are being called to work once more.

Speaking more broadly, this labor shortage in the healthcare field is not limited to physicians. Nurses, epidemiologists, and other, less star-studded positions are perhaps even more needed than doctors, as they comprise the larger body of the healthcare workforce. And yet, the idea is presented to pre-med students that one must either succeed in becoming a physician (with all other achievements subordinate to this one, hallowed goal) or leave the medical field entirely. Pre-med students themselves do, admittedly, bear some of the onus for this. Those who choose that track for the sake of money or prestige many not be prepared for its rigor, and certainly contribute to dropout numbers.

In order to investigate this, I conducted a basic oral history assessment on pre-med attrition at Oregon State University (OSU). Oral history in general is the gathering of testimony from a living person about their own experiences, which is then placed in proper historical context. It depends on human memory, and so, can only be done retrospectively within the time period of one lifespan. In this case, the testimony was centered around the pre-med track at OSU, which is a track that students from a variety of majors can take over the course of their undergraduate careers that is meant to help students find their way to medical school. It consists

of primarily science-based courses balanced by writing and social sciences, with the ultimate goal of preparing students for the MCAT, as well as medical school applications.

Here, I was given the opportunity to interview five undergraduate students currently attending Oregon State University (OSU), each of whom started out as pre-med students and who opted for different paths during their time at OSU. First and foremost, contact with each of the five interviewees (who will be referred to by pseudonymous initials) was primarily established through networking. Throughout the 2018-2019 academic years, I shared classes with multiple individuals who revealed that they were formerly pre-med during self-introductions, and two of those individuals agreed to be interviewed. One of those two further recommended her friend, who had also left pre-med. Another two fellow students were not formerly pre-med themselves, but knew others who were, and those others also agreed to participate in interviews. Finally, I was friends with one last student who I asked to interview, knowing that they also left the pre-med track, leaving me with a total of 5 interviewees.

4 of the 5 were interviewed in-person for approximately 20-30 minutes each during the Winter 2020 term, with the last interview conducted through e-mail due to the recent coronavirus outbreak. All five interviewees (SO, MG, AM, AS, and TP) were seniors in their fourth year, who had swapped out of pre-med during their first three undergraduate years. SO and MG share an Asian cultural background, while AM, AS, and TP are Caucasian. SO, MG, and TP are male, while AM and AS are female. Field notes were taken via personal computer during in-person interviews before being further organized and re-transcribed. Questions were centered around the interviewees' original motivations for entering the medical field, their experiences in the pre-med track, and their reasons for leaving it. While the in-person interviews were more fluid and conversational, the e-mail interview included a list of questions to be answered. Each

interviewee had the ability to opt out of answering questions they felt uncomfortable with, and each signed a waiver guaranteeing their right to privacy and their ability to veto the release of any information they did not wish to be published. Below are their views and memories of the time they spent as pre-med students at Oregon State University.

2 Initial Interest

The decision to leave the pre-med path must be preceded by the decision to join it in the first place, and so, I began by asking for the reason for each of their initial interests. My first interviewee was SO, who is now working towards a career in computer science after having swapped out of pre-med in the summer between his sophomore and junior years. The first question was if he had any family background in medicine, and if so, how that might have influenced his original decision to enter medicine:

> **HX:** *Does anyone in your family have a history in the medical field, as a doctor, nurse, PA, or similar?*
>
> **SO:** *My dad is pharmacist. So, I grew up seeing him help friends and other people- and I grew up in a mostly Asian community where people weren't so trusting of Western medicine, so they, like, weren't sure what medicine to take and he would help them with that. Aside from that, I really wasn't sure what I wanted to do, and it was like, hey medicine is a pretty prestigious occupation, and you make a lot of money and it looks good. It'll be looked highly on in the future, and medicine's interesting. I liked learning about biology, so I thought I might as well try it.*
>
> **HX:** *Would you say it's primarily seeing your dad work then, that made you want to become a doctor?*
>
> **SO:** *It's mostly not knowing what I wanted to do. I mean, I figured I might as well try the hardest thing out there. I like to challenge myself and see if I can do things.*

It seems evident here that becoming a doctor was not a dream for him, but rather, a default option that met his and his family's standards as an acceptable career choice, and one that might have come to mind partially due to exposure to his father's practice. SO grew up in a community with some distrust of Western medicine, which resulted in the discovery of a need for medical professionals that the people around him could trust and rely on for advice. Perhaps originally inspired by his father's work, medicine happened to fit both community need and his desires and interests, but perhaps it wasn't the shining light at the end of the tunnel for him, even though he was willing to work hard for the sake of that goal. The mention of liking challenge suggests that the idea of hard work for the sake of a lofty goal was also a motivating factor (S.O, personal communication, February 10, 2019).

Consistent with the idea that medicine might be selected more for convenience and suitability than for passion was AM's response when asked the same question:

> **"***A lot of it was not knowing what else I wanted to do. I knew I liked biology. Medicine was the thing they [teachers, advisers, other surrounding individuals] talked about the most- and I liked helping people and I liked science, so there you go. Though, my Grandpa was a neurosurgeon; he thinks anyone who isn't a surgeon isn't a real doctor.*"

Here again, medicine was not a self-selected, personal interest. Rather, becoming a doctor was presented as almost a default career choice for anyone who liked science and had vaguely humanitarian views on helping others. This happened on both personal and professional levels, from family to academic advisors, and began earlier in life than college, as AM made the decision to go pre-med around the end of high school. Exposure to the idea of being a doctor, and the suggestion that anyone with interests that might align to serving in the healthcare field should try to be a doctor seem to be her main reasons for entering pre-med (A.M, personal communication, February 12, 2019).

AS, who now plans to go into psychology, was also advised to go into medicine because her interests "fit" with the skillset a medical professional might be interested in:

>   **"***My Grandma was an audiologist, so I kind of had family in medicine. Mostly, I really liked genetics, and there are only a few routes for that- PhD researcher, or medical doctor- and I hate research, so the other options just didn't appeal to me as much. And then the first year of college, my advisor suggested that becoming a doctor might be good.***"*

In her case though, it was less that being a doctor made sense, and more that she didn't like options besides being a doctor that were presented to her. There appeared to be a tacit understanding that an interest in certain life science fields relegates students to entering medicine or research, which meant that if she was not inclined to do research for a living, she would have no choice but to enter medicine to work with her subject of personal interest (A.S, personal communication, February 11, 2019). This same mindset could ultimately make other students more inclined to pick choices that they may end up dissatisfied with, out of the impression that alternatives are unacceptable or unattainable.

Unlike AS, and AM and SO for that matter, MG was heavily bolstered by familial pressure:

>   **"***No one in the family is a doctor; we're mostly engineers... I took a couple AP classes in high school. And the first one I was really good in was AP Bio, so it was primarily academically based. Dad wanted a doctor in the family. Mom wanted my older sibling to be a medical doctor at first, but then they wanted to do clinical psychology, and I guess it wasn't close enough. I don't know. Both my parents are engineers, so maybe they didn't like their jobs and didn't want me to be one too.***"*

He does share an initial interest in life science, and his family's reasoning does hint at the idea that anyone interested in life science should be a doctor. However, his initial interest in life

science, which ended up spurring his parents forward, was based on academics (M.G, personal communication, February 10, 2019). He performed well in a field associated with medicine, and so, was encouraged and expected to continue. It should be noted here that the expectations of parents from MG's Asian cultural background may also play a role in initial tendencies towards medicine, as, anecdotally, parents from those backgrounds are often portrayed as expecting their children to enter more prestigious and financially secure professions.

Comparatively speaking, TP appeared to be the subject of less outside guidance than the other interviewees. He had a separate interest in healthcare to begin with that did not sprout from external suggestions and had no family background related to the medical field that he knew of (T.P, personal communication, March 24, 2020). Rather, the primary advice he received was to avoid majors that might not reliably provide straightforward career paths, like theater:

> **"***The major career guidance I was given was "Don't be a theater major," and do something that I find interesting and that will support me/my family. I was, and still am, interested in science and the multifaceted field of health and healthcare. I want to be able to help take care of people and give them the tools to live healthy lives*."

It can be seen that there are a number of common threads between their answers, which was not unexpected. SO and M share cultural backgrounds, as do AM, AS, and TP. Present as well was how their existing uncertainty in their life goals became directed by what almost seems like targeted advertising, the most mentioned being advisor suggestion. This could serve as priming to notice references to the medical profession in a variety of media, which could further influence decision-making. All five were originally in various life science majors- some still are- and all expressed that they weren't sure what they wanted to do with their lives, though several

were certain of specific careers they intended to avoid. Entering the medical field was not a dream, but a back-up plan in the absence of an alternate, more personalized, goal.

3 Experiences at OSU

Continuing the interviews chronologically, I then asked about their experiences in the pre-med environment at OSU, or rather, what their impressions of the pre-med experience at OSU were. MG, who made up his mind to leave the pre-med track earlier than the others (only a single term into college), had relatively little to say on the matter, but among the others, there did seem to be a consensus on several shared experiences/opinions.

> **HX:** *How do you feel about your time in pre-med at OSU? Pros, cons, or just things you think you would have changed?*
>
> **SO:** *I wish more advisors who understood pre-med applications and options on career choices, and maybe put less responsibility on individual students to learn it all themselves. OSU location-wise isn't great- Samaritan's far. Not too many doctors to shadow either; you basically have to be a CNA or do caretaking work. Research-wise, OSU is great, which is helpful if you want to go into medical science and stuff but I wish there were more opportunities to actually experience medicine, and OSU is not the best for offering that.*

SO brought up a particular point of concern for pre-med students at OSU, which is that OSU is a university that lacks an on-campus hospital to shadow at. There are also limited places to shadow in the immediate area, and what locations are available can require a Certificate of Liability, or a type of proof of insurance offered by universities. Without this certificate, pre-meds are often prevented from shadowing, even if they have a physician who is willing to be shadowed. This can be problematic, as OSU only offers certificates to those who are accepted

into a competitive preceptorship program that is only available to those in their junior or senior years (junior or senior class standing is technically accepted, but discouraged) (OSU 2020).

The lack of ability to shadow is one issue that can be frustrating to students who were encouraged to enter the pre-med track, and then were prevented from completing activities that the purpose of entering that track (entering medical school) requires.

SO also mentions that it seemed like individual students are expected to learn all the ins and outs of pre-med themselves, feeling that there was insufficient guidance to tackle a field with a myriad of options that go beyond the advice to simply become a doctor.

Other interviewees had their own impressions. AS commented that she didn't like the coursework:

> **"***At one point, I was in genetics class, and truly, science classes are just mind-numbing- I wasn't having any fun. It's so rigorous, and professors treat it like theirs is the only class, so there was a lot of work. It was just so exhausting.***"*

She had also experienced repeated difficulty registering for required classes, feeling that her advisor was unwilling to listen to her and was brushing off her problems despite her repeatedly explaining that there was, in fact, a problem. To then dislike the classes that she had to go to lengths to get access to was a thoroughly unpleasant experience. In contrast with AS's and SO's though, AM was happy with the guidance that the university gave, and identified a different source of dissatisfaction:

> **"***I felt like there was really good guidance- like, if I wanted to go to medical school, I could have gotten there. I felt like I had support system. The worst thing was other pre-med students. There was competition, which is fine, except for feeling that if they get into medical*

school, I won't. And even now, taking a lot of classes with other pre-meds, it feels like it's gotten worse."

There is a strong sense of competition between pre-med students, which is natural in a field that demands rigor and expects excellence. It is almost inevitable that the success of one requires the failure of another, as students scramble for the tiny number of openings available in medical schools. However, for some, this competition reaches unhealthy heights, as they find themselves starting to hope that, if they don't succeed, then at the very least their peers will do worse than them. This may be particularly unsettling in those who are attempting to enter a profession based around helping others, and who may be finding their humanitarian and empathic sensibilities taking a small beating as they see hope in the face of their fellow pre-meds dropping out. Competition intensifies as students get closer to applying to medical school and realize just how few spots there are in comparison to the sheer number of applicants. They feel that they must get better grades, get more volunteer hours, shadow more professionals, and test better on the MCAT than their peers to even have a chance of succeeding- which can be problematic if they wish to have a sense of community in the pre-med track. And, in at least this one case, the cutthroat atmosphere can lead to otherwise capable students leaving a field they feel they might otherwise have performed well in.

I had expected more comments on academic rigor. Burnout is a growing concern in a number of academic circles as the volume of information students need to learn increases year by year, and as students are expected to become better rounded to prepare for holistic screening processes during application cycles. There was one complaint about coursework quantity, but AS still never felt that she was academically incapable of making it into medical school; the issue was that she wasn't enjoying the type of work being done.

Instead of academic rigor, the prevailing complaint was that advising was subpar. That, rather than helping, the suggestions and guidelines for pre-med students were lacking in clarity, efficiency, and encouragement. AM was the only one who said otherwise. The interviewees in general professed to no significant academic difficulty, and AM in particular seemed to enjoy her classes (of the interviewees, AM, AS, and TP were the ones most excited about their current majors, and who were more determined to work in areas that were more similar to those of the healthcare field).

4 Leaving the Pre-Med Track

Finally, I asked what drove each individual to leave the pre-med track. In several cases, it was sheer disinterest or a new, stronger interest in something other than practicing medicine. In others, it was unwillingness to commit to the financial burden. In one, it was a reluctance to attend more school. In all cases, it was a combination of multiple factors.

SO described his thought process in detail:

> *"I really did enjoy biology and the life science stuff. But I was in a research lab around the beginning of college, and it was fun, but like, I didn't have the greatest supervisor or post-docs, so it got tiring and tedious, which was a bit of a push away from biology. And like, I didn't do great in anatomy and physiology, so it was like "oh no, my GPA is ruined!" And looking at kind of work that goes into medicine, with long hours, you make money, but there's no work life balance. It's more like earning money for the sake of earning money, and I think it's more valuable to have time for people and relationships outside of work, using that money to spend on other people. I just didn't see that happening going into medicine...*
> *"...Oh, it was a book, When Breath Becomes Air- it tells about this surgeon who basically gets diagnosed with cancer during his residency, and then the rest is about, like, how he*

*thinks about how he spent all this time and effort so far, but it's all pretty much wasted now, and I
didn't want that. There's just so much work involved, and it doesn't feel like it leads where I
wanted."*

SO's perception of a life in medicine was influenced by numerous sources, from his
classes to his personal experiences interacting with medical professionals. The impression that he
received was that medicine requires long, grueling hours and single-minded dedication to the
job, all at the expense of personal freedom and life satisfaction. The primary benefit in this
would be the potential for financial gain, which is undermined by the perceived lack of personal
time and the chance of being dissatisfied with the profession as a whole.

Ultimately, he spoke to his advisor, who told him that if he really wanted to go into
medicine, all the obstacles in his path wouldn't matter, which made him reflect on his options
before eventually choosing to switch majors. SO's situation illustrates that there are a variety of
reasons a student may choose to change paths. First was a push away from the subject of his
major. Then came a deeper analysis of what being a doctor might entail. Finally, the idea that all
the hard work required to be a doctor might ultimately be for nothing if something unforeseen
happens or if the path doesn't lead to a desired location.

TP had similar concerns with not liking the work-life balance that being a doctor might
require:

*"I took the intro to medical career course, where we met with and heard the stories of
people in different healthcare positions each week. The most influential guest was a physician
who said his job helping people was very rewarding, but there are many sacrifices. He said there
is no work-life balance, your work is your life. He also said he had to miss a lot of family
experiences, like his kids' dance recitals and soccer games. This isn't something I'm willing to
give up for a job. There are plenty of other ways I can help people."*

The idea that one must sacrifice all other aspects of life for the sake of being a doctor is an off-putting one. It's unlikely that the idea of abandoning social relationships and non-career-affiliated hobbies is an attractive one to anybody, let alone to people who are expected to show that they have strong social connections to their friends and their community. Yet, the concept of sacrifice from an early point is embedded into the pre-med image, where the only activities people are supposed to engage in are those that might look good on an application. Even then, the very fact that those activities are required might seem to cheapen them.

Community service is one example of an activity that has become almost commercialized. Participating in community service is a demonstration of care for society as a whole, which means that a medical school applicant who performs community service is more likely to be accepted. What this means is that community service has effectively become a requirement. One advising site recommends "a consistent 10-15 hours per month for several years," (TPN 2020). Students are expected to show that they care, to the point that caring has become a show in and of itself.

More to the point, that show must start early. TP's own experiences only drive the last aspect home:

> *"I had an advisor freshman year who told me if I hadn't already been shadowing doctors and volunteering in healthcare during high school, I was already behind."*

At the same time, AS's dissatisfaction with the courses involved in pre-med prompted her to leave in the winter of her second year at OSU before ultimately committing to her new interest: psychology, where she is now taking classes she enjoys, and where she is now planning

to apply for a Master's degree. Overall, her approach to leaving pre-med was, "Why stick with it if I'm not having fun?" stating that "Psych is just so much nicer."

With all of the above said, it appears evident that, in the face of numerous challenges, it takes a certain amount of passion and ambition to become a doctor- passion to stay on the path, and ambition to progress along it. Lacking either of the two, therefore, presents a challenge to aspiring medical professionals.

AM and MG both felt that they lacked one or the other. When asked for her reasons for leaving the track, AM responded that, after hearing about how other pre-meds were excited to become doctors, she "felt the competitiveness but not the passion." This goes back to an earlier assertion she made, where she said that, to her, one of the worst parts of being pre-med was how the competitiveness between students felt like it was becoming unhealthier as time passed.

MG mirrored her, saying "the idea of applying for medical school sounded daunting. I thought I might not be fit for the competitiveness."

5 Analysis

I began this process expecting that the most visible complaints would be the most common; namely, that most interviewees would say that their decisions to leave the pre-med track were most heavily influenced by financial and academic factors. I had expected talk of student loans and a deluge of complaints about organic chemistry and physics courses, with maybe one or two comments about anatomy and physiology. And yet, for the most part, the interviewees were primarily motivated by other personal factors, chief among them a growing dissatisfaction and disillusionment with the idea of living life as medical professionals.

Interestingly, AM had no new interests, nor did she have another career path in mind. All she was certain of was that she no longer had any desire to enter the medical field, even if she did still like her major. In contrast, SO and MG in particular went in almost the opposite direction, going from biology to technology, swapping one branch of STEM for another, though MG took a more progressive approach:

> "*I applied at OSU as bio-health sciences at first, because I thought if I did something related to medical school, it would be good. Then I went to bioengineering, then engineering.*"

SO felt that, despite no longer being pre-med, and despite the fact that he had left life science entirely, being pre-med has still had a positive effect on his life by allowing him greater understanding of topics not directly associated with his new career path. TP also felt that, while he no longer desired to be a doctor, he was still heavily influenced by his time as a pre-med:

> "*I began taking more specific biochemistry courses and became interested in chromatin and epigenetics. I'm also studying science communication and will be pursuing that as a career.*"

Overall, it can be seen that experiences (and interpretations of those experiences) preceding, during, and following pre-med can be highly varied. The interviewees differed in many aspects from the moment they chose to begin the pre-med path to their choices of new paths after they left. One went to psychology, two went to technology, one went to science communication, and another is not yet decided. I myself was also on the pre-med track; I technically still am, in fact, though I have no current intention of applying for medical school. Like several of the others, I became pre-med out of both uncertainty and obligation, and, also like those others, I ended up choosing to go in a slightly different direction (health law instead of medical practice) in the end.

When looking at the gathered information with regard to future applications, rather than interviewing a select group of personal and second-degree acquaintances, utilizing a survey with similar, yet more defined, questions to students at multiple universities could provide a large enough population to gain relevant quantitative and qualitative data from. Random sampling would increase the ability to generalize gathered data, as the interviewees from this work are far from representative of the entirety of the pre-med population of the United States. The findings from interviews similar to those completed here could be used to inform upon the questions presented in a more research-oriented survey. For example, a larger number of interviews could be used to narrow down the most common reasons for students to drop out of pre-med, allowing the makers of a survey to introduce a quantitative Likert scale to more accurately measure the respective impacts that various social, academic, and financial factors have on attrition at the undergraduate level. A parallel line of reasoning might allow researchers to identify institutional factors that affect students at different universities, making certain schools more or less capable of retaining pre-med individuals, potentially affecting academic and advising policies.

This, in turn, can potentially help streamline the academic processes relevant to the training of healthcare professionals. Mitigation of factors that might cause a given individual to drop out or switch tracks could be of great benefit. Making it less likely for those who may be unsuited for medicine to enter the pre-med track in the first place could also have a positive impact on the pre-med environment. The model used here is also not limited to pre-med and other healthcare tracks. Similar principles could conceivably be applied to other professional paths. It is estimated that approximately a third of all first-time college students end up changing their major in their first three undergraduate years (Lederman 2017). This can represent an excessive spending of time and effort on both the students' and the professors' part, especially if

the original major has little to no bearing on the new one, with the student seeing no value in retaining information from the original.

It is also worth noting that STEM majors, especially math majors, are more likely to change majors than those in other fields, such as humanities. Given the increasing market demand for specialists in many STEM fields, this loss of potential workforce members in those fields is concerning. In light of the current healthcare emergency, it is now more important than ever to look deeper into the root causes of professional shortages, which begin far earlier than the graduate school level.

6 Conclusion

This particular series of interviews demonstrated that rationale for beginning the pre-med path, the experiences acquired during it, and the decision to leave it can vary significantly between individuals. Out of the 5 interviewees, 4 became pre-med out of obligation or out of uncertainty. That is to say, they didn't pick medicine because they felt passion for the medical field, but rather, that they believed medicine was the most acceptable choice. Of those 4, 2 left due to the competitiveness, 1 ended up disliking the academic work required by the subject, and 1 cited a number of reasons, ranging from a basic desire to not go through additional years of education to a dislike of the idea of working so hard and so long for an uncertain and potentially unpleasant reward. The sole interviewee who became pre-med primarily out of interest in practicing medicine left over concerns about maintaining work-life balance.

The 4:1 ratio here might suggest that those who enter pre-med for convenience are more likely to change their minds about medicine than those who were interested in healthcare

primarily for its own sake. It was noted that, of those 4, 2 received input from advisors and other authority figures who suggested that they enter pre-med, and the other 2 were encouraged by family to varying degrees. All 4 were, at the time of their original decision, unsure of what career path they wanted to take. It would be interesting to conduct similar interviews with pre-med students who are staying in their track to see how that ratio might change, then expand that further to those students who were ultimately accepted into medical school. How many of them entered medicine out of obligation? How many of them chose medicine because they didn't know what else to do? How many of them wanted to make money and gain prestige? How many of those people who said yes to these questions became physicians in the end?

Medical schools are already overwhelmed by applicant numbers, even with existing pre-med attrition. Acceptance numbers would be unlikely to change if those who might not be particularly interested in medicine itself simply didn't become pre-med in the first place. Acceptance rates, however, might increase if the candidate pool were smaller, which could, in turn, decrease the level of competitive stress placed upon students, and make the overall pre-med environment more hospitable. This concept applies to items like job shadowing openings and internship opportunities too, making academic programs like the preceptorship program at OSU mentioned earlier more accessible. The decreased stress could potentially make students less prone to burnout by the time they apply to medical school as well.

This would require some changes to advising methods, which could be straightforward, and to society as a whole, the latter of which cannot be encompassed within the scope of this piece. The former can effectively be summarized as increasing reluctance to recommend the pre-med track to students who demonstrate uncertainty of purpose, especially in life science fields. Medicine is a growing field that demonstrably has a shortage of workers, but simply suggesting

pre-med as a default does not alleviate the issue- it simply places a greater financial and academic burden on students who might not be suited for the field. Recruitment into pre-med is high due to environmental factors as well, as students are lured in by the promise of prestige and long-term financial security, but it's important to emphasize the reality of life as a medical professional early on. Simply citing dropout statistics is not enough to convey that medicine is a lifelong challenge. Providing physicians to interview in introductory pre-med classes is helpful, but it is also undermined by a lack of understanding of the profession, which impedes effective questioning. Additionally, rather than only presenting those who summarize their lives as "medicine is hard, but it's worth it in the end," it might be just as helpful to provide testimony from those who chose to do otherwise. Medicine is not a default choice for every science major with above average grades, and it should not be presented as one.

Based on this exploratory work, it seems prudent to look more deeply and carefully into the various factors that contribute to the quality of the pre-med environment at OSU, and perhaps into pre-med experiences as a whole. Considering the pressures placed on those in the medical field from the student to the practicing stages, alleviating attrition from the very start could play a role in improving the quality of health professionals produced by medical schools, as well as help students who might have simply drifted into medicine find professions they are more inclined to be productive in. Many, many studies focus on medical school and the students there, from their class loads to their demographics, and few, if any of them, are unwarranted. The years preceding medical school, however, are also important to physician development. In a time where medical professionals are in critical shortage, it becomes more important than ever to look at the factors that shape the paths of those who would become doctors.

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Date: 02/10/2020
Location: Gilkey 108
Interviewer: Han Xue
Interviewee: MG

H: Hi, how are you today?

M: Good.

H: I'm just going to ask a few opening questions, and the like. Just to get an idea of your background.

M: Okay.

H: Does anyone in your family have a history in the medical field, as a doctor, nurse, PA, or similar?

M: No one in the family is a doctor; we're mostly engineers.

H: What made you interested in medicine in the first place then?

M: I took a couple AP classes in high school. And the first one I was really good in was AP bio, so it was primarily academically based. Dad wanted a doctor in the family. Mom wanted my older sibling to be a medical doctor at first, but they wanted to do clinical psychology, and I guess it wasn't close enough. I don't know. Both my parents are engineers, so maybe they didn't like their jobs and didn't want me to be one too.

H: You planned to go into medicine from high school then. Was this early in high school?

M: Sort of. Around sophomore junior and senior year. That's when my mother started pushing me towards medicine.

H: Once you entered college, major were you at first?

M: I applied at OSU as bio-health sciences at first, because I thought if I did something related to medical school, it would be good. Then I went to bioengineering, then engineering.

H: When did you start thinking you were going to swap?

M: At the start of college. Pretty early on, I went from biohealth to bioengineering, and then winter term of freshmen year, electrical engineering.

H: And what made you think about swapping out?

M: So, the idea of applying for medical school sounded daunting. I thought I might not be fit for competitiveness.

H: Why daunting?

M: I felt kind of intimidated by the MCAT. This was right after taking the SAT and AP tests, and I didn't want more of that life.

H: Mostly personal reasons then. No concerns about paying for medical school?

M: No, nothing related to financial concerns.

H: And how did your parents take your decision?

M: Initially, Dad was more cool with it because he likes their job more than Mom does. Mom took more convincing; she thought it was phase and would run out in a week or so. It took a little bit for her to come around. I had a serious talk with my mom, and she thought of the financial aspects. That was the biggest reason she ended up alright with it, I think. Engineering isn't financially infeasible. If I wanted to be a teacher, then Mom would have been extremely mad. It took a little convincing, but not as much as it would have been for a different field.

H: You went to bioengineering at first?

M: Yeah. I took CBEE 101, the bio part. I switched from biohealth to bioengineering and Mom thought my background would be extremely useful for that. Swapping to bioengineering more of a parental decision because Mom knew more about it because of her engineering field. So, it would be easier to find internships, then switch to get a little bit more practical experience.

H: But then you went to engineering?

M: Around the time I was applying to college, my interests heavily deviated into consumer electronics.

H: And now you're in engineering. Nice!

M: Yeah, it's nice.

H: What do you think of pre-med now, looking back?

M: Yeah… pre-med is … hard. Yeah. My roommate is actually doing the pre-med track right now, and every time I talk to him, it just reaffirms my decision.

H: Alright, that pretty much covers it. Do you have any other comments or concerns?

M: Not really. To summarize, started pre-med because I thought would be good at it, since I was good at biology and stuff like that because of AP Bio, but the more I understood process of becoming medical doctor, the less enthusiastic I was. Around senior year of high school, my interests shifted. It all kind of boiled down into winter term of freshman year; I did a 180° and left.

H: Perfect! I may send a few follow-up questions at a later date.

M: Alright.

H: Thank you!

Date: 02/12/2020

Location: Gilkey 108

Interviewer: Han Xue

Interviewee: AM

H: Hey, how are you today?

A: Pretty good. You?

H: Pretty good too. I'm just going to ask a few opening questions, and the like. Just to get an idea of your background.

A: Sounds good.

H: Does anyone in your family have a history in the medical field, as a doctor, nurse, PA, or similar? And if so, do you think that influenced your original interest in medicine?

A: Not really. A lot of it was not knowing what else I wanted to do. I knew I liked biology. Medicine was the thing they [teachers, advisers, other surrounding individuals] talked about the most- and I liked helping people and I liked science, so there you go. Though, my Grandpa was a neurosurgeon; he thinks anyone who isn't a surgeon isn't a real doctor.

H: Alright. When did you first start thinking about becoming a doctor?

A: About when? I didn't really figure out what I wanted to study till senior year high school, so probably around then. I was always a bit doubtful about it, but it was about year and a half, two years ago, when I decided I didn't want to go to medical school.

H: What made you switch out?

A: A lot of it was talking to other pre-meds and hearing how excited they were- I guess I felt competitiveness but not the passion.

H: This was around second year, right?

A: Around mid-sophomore year.

H: Did you feel like that was something you lacked because of the environment, or more of a personal preference?

A: I felt like there was really good guidance- like, if I wanted to go to medical school, I could have gotten there. I felt like I had support system. The worst thing was other pre-med students. There was competition, which is fine, except for feeling that if they get into medical school, I won't. And even now, taking a lot of classes with other pre-meds, it feels like it's gotten worse.

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H: No financial concerns about going to medical school?

A: No financial pressure. Definitely some familial pressure to go into something with prestige- Dad especially wanted me to go into job with prestige and stable finances, but my family was mostly supportive about any job that fits those things.

H: And what career or field are you planning to go into now?

A: I'm not quite sure what I'm going into yet. I'm still interested in healthcare, but more public stuff. It's still pretty big question mark.

H: You were influenced to go into healthcare then?

A: Yeah, pre-med definitely helped my decision to stick to medical field. I'm still on the pre-med track, and I like the subject matter, but I'm not formally preparing to go to medical.

H: And how do you like the courses?

A: Classes can be tough, but they're not discouraging. I recommend people to explore options; it's a good way to find out if they're not going to want to stay on that path.

H: Alright, that pretty much covers it! I may send a few follow-up questions later though.

A: Sure, sounds good.

H: Thank you!

Date: 02/10/2020
Location: Gilkey 104
Interviewer: Han Xue
Interviewee: SO

H: Hello, how are you today?

S: Good.

H: I'm just going to ask a few opening questions, and the like. Just to get an idea of your background.

S: Sounds good.

H: Does anyone in your family have a history in the medical field, as a doctor, nurse, PA, or similar?

S: My dad is pharmacist. So, I grew up seeing him help friends and other people- and I grew up in a mostly Asian community where people weren't so trusting of Western medicine, so they, like, weren't sure what medicine to take and he would help them with that. Aside from that, I really wasn't sure what I wanted to do, and it was like, hey medicine is a pretty prestigious occupation, and you make a lot of money and it looks good. It'll be looked highly on in the future, and medicine's interesting. I liked learning about biology, so I thought I might as well try it.

H: Would you say it's primarily seeing your dad work then, that made you want to become a doctor?

S: It's mostly not knowing what I wanted to do. I mean, I figured I might as well try the hardest thing out there. I like to challenge myself and see if I can do things.

H: If that's what you're after, then yeah, medicine can be pretty hard. What made you decide to swap out then? Was there a particular point?

S: Not a particular point, no; just a culmination of a lot of things. I spent my first year at OSU. I really did enjoy biology and the life science stuff. But I was in a research lab around the beginning of college, and it was fun, but like, I didn't have the greatest supervisor or post-docs, so it got tiring and tedious, which was a bit of a push away from biology. And like, I didn't do great in anatomy and physiology, so it was like "oh no, my GPA is ruined!" And looking at kind of work that goes into medicine, with long hours, you make money, but there's no work life balance. It's more like earning money for the sake of earning money, and I think it's more valuable to have time for people and relationships outside of work, using that money to spend on other people. I just didn't see that happening going into medicine.

H: Did you get that impression from talking to people, like shadowing, or research, or from somewhere else?

S: I did hospital volunteering, restocking rooms, so like, I talked to nurses and a pharmacist- and I know someone who's dad is an anesthesiologist. Oh, it was a book, When Breath Becomes Air-

it tells about this surgeon who basically gets diagnosed with cancer during his residency, and then the rest is about, like, how he thinks about how he spent all this time and effort so far, but it's all pretty much wasted now, and I didn't want that. There's just so much work involved, and it doesn't feel like it leads where I wanted. But I've never really shadowed an actual physician.

H: Yeah, it's a lot of work, especially looking at how much of it might not be applied directly. You end up referring things to other people.

S: Exactly. It really is, especially in America. The whole application process, like, in other countries, you go straight to medical school after high school without needing to spend all that time and money getting a bachelors. When you take into account all that time and money and effort you spend, it's just not a smart decision.

H: Did you end up talking to your advisor or anyone else about it before you switched.

S: Yeah, my advisor is Kevin Ahern. I talked to him about this stuff, and he was like, "Do you really like medicine?" I was like, "Guess so," and he said that if I really wanted it, all the bad things and obstacles blocking that path wouldn't matter, and it was interesting. And he told me to think about it and come back to talk about it again. And I ended up switching.

H: What made you switch to computers? Did you have prior experience?

S: I have some background in computer science- I took a basic course in high school. That's pretty much it. Think I'm enjoying it so far- I took computer science class in high school and freshman year. Had some spare time in sophomore year, so I did that then too.

H: Progression along the pre-med path is pretty regimented.

S: Yeah, I didn't like that too much. I was really, really passionate about medicine, so it was alright, but I swapped out in summer of sophomore/junior year. I just like computers more.

H: Would you have changed out earlier if you had known beforehand about what pre-med was like?

S: No; I would have made smarter coursework decisions for pre-med though. Maybe gotten some shadowing or something- some other experience in the medical field before OSU. Overall, I'm happy with the experience. Like, I got some broad knowledge- when they talk about whatever, I can kind of get it.

H: How did your family feel about you swapping out of pre-med?

S: My parents were actually pretty chill about it- medicine wasn't really the specific goal. It was more like, "Don't you think if you do this other path," and "go for more prestigious, graduate schools." They didn't really push for medicine in particular.

H: It's great that they were supportive!

S: Yeah, they're pretty nice.

H: How do you feel about your time in pre-med at OSU? Pros, cons, or just things you think you would have changed?

S: I wish more advisors who understood pre-med applications and options on career choices, and maybe put less responsibility on individual students to learn it all themselves. OSU location-wise isn't great- Samaritan's far. Not too many doctors to shadow either; you basically have to be a CNA or do caretaking work. Research-wise, OSU is great, which is helpful if you want to go into medical science and stuff but I wish there were more opportunities to actually experience medicine, and OSU is not the best for offering that.

H: Alright, that pretty much covers it! I may send a few follow-up questions at a later date.

S: Sure, sounds good.

H: Thank you!

03/24/2020

- **What is your primary major at OSU?**: Biochemistry and Molecular Biology

- **How many years have you attended OSU?**: Currently in my fourth year, graduating spring 2020

- **Do you have any family members who are/were in the medical field/related to medical field (physician, PA, nurse, therapist, caretaker, etc.). Immediate family would be parents, siblings, grandparents, aunts/uncles/cousins. Include any other individuals you may be very close to**: None

- **How has "above" influenced your choice to enter/leave medical field?**: My parents were technical theater majors, my grandfathers are both in business, and my grandmothers were secretaries/are homemakers. The major career guidance I was given was don't be a theater major, and do something that I find interesting and that will support me/my family.

Primarily elaborate on the following. Include one or two explanatory comments for rating value. Write NA if not applicable.

- **On a scale of 1-5, how important were the following in your initial decision to enter the medical field? 1 being least, 5 being most.**

- *Financial- have money, want more money? Socioeconomic status of family?*:
  1

- *Personal interest- friend/family ill, like science?*:
  4- I was and still am interested in science and the multifaceted field of health and healthcare. I want to be able to help take care of people and give them the tools to live healthy lives. I have also visited many medical specialists throughout my life, like cardiologists and endocrinologists, and the work they did was always very interesting.

- *External suggestion- prestige?*:
  1

- *Other- describe original reason for interest in medicine- childhood memory?*:
  N/A

- **On a scale of 1-5, how significant were the following factors in your decision not to enter the medical field?**

- *Finances (second job, loans, scholarships)*:

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Date: 02/11/2020
Location: Gilkey 108
Interviewer: Han Xue
Interviewee: AS

H: Hello, how are you today?

A: Alright.

H: I'm just going to ask a few opening questions, and the like. Just to get an idea of your background.

A: Okay.

H: Does anyone in your family have a history in the medical field, as a doctor, nurse, PA, or similar? And if so, did they influence your initial interest in medicine?

A: My Grandma was an audiologist, so I kind of had family in medicine. Mostly, I really liked genetics, and there are only a few routes for that- PhD researcher, or medical doctor- and I hate research, so the other options just didn't appeal to me as much. And then the first year of college, my advisor suggested that becoming a doctor might be good.

H: When did you end up swapping out then?

A: I swapped out in winter of second year. I kind-of-not-really talked to my advisor about it. I switched to pscyh in fourth year- right before fall term.

H: Why did you change your mind about pre-med?

A: At one point, I was in genetics class, and truly, science classes are just mind-numbing- I wasn't having any fun. It's so rigorous, and professors treat it like theirs is the only class, so there was a lot of work. It was just so exhausting. Psych is just nicer.

H: But you weren't having any academic difficulties in pre-med?

A: I was doing fine; it just wasn't fun. And it was like, why stick with it if I'm not having fun? I always liked psych, and I'm taking classes I actually enjoy now. I was doing fine academically in pre-med, but it just was not fun, and why stick with it if you're not having fun? My family was as a little "Are you sure…?" when I dropped, but there was no real opposition. Everyone knows that they can't change my mind, so they know not to try.

H: What impressions do you have of your time in pre-med?

A: Chemistry sucks. And my advisor wasn't great. They were just not helpful, and suggested some bad choices. I was transfer student, and I was trying to register for classes, so I asked for a PIN number. They told me I didn't need a PIN number, even though the system was asking for one

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and I clearly did. And then they finally gave me one, I registered, and they were like, "See, you didn't need one." It was a different system, every term, and it just wasn't helpful.

H: That would be annoying, yeah. And you were pre-med at your old school as well?

A: Yes. I was in pre-med for first term at OSU, but the change was coming already. I knew I could do it, but didn't I want to.

H: What influenced you to exit pre-med?

A: How long and awful process of going to med school would be. And so many years just to start that career. It seemed like such a pain.

H: Not financial at all?

A: Not financial. I'm applying to graduate school now in a different area actually.

H: What do you want to study?

A: Human sexuality and family marriage and then practice psychotherapy. It's always been cool to me, I I was going to do psych minor, but it was only four extra classes, so I just got the major instead. With a bio minor, because I already completed it.

H: That's convenient.

A: I know!

H: Alright, that pretty much covers it! I may send a few follow-up questions at a later date though.

A: Great, sounds good.

H: Thank you!