Understanding Medical Student Specialty Choices in Primary Care

By
Sally Wood

A Master's Paper submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Public Health in the Public Health Leadership Program.
Chapel Hill
2010

_____
Advisor and First Reader

_____
Date

_____
MPH Second Reader

_____
Date

Abstract

Background: Over the last decade, the number of medical students choosing a primary care specialty has declined, contributing to what many think is a specialty-dominated workforce. With many predicting a primary care physician shortage, the declining interest in primary care among medical students is concerning. **Objective:** To determine the important factors associated with the choice of primary care specialties and non-primary care specialties. **Methods:** In this cross-sectional study, I distributed surveys about specialty intent and influential factors to fourth-year UNC medical students. After appropriate coding, I analyzed the data using Pearson's chi-square tests (categorical data) and the students t-tests (continuous data). **Results:** The response rate was 84.4%. Only 27.4% of students chose a primary care specialty. Female sex was significantly associated with a primary care specialty choice, though background (rural, urban, suburban) was not. Students identified work and intellectual satisfaction as the most influential factors, and students choosing primary care valued a sense of doing good more and financial compensation less than did those choosing non-primary care. Although 45.5% of students chose a specialty they were considering at matriculation, 84.7% of students considered other specialties during medical school. Students who chose a primary care specialty were more likely to have considered a primary care specialty at matriculation. **Conclusion:** Students valued work satisfaction and intellectual satisfaction when choosing a career, and there are some moderate differences in important factors between those choosing primary care and those choosing non-primary care. Primary care intentions at matriculation may predict eventual primary care choice.

Introduction

It is estimated that the Patient Protection and Affordable Care Act (PPACA) of 2010 will provide access to our health care system for 32 million Americans by providing them with health insurance (Goodson 2010, 742-744). But will these newly insured patients find doctors to care for them? Many are projecting that our increasingly specialized physician workforce will not be able to accommodate this much larger number of insured persons looking for care (Goodson 2010, 742-744). Just as Massachusetts struggled to provide primary care to its newly insured citizens as its 2006 health reform was implemented, so will other states if access to health insurance is expanded throughout the nation (Bodenheimer, Grumbach, and Berenson 2009, 2693-2696) –which is exactly what PPACA does.

Even in 2009, prior to the passage of PPACA, the *New York Times* wrote about the primary care shortage, quoting President Obama as saying, "We're not producing enough primary care doctors" (Pear 2009, A1). And we aren't. Currently, about 30% of the U.S. physician workforce practices primary care, far fewer than the 50% of physicians in other industrialized nations with lower health care costs and better health outcomes (Goodson 2010, 742-744). Popularity of primary care specialties has been declining with medical students: 2009 was the twelfth year in a row that the number of medical students choosing primary care specialties had declined (Bodenheimer, Grumbach, and Berenson 2009, 2693-2696).

Why aren't medical students choosing primary care specialties? In the same article raising the Obama administration's alarm about the state of the physician workforce, President Obama identified debt as the major barrier for medical students entering primary care careers (Pear 2009, A1). Others attribute the decline to the increased workload of primary care physicians as the prevalence of chronic diseases increases (Goodson 2010, 742-744) or the increasing income gap between specialists and primary care physicians (Bodenheimer, Berenson, and Rudolf 2007, 301-306).

Throughout this declining trend of medical students entering primary care and especially in the early 1990s, when primary care was also thought to be in crisis, many have studied why medical students are choosing the specialties they do. How does debt influence this decision? Medical education? Personality? MCAT scores? This literature provides valuable insight into what is a very complex decision and, even with its limitations, may provide guidance for how the trend away from primary care can be reversed.

I conducted a small study to examine the specialty choices of the University of North Carolina School of Medicine (UNC-SOM) 2011 graduates and to identify why they chose these specialties. A public medical school, UNC-SOM's mission is to improve and protect the health of North Carolinians—especially those who are underserved(University of North Carolina School of Medicine 2005). As the North Carolina Institute of Medicine estimates that over 1.1 million additional North Carolina residents will have health insurance by 2019 (North Carolina Institute of Medicine 2011), this study may provide insight into how to produce more primary care physicians for North Carolina to accommodate these new patients—although graduating more primary care physicians from one state school is likely only an aspect of the solution.

This paper begins with an exploration of why increasing the proportion of primary care physicians even matters as it establishes what we know about how medical students make specialty decisions—specifically, why medical students do or do not choose primary care. I then present the methods, results, and conclusions from my survey of the 2011 UNC-SOM graduating class.

The Primary Care Physician Shortage and Why It Matters

Studies have demonstrated that geographic a greater density of primary care physicians results in lower health care utilization and costs, and better health outcomes (Starfield, Shi, and Macinko 2005, 457-502;Macinko 2003, 831;Basu, Friedman, and Burstin 2002, 1260-1269;Basu 2004, 489-510;Greenfield 1992, 1624).

Researchers posit that primary care physicians may be associated with lower health care costs because of lower utilization and prevention of more expensive interventions and treatments. A 1992 cross-sectional study found that specialists in a variety of health systems had had higher hospitalization rates, prescribed more prescription drugs per patient, and ordered more tests per patient than did primary care physicians (Greenfield 1992, 1624).

Basu et al. (Basu 2004, 489-510) found that communities with a greater proportion of primary care doctors appeared to have fewer preventable hospitalizations in three of the four states studied. This supported results from an earlier study that a greater density of primary care doctors was associated with fewer preventable hospitalizations for New York residents (Basu, Friedman, and Burstin 2002, 1260-1269). While causation cannot be inferred from these studies, reasonable explanations for the associations include primary care's emphasis on preventive care, which may reduce the hospitalizations.

Studies have also found that a greater density of primary care physicians is associated with better health outcomes for residents of a community. In a comprehensive review of the literature, Starfield et al. (Starfield, Shi, and Macinko 2005, 457-502) found a positive relationship between the supply of primary care and better health outcomes. The studies they reviewed were diverse in their outcome measures (e.g. mortality, morbidity), analytic approaches, and geographic categorization (e.g. state, county, urban) and controlled for population characteristics that affect health, such as education, race and income.

A comparison of countries with a strong primary care orientation to the United States also supports this association. Macinko et al. (Macinko 2003, 831)found that countries with a "strong" primary care orientation, have lower all-cause mortality, all-cause premature mortality, and cause-specific mortality even after controlling for system-level factors (total physicians, gross domestic product per capita, and the percent of elderly) and other determinants of population health (per capita income, alcohol and tobacco consumption, average number of ambulatory visits).

While other factors such as stronger public health and social work systems may confound the apparent relationship between more primary care and better outcomes, other studies have found similar results: countries that provide universal access to primary care physicians have better health outcomes, such as lower death rates from hypertension and stroke and lower infant mortality rates (Starfield, Shi, and Macinko 2005, 457-502). Starfield et al. (Starfield, Shi, and Macinko 2005, 457-502) even found evidence that a greater supply of primary care physicians can reduce health disparities.

As our health care costs continue to rise, as the prevalence of chronic diseases continues to increase, and as our health outcomes continue to disappoint, primary care physicians and prevention may be part of the solution. However, primary care physicians only make up between 30 and 35% of the physician workforce in the US—far less than the 50% found in countries with better health outcomes and lower costs (Bodenheimer, Chen, and Bennett 2009, 64;American Medical Association 2011). While the workforce has nearly doubled since 1975, the increase in specialists has far outpaced the increase in primary care doctors (American Medical Association 2011). The American Medical Association reported that the proportion of physicians in primary care (family medicine, general practice, internal medicine, obstetrics/gynecology, and pediatrics) increased by 112.3% since 1975, the proportion of physicians in primary care subspecialties (e.g. internal medicine subspecialty) increased by 771.8% (American Medical Association 2011). In 1975, the proportion of physicians practicing in primary care (as defined above) was 36.8%; in 2009, this proportion was 31.6% (American Medical Association 2011). Nearly half (47.4%) of the practicing primary care physicians were older than 45, and 25.2% of these physicians were between 35 and 44 years old.

Trends in medical school graduates' career choices help explain this decline in the proportion of primary care physicians and the rise of subspecialists. Newton et al. (Newton and Grayson 2003, 1179-1182) found that in 1987, 49.2% of medical school graduates matched into internal medicine, family medicine or pediatrics. While the percentage of graduates matching in

these primary care specialties peaked in 1998 at 53.2%, the percentage decreased to 44.2% in 2002. In addition, by 2002, students were more likely to subspecialize within a primary care field, and only 21.5% of students expressed an interest in primary care, as compared to 35.6% in 1999 (Newton and Grayson 2003, 1179-1182).

Declining interest in primary care careers has continued since 2002, with the "popularity" (Phillips et al. 2009, 1) of primary care reaching "historic lows" (1). The number of students choosing to match in internal medicine continued to decline, and the number of students choosing general internal medicine continued a faster decline (Hauer et al. 2008, 1154-1164). Fifty-four percent of internal medicine residents chose to practice general internal medicine in 1999, and only 20% chose to practice general internal medicine in 2008 (Schwartz et al. 2011, 744-749). Results from the 2009 National Resident Matching Program (NRMP) showed a continuing declining trend for medical students entering family medicine (Pugno et al. 2010, 552-561).

Projections of a future primary care shortage vary. In 2006, the American College of Physicians (American College of Physicians 2006) predicted "an impending collapse of primary care" (1). With a growing elderly population and the rising prevalence of chronic diseases, this report argued that the demand for general internists would increase by 38% from 2000 to 2020 (American College of Physicians 2006). Colwill et al. (Colwill, Cultice, and Kruse 2008, w232-41) predicted that, while the supply of primary care physicians for children should meet demand through 2025, the workload for generalist physicians for adults will increase such that there will be a deficit of 35,000 to 45,000 generalist physicians for adults. A report from the Association of American Medical Colleges (AAMC) predicted a 124,000 physician shortage by 2025, and suggested that demand is likely to increase much faster than supply for primary care specialties, as compared to other specialties (Dill and Salsberg 2008).

In contrast, the U.S. Department of Health and Human Services concluded that, while there would likely be a physician shortage in the next twenty years as the population's needs

grow faster than the physician supply, there was not a clear indicator that there would be a primary care physician shortage (as there was in the 1990s) (U.S. Department of Health and Human Services, Health Resources and Services Administration, and Bureau of Health Professions 2008). In addition, while the Council on Graduate Medical Education (COGME) predicted a physician shortage by 2020, this report highlighted the shortages in non-generalists specialties and recommended that the demand for primary care and for specialty physicians be studied to better determine the need for primary care physicians (Council on Graduate Medical Education 2005).

While projections of a primary care shortage are not consistent, Bodenheimer and Pham (Bodenheimer, Chen, and Bennett 2009, 64) argue that there is already evidence of limited access to primary care physicians: delays in scheduling appointments, difficulty getting in touch with doctors, fewer primary care doctors accepting new patients and Medicaid and Medicare patients, and more people going to the emergency room. In addition, we know that those who live in rural and impoverished areas have difficult accessing a primary care physician (Phillips et al. 2009).

Furthermore, many argue that a shortage of primary care doctors "is inevitable in the near future" (801) as the U.S. population grows and ages (Bodenheimer, Chen, and Bennett 2009, 64). Policy changes resulting in universal access or substantially decreasing the uninsured would likely overwhelm the current state of primary care (Phillips et al. 2009).

However, as debates continue about the validity of projections and the need for primary care, the diminishing trend of medical student interest in primary care cannot be disputed. Understanding why fewer medical students are choosing primary care is important as our nation begins to implement the Patient Protection and Affordable Care Act and face the rising health care costs of our system. If dissuading or persuading factors can be identified, then policy changes directed at these factors may be able to reverse the trend.

Factors Influencing Primary Care Specialty Choice

I conducted a systematic review of literature from 1995 through 2011 to assess the factors influencing the specialty choice of medical students—specifically, the factors influencing medical students to choose primary care specialties. I reviewed and evaluated the quality of 37 articles (Appendix A provides the search strategy and a very detailed review of the individual articles). Analysis of these articles was challenging, as the studies were often of low quality—a problem amply discussed in the literature. Reflecting on the quality of this literature in 1996, Meur, Bland and Maldonado(Meurer, Bland, and Maldonado 1996, 68-77) concluded, "the literature on specialty choice is difficult to interpret because of multiple biases, design weaknesses, small number of subjects, inconsistencies in both dependent and independent variables and conflicting results" (68).

The literature continues to be limited by these problems. The majority of the studies included in my review was observational or cross-sectional, and therefore introduced great potential for confounding bias. In addition, causality cannot be assumed with these study designs. Furthermore, the sample size of these studies is often small or limited to one (or a few) medical schools, which results in poor generalizability.

While many studies used national surveys such as the Association of American Medical Colleges' (AAMC) Graduation Questionnaire (GQ) and Matriculating Student Questionnaire (MSQ), other survey instruments which were not valid or reliable were often used, introducing measurement bias and confounding bias. Retrospective surveys querying students about influential factors in their specialty decision are especially difficult to interpret, given that the validity of these introspective causal reports assumes that physicians can accurately identify these factors—something that Pathman and Agnew deem fraught with bias (Pathman and Agnew 1993, 203-207).

The definition of primary care—that is, what specialties are considered primary care—is not consistent in the literature, which further limits the analysis. The dependent variables included in multivariable analyses are often different as well, which may lead to different results.

Despite the limitations of the literature, the studies do provide valuable information—especially when analyzed together. Only studies judged to be of fair or good overall quality are included in the synthesis of results. In general, the literature suggests that several intuitively obvious characteristics seem to have an influence on choice of specialty, but others do not, and most of the characteristics are related to specialty choice in complicated and even confounding ways (see Appendix A for a much more detailed review of the literature as it addresses each characteristic).

As is anecdotally expected, sex matters: women are more likely to choose primary care (Kassebaum, Szenas, and Schuchert 1996, 198-209). Older students are also more likely to go into primary care, but in this case, age is probably a proxy for other variables, such as family status and career interests (Bland, Meurer, and Maldonado 1995, 620-641). Race and ethnicity, contrary to popular expectations, do not seem to be associated with primary care when other variables are controlled (Jeffe, Whelan, and Andriole 2010, 947-958). Married students are more likely to choose primary care but, as with age, marital status is probably a proxy for a constellation of other contextual variables (Bland, Meurer, and Maldonado 1995, 620-641). Background is especially important in terms of rurality: students from rural areas or small towns are more likely to choose primary care (Phillips et al. 2010, 616-622). On the other hand, other measures of background, such as one's parents' professions, or socioeconomic status (SES), are not as strongly associated with specialty choice. People whose parents were not themselves physicians, and people who come from lower SES levels are somewhat more likely to become primary care doctors (Kassebaum, Szenas, and Schuchert 1996, 198-209;Colquitt et al. 1996b, 399-411).

Much is made today of whether matriculating career interests, personality, and values dictate specialty choice. As a whole, the literature suggests that the obvious finding – a strong pre-existing interest in primary care – holds, although it is complicated by students' likelihood of changing their minds more than once during medical school (Bland, Meurer, and Maldonado 1995, 620-641;Colquitt et al. 1996b, 399-411). Those who rank being more interested in treating a strong sense of social responsibility and service and the preference for interacting with people higher than they rank prestige and income are more likely to choose primary care (Kassebaum, Szenas, and Schuchert 1996, 198-209;Kiker and Zeh 1998, 152-167;Bazargan et al. 2006, 1460-1465).

Not surprisingly, we also know that personal interest in day-to-day activities (practice characteristics) of specialties influences career choices. Students interested in diverse patient populations and comprehensive care and less interested in procedures and technology are more likely to choose primary care (Bland, Meurer, and Maldonado 1995, 620-641;Burack et al. 1997, 534-541;Fincher and Lewis 1999, S121-3).

Debt and expected income are often cited as reasons why students do not choose primary care. While there is convincing and consistent evidence that lower income expectations are associated with primary care choice, the influence of debt is more complex (Phillips et al. 2010, 616-622). While debt likely has some influence on primary care choice, the effect is likely modest and influenced by other factors, such as expected income and personal situations (e.g. families) (Phillips et al. 2010, 616-622;Colquitt et al. 1996b, 399-411).

Lifestyle is also a popular source of hypotheses about specialty choice. However, studies have not consistently defined lifestyle, and its relation to specialty choice is complicated by the fact that part-time work and other "lifestyle" considerations (e.g. income) are possible in more than one specialty. The evidence does not support a consistent association.

Finally, medical education itself makes a difference. Those who attend public medical schools are more likely than are private medical school students to choose primary care,

although it is not clear what the causal order may be: students choose a public medical school based on primary care orientation or public medical schools create cultures that foster primary care interests (Kiker and Zeh 1998, 152-167). The curriculum also matters, in predictable ways: required primary care clerkships and more primary care exposure in the third and fourth year, are both associated with a greater likelihood of primary care choice (Kassebaum, Szenas, and Schuchert 1996, 198-209;Campos-Outcalt and Senf 1999, 1016-1020). However, experiences in the first two years of medical school have little effect on career choice (Campos-Outcalt and Senf 1999, 1016-1020;Stimmel and Serber 1999, 117-126).

With this review of the literature, I conducted an original survey of the deliberations underlying specialty choices among fourth-year students at the UNC-SOM.

Methods

I conducted a cross-sectional study of fourth-year medical students in the spring of 2011 at UNC-SOM. I distributed an Institutional Review Board (IRB)-approved paper copy of the survey (see Appendix B) during a class meeting on the day the National Resident Matching Program (NRMP) released the 2011 Residency Match results. Students who were receiving their match results that day and who were in attendance at the class meeting were asked to complete the survey prior to receiving their match results. This timing ensured that students had finalized a specialty choice, but were not influenced by the NRMP match results. The survey was both anonymous and voluntary, and all students were offered a small incentive, regardless of whether they had completed the survey.

I designed the survey instrument to be grounded in the findings from the literature, as discussed above, and to be responsive to the feedback from five UNC-SOM medical students who reviewed earlier drafts with knowledge of my research question. The final survey included eleven questions and queried students about final specialty choice, intent to subspecialize, important factors influencing specialty choice, other specialties considered, matriculating

specialty intent, and future career plans (e.g. teaching, clinical research, administration, etc.). Students were asked to select specialties from a list, to rank six factors (financial compensation, work satisfaction, intellectual satisfaction, lifestyle, length of training and sense of good) influencing their final specialty decision in order of importance from 1 (very important) to 6 (less important), and predict how they would spend their professional time in ten years by assigning a percentage to time spent across different activities. Other questions about additional influential factors, including a specific question about the influence of medical education, were open-ended. I requested only very limited demographic information (sex, race/ethnicity, rural or urban background) to reduce burden and preserve anonymity.

I coded survey responses and entered the data into an excel spreadsheet. Each specialty was assigned an individual number, and each yes/no response was coded similarly to reduce the potential for error. I categorized ethnicity entries into six different categories which were then coded. A minority of students did not rank the listed factors correctly either by using some numbers twice or simply "checking" the important factors. Numbers that were used twice were coded as written, but "checking" factors without any indicated rank was considered missing data.

I reviewed the responses for all open-ended questions and created thematic categories for each question. I reviewed the categories with my adviser. I coded comments based on these themes, and comments often contained more than one coded theme or value. Therefore, when I indicate proportions of comments, I am considering the total number of codes, which exceeds the number of comments.

After coding and data entry was completed, I selected ten original surveys to check for coding and entry accuracy. I found that each entry was accurate.

I used STATA software to analyze the data. In general, the analysis compared the primary care specialties and the non-primary care specialties. Analyses to examine the

relationship between dependent variables and individual specialties (e.g. family medicine) were not possible, given the small sample size.

I defined primary care specialties to include internal medicine with no intention to subspecialize (general internal medicine), pediatrics with no intention to subspecialize (general pediatrics), medicine-pediatrics with no intention to specialize (general medicine-pediatrics), obstetrics/gynecology with no intention to subspecialize (general obstetrics/gynecology), and family medicine regardless of intention to subspecialize. Non-primary care specialties included internal medicine with intention to subspecialize (or unsure about subspecialization), pediatrics with intention to subspecialize, obstetrics/gynecology with intention to subspecialize and all other specialties.

However, because general obstetrics/gynecology is often not considered a primary care specialty in the literature, a separate categorization defined primary care specialties as general internal medicine, general pediatrics, general medicine-pediatrics, and family medicine regardless of subspecialization intent. I did separate analyses with this categorization and noted any difference found with this definition of primary care specialties.

To analyze the importance of the ranked influential factors (e.g. financial compensation, etc), I created three different categories: very important (if rank order was 1 or 2), important (if rank order was 3 or 4), and less important (if rank order was 5 or 6 or not indicated).

I calculated overall frequencies of responses and conducted Pearson's chi-square tests for categorical data to compare the importance of each factor between those choosing a primary care career and those choosing a non-primary care career. Given the small sample size, I used Fisher's Exact Test to determine the significance of the correlations. Calculation of means and ranges and t- tests were used to analyze continuous data (i.e. future plans of students).

Results

All fourth-year students who were matching (n=147) in the spring of 2011 were eligible to take the survey. Seventy-seven (52.4%) of eligible students were female, according to school records (Dent 2011,). Race and ethnicity data were not available for students who matched, although these data (self-reported) were available for the entire graduating class of 2011 (n=157): 115 (73.2%) white students, 18 (11.5%) African-American students, 17 (10.8%) Asian students (Chinese, Asian Indian, Korean), 1 (<1%) Filipino, 6 (3.8%) other/unknown/not provided (Currie 2011). Specialty choice data were available for all eligible students; see Figure 1 for this specialty data (Dent 2011).

One-hundred and twenty four students completed the survey, for a response rate of 84.4%. Sixty-three female and sixty male students completed the survey (one respondent did not identify his/her sex). Seventy-two percent of respondents (n= 89) self-identified as Caucasian/White, 10.5% (n=13) as South Asian/Chinese/Indian, and 6.5% (n=8) as African-American/black. Four percent of responding students (n=5) were Hispanic. One student was biracial, and 7 students did not disclose their ethnicities. Close to 17% of students reported a rural background, 14.5% reported an urban background, and 65.3% reported a suburban background. Two students reported both a rural and suburban background, and 2 students did not respond.

Based on a comparison of school (Dent 2011,) and survey results, I estimate that the following students did not complete the survey: 1 of 6 students choosing anesthesiology, 1 of 2 students choosing dermatology, 1 of 15 students choosing family medicine, 5 of 11 students choosing general surgery, 8 of 30 students choosing internal medicine, 1 of 14 students choosing obstetrics/gynecology, 2 of 2 students choosing ophthalmology, 1 of 5 students choosing otolaryngology, 1 of 7 students choosing pathology, and 2 of 3 students choosing physical medicine and rehabilitation. See Figure 1 for additional details.

Specialty Choices and Subspecialization

Specialty choices of students were diverse (see Figure 1). The specialties chosen by the highest number of student were internal medicine, pediatrics, family medicine, and obstetrics/gynecology. Almost eighteen percent (17.7%) of students (n=22) selected internal medicine, 12.1% (n=15) selected pediatrics, 11.3% (n=14) selected family medicine, and 10.5% (n=13) selected obstetrics/gynecology. Students also frequently selected emergency medicine (n=7, 5.6%) and psychiatry (n=8, 6.5%).

Overall, 58.1% of students (n=72) indicated they planned to subspecialize within their chosen field. Thirty-five percent (35.5%, n=44) did not plan to subspecialize, and 5.6% (n=7) were unsure about subspecialization (1 student did not respond to this question). Within the primary care fields (including internal medicine, family medicine, medicine-pediatrics, obstetrics/gynecology, and family medicine), 52% of students planned to subspecialize (see Table 1 for a subspecialty intentions within each primary care field). Sixty-four percent of those choosing internal medicine planned to subspecialize (82% if those students who were unsure about subspecialization are grouped with those planning to subspecialize), and 47% of those choosing pediatrics planned to subspecialize. In addition, the majority of those choosing medicine-pediatrics and obstetrics/gynecology planned to subspecialize.

Based on subspecialization intent, a total of 34 students (27.4%) planned to practice in primary care, defined as general internal medicine, general pediatrics, general medicine-pediatrics, general obstetrics/gynecology, and family medicine. If general obstetrics/gynecology was not considered a primary care specialty, 29 students (23.4%) planned to practice in primary care.

Demographic Associations

Twenty-four female students (61.5% of all women) compared to 9 male students (17.6% of all men) chose a primary care field. This difference was significant (p= 0.002). When general obstetrics/gynecology was not considered a primary care specialty, the association remained significant (p= 0.008).

In my survey, the association between ethnicity and primary care choice is significant (p=0.014). A significantly higher proportion of Hispanics (80%) chose primary care and a slightly higher proportion of South Asian/Chinese/Indians (30.8%) chose primary care than did Caucasian students (21.4%) and African-American students (25%). This association did not change when obstetrics/gynecology was removed from the primary care category.

There was no significant association between rural, urban or suburban background and primary care specialty choice, regardless of whether obstetrics/gynecology was included in the primary care specialty category (p=0.828 if obstetrics/gynecology was considered a primary care specialty; p = 0.475 if not).

Influential Factors in Specialty Decision

Overall, students reported that work satisfaction and intellectual satisfaction were the most important factors influencing their specialty decision, with 79.7% of students indicating work satisfaction was very important and 56.7% of students indicating that intellectual satisfaction was very important (see Table 2). Students felt that financial compensation and length of training were less important, as 70.2% of students indicated financial compensation was less important and 82.6% of students indicated that length of training was less important.

In a comparison of the importance of factors between those choosing a primary care specialty and those choosing a non-primary care specialty, the importance of only two factors were significantly different between the two groups: financial compensation and sense of doing good (see Tables 3 and 4). More of the students choosing primary care (85.3%) indicated that financial compensation was least important compared to students choosing a non-primary care specialty (64.4%) (p = 0.034). More students choosing primary care rated a sense of doing good as very important (66.7%) compared to those choosing a non-primary care specialty (28.9%) (p = 0.001). Of note, the difference in the relative importance of intellectual satisfaction was almost significant (p=0.058), with more of the students choosing non-primary care

specialties ranking this as very important than was true of the students choosing primary care specialties.

When general obstetrics/gynecology was not considered a primary care specialty, the association between financial compensation and primary care choice remained ($p < 0.001$), and the association between sense of doing good and primary care choice remained ($p<0.001$). The difference in the relative importance of intellectual satisfaction between those choosing primary care specialties (not including obstetrics/gynecology) and those choosing non-primary care specialties became significant: more students choosing a non-primary care specialty (62.8%) ranked intellectual satisfaction as very important compared to those choosing a primary care specialty (34.6%) ($p = 0.028$).

Twenty-seven students said that variables beyond those explicitly presented in the survey were also influential in their decisions. I grouped the responses into five categories: location (n=5), family (n=3), future opportunities and career flexibility (n=7), characteristics of practice (n=6), and personal interest, enjoyment and people (n=6). Comments in the future opportunities and career flexibility category ranged from "ability to do international medicine" to "flexibility in career options" to "research opportunities." Comments categorized as practice characteristics included responses like "breadth of knowledge and skills," "ability to do procedures" and "patient population." Comments categorized as personal interest, enjoyment and people ranged from "it's what I most enjoyed" to "mentors" to "personal interest." See Appendix C for all comments.

Consideration of Other Specialties

The majority of students (84.7%) considered other specialties before making their final decision. This was true for both those choosing a primary care specialty (82.4%) and those choosing a non-primary care specialty (85.5%).

Overall, the specialties students considered varied greatly (see Figure 2). The following specialties were considered by the highest number of students: general surgery (n=34), internal

medicine (n=30), pediatrics (n=21), family medicine (n=20), medicine-pediatrics (n=20), emergency medicine (n=19) and obstetrics/gynecology (n=19). Of those who considered other specialties, 66.7% considered a primary care field (internal medicine, pediatrics, family medicine, obstetrics/gynecology and medicine-pediatrics). This decreased to 58.1% of students when obstetrics/gynecology was not considered a primary care field.

Of those students who chose a primary care specialty and considered other specialties, 82.1% considered at least one other primary field (internal medicine, pediatrics, family medicine, medicine-pediatrics, obstetrics/gynecology). Of those students who chose a non-primary care specialty and considered other specialties, 61.4% considered at least one primary care field. This difference approached but did not quite achieve significance as determined by Pearson's chi-square test ($p= 0.060$), likely as a result of the interaction of relatively small sample size and a relatively skewed distribution, with most students in both groups saying that they had at least considered a primary care field.

If obstetrics/gynecology was not considered a primary care field, the percentages differed slightly. Of those students choosing a primary care specialty and considering other specialties, 75% considered at least one other primary care field. Of those students choosing a non-primary care specialty and considering other specialties, 53.1% considered at least one primary care field. This difference, once again, approached significance ($p = 0.064$) without quite achieving it.

When asked about why they did not choose the other specialties they considered, 101 students provided comments. Seven thematic categories emerged from these comments: intellectual satisfaction, lifestyle, work environment or satisfaction, residency training, medical school experiences, general personal fit or enjoyment, and future goals (see Appendix D for all comments and categories). The total number of coded values or themes was 134. Students most commonly cited work environment or satisfaction (n=53 comments, 39.6%), which included comments ranging from "work satisfaction" to "lack of patient continuity" to "diversity

within the field." Students also commonly cited lifestyle (n=19 comments, 14.2%), intellectual satisfaction (n=15 comments, 11.2%), general personal fit or enjoyment (n=15, 11.2%), and training (n=13 comments, 9.7%).

The comments from both groups – those choosing a primary care specialty (including obstetrics/gynecology) and those choosing a non-primary care specialty – shared some similarities. Both groups most frequently commented that work satisfaction was a deciding factor (36.6% of the coded values and 40% of the coded values, respectively). The second most frequent comment category among those choosing primary care was training (19.5% of the coded values compared to 5.4% of the coded values from those not choosing primary care). The second most frequent comment category among those choosing a non-primary care specialty was lifestyle (16% of coded values compared to 9.8% of coded values from those choosing primary care specialties).

Specialty Intention at Matriculation

Students were interested in a variety of specialties at matriculation. The following specialties were considered by the most students: internal medicine (n=28), pediatrics (n=24), family medicine (n=13), obstetrics/gynecology (n=10), and orthopedic surgery (n=10). Overall, 43.1% (n=53) of students chose the specialty (or one of the specialties) they were interested in at matriculation. Of those students choosing a non-primary care specialty, 61.1% (n=33) chose a specialty they were interested in at matriculation. Of those students choosing a primary-care specialty, 45.5% (n=90) chose a specialty they were interested in at matriculation. This difference was not significant.

Those students selecting a primary care specialty were more likely to consider a primary care field specialty (internal medicine, family medicine, pediatrics, medicine-pediatrics, obstetrics/gynecology) compared to those students selecting a non-primary care specialty. Of those choosing a primary care specialty, 84.9% (n=28) were interested in a primary care field at

matriculation compared to 46.7% (n=42) of those choosing a non-primary care specialty. This difference was significant ($p<0.001$).

If we take obstetrics/gynecology out of the primary care group, the trend persists. Of those choosing a primary care specialty, 66.7% (n=22) were interested in a primary care field at matriculation compared to 41.1% (n=37) of those choosing a non-primary care specialty. This difference was significant ($p = 0.015$).

Medical School Experiences

I asked students an open-ended question about whether anything in medical school changed their matriculating specialty intent, and 73 students commented. Five thematic categories became apparent: clinical, preclinical (preclinical clinical experiences, basic science courses), residents/faculty (personalities of faculty and residents and mentors), other experiences (such as international experiences or graduate school), and other. The total number of coded values was 85.

The overwhelming majority of coded values (n= 65, 76.5%) were comments about clinical experiences and rotations. There were eight comments (9.4%) about residents, faculty, and role models; 5 comments (5.9%) about other experiences; and 4 comments (4.7%) about preclinical experiences (see Appendix E for the all comments and categorization).

Future Plans

Students indicated they planned diverse careers in the future. Overall, students planned to spend 60.9% of their time in patient care, 16.4% of their time teaching, and 9.7% of their time in clinical, health services or health policy research (see Table 5). Most students (n=121) planned to be involved with patient care, and many students (n=103) planned to be involved with teaching (see Table 6).

Few differences in expectations about future careers emerged (Table 7). Those choosing a primary care career were more likely to predict spending a greater percentage of their time in policy-making or policy advocacy (5.9% versus 2.6%). Otherwise, there were no

significant differences. This did not change if obstetrics/gynecology was not considered a primary care specialty.

Discussion

The study response rate of 84.4% was very high and a strength of the study. However, given the small sample size and therefore the small subgroups (e.g. African Americans, those choosing neurosurgery), it is important to evaluate the representativeness of the study sample regardless of the high response rate.

The survey respondents were largely representative of all the UNC students who were receiving their match results that day in terms of sex and specialty choice and, to a limited extent, ethnicity. Only one specialty (ophthalmology) was not represented in the survey, and those students who did not take the survey chose specialties in both primary care fields (n=10 students) and non-primary care fields (n=13 students), although it is impossible to determine the subspecialty intentions for these students. While ethnicity data were not available for those students who matched (n=147), the distribution of self-reported ethnicities from the graduating class (n=157) can be compared to the distribution of the survey to evaluate (approximately) the potential for respondent bias with regards to ethnicity. The proportions of Caucasian/White and Asian students were similar in each dataset; the proportion of African American students who responded to the survey was much lower than the proportion in the entire class. It is difficult to know if this is due to missing survey data (i.e. those who did not disclose an ethnicity on the survey) or a difference between those who matched and the entire class. However, it is important to realize this potential difference.

Overall, the study population represented the source population well, and therefore, the potential for respondent bias is limited.

Subspecialization and Primary Care Intentions

While the majority of students planned to subspecialize, the more significant finding is the proportion of those planning to subspecialize within a primary care field (internal medicine, pediatrics, obstetrics/gynecology, family medicine, and medicine-pediatrics). This trend of subspecialization within primary care fields is not unique to UNC. Data from the AAMC's GQ from 2009 and 2010 found that 73% and 73.7% (respectively) of students choosing family medicine, internal medicine, and pediatrics planned to subspecialize (Anderson and Cantow 2009;Anderson and Cantow 2010). However, with 50% of those choosing to specialize within family medicine, internal medicine and pediatrics (57% if those uncertain about subspecialization are grouped as planning to subspecialize), a lower proportion of UNC students choosing primary care fields seem to plan to subspecialize.

Twenty-eight percent of the graduating class, therefore, planned to practice in primary care. This is only slightly lower than the current workforce estimates of practicing primary care physicians (American Medical Association 2011). However, if general obstetrics/gynecology is not considered a primary care specialty, the percentage drops to 23%, which is significantly lower than the current workforce estimates. This may reflect the continuing trend of choosing non-primary care specialties, although the NMRP reported in 2011 that, for the second year, more medical students matched into family medicine, pediatrics and internal medicine (National Resident Matching Program 2011).

The analysis of subspecialization and categorization of primary care specialties is limited by the fact that these plans and intentions may change during residency. A survey querying students' career plans in their final year of residency would provide more accurate information. However, because this study focused on the choices and intentions of medical school and the effect of medical school experiences on the specialty decision and because specialty choice is likely influenced by subspecialty intentions (i.e. an interest in cardiology will result in a choice of internal medicine), I felt that analyzing the data based on planned intentions was the best, most reasonable option.

Demographic Associations

The association between sex and primary care choice is consistent with the literature (Jeffe, Whelan, and Andriole 2010, 947-958;Bland, Meurer, and Maldonado 1995, 620-641); however, the association between race and ethnicity and primary care choice is not (Jeffe, Whelan, and Andriole 2010, 947-958;Meurer 1995, 388-397). This association may be explained by confounding factors, and may not remain in a multivariable analysis. The categorization of multiple ethnicities (Chinese, South Asian, and Indian) may have also affected this analysis. Additional data about UNC students to increase the sample size is necessary before drawing any firm conclusions.

The lack of association between rural background and primary care choice may be due to the small sample size, as very few students indicated their background as rural, and the literature has proved this association well. Alternatively, North Carolina has two state medical schools, Brody School of Medicine at East Carolina University (ECU) and UNCSOM. ECU is located rurally, has a primary care focused mission, and may attract more in-state students interested in rural primary care medicine.

Influential Factors

Students overwhelmingly identified work satisfaction and intellectual satisfaction as the most important factors in their specialty choice. This was a prominent theme throughout the open-ended responses, as well, as students most commonly cited work satisfaction as an important factor in dissuading them from other considered specialties. In addition, the majority of comments about influential medical school experiences were about clinical rotations. These clinical rotations introduce students to the practice characteristics and intellectual challenges of specialties—which may be why these experiences seemed so influential. This all suggests that work and intellectual satisfaction are very important in specialty choice. While the literature recognizes practice characteristics and work satisfaction as influential factors (Hauer et al.

2008, 1154-1164;Fincher and Lewis 1999, S121-3), the importance of the effect had not been considered or determined.

The lack of importance given to financial compensation was surprising. There is the potential that students were potentially influenced by social desirability, as they were aware that I (one of their colleagues) would be examining the surveys and may be able to identify them based on the demographic information collected. It is also possible that students, in the anticipation of receiving their match results, were not considering their debt level or loans, which may influence the importance of financial compensation. Alternatively, because the tuition for in-state students is quite low at UNC-SOM, UNC students graduate with significantly less debt than do students at other schools (Association of American Medical Colleges 2011), and therefore their specialty decisions may be less affected by financial compensation. With these caveats in mind, however, it may be true that future income expectations are genuinely less important to students than the literature and the popular press have often supposed.

Those choosing primary care specialties attributed less importance to financial compensation and more importance to a sense of doing good than those choosing non-primary care specialties. This is congruent with current literature (Kassebaum, Szenas, and Schuchert 1996, 198-209;Phillips et al. 2010, 616-622;Bazargan et al. 2006, 1460-1465;Jeffe et al. 2007, 888-894). However, this association may be confounded by the timing of the survey. At the time of the survey, students had already chosen a specialty and those entering primary care may have already accepted receiving less financial compensation in their career. Therefore, they may have ranked financial compensation of lower importance in the anticipation of receiving lower financial compensation.

Those students choosing a non-primary care specialty attributed more importance to intellectual satisfaction as compared to those choosing a primary care specialty, although this difference was only significant when obstetrics/gynecology was not considered a primary care

specialty. However, this does echo some findings in the literature (Kassebaum, Szenas, and Schuchert 1996, 198-209;Meurer 1995, 388-397).

Finally, very few students commented when asked if factors other than those listed influenced their specialty decisions, and students identified location, family, personal fit, and future opportunities and career flexibility (practice characteristics comments were similar to work satisfaction). Because the literature suggests that multiple factors are involved in specialty decision-making, the paucity of answers may lend weight to Pathman and Agnew's assertion that medical students cannot accurately identify influential factors (Pathman and Agnew 1993, 203-207).

Consideration of Other Specialties

The majority of students considered other specialties before their final decision, but the specialties considered did not differ significantly between those choosing a primary care specialty and those choosing a non-primary care specialty. This was surprising, but also interesting as it may suggest that students explore several different specialties throughout medical school.

The themes of the comments largely echoed factors already mentioned earlier in the survey (e.g. length of training, work satisfaction, lifestyle); no comments mentioned financial concerns as an important factor.

As mentioned above, work satisfaction was a significant dissuading or persuading factor when considering other specialties for both those choosing primary care and those choosing non-primary care. However, the second most frequent comments differed between the two groups—those choosing a non-primary care specialty more frequently indicated lifestyle and those choosing a primary care specialty more frequently indicated training as an important deciding factor. While no definitive conclusions can be made (as not all students commented), this may suggest that lifestyle is more important to those choosing non-primary care specialties, though analysis of the listed influential factors did not suggest this.

Specialty Intentions at Matriculation

A surprisingly large proportion of students chose a specialty that they considered at matriculation. This is in contrast to Bland et al.'s findings that most medical students change their specialty decision during medical school (Bland, Meurer, and Maldonado 1995, 620-641) and may suggest more stability to matriculation intent. Those indicating a preference for a primary care field at matriculation were significantly more likely to choose a primary care specialty, which is consistent with the literature (Kassebaum, Szenas, and Schuchert 1996, 198-209;Colquitt et al. 1996a, 399-411). While most students consider other specialties, there seems to be some stability of matriculation choice for both students choosing primary care specialties and non-primary care specialties.

Students reported that that clinical rotations and experiences influenced their specialty decisions significantly. In contrast, and likely consistent with the literature, very few students felt their preclinical experiences influenced their specialty decisions (Bland, Meurer, and Maldonado 1995, 620-641). However, it is difficult to determine the effect of medical school experiences with this qualitative data, and the data is likely significantly limited by recall bias (as clinical rotations were the most recent experience the majority of these students had).

Future Plans

UNC students indicated they anticipate a diversity of activity within their chosen career path. The analysis about future career plans was likely limited by the small sample size, but, nonetheless, found only one significant difference between those choosing a primary care specialty and those choosing a non-primary care specialty: students choosing a primary care specialty are more likely to anticipate spending more time in policy advocacy work. This finding may be confounded by differences in personal values—such as sense of good (as found in this study) or altruism or beliefs about the health care systems (as found in the literature) (Phillips et al. 2010, 616-622).

Limitations and Strengths

This cross-sectional study is limited by the small sample size, which limited the power of the analysis. In addition, the external validity of this study is limited, as students from one public medical school were surveyed. This study is also limited by the study design, as the cross-sectional design of the study invites the potential of bias by confounding. While some factors known to influence specialty choice were included in the model, many were not. While the timing of the survey was generally a strength of this study, there is the potential for recall bias. In addition, the survey instrument was likely not valid or reliable and may not have solicited accurate findings about the specialty decision due to Pathman and Agnew's introspective causal bias (Pathman and Agnew 1993, 203-207). Additionally, the analysis was based on students' plans to subspecialize, and there is a possibility that plans may change during residency.

I also grouped many diverse specialties into two categories, primary care specialties and non-primary care specialties. Multiple authors have documented that different factors influence different primary care specialties; therefore, this categorization may be too broad and obscure the importance of some factors. That said, there are similarities between the primary care specialties—such as prevention, diversity of patients, lower financial compensation—that likely make this analysis valuable.

The study response rate was very high, which increases the strengths of these results. In addition, selection bias is limited based on the comparison of the respondents and non-respondents. The timing of this study was also a strength, as fourth-year students had committed to a specialty, but were not yet aware of their match results (preventing disappointment or happiness from interfering with the survey responses). While the open-ended questions may have introduced bias, the responses also provided interesting and unique information. Therefore, these study findings still present interesting and valuable information about how UNC medical students make their specialty choices.

Conclusion

Despite different projections of the adequacy of our primary care physician workforce in the coming years, PPACA will not only increase access to our health care system, thereby likely increasing the demand for primary care physicians, but will also attempt to re-build primary care with new models of care, new reimbursement plans, and educational initiatives. But, will these new policies help reverse the trend of declining medical student interest in primary care such that the primary care workforce can respond to the demand? If not, what can reverse this trend to increase the proportion of primary care physicians in the workforce?

An understanding of why students select the specialty choices that they do is critical to answering these questions. This study, although significantly limited by confounding bias and poor generalizability, does offer some insight.

First, UNC medical students identified work satisfaction and intellectual satisfaction as very influential factors—more influential than financial compensation, lifestyle, and length of training. While UNC's low debt level may influence these findings and limit the generalizability, the importance of work satisfaction and intellectual satisfaction was evident throughout the survey.

The importance of these factors hints at the complexity of specialty decisions. Medical students' expectations of work satisfaction and intellectual satisfaction are likely driven by perceptions of the actuality of different specialties, and these perceptions are likely influenced by a variety of experiences, personal values, and life situations. Based on the qualitative survey responses, medical education certainly affects these perceptions—students most frequently cited work environment and practice characteristics perceptions as gleaned from their clinical experiences in medical school as important factors and identified clinical rotations as an influential part of medical school.

But, clinical medical education inherently relies on the actuality of practice—that is, students are educated with and in real, clinical experiences. Medical students learn about pediatrics by working in a pediatric clinic. They observe some actualities of work environment

and the intellectual challenges through their medical education—which shape their perceptions and thoughts about their future careers.

Other experiences outside of medical school—such as personal experiences with health care or physician family members or growing up in a rural town—also likely shape expectations of work satisfaction and intellectual satisfaction.

Therefore, identifying work satisfaction and intellectual satisfaction as important factors influencing specialty decisions not only reveals the complexity of the decision, but also the challenge of a solution. Theoretically, policies to reverse the declining interest of medical students in primary care should target the most influential factors. But, "targeting" work satisfaction and intellectual satisfaction is difficult, as so many different experiences, situations, and values influence these factors. In addition, other factors, such as financial compensation, likely exert some influence over the specialty decision. Much like health care policy, there is not one target.

The closest thing to one "target" is the identification of specialty choice at matriculation. Consistent with the literature, I found that interest in primary care at matriculation did seem to predict eventual primary care career choice. Therefore, admission policies selecting for students interested in primary care may actually be successful in increasing the number of students choosing a primary care specialty. Indeed, schools with strong primary care missions likely already do this—formally or informally. However, medical school admission policies are certainly not subject to national regulation, and this type of policy may not be enough to increase the supply of primary care physicians. But, it may be somewhere for medical schools to start.

Deciphering how medical students make specialty decisions is difficult and challenging. Certainly, many have made efforts to understand the process in an attempt to understand the declining trends, and the results have been both consistent and inconsistent. Further research, informed by the mistakes and successes of past research, is needed so that we might begin to

increase the proportion of primary care doctors in our health care system—leading perhaps to decreased costs, improved health outcomes, and better quality.

Tables and Figures

Figure 1: Class of 2011 Residency Match Results (Official UNC-SOM/NRMP Data and Survey Data)

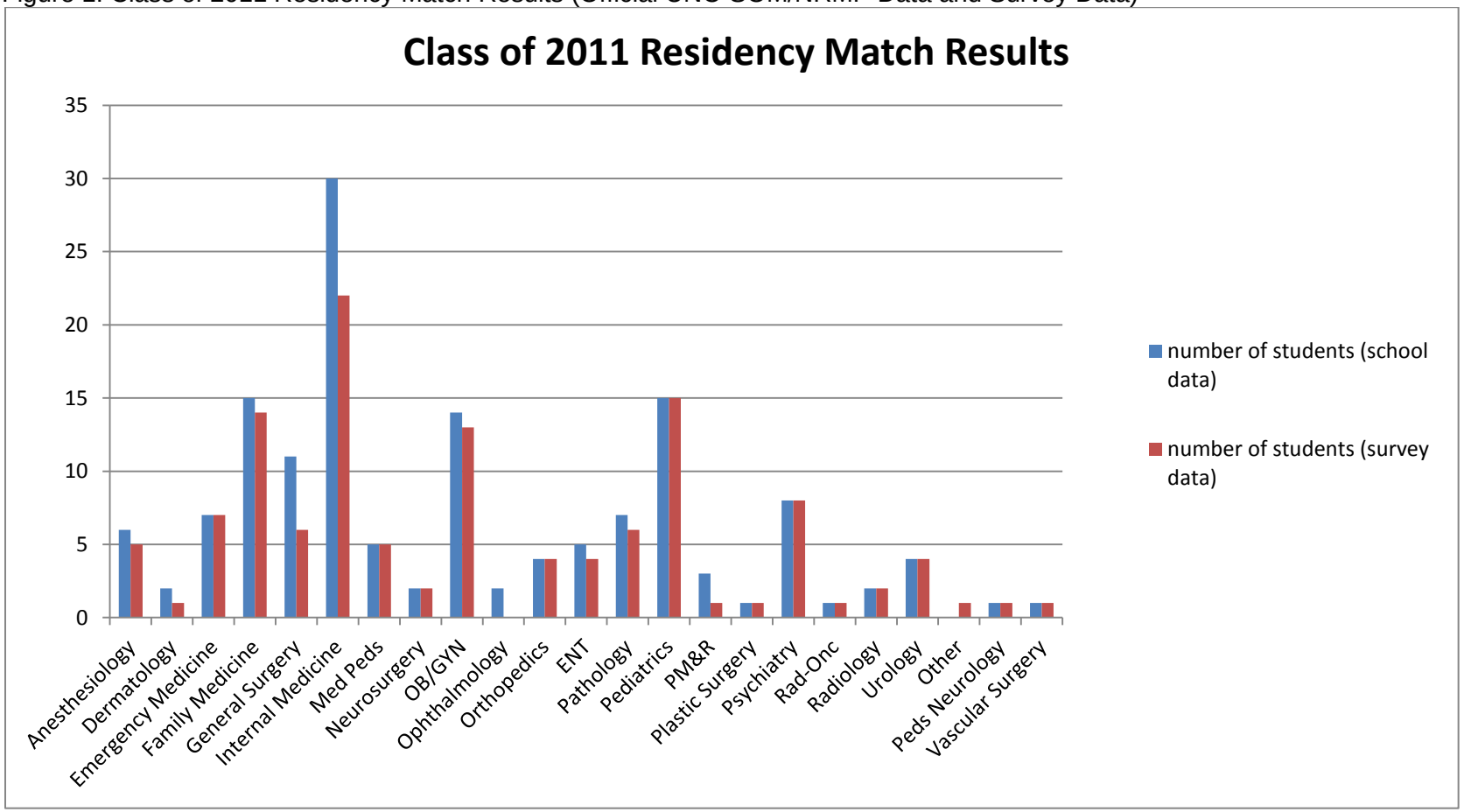
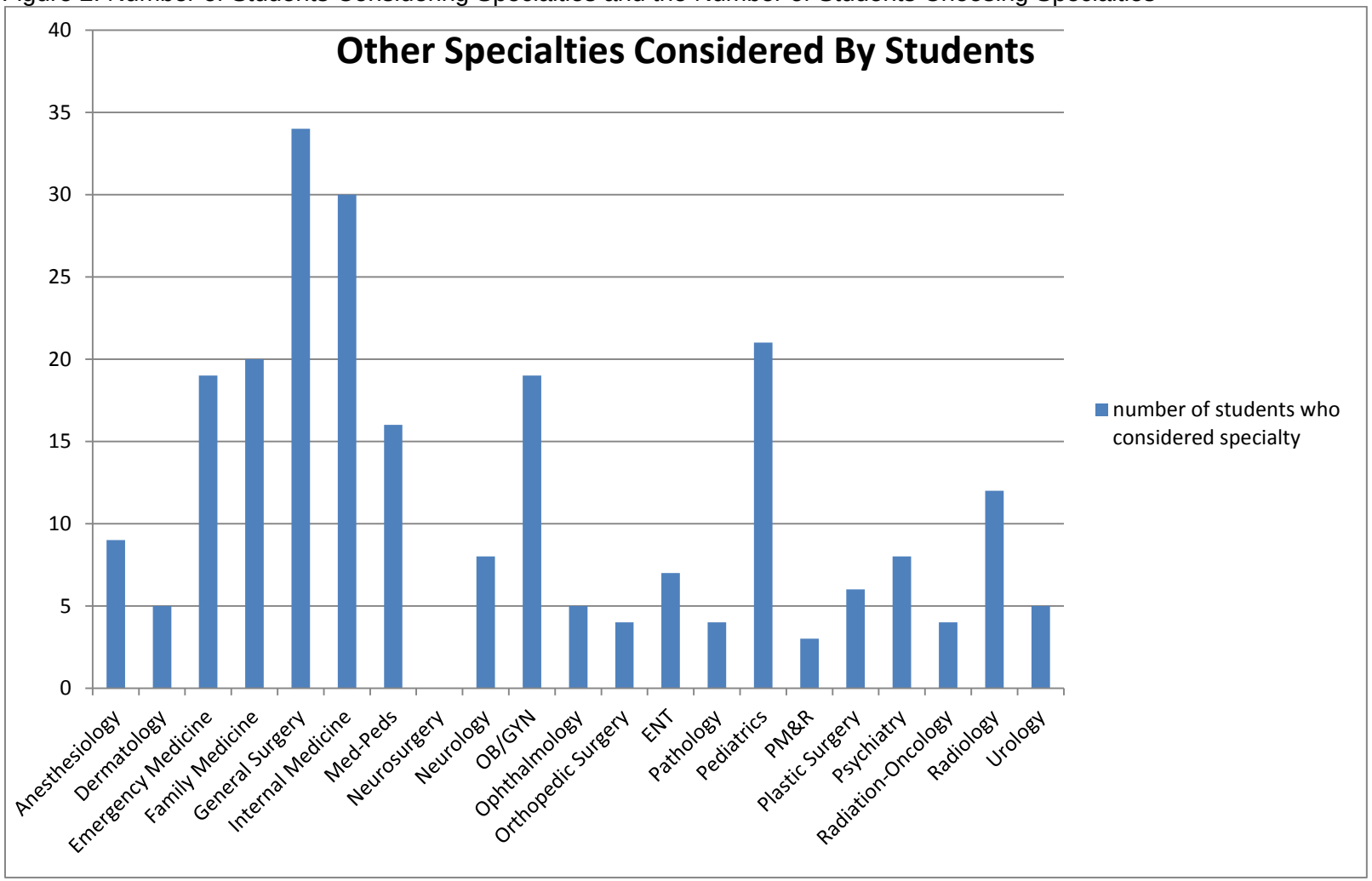


Figure 2: Number of Students Considering Specialties and the Number of Students Choosing Specialties



Please note that students also considered developmental pediatrics (n=1), neurodevelopmental disabilities (n=1), geriatrics (n=2), oncology (n=1), and cardiothoracic surgery (n=1), but no students chose these specialties.

Table 1: Subspecialization Intentions Within Primary Care Fields

Specialty Choice	Plan to Subspecialize	Unsure	Do Not Plan to Subspecialize
Family Medicine (n=14)	5	0	9
Internal Medicine (n=22)	14	4	4
Medicine-Pediatrics (n=5)	2	0	3
Pediatrics (n=15)	7	0	8
Ob-Gyn (n=13)	8	0	5

Table 2: Relative Importance of Six Factors in Specialty Choice (all students)

Factor	Very Important # of students (%)	Important # of students (%)	Less Important # of students(%)
Financial Compensation (n=124)	7 (5.7)	30 (24.2)	87 (70.2)
Intellectual Satisfaction (n=120)	68 (56.7)	40 (33.3)	12 (10)
Work Satisfaction (n=118)	94 (79.7)	21 (17.8)	3 (2.5)
Lifestyle (n=118)	28 (23.7)	67 (56.8)	23 (19.5)
Sense of doing good (n=120)	46 (38.3)	53 (44.2)	21 (17.5)
Length of Training (n=121)	2 (1.7)	19 (15.7)	100 (82.6)

Table 3: Comparison of Relative Importance of Financial Compensation between Students Choosing Primary Care Specialties (including Ob-Gyn) and Students Choosing Non-Primary Care Specialties

Financial Compensation	Very Important # of students (%)	Important # of students (%)	Less Important # of students(%)
Non-Primary Care Specialty (n=90)	5 (5.6)	27 (30)	58 (64.4)
Primary Care Specialty (n=34)	2 (5.9)	3 (8.8)	29 (85.3)

Table 4: Comparison of Relative Importance of Sense of Doing Good between Students Choosing Primary Care Specialties (including Ob-Gyn) and Students Choosing Non-Primary Care Specialties

Sense of Doing Good	Very Important # of students (%)	Important # of students (%)	Less Important # of students(%)
Non-Primary Care Specialty	26 (28.9)	47 (52.2)	17 (18.9)
Primary Care Specialty	20 (66.7)	6 (20)	4 (13.3)

Table 5: Overall Anticipated Mean Percent and Range of Time Involved in Professional Activities

Professional Activity	Mean Percent of Time Involved (Standard Deviation)	Range of Percent of Time Involved
Training or Fellowship	1.5 (4.9)	0 to 25
Bench Research	3.0 (10.1)	0 to 60
Clinical, Health Services, or Health Policy Research	9.7 (12.6)	0 to70
Patient Care	60.9 (20.6)	1 to100
Teaching	16.4 (11.3)	0 to 50
Administration or Management	3.2 (7.4)	1 to60
Policy-Making or Policy-Advocacy	3.2 (7.43)	0 to40
International Work	0.8 (6.5)	0 to70
Other	1.1 (6.9)	0 to 50

Table 6: Number of Students Indicating Some Percentage of Time For Involvement, Mean Percent Involvement Time and Range of Involvement Time (of students indicating some involvement)

Professional Activity	Number of Students	Mean Percent of Time Involved	Range of Percent of Time Involved
Training or Fellowship	14	13.1	2 to25
Bench Research	15	24.3	5 to60
Clinical, Health Services, or Health Policy Research	67	17.7	1 to70
Patient Care	121	61.9	8 to100
Teaching	103	19.6	2 to50
Administration or Management	34	11.4	1 to 60
Policy-Making or Policy-Advocacy	38	11.2	1 to40
International Work	4	25	10 to70
Other	4	33.8	5 to50

Table 7: Comparison of Mean Percent Involvement Time Between Those Choosing Primary Care and Non-Primary Care*

Professional Activity	Mean Percent of Time Involved (Non-Primary Care)	Mean Percent of Time Involved (Primary Care)
Training or Fellowship	1.7	0.8
Bench Research	3.3	2.1
Clinical, Health Services, or Health Policy Research	10.2	8.1
Patient Care	60.9	60.8
Teaching	15.9	17.8
Administration or Management	2.9	3.8
Policy-Making or Policy-Advocacy	2.6**	5.9**
International Work	0.9	0.6
Other	1.5	0

*The mean percentages and significance did not differ when primary care specialties did not include general obstetrics/gynecology

**$p<0.05$

References

American College of Physicians. 2006. *The impending collapse of primary care medicine and its implications for the state of the nation's health care: A report from the american college of physicians.*

American Medical Association. 2011. *Physician characteristics and distribution in the U.S. [serial].Earlier Title: Physician distribution and medical licensure in the U.S.; Phys. charact. distrib. U.S.; Physician characteristics and distribution in the United States.* Chicago, Ill.: Survey & Data Resources, American Medical Association. http://search.lib.unc.edu.libproxy.lib.unc.edu?R=UNCb1804302.

Anderson, M. B. and J. Cantow. 2009. *2009 GQ medical school graduation questionnaire: All schools summary report.* Association of American Medical Colleges, , https://www.aamc.org/download/90054/data/gqfinalreport2009.pdf.

———2010. *2010 GQ medical schools graduation questionaire: All schools summary report.* Association of American Medical Colleges, , https://www.aamc.org/download/140716/data/2010_gq_all_schools.pdf.

Association of American Medical Colleges, "Medical School Missions Management Tool 2011: Prepared for University of North Carolina at Chapel Hill School of Medicine" 2011).

Barrett,F. A., M. S. Lipsky, and M. N. Lutfiyya. 2011. "The Impact of Rural Training Experiences on Medical Students: A Critical Review." *Academic Medicine : Journal of the Association of American Medical Colleges* 86 (2) (Feb):259-63.

Basu,J., B. Friedman, and H. Burstin. 2002. "Primary Care, HMO Enrollment, and Hospitalization for Ambulatory Care Sensitive Conditions: A New Approach." *Medical Care* 40 (12):1260-9.

Basu,Jayasree J. 2004. "Managed Care and Preventable Hospitalization among Medicaid Adults." *Health Services Research* 39 (3):489-510.

Bazargan,M., R. W. Lindstrom, A. Dakak, C. Ani, K. E. Wolf, and R. A. Edelstein. 2006. "Impact of Desire to Work in Underserved Communities on Selection of Specialty among Fourth-Year Medical Students." *Journal of the National Medical Association* 98 (9) (Sep):1460-5.

Bland,C. J., L. N. Meurer, and G. Maldonado. 1995. "Determinants of Primary Care Specialty Choice: A Non-Statistical Meta-Analysis of the Literature." *Academic Medicine : Journal of the Association of American Medical Colleges* 70 (7) (Jul):620-41.

Bodenheimer,T., E. Chen, and H. D. Bennett. 2009. "Confronting the Growing Burden of Chronic Disease: Can the US Health Care Workforce do the Job?" *Health Affairs* 28 (1):64.

Bodenheimer,T., R. A. Berenson, and P. Rudolf. 2007. "The Primary Care-Specialty Income Gap: Why it Matters." *Annals of Internal Medicine* 146 (4) (Feb 20):301-6.

Bodenheimer,T., K. Grumbach, and R. A. Berenson. 2009. "A Lifeline for Primary Care." *The New England Journal of Medicine* 360 (26) (Jun 25):2693-6.

Burack,J. H., D. M. Irby, J. D. Carline, D. M. Ambrozy, K. E. Ellsbury, and F. T. Stritter. 1997. "A Study of Medical Students' Specialty-Choice Pathways: Trying on Possible Selves." *Academic Medicine : Journal of the Association of American Medical Colleges* 72 (6) (Jun):534-41.

Campos-Outcalt,D., and J. Senf. 1999. "A Longitudinal, National Study of the Effect of Implementing a Required Third-Year Family Practice Clerkship Or a Department of Family Medicine on the Selection of Family Medicine by Medical Students." *Academic Medicine : Journal of the Association of American Medical Colleges* 74 (9) (Sep):1016-20.

Campos-Outcalt,D., J. Senf, A. J. Watkins, and S. Bastacky. 1995. "The Effects of Medical School Curricula, Faculty Role Models, and Biomedical Research Support on Choice of Generalist Physician Careers: A Review and Quality Assessment of the Literature." *Academic Medicine : Journal of the Association of American Medical Colleges* 70 (7) (Jul):611-9.

Ciechanowski,P. S., L. L. Worley, J. E. Russo, and W. J. Katon. 2006. "Using Relationship Styles Based on Attachment Theory to Improve Understanding of Specialty Choice in Medicine." *BMC Medical Education* 6 (Jan 11):3.

Colquitt,W. L., M. C. Zeh, C. D. Killian, and J. M. Cultice. 1996a. "Effect of Debt on U.S. Medical School Graduates' Preferences for Family Medicine, General Internal Medicine, and General Pediatrics." *Academic Medicine : Journal of the Association of American Medical Colleges* 71 (4) (Apr):399-411.

———. 1996b. "Effect of Debt on U.S. Medical School Graduates' Preferences for Family Medicine, General Internal Medicine, and General Pediatrics." *Academic Medicine : Journal of the Association of American Medical Colleges* 71 (4) (Apr):399-411.

Colwill,J. M., J. M. Cultice, and R. L. Kruse. 2008. "Will Generalist Physician Supply Meet Demands of an Increasing and Aging Population?" *Health Affairs (Project Hope)* 27 (3) (May-Jun):w232-41.

Council on Graduate Medical Education. 2005. *Physician workforce policy guidelines for the united states, 2000-2020.* Sixteenth Report, http://wyowdc.org/docs/hwp/resources/COGME-16th-Report---Physician-Workforce-Policy-Guidelines.pdf (accessed June 7 2011).

Currie, P. 2011. Class of 2011.

G. Dent, "Senior Placements By Specialty: Match 2011" 2011), http://www.med.unc.edu/md/residency-match/residency-placements/2011/2011%20Final%20Public%20Alpha%20List%20by%20Specialty.pdf/view (Accessed June 28, 2011).

DeZee,K. J., D. Maurer, R. Colt, W. Shimeall, R. Mallory, J. Powers, and S. J. Durning. 2011. "Effect of Financial Remuneration on Specialty Choice of Fourth-Year U.S. Medical

Students." *Academic Medicine : Journal of the Association of American Medical Colleges* 86 (2) (Feb):187-93.

Dill, M. J. and E. S. Salsberg. 2008. *The complexities of physician supply and demand: Projections through 2025.* Association of American Medical Colleges Center for Workforce Studies, , http://www.tht.org/education/resources/AAMC.pdf.

Dorsey,E. R., D. Jarjoura, and G. W. Rutecki. 2003. "Influence of Controllable Lifestyle on Recent Trends in Specialty Choice by US Medical Students." *JAMA : The Journal of the American Medical Association* 290 (9) (Sep 3):1173-8.

———. 2005. "The Influence of Controllable Lifestyle and Sex on the Specialty Choices of Graduating U.S. Medical Students, 1996-2003." *Academic Medicine : Journal of the Association of American Medical Colleges* 80 (9) (Sep):791-6.

Ellsbury,K. E., J. H. Burack, D. M. Irby, F. T. Stritter, D. Ambrozy, J. D. Carline, J. Guo, and D. C. Schaad. 1996. "The Shift to Primary Care: Emerging Influences on Specialty Choice." *Academic Medicine : Journal of the Association of American Medical Colleges* 71 (10 Suppl) (Oct):S16-8.

Fincher,R. M., and L. A. Lewis. 1999. "Influences on Specialty Choice: Are they Different for Switchers and Non-Switchers?" *Academic Medicine : Journal of the Association of American Medical Colleges* 74 (10 Suppl) (Oct):S121-3.

Gazewood,J. D., J. Owen, and L. K. Rollins. 2002. "Effect of Generalist Preceptor Specialty in a Third-Year Clerkship on Career Choice." *Family Medicine* 34 (9) (Oct):673-7.

Goodson,J. D. 2010. "Patient Protection and Affordable Care Act: Promise and Peril for Primary Care." *Annals of Internal Medicine* 152 (11) (Jun 1):742-4.

Grayson,M. S., M. Klein, and K. B. Franke. 2001. "Impact of a First-Year Primary Care Experience on Residency Choice." *Journal of General Internal Medicine* 16 (12) (Dec):860-3.

Greenfield,S. 1992. "Variations in Resource Utilization among Medical Specialties and Systems of Care." *JAMA : The Journal of the American Medical Association* 267 (12):1624.

Hauer,K. E., S. J. Durning, W. N. Kernan, M. J. Fagan, M. Mintz, P. S. O'Sullivan, M. Battistone et al. 2008. "Factors Associated with Medical Students' Career Choices regarding Internal Medicine." *JAMA : The Journal of the American Medical Association* 300 (10) (Sep 10):1154-64.

Hunt,D. D., C. Scott, S. Zhong, and E. Goldstein. 1996. "Frequency and Effect of Negative Comments ("Badmouthing") on Medical Students' Career Choices." *Academic Medicine : Journal of the Association of American Medical Colleges* 71 (6) (Jun):665-9.

Jeffe,D. B., D. A. Andriole, H. L. Hageman, and A. J. Whelan. 2007. "The Changing Paradigm of Contemporary U.S. Allopathic Medical School Graduates' Career Paths: Analysis of the

1997-2004 National AAMC Graduation Questionnaire Database." *Academic Medicine : Journal of the Association of American Medical Colleges* 82 (9) (Sep):888-94.

Jeffe,D. B., A. J. Whelan, and D. A. Andriole. 2010. "Primary Care Specialty Choices of United States Medical Graduates, 1997-2006." *Academic Medicine : Journal of the Association of American Medical Colleges* 85 (6) (Jun):947-58.

Kahn,M. J., R. J. Markert, F. A. Lopez, S. Specter, H. Randall, and N. K. Krane. 2006. "Is Medical Student Choice of a Primary Care Residency Influenced by Debt?" *MedGenMed : Medscape General Medicine* 8 (4) (Oct 24):18.

Kassebaum,D. G. 1995. "Specialty Intentions of 1995 U.S. Medical School Graduates and Patterns of Generalist Career Choice and Decision Making." *Academic Medicine* 70 (12) (-12):1152-7.

Kassebaum,D. G., P. L. Szenas, and M. K. Schuchert. 1996. "Determinants of the Generalist Career Intentions of 1995 Graduating Medical Students." *Academic Medicine : Journal of the Association of American Medical Colleges* 71 (2) (Feb):198-209.

Kiker,B. F., and M. Zeh. 1998. "Relative Income Expectations, Expected Malpractice Premium Costs, and Other Determinants of Physician Specialty Choice." *Journal of Health and Social Behavior* 39 (2) (Jun):152-67.

Lawson,S. R., J. D. Hoban, and P. E. Mazmanian. 2004a. "Understanding Primary Care Residency Choices: A Test of Selected Variables in the Bland-Meurer Model." *Academic Medicine : Journal of the Association of American Medical Colleges* 79 (10 Suppl) (Oct):S36-9.

———. 2004b. "Understanding Primary Care Residency Choices: A Test of Selected Variables in the Bland-Meurer Model." *Academic Medicine : Journal of the Association of American Medical Colleges* 79 (10 Suppl) (Oct):S36-9.

Macinko,J. 2003. "The Contribution of Primary Care Systems to Health Outcomes within Organization for Economic Cooperation and Development (OECD) Countries, 1970-1998." *Health Services Research* 38 (3):831.

Mengel,M. B., and A. B. Davis. 1995. "Required First-Year Generalist Clinical Experience Courses and their Relationship to Career Choice: The Critical Effect of Family Medicine Involvement." *Family Medicine* 27 (10) (Nov-Dec):652-7.

Meurer,L. N. 1995. "Influence of Medical School Curriculum on Primary Care Specialty Choice: Analysis and Synthesis of the Literature." *Academic Medicine : Journal of the Association of American Medical Colleges* 70 (5) (May):388-97.

Meurer,L. N., C. J. Bland, and G. Maldonado. 1996. "The State of the Literature on Primary Care Specialty Choice: Where do we Go from here?" *Academic Medicine : Journal of the Association of American Medical Colleges* 71 (1) (Jan):68-77.

National Resident Matching Program, "For Second Year, More U.S. Medical School Seniors Match to Primary Care Residencies" 2011), http://www.nrmp.org/pressrelease2011.pdf (Accessed June 22, 2011).

Newton,D. A., and M. S. Grayson. 2003. "Trends in Career Choice by US Medical School Graduates." *JAMA : The Journal of the American Medical Association* 290 (9) (Sep 3):1179-82.

Newton,D. A., M. S. Grayson, and L. F. Thompson. 2005. "The Variable Influence of Lifestyle and Income on Medical Students' Career Specialty Choices: Data from Two U.S. Medical Schools, 1998-2004." *Academic Medicine : Journal of the Association of American Medical Colleges* 80 (9) (Sep):809-14.

Newton,D. A., M. S. Grayson, and T. W. Whitley. 1998. "What Predicts Medical Student Career Choice?" *Journal of General Internal Medicine* 13 (3) (Mar):200-3.

North Carolina Institute of Medicine. 2011. *Implementation of the patient protection and affordable care act in north carolina: Interim report.* , http://www.nciom.org/wp-content/uploads/2011/03/HR-Interim-Report.pdf.

Pathman,D. E., and C. R. Agnew. 1993. "Querying Physicians' Beliefs in Career Choice Studies: The Limitations of Introspective Causal Reports." *Family Medicine* 25 (3) (Mar):203-7.

R. Pear, "Shortage of Doctors an Obstacle to Obama Goals," *The New York Times* A1. http://www.nytimes.com/2009/04/27/health/policy/27care.html?scp=1&sq=%22we're%20not%20producing%20enough%20primary%20care%20physicians%22&st=cse.

Phillips, R. L., M. S. Dodoo, S. Petterson, I. Xierali, A. Bazemore, B. Teevan, K. Bennett, C. Legagneur, J. Rudd and J. Phillips. 2009. *Specialty and geographic distribution of the physician workforce--what influences medical student and resident choices?* The Robert Graham Center, , http://www.graham-center.org/online/etc/medialib/graham/documents/publications/mongraphs-books/2009/rgcmo-specialty-geographic.Par.0001.File.tmp/Specialty-geography-compressed.pdf (accessed June 7 2011).

Phillips,J. P., D. P. Weismantel, K. J. Gold, and T. L. Schwenk. 2010. "Medical Student Debt and Primary Care Specialty Intentions." *Family Medicine* 42 (9) (Oct):616-22.

Pugno,P. A., A. L. McGaha, G. T. Schmittling, A. D. DeVilbiss Bieck, P. W. Crosley, and D. J. Ostergaard. 2010. "Results of the 2010 National Resident Matching Program: Family Medicine." *Family Medicine* 42 (8) (Sep):552-61.

Rosenblatt,R. A., and C. H. Andrilla. 2005. "The Impact of U.S. Medical Students' Debt on their Choice of Primary Care Careers: An Analysis of Data from the 2002 Medical School Graduation Questionnaire." *Academic Medicine : Journal of the Association of American Medical Colleges* 80 (9) (Sep):815-9.

Rosenthal,M. P., P. A. Marquette, and J. J. Diamond. 1996. "Trends Along the Debt-Income Axis: Implications for Medical Students' Selections of Family Practice Careers." *Academic Medicine : Journal of the Association of American Medical Colleges* 71 (6) (Jun):675-7.

Schwartz,M. D., S. Durning, M. Linzer, and K. E. Hauer. 2011. "Changes in Medical Students' Views of Internal Medicine Careers from 1990 to 2007." *Archives of Internal Medicine* 171 (8) (Apr 25):744-9.

Schwartz,M. D., M. Linzer, D. Babbott, G. W. Divine, and W. E. Broadhead. 1995. "The Impact of an Ambulatory Rotation on Medical Student Interest in Internal Medicine. the Society of General Internal Medicine Task Force on Career Choice in Internal Medicine." *Journal of General Internal Medicine* 10 (10) (Oct):542-9.

Senf,J. H., D. Campos-Outcalt, and R. Kutob. 2003a. "Factors Related to the Choice of Family Medicine: A Reassessment and Literature Review." *The Journal of the American Board of Family Practice / American Board of Family Practice* 16 (6) (Nov-Dec):502-12.

———. 2003b. "Factors Related to the Choice of Family Medicine: A Reassessment and Literature Review." *The Journal of the American Board of Family Practice / American Board of Family Practice* 16 (6) (Nov-Dec):502-12.

Senf,J. H., D. Campos-Outcalt, A. J. Watkins, S. Bastacky, and C. Killian. 1997. "A Systematic Analysis of how Medical School Characteristics Relate to Graduates' Choices of Primary Care Specialties." *Academic Medicine : Journal of the Association of American Medical Colleges* 72 (6) (Jun):524-33.

Starfield,B., L. Shi, and J. Macinko. 2005. "Contribution of Primary Care to Health Systems and Health." *Milbank Quarterly* 83 (3):457-502.

Stimmel,B., and M. Serber. 1999. "The Role of Curriculum in Influencing Students to Select Generalist Training: A 21-Year Longitudinal Study." *Journal of Urban Health : Bulletin of the New York Academy of Medicine* 76 (1) (Mar):117-26.

Thornton,J., and F. Esposto. 2003. "How Important are Economic Factors in Choice of Medical Specialty?" *Health Economics* 12 (1) (Jan):67-73.

U.S. Department of Health and Human Services, Health Resources and Services Administration and Bureau of Health Professions. 2008. *The physician workforce: Projections and research into current issues affecting supply and demand.* .

University of North Carolina School of Medicine. 2005. "Mission." 06/09. http://www.med.unc.edu/www/about/mission .

Appendix A: Systematic Review Method and Comprehensive Results

Method

A literature search was performed to determine what is known about the factors influencing medical students' career choices. I searched PubMED (MEDLINE) with the following terms: career choice and students, medical and (primary health care or physicians, primary care). The search was limited to articles published from 1995 through 2011.

The PubMED search returned 79 articles. I included articles only if they represented original research, if the study population was U.S., allopathic medical students, if the study outcome or dependent variable was fourth-year medical student career choice, and if the study examined factors associated with fourth-year medical student career choice.

I excluded studies that surveyed residents or physicians about their career choice to minimize recall bias, and studies which focused on a specific medical school population (e.g. female students, underrepresented minorities). Studies that examined factors associated with primary care fields (defined as internal medicine, pediatrics, family medicine, and obstetrics/gynecology) were included, while studies that examined factors associated with non-primary care fields (e.g. general surgery) were not included. Studies that specifically identified the outcome as rural primary care were also excluded. Studies that evaluated the effect of admission policies or pre-admission statistics (e.g. undergraduate background or Medical College Admission Test scores) on specialty selection were beyond the scope of this review.

Through title and abstract review, 18 articles met the inclusion criteria. The references of these articles were hand-searched and reviewed to yield an additional 19 relevant articles. I critically appraised a total of 37 articles by identifying the study objective, type of study, and population studied and by assessing the results and evaluating the internal and external validity on a scale of poor, fair and good. Some studies included results additional to medical student career choice, but only the results about the factors influencing medical student career choice were included and evaluated. The overall quality of the study was based primarily on the

strength of the internal validity, the statistical analysis, and the strength of the external validity. Below, I provide a table that includes summaries of the included studies as well as a critical appraisal of their quality, limitations, and strengths. Following the table, I discuss each of the included articles that I judged to be of fair to good quality.

Citation	Study Objective*	Research Design	Population	Internal Validity	External Validity	Overall Quality
Barrett, Lipsky and Lutfiyya, 2011	To determine the effect of rural training experiences on medical students.	Systematic Review of literature published from 1966 through Jun 2009. The authors selected relevant articles about undergraduate medical school rural training experiences.	Undergraduate medical students experiencing rural training.	Fair to Good	Unknown but likely fair	Poor to Fair
Bazargan et al, 2006	To determine the factors associated with choosing a specialty.	Cross Sectional: A 51-item, web-based, voluntary and anonymous survey of 668 fourth-year medical students from 32 medical schools. The survey used a Likert scale to identify the influence of factors on specialty choice.	668 fourth-year students from 32 medical schools responded (all 126 medical schools invited to participate). 19% of fourth-year students from 32 medical schools responded.	Fair	Fair to Good	Fair to Good
Bland et al, 1995	To determine the determinants of PC specialty choice through a non-statistical meta-analysis of the literature	Systematic Review and Non-Statistical Meta-Analysis: The authors systematically searched for literature on PC specialty choice published or written between 1987 and 1993. The authors selected relevant articles (original research or reviews, US and Canadian studies, studies pertaining to career choice in primary care specialties) and critically appraised each article.	Population not clearly defined: articles, books or reports were included if they examined specialty choice and primary care.	Good	Likely Good	Good
Burack et al, 1997	To determine the factors that are important to students choosing a PC specialty and a non-PC specialty.	Qualitative: Students participated in focus group discussions, which were recorded and coded for a statistical analysis	Of the 157 University of Washington School of Medicine graduating class, 47 students participated.	Fair	Poor	Fair

Campos-Outcalt et al, 1995	To determine the effects of medical school curricula, faculty role models, and federal biomedical research support on the specialty choices of US medical students	Systematic Review: The authors systematically searched the literature using a clear search strategy for original research articles (excluding literature reviews, commentary and editorials) pertaining to the three aims of the review. Articles were searched in the following date range: 1984 through 1993.	Not clearly defined.	Good	Likely Good	Good
Campos-Outcalt and Senf, 1999	To determine the effects of a required third-year FM clerkship and of a FM Department on specialty choices of medical students.	Ecological/Longitudinal: Data from 121 US medical schools were collected. Specifically, the percentage of students entering FM from 1980-81 through 1996, the organizational structure of the schools, the required curriculum of the schools, and ownership (public vs. private) of the schools were gathered and comparisons were made over time. Data from three years prior to changes (addition of a FM clerkship or department) and three years after these changes were analyzed.	The medical students who attended schools that had a required FM clerkship from 1980 through 1993, schools that had no required FM clerkship during this period, and schools that added a required FM clerkship during this period. 13 schools were excluded because they did not meet the descriptions of the above schools.	Fair	Fair	Fair
Ciechanowski et al, 2006	To determine if relationship styles effect the choice of a PC career.	Cross-Sectional: Fourth year students completed a questionnaire to assess relationship style and gave permission for the authors to access information about the recent residency specialty match.	106 of 129 fourth year students (Class of 2003) completed the survey.	Fair to Good	Poor	Fair
Colquitt et al, 1996	To determine the effect of debt on medical students' career choices and how debt might influence these choices.	Cross Sectional: The authors analyzed data from the GQ, MSQ, the Student and Applicant Information Management System (SAIMS; demographic data), and the HEAL and AAMC MEDLOANS programs to determine the effect of debt on career choice.	Medical students graduating in 1991 and 1992 who completed the GQ and the MSQ. Specific MSQ rates are not specified, but are over 80%. GQ response rates for 1991 and 1992 were over 70%.	Fair to Good	Fair to Good	Fair to Good

DeZee et al, 2011	Could financial incentives reverse the declining interest in primary care?	Cross Sectional (quantitative and qualitative): An electronic questionnaire was emailed to all fourth-year students applying for residency training in the Military Healthcare System.	All fourth-year medical students applying to residency training in the Military Healthcare System (797) were eligible to participate. 447 responded.	Fair to Good	Fair	Fair to Good
Dorsey et al, 2003	To determine the extent to which controllable lifestyle and other characteristics of specialties influences career decision making.	Ecological: Specialty preferences of medical students graduating from 1996 until 2002 were determined. Specialties were classified as having a controllable or uncontrollable lifestyle, and the average income and average number of hours worked in each specialty was determined. Trends and associations were examined over time.	Fourth-year medical students participating in the match (National Resident Matching Program--NRMP--San Francisco Matching Program--SFMatch--and the American Urological Association--AUA) from 1996 until 2002.	Fair	Good	Fair to Good
Dorsey et al, 2005	To determine if the preferences of female medical students explain the recent trend of medical students' choices of specialties with controllable lifestyles.	Ecological: The authors used the responses to the 1996-2003 Medical School Graduation Questionnaires to examine the trends of specialty choice by time and by sex.	Fourth-year medical students who responded to the Graduation Questionnaire from 1996 through 2003.	Fair	Good	Fair to Good
Ellsbury et al, 1996	To determine the factors that influence the choice of a PC specialty and the choice of a non-PC specialty.	Cross Sectional: Questionnaires were distributed to 320 graduating medical students at the University of Washington (UW) and the University of North Carolina (UNC) at the time of list submission for the 1995 National Internship and Residency Match Program. The questionnaire asked students to list their current specialty and subspecialty choices and then to list up to 5 major factors that led them to that choice.	320 fourth-year medical students submitting a rank list in 1995 from UW or UNC were eligible to participate. 144 (92%) and 156 (96%) of UNC and UW students, respectively, completed the survey. 179 of the 299 students were male and 112 were female.	Fair to Good	Fair	Fair

Elnicki et al, 1999	To determine if participation in an IM preceptorship by medical students affects residency choice in IM.	Prospective Cohort Study: Students who completed the first year of medical school at West Virginia University School of Medicine and who applied and were accepted to the 2 month IM preceptorship (between the first and second year) were compared to those who applied and were not chosen for/rejected the preceptorship, those who participated in a FM preceptorship, and those who did not apply or participate in any preceptorship.	588 rising second year students at West Virginia University School of Medicine from 1995-2001 who applied for and were chosen for the preceptorship in IM, who applied for and were not chosen for/rejected the IM preceptorship, who participated in the FM preceptorship, and who did not apply for or participate in any preceptorship.	Poor to Fair	Poor	Poor
Fincher and Lewis, 1999	To determine if the factors associated with specialty choice different for medical students who "switch" from or to primary care during medical school are different compared to those students who do not switch.	Longitudinal: Students entering the Medical College of Georgia in 1994 and 1995 were asked to complete a survey at matriculation and then again at the beginning of the fourth year. Specialty choices for each student were gathered from the NRMP results.	367 medical students matriculating at the Medical College of Georgia completed the matriculation survey; 238 (65%) of these medical students also completed the survey at the beginning of fourth year--these 238 students were included in the study sample. The study sample was comparable to the graduating students in terms of sex and specialty choice.	Fair to Good	Fair	Fair to Good
Gazewood, Owen, and Rollins, 2002	To determine the effect of a primary care clerkship on PC career choice.	Retrospective Cohort Study: Information about student experience in the primary care clerkship was obtained from course records; demographic data was obtained from the AAMC student profile sheet, and career choice information was obtained from the GQ. Four classes of students experiencing this primary care clerkship were compared to four classes of students not experiencing this clerkship (i.e. the classes graduating the 4 years prior to the beginning of the clerkship).	489 University of Virginia School of Medicine students completed the primary care clerkship and graduated between 1995 and 1998. 25 students were excluded (unknown reason); therefore, 469 students were included in the analysis.	Fair	Poor to Fair	Fair

Grayson, Klein and Franke, 2001	To determine if a first-year longitudinal primary care experience influence career decisions (i.e. residency selections).	Retrospective Cohort: Exposure was the first-year Introduction to Primary Care (IPC) elective and the outcome was specialty choice. Students were grouped into three groups: those who took IPC, those who wanted to take IPC but were not randomly selected, and those who chose another elective.	New York Medical College (NYMC) students matriculating from 1988 through 1993. A total of 925 students were studied--282 students who took IPC, 398 students who wanted to take IPC but were not randomly selected, and 245 students who chose another elective.	Fair	Poor	Poor to Fair
Hauer et al, 2008	To determine the factors related to a choice of an internal medicine career.	Cross Sectional: An electronic survey was sent to fourth-year medical students at 11 US medical schools in the spring of 2007. The survey requested information about demographics, debt, experiences on the core IM clerkship and sub-internship, IM interest group participation and specialties chosen or considered.	1177 of 1439 eligible participants completed the survey (overall response rate of 82%). The average age of the participants was 27.7 and 48.4% of the participants were male. The participants were comparable with the US medical students completing the GQ.	Fair to Good	Good	Fair to Good
Hunt et al, 1996	To determine if the frequency and effect of badmouthing different specialties has an effect on students' career choices.	Cross Sectional: A two-page anonymous questionnaire was sent to 1447 graduating students from nine medical schools. The questionnaire asked about career choice, "badmouthing" different specialties, and the effect of "badmouthing" on their career choice (6-point Likert scale).	1114 of the 1447 graduating medical students responded to the survey (77% response rate). The students were from nine medical schools, which were selected based on the percentage of students going into primary care (representation from schools with a high, middle, and low percentage) based on the AAMC's Institutional Goals Ranking Report.	Fair to Good	Fair	Fair

Jeffe et al, 2010	To determine the trends in specialty choice among medical students from 1997-2006 and the predictors of PC specialty choices?	Cross-Sectional: Data was gathered for medical students graduating from 1997-2006 who had completed both the AAMC's Matriculating Student Questionnaire (MSK) and the Graduation Questionnaire (GQ).	The study sample was 102,673 graduates or 64.9% of all 1997-2006 graduates. Response rates varied from 60.1% to 91.7%. Responses from MD/PhD graduates (n=2377) were excluded, and incomplete responses (n=7067) were excluded.	Good	Good	Good
Kahn et al, 2006	To determine if career choice in PC influenced by debt.	Cross Sectional: Residency choice and debt level were analyzed for 2001-2005 graduates from 3 medical schools.	2022 graduates from Louisiana State University School of Medicine (LSU, 830), Tulane University School of Medicine (n=715), and University of South Florida College of Medicine (USF, n= 477). Graduates who matched into a transitional year (n=12) or into a combined program with PC and non-PC (i.e. IM/neurology, n=?) were excluded.	Fair	Fair	Fair
Kassebaum, Szenas and Schuchert, 1996	To determine the demographic, structural, attitudinal, and educational characteristics associated with generalist career choices.	Cross Sectional/Longitudinal Cohort?: Data from the Applicant's Master File (pre-admission information), AAMC Matriculation Questionnaire (MQ) and Graduation Questionnaire (GQ) for medical students graduating in 1995 were analyzed to determine the factors associated with generalist career choices. Information about medical schools was obtained from the Institutional Profile System (1993-1994)	13,336 of the 15,888 students graduating from medical school in 1995 completed the GQ and were eligible for the analysis. Students who were entering a FM, IM, or pediatric residency but who were uncertain about later subspecialization (n=1656) were excluded from the analysis.	Fair to Good	Good	Fair to Good

Kiker and Zeh, 1998	To determine the effects of relative income expectations, perception of expected malpractice insurance cost, and other noneconomic factors on medical student career choice.	Cross Sectional: Responses to the 1995 GQ were used to analyze the demographic and economic factors associated with the choice of career (categorized as generalists, medical, surgical, and support).	15,888 medical students graduated in 1995. 81.7% of these graduates completed the GQ.	Fair to Good	Good	Fair to Good
Lawson, Hoban and Mazmanian, 2004	To determine if the variables in the Bland-Meuer model could accurately predict PC career choices of medical students.	Cross Sectional: Independent variables such as student characteristics, medical experiences, and future plans were gathered from the Virginia Commonwealth University School of Medicine and the GQ for students graduating from 1998 through 2002. These variables were entered into a model to determine effect on PC career choice.	The graduates of the Virginia Commonwealth University School of Medicine from 1998-2002. 555 of the 832 total graduates responded to the GQ and therefore became the study sample.	Fair to Good	Fair	Fair
Mengel and Davis, 1995	To determine the effect of a required first-year generalists course (RFGCE) on the percentage of students choosing FM as a career.	Prospective Cohort: The authors used the *1989-1990 AAMC Curriculum Directory* to establish which medical schools had a RFGCE and characterize those RFGCEs (course hours). The number of medical students (graduating 1993) who entered FM as a career was obtained through surveys conducted by the American Academy of Family Physicians (AAFP). Additional information about medical schools was obtained through telephone surveys and AAFP and AAMC publications.	Those medical students who entered medical school in 1989 and graduated medical school in 1993.	Fair	Good	Fair
Meurer, 1995	To determine the effect of medical school curricula on medical student specialty choices	Systematic Review: The authors systematically searched the literature and identified relevant articles from 1980 through 1993.	Not clearly defined.	Fair to Good	Good	Fair to Good

Mutha, Takayama, and O'Neil, 1997	To determine additional factors influencing medical students' career decisions and to better characterize those factors already known.	Cross-Sectional/Focus Groups: Third and fourth year medical students were randomly recruited from 3 California medical schools to participate in focus groups. Participants completed a pre and post-discussion survey.	52 third and fourth-year medical students from 3 California medical schools were randomly contacted and invited to participate in one of 12 focus groups held in the spring of 1993. 70% of those contacted agreed to participate.	Poor to Fair	Poor	Poor
Newton, Grayson and Thompson, 2005	To determine the relative influence of lifestyle and income on the career choices of medical students.	Cross Sectional: Surveys of fourth year medical students from the Brody School of Medicine at East Carolina University (ECU) and New York Medical College (NYMC) were surveyed from 1998-2004. The survey asked students to rate the importance of different factors on their decision	1,334 fourth-year medical students graduating from ECU or NYMC between 1998 and 2004. Those who did not identify a career (n=7), who chose careers selected by fewer than nine students (n=7), and those who selected "other" for a career (n=32) were excluded.	Good	Fair	Fair to Good
Newton, Grayson and Whitley, 1998	To determine the relative influence of students' demographics, medical school characteristics, students' perception of specialty characteristics, and student-held values on career choice.	Cross-Sectional: Graduating medical students from 1995, 1996, and 1997 at New York Medical College (NYMC) and East Carolina University School of Medicine (ECUSOM) were asked to response to a survey about their career choice and three broad categories of factors (demographics, student-rated influences on career choice, and medical school characteristics).	793 graduating medical students from 1995, 1996, and 1997 at NYMC and ECUSOM received a request to complete the questionnaire. 649 (81.8%) responded (92.5% of the ECUSOM students and 77.9% of the NYMC students) and 565 (71.2%) provided complete responses (89.7% of the ECUSOM students and 64.5% of the NYMC students).	Fair to Good	Fair to Good	Fair to Good
Phillips et al, 2009	To determine the effect of financial and educational factors on medical students' choice to practice in PC and in underserved areas. Note: data regarding underserved areas is not reviewed	Ecological/Cross-Sectional: This study was the analysis of about 20 years of the AAMC's Graduation Questionnaire (GQ), a survey of fourth year medical students. Additional information about Title VII grant awards came from the US Health Resources and Services Administration's Bureau of Health Professions.	Based on student response rate, data from the GQ from 1980 to 2004 was used. 310,000 responses were used--representing about 2/3s of all the graduating students from that time.	Fair	Fair to Good	Fair to Good

Rosenblatt et al, 2005	To determine if rising medical school debt explain the recent decline in medical student interest in PC or FM.	Cross Sectional: The authors analyzed demographic data (age at graduation, gender, and race/ethnicity), debt-related data and career choices from the 2002 AAMC Graduation Questionnaire (GQ).	Fourth-year medical students who completed the GQ in 2002.	Fair	Good	Fair to Good
Rosenthall, Marquette and Diamond, 1996	To determine if the level of medical student debt influences career choice in FM.	Longitudinal Study: The authors collected and analyzed data for 326 graduates of 1992 and 1993, including matriculation data, career choice and debt data. A binary logistic regression equation was calculated.	The 421 students in the graduating classes of 1992 and 1993 at Jefferson Medical School were eligible; 326 met the inclusion criteria (in a 4 year medical program).	Fair	Poor	Fair
Schwartz et al, 1995	To determine the effect of ambulatory IM rotations on medical students' career choices (specifically, the choice of IM)	Cross Sectional: A questionnaire was sent to 1650 senior US medical students from 16 medical schools and inquired about the ambulatory IM rotation and career choice.	1,635 US medical students from 16 medical schools who were graduating in spring 1990 were eligible (15 students were excluded from the initial 1650 because they were not graduating). The medical schools were randomly selected from four strata (defined by public or private schools and proportion of students choosing IM). 1244 (76%) responded to the survey.	Fair	Fair to Good	Fair to Good
Senf, Campos-Outcalt, and	To determine the factors related to a career choice in FM	Systematic Review: The authors systematically searched the literature with a clear search strategy and included articles relevant to their main aim.	Not clearly defined.	Good	Likely Good	Good

Senf et al, 1997	To determine the medical school characteristics that influence medical students' choice of residency.	Cross-Sectional: The authors collected data on career choices of the 1994 graduating medical school class (GQ and MSQ) and medical school data from various sources and a questionnaire mailed to medical schools. They used a stepwise regression analysis to determine which factors were significantly associated with career choice.	1994 medical school graduates and 121 medical schools (excluding Puerto Rico and Uniformed Services University of the Health Sciences F. Edward Hebert School of Medicine)	Fair	Good	Fair
Stimmel and Serber, 1999	To determine the effect of different preclinical curriculums on medical students' specialty choice.	Retrospective Cohort: The career choices of Mount Sinai medical student graduates from 1970 to 1990 were analyzed based. Three groups with different preclinical education were created: Mount Sinai 4 year medical students, students receiving the first two years of training at the Sophie Davis School of Biomedical Education (SDBM) and clinical training at Mount Sinai, and students receiving the first two years of training at a foreign medical school and clinical training at Mount Sinai.	Graduates of Mount Sinai School of Medicine from 1970 through 1990 were eligible. 1,659 students were included in the data analysis. It is unclear how many students were not included in the data analysis.	Fair	Poor	Fair
Thorton and Esposto, 2003	To determine the importance of earnings, work hours, vacation time, and length of residency programs in the choice of medical specialty.	Empirical Modeling (?): The authors developed an empirical model to describe the economic mechanism that results in specialty choice. The variables included in the model were earnings, weeks worked per year, hours worked per week, and length of training period. The authors used data on the number of residents, length of training, specialty earnings, weekly hours worked, and weeks worked per year from 1988-1998.	Resident physician workforce (FM, IM, Pediatrics, Ob-Gyn, Surgery, Radiology, Psychiatry, and Anesthesiology) from 1988-1998.	Good	Fair	Fair to Good

Wayne, Timm, Serna and Solan, 2010	Is a desire to serve underserved populations associated with a choice of a PC care?	Longitudinal Cohort: Cohort of medical students at the University of New Mexico were surveyed at matriculation (Medical Students' Attitudes Towards the Underserved--MSATU) and their specialty choice was determined upon graduation. Other data collected included sex, age, ethnicity, and USMLE Step 1 Scores.	All University of New Mexico (UNM) medical students matriculating between 1993 and 2005 were eligible.	Fair	Poor	Fair

Results

Demographic Factors

Sex: Overall, the majority of both systematic reviews and cross-sectional studies have found an association between sex and primary care career choice; specifically, females are more likely to choose a primary care career. This association seems to be consistent throughout the years, and no study found that females were less likely to choose primary care (only that there was no association).

In a good quality systematic review of the literature from 1987 to 1993, Bland et al. (Bland, Meurer, and Maldonado 1995, 620-641) found that being female was associated with a primary care career choice; however, the authors suggested that confounding bias may limit this association, as women are more likely to desire relationships with patients or less likely to value income. However, in another good quality systematic review of literature from 1993 through 2001, Senf et al (Senf, Campos-Outcalt, and Kutob 2003b, 502-512) concluded that this association was inconsistent and only slight.

Most observational studies have also found associations between sex and primary care choice. In an analysis of survey data from the MSQ and the GQ for medical students graduating in 1995, Kassebaum, Szenas and Schuchert (Kassebaum, Szenas, and Schuchert 1996, 198-209) found that female graduates were more likely to choose a primary care career (defined as family medicine, general internal medicine and general pediatrics). Kiker and Zeh's multivariable analysis of the 1995 GQ survey data, while controlling for different factors than the prior analysis, also found that women were more likely than men to choose a primary care career (Kiker and Zeh 1998, 152-167).

Using data from the MSQ and the GQ from 1997 through 2006, Jeffe et al. (Jeffe, Whelan, and Andriole 2010, 947-958;Jeffe, Whelan, and Andriole 2010, 947-958;Jeffe et al. 2007, 888-894) also found that female students were more likely to choose a primary care specialty (defined as family medicine, general and subspecialty internal medicine,

obstetrics/gynecology, general and subspecialty pediatrics, and medicine-pediatrics). And, in a cross-sectional and ecological study of 20 years of survey data, Phillips et al. (Phillips et al. 2009,) found that males were less likely to choose primary care.

In a slightly smaller survey of 668 fourth-year students from 32 medical schools, Bazargan et al. ()found that, after controlling for other demographic factors, economic factors, lifestyle and personal values, females were more likely to choose a primary care career (defined as internal medicine, family medicine, and general pediatrics). Other smaller and less generalizable studies have also supported this association (Stimmel and Serber 1999, 117-126;Lawson, Hoban, and Mazmanian 2004a, S36-9).

Only one large cross-sectional study using MSQ and GQ survey data from 1991 and 1992 and a smaller cross-sectional study with limited external validity found no association between gender and career choice (Colquitt et al. 1996b, 399-411;Newton, Grayson, and Whitley 1998, 200-203). While Hauer et al. (Hauer et al. 2008, 1154-1164) found that males were more likely to choose internal medicine as a career, this study did not differentiate between general internal medicine and subspecialty internal medicine.

While most of these studies support the association between female sex and primary care choice, Bland et al.'s (Bland, Meurer, and Maldonado 1995, 620-641) suggestion about unmeasured, confounding factors likely influences these findings.

Age: The data about age is generally mixed, although most good quality and generalizable studies found that older age is associated with primary care choice. However, this association is likely biased by confounding factors, such as family, length of training, and other perspectives.

In a good quality systematic review, Bland et al. (Bland, Meurer, and Maldonado 1995, 620-641) found that being older was associated with choosing a primary care career; however, the authors realized that confounding factors such as life situation not yet assessed may be responsible for this association. Other systematic reviews of both earlier literature and more

recent literature also concluded that older age was positively associated with primary care career choice (Meurer 1995, 388-397;Senf, Campos-Outcalt, and Kutob 2003a, 502-512).

Cross-sectional studies, however, have found mixed results. An analysis of the MSQ and GQ from the 1995 national graduating medical student class found that graduates who were 28 years or older at matriculation were more likely to choose a primary care career as compared to younger graduates (Kassebaum, Szenas, and Schuchert 1996, 198-209). In addition, a multinomial regression analysis of survey results from 668 fourth-year students from 32 medical schools found that younger medical students were more likely to choose a primary care specialty (defined as family medicine, general pediatrics, and internal medicine) as compared to other specialties (Bazargan et al. 2006, 1460-1465).

However, a comprehensive study of 20 years of survey data found only a slight positive association between older age and primary care choice (Phillips et al. 2009), and a multivariable analysis of survey data from 1991 and 1992 graduates determined there was no association between age and primary care specialty choice (Colquitt et al. 1996b, 399-411). Two smaller cross-sectional analyses with limited generalizability also found no association between age and career choice (Lawson, Hoban, and Mazmanian 2004a, S36-9;Newton, Grayson, and Whitley 1998, 200-203).

While older age may be associated with primary care choice, the strength of the studies refuting this association in addition to the potential for confounding in observational studies suggests that confounding factors likely explain this association.

Race and Ethnicity: Only two systematic reviews and one observational study found that there was either not enough evidence to determine an association or there was an association; all other studies found no association between race and ethnicity and primary care specialty choice.

Based on a thorough literature review of articles published from 1987 through 1993, Bland et al. were not able to draw conclusions about the association between race and ethnicity

and a primary care career choice, as the results in the literature were mixed(Bland, Meurer, and Maldonado 1995, 620-641).

However, another systematic review of literature from 1980 through 1993 concluded that race and ethnicity were not associated with a primary care career choice (Meurer 1995, 388-397). Yet another review of literature from 1993 through 2002 found that being Hispanic was associated with a primary care choice (Senf, Campos-Outcalt, and Kutob 2003b, 502-512).

Most cross-sectional studies found no association between race and ethnicity and career choice. Jeffe et al. analyzed survey data from the MSQ and GQ from 1997 through 2006 and found no association between race or ethnicity and career choice (Jeffe, Whelan, and Andriole 2010, 947-958). Bazargan et al.'s multinomial regression analysis of survey results of fourth-year medical students found that race was not significantly associated with specialty choice (Bazargan et al. 2006, 1460-1465). A smaller study representing two medical schools also found no association (Newton, Grayson, and Whitley 1998, 200-203).

Only one analysis of national survey results from the 1991 and 1992 graduating medical school classes found an association between race and ethnicity and choice of general internal medicine and choice of pediatrics (Colquitt et al. 1996a, 399-411).

In summary, while grouping primary care specialties into one group may obscure associations between race and ethnicity and individual primary care specialties (e.g. general internal medicine), current evidence does not support an association between race and ethnicity and specialty choice.

Marital Status: Most studies examining marital status and primary care choices concluded that those who were married were more likely to choose a primary care specialty. However, given the potential for confounding and strength of the studies finding no association, a conclusion is difficult.

After a thorough review of articles published from 1987 through 1993, Bland et al. (Bland, Meurer, and Maldonado 1995, 620-641) found that those students who were married

were more likely to choose a primary care career. However, the authors acknowledged that confounding factors not yet assessed in the literature may be responsible for the association. Meur et al.'s systematic review of literature from 1980 through 1993 also concluded that being married was associated with a primary care career choice (Meurer 1995, 388-397). However, a systematic review of the literature from 1993 through 2001 found that marital status was not a significant predictor of family medicine career choice (Senf, Campos-Outcalt, and Kutob 2003a, 502-512).

Multivariable analyses of survey data have found mixed results, likely because the dependent variables and independent variables differed. A multivariable analysis of the 1995 GQ survey data found that those students who were married were more likely to select a primary care specialty and less likely to select a surgical or support (e.g. anesthesiology) specialty (Kiker and Zeh 1998, 152-167). Another multivariable analysis of survey data of ECU and NYMC medical students from 1995 through 1997 found that being married was positively associated with primary care career choice (OR = 2.2). In addition, a study of over 20 years of survey data also found that married students were more likely to choose a primary care specialty (Phillips et al. 2009).

However, another multivariable analysis of GQ data from 1998 through 2002 for VCU medical students found no association between marital status and choosing a primary care career (Lawson, Hoban, and Mazmanian 2004a, S36-9). And, a thorough analysis of national survey data from the 1991 and 1992 graduating classes also determined there was no association (Colquitt et al. 1996b, 399-411).

These data are difficult to synthesize, given the potential for confounding factors and the different dependent variables used in each analysis. While marital status may be associated with a choice in primary care, confounding factors not measured likely explain the association.

Geographic Background: The literature generally found that students from a small town or rural background were more likely to choose a primary care specialty; however, as Bland et

al. (Bland, Meurer, and Maldonado 1995, 620-641) cautioned, confounding (e.g. future plans) likely limits this conclusion.

Based on a systematic review of the literature, Bland et al. (Bland, Meurer, and Maldonado 1995, 620-641) found that some studies with small sample sizes have demonstrated an association between a small town or rural background and primary care career choice, but were hesitant to draw a conclusion based on these studies. Meur et al. (Meurer 1995, 388-397), however, found there was an association between being from a small town or having a spouse from a small town and choosing a primary care career. In yet another systematic review, Senf et al. (Senf, Campos-Outcalt, and Kutob 2003a, 502-512) determined that a rural background was associated with choosing a career in family medicine.

All cross-sectional and longitudinal studies found an association between rural or small town background and primary care choice. An analysis of MSQ and GQ data from the 1995 graduating medical students found that students from a rural hometown were more likely to choose a primary care career as compared to students from an urban or otherwise non-rural background (OR 1.37). In addition, Phillips et al. found that being born in a rural county was a positive predictor of primary care choice, based on a cross-sectional and ecological study of survey data spanning 20 years (Phillips et al. 2009).

While the data does seem to support this association, Bland et al. (Bland, Meurer, and Maldonado 1995, 620-641) cautioned that more consistent association is between small town or rural background and eventual practice location. And, because practice in a small town requires a specialty with a broad knowledge base—such as a primary care specialty—future practice plans likely confound this association (Bland, Meurer, and Maldonado 1995, 620-641).

Parents: Only three characteristics about the parents of fourth-year medical students--socioeconomic status (SES), occupation and education--have been assessed in the literature. Again, confounding likely limits these results.

A good quality systematic review of literature from 1987 through 1993 found that having non-physician parents was associated with a medical student career choice of primary care (Bland, Meurer, and Maldonado 1995, 620-641). However, the authors cautioned that confounding factors such as life situation or personal values may have been responsible for this association. Another systematic review of literature from 1993 through 2001 found that students with parents who were of lower SES or had less education were more likely to choose a family medicine career (Senf, Campos-Outcalt, and Kutob 2003a, 502-512).

An analysis of national survey data from 1991 and 1992 determined only a slight association between parents' SES and choice of primary career (those from a lower SES background were slightly more likely to choose general internal medicine and family medicine), after controlling for expected income, debt, and other demographic factors (Colquitt et al. 1996a, 399-411). However, these authors did find that students with physician parents were less likely to choose a primary care specialty (Colquitt et al. 1996b, 399-411).

A good quality multivariable analysis of the MSQ and GQ data from students (n=13,336) graduating in 1995 found that students whose parents had an income of >$100,000 were less likely to choose a primary care career (OR 0.76), even after controlling for other influential factors (Kassebaum, Szenas, and Schuchert 1996, 198-209). These authors found that parents' education levels were not associated with career choice (Kassebaum, Szenas, and Schuchert 1996, 198-209).

A good quality cross-sectional study using survey data from the MSQ and GQ from 1997 through 2006 found that students with a physician parent were less likely to choose a career in primary care (defined as family medicine, internal medicine, pediatrics, and obstetrics/gynecology) (Jeffe, Whelan, and Andriole 2010, 947-958).

However, Bazargan et al.'s bivariate and multinomial regression analysis of survey results from 668 fourth-year students from 32 medical schools found no significant association between SES of parents and career choice, after controlling for race, gender and financial

considerations among other factors (Bazargan et al. 2006, 1460-1465). A smaller study of two medical schools found no association between parents education and career choice (Newton, Grayson, and Whitley 1998, 200-203).

Because parents' SES, education and occupation are all related (and most studies only accounted for one or two) and because factors like expected income and interest in serving the underserved may confound the relationship, it is difficult to determine an association between parent characteristics and career choice.

Personal Interests, Values and Personality

Career Plans at Matriculation: Interest in a primary care specialty at matriculation has been found to be one of the strongest predictors of eventual primary care choice.

In their systematic review, Bland et al. dismissed the findings that career plans at matriculation influenced eventual career choice, as most students change their specialty choice during medical school (Bland, Meurer, and Maldonado 1995, 620-641). However, Meur also conducted a systematic review of the literature from 1980 through 1993 and, while acknowledging that the majority of students changed their specialty choice during medical school, concluded that evidence still suggested that a preference for family medicine at matriculation was associated with choice of a family medicine career (Meurer 1995, 388-397).

Three studies based on MSQ and GQ data supported the Meur's conclusion. Colquitt et al. (Colquitt et al. 1996b, 399-411) determined through a comprehensive multivariable analysis based on national survey data from 1991 and 1992 that interest in a primary care specialty at matriculation was one of the strongest predictors of primary care choice.

Senf et al. (Senf et al. 1997, 524-533) analyzed the MSQ and the GQ from medical students graduating in 1994 and found that interest in a primary care specialty at matriculation was significantly associated with eventual primary care specialty choice.

Additionally, Kassebaum et al. (Kassebaum 1995, 1152-7)analyzed the MSQ and GQ surveys from over 13,000 medical students graduating in 1995 and found those students who

expressed an interest in a primary care career at matriculation were more likely to choose a primary care career (OR 2.44), even after controlling for other factors known to be influential in career choice.

Therefore, while career interests of medical students change throughout medical school, intention to practice primary care at matriculation likely predicts eventual primary care specialty choice.

Personal Values and Interests: The literature examining the effect of personal values on primary care specialty choice is difficult to interpret, as the dependent variables are different across studies and the potential for confounding by variables not assessed is great. However, certain themes emerge from the findings.

Bland and other's systematic review found that a lowered interest in prestige was associated with choice of a primary care career (Bland, Meurer, and Maldonado 1995, 620-641). In a systematic review of the literature from 1980 through 1993, Meur (Meurer 1995, 388-397) found that tolerance for ambiguity and believing that financial compensation, social status and scientific ability are less important were associated with a primary care career choice.

Burack et al. (Burack et al. 1997, 534-541) conducted a series of focus groups for 47 University of Washington graduating medical students to determine what factors influenced their specialty choices. Those students choosing primary care specialties (defined as family practice, internal medicine and pediatrics) identified personal values of holism, continuity, and prevention as factors influencing their decision. This study is limited by small size, bias from peer pressure, and lack of external validity.

Kassebaum et al. conducted a multivariable analysis of the MSQ and GQ data from 1995 and found that matriculating students who believed helping people was very important were more likely to choose primary care as a career (OR 1.37) (Kassebaum, Szenas, and Schuchert 1996, 198-209). Those students who valued research, intellectual challenges, and

leading opportunities at matriculation were less likely to choose primary care (Kassebaum, Szenas, and Schuchert 1996, 198-209).

In another analysis of the 1995 GQ survey data, Kiker and Zeh (Kiker and Zeh 1998, 152-167) found that those graduates who valued prestige were less likely to choose a primary care specialty choice and more likely to choose a surgical career.

A cross-sectional study of survey data from 1997 through 2006 found that medical students who rated social responsibility highly and had altruistic beliefs about the health care system were more likely to choose a primary care career as compared to those choosing a non-primary care career (Jeffe, Whelan, and Andriole 2010, 947-958).

A multinomial regression analysis of survey results of 668 fourth-year students from 32 medical schools found that, after controlling for a comprehensive set of factors, those students who rated social consciousness questions (e.g. personal social values, feeling an obligation to serve) highly were 2, 2.6 and 3.9 times more likely to select a primary care career over a medical subspecialty, surgical specialty, and support specialty, respectively (Bazargan et al. 2006, 1460-1465).

Newton et al. (Newton, Grayson, and Whitley 1998, 200-203) found that students who valued interactions with people as opposed to technical skills were more likely to choose a primary care career; those who valued prestige and income were less likely to choose a primary care specialty.

Therefore, it seems that medical students who value social responsibility, service, and interactions with people more so than prestige, financial compensation, research and intellectual challenges are more likely to choose a primary care specialty. However, given the heterogeneity of the literature and the potential for confounding, this conclusion is slightly limited, though it remains relatively strong.

Personality: The data examining the effect of personality on specialty choice is weak—both in quality and quantity--and is therefore difficult to draw conclusions from.

A systematic review of relevant literature published from 1987 to 1993 found that personality types, as determined by questionnaires like the Myers-Briggs Type Indicator, the California Psychological Inventory, and Budner's Intolerance of Ambiguity, were not associated with primary care career choice (Bland, Meurer, and Maldonado 1995, 620-641). The authors suggested that the personality measurements used were not evaluating the correct values or traits or were not sensitive enough to determine differences.

In contrast, Meur, who reviewed relevant literature from 1980 through 1993, concluded that the sensing-feeling personality type was associated with a choice of family medicine (Meurer 1995, 388-397).

Ciechanowski et al. conducted a cross sectional study of fourth year students in 2003 to determine the effect of relationship style on career choice (Ciechanowski et al. 2006, 3). Controlling for other factors that may have influenced career choice (such as patient-centeredness or career rewards), the authors found a significant association between one relationship style and a career choice in primary care (defined as family medicine, general internal medicine, pediatrics, and obstetrics/gynecology). Specifically, those students identifying a self-reliant relationship style were more likely to choose a primary care specialty (OR = 5.3; CI 1.8, 15.6). This relationship was fully mediated by a group of patient-centered factors (e.g. interaction with patients, diversity of patient population, etc) influencing the career decision (Ciechanowski et al. 2006, 3). The study results are limited by a wide confidence interval and very poor external validity, as the study was done at one medical school with 106 students.

Therefore, because the effect of personality is difficult to isolate from personal interests and because of the measurement limitations, no conclusions can be drawn about personality and primary care specialty choice.

Future Practice Intentions

Primary Care Characteristics: Several studies have gathered data on factors specific to primary care, such as diversity of patients that influence a student's choice of a primary care career.

Bland and other's systematic review found that an interest in diverse patient populations and health problems and less interest in medical technology and surgery were associated with choice of a primary care career (Bland, Meurer, and Maldonado 1995, 620-641)

A cross-sectional study designed by Ellsbury et al. requested that students from the University of Washington and the University of North Carolina indicate the five most important factors that influenced their career choices (Ellsbury et al. 1996, S16-8). Among the five most common factors listed were variety in specialty (34% of students), primary care orientation (32% of students), and intellectual content and research opportunities (32% of students). The authors found students choosing non-primary care specialties were more likely to indicate intellectual content and research opportunities and opportunities to do procedures as important factors as compared to those choosing primary care specialties (these factors were negatively associated with a primary care choice). Those choosing primary care specialties were more likely to indicate primary care orientation and job opportunities as important factors (Ellsbury et al. 1996, S16-8). The results of this study are limited by the potential for recall bias, bias by introspective causal reporting and poor generalizability.

Burack et al. (Burack et al. 1997, 534-541) conducted focus groups for 47 medical students to identify factors that influenced their career decisions. The students who chose a primary care specialty (defined as family medicine, internal medicine and pediatrics) identified the diversity of patients and day-to-day activities as influencing their career choices, while students choosing a non-primary care specialty identified the ability to do procedures, the day-to-day activities, the practice setting and the intellectual challenge as influencing their career choices. This study is significantly limited by the small size, the potential bias introduced by

peer discussion and by poor external validity (focus groups conducted at one medical school); therefore, it is difficult to draw conclusions from this study.

Fincher and Lewis designed a longitudinal study to assess the factors influencing medical students who "switched" from non-primary care intentions at matriculation to primary care choice and medical students who retained their primary care intentions throughout medical school (Fincher and Lewis 1999, S121-3). Through administering a survey to matriculating and graduating students at the Medical College of Georgia, they found that the opportunity to provide comprehensive care was one of the strongest factors influencing those who "switched." This factor, along with the opportunity for patient relationships were strong factors influencing the decision for those students who did not switch. However, this study is limited by poor external validity and potential bias by confounding.

Haur et al. reported from a cross-sectional study examining the factors associated with a career choice of internal medicine that students who enjoyed caring for internal medicine patients were more likely to choose internal medicine as a career (Hauer et al. 2008, 1154-1164). While limited by confounding and the lack of differentiation between a generalist and subspecialist career, this study was overall of good quality.

Therefore, those students valuing the diversity and type of patients, the ability to provide comprehensive care, and the general primary care orientation are more likely to choose a primary care career. While this seems self-evident, the studies suggest distinct differences in interest between those choosing primary care and those choosing other careers. While enjoying the practice characteristics of a career is likely a factor in decision making, the extent of the influence is unclear from these studies.

Practice Location and Plans: Practice location and type of practice are also factors in specialty choice.

In a cross-sectional study of 668 fourth-year students from 32 medical schools, Bazargan et al. found that students who rated practice-oriented considerations, such as desired

practice location, practice type (e.g. private), and practice setting, highly were 1.5 and 1.3 times more likely to choose a primary care specialty over a support specialty or a surgical specialty, respectively (Bazargan et al. 2006, 1460-1465). While these results are limited by fair internal validity and by the use of broad categories of specialties and factors, this study likely still produced valid results.

Other studies examined the association between future practice plans and primary care choice. A multivariable analysis of the 1995 GQ survey data found that students who plan to practice in a rural area are more likely to choose primary care (Kiker and Zeh 1998, 152-167). In a large analysis of data from the MSQ and GQ, Jeffe et al. found that students who intended to work in academics full-time were less likely to choose a primary care specialty (Jeffe, Whelan, and Andriole 2010, 947-958). An analysis of VCU students from 1998 to 2002 found that plans to practice in an underserved area were positively associated with a primary care career choice (Lawson, Hoban, and Mazmanian 2004b, S36-9).

These findings are diverse. It is likely that future plans, like location, certainly influence the specialty choice of medical students.

Financial Considerations

General: Some studies analyzed financial considerations in general. While it is difficult to draw conclusions from these studies because of broad categorization and limited external validity, they provide some insight into financial factors in general.

Bazargan et al. analyzed the results of a survey taken by 668 medical students from 32 different medical schools. After controlling for sex, race, SES of parents, geographic location of medical school, and five other categories of factors (see Appendix), students who rated financial considerations as important were 2.5 times more likely to choose a support specialty (e.g. anesthesiology, emergency medicine) over primary care (Bazargan et al. 2006, 1460-1465). In this analysis, financial considerations included receipt of financial aid, debt, and potential

income of the specialty. While limited by internal validity and by the use of broad categories of specialties and factors, this study likely still produced valid results.

Dezee et al. conducted a survey for all 2009 graduating US medical students with a Department of Defense service obligation to examine the effect of financial incentives on career choice (DeZee et al. 2011, 187-193). Of those students who did not choose a primary care career (defined as internal medicine, pediatrics, and family medicine), only 30% indicated that they would have applied to a primary care specialty if there was a "bonus." Students suggested that the amount of the bonus be anywhere from $6,000 to $100,000 with a median of $27,500 (DeZee et al. 2011, 187-193).

The authors also asked the respondents why they did not choose primary care; and financial considerations was the fourth most frequent response behind preference for another specialty, not interested, practice aspects and patient characteristics. When the respondents were asked what would have made them consider primary care, the most common response was "nothing," followed by financial considerations and lifestyle (DeZee et al. 2011, 187-193). The results of this study are limited by the poor generalizability and potential for confounding, but suggest that financial compensation is somewhat influential in career decision-making.

Debt: The literature about debt and specialty choice is complex and challenging to interpret not only because of the conflicting results, but also because of the many confounding factors that are related to debt and specialty choice. In addition, as training-related debt has increased substantially since 1995, it may be difficult to compare studies across a broad time range (1995-2011).

Based on a good quality systematic review of literature published from 1987 to 1993, Bland et al. found that debt had limited—if any--influence on primary care specialty choice. While several studies included in the review found some association, this association diminished when the ownership of the school (public versus private) was included in the analysis (Bland, Meurer, and Maldonado 1995, 620-641). In another systematic review, Senf et

al. (Senf, Campos-Outcalt, and Kutob 2003a, 502-512) found that debt was not associated with the specialty choice of family medicine.

Results from cross-sectional and longitudinal studies, however, are more diverse. Colquitt et al. (Colquitt et al. 1996b, 399-411) designed a cross-sectional study to examine the effect of debt and other financial considerations on medical students' career choices in 1991 and 1992. They found that educational debt does influence the specialty choice of medical students, even after controlling for type of loans, receipt of financial aid, cost of medical education, expected income and other demographic factors. However, the relationship varied based on gender, expected income level, and geographic location of planned practice.

The authors also found that, as the ratio of debt to expected income increased, the likelihood of choosing general internal medicine, family medicine, and pediatrics over a non-primary care specialty decreased (Colquitt et al. 1996b, 399-411). The authors attempted to decrease bias by confounding by controlling for other financial factors and used national data for medical students graduating in 1991 and 1992; therefore, the study quality is good.

Kassebaum et al. analyzed the MSQ and GQ data for the 1995 national graduating class of medical students and found that educational debt was not associated with choosing a primary care or non-primary care career, after adjusting for other financial, demographic, and influential factors (Kassebaum, Szenas, and Schuchert 1996, 198-209). However, Kiker and Zeh (1998) also analyzed the 1995 GQ data and, after adjusting for other economic, demographic and personal factors, found that students with concerns about educational debt were less likely to choose a primary care specialty (defined as general family medicine, general internal medicine and general pediatrics). Kassebaum et al. (1996) did not include loans or expected income in the analysis, which might account for the difference in findings.

In a cross-sectional study using national data from the MSQ and GQ from 1997 through 2006, Jeffe et al. concluded that graduating medical students with high levels of debt were less likely to choose general or subspecialty internal medicine and general or subspecialty pediatrics

as a career (Jeffe, Whelan, and Andriole 2010, 947-958). Those with high levels of debt were more likely to choose obstetrics/gynecology as a career, and the authors found no significant association between the choice of family medicine and debt. However, the authors cautioned that these associations among debt and career choices were not strong (Jeffe, Whelan, and Andriole 2010, 947-958).

Rosenblatt and Andrilla (Rosenblatt and Andrilla 2005, 815-819) used the GQ survey data from 2002 to analyze the effect of debt on career choices and found that, while students with higher debt levels were more likely to report that debt influenced their career choice, debt level was "only modestly related to career choice after controlling for students' other characteristics" (817).

Based on an extensive analysis of survey data from the past 20 years, Phillips et al. (Phillips et al. 2009) found that those students with no debt or a debt level greater than $250,000 were less likely to choose a primary care specialty. Those with debt between none and greater than $250,000 were more likely to choose a primary care career. Phillips et al. suggested that this relationship can be explained by the type of students who attend medical school—those who are debt averse may not choose to attend medical school.

Several smaller analyses of survey data also found conflicting results. One cross-sectional study from 1992 and 1993 with limited external validity found a negative association between debt level and primary care career choice, after controlling for income expectations, specialty choice at matriculation and gender (Rosenthal, Marquette, and Diamond 1996, 675-677). Two good quality analyses with limited external validity found no association between debt level and career choice of primary care (Lawson, Hoban, and Mazmanian 2004a, S36-9;Newton, Grayson, and Thompson 2005, 809-814). Another good quality analysis of survey data from three medical schools also found no significant association between primary care career choice and debt (Kahn et al. 2006, 18).

In summary, debt likely has some complex influence on primary care choices; however, the extent of the effect is debatable and should be considered with other financial considerations (e.g. expected income) and personal values and factors (e.g. personal life such as family).

Expected Income: Both systematic reviews and observational studies found an association between lower income expectations and primary care career choice.

A good quality systematic review of literature published between 1987 and 1993 found that lower income expectations were associated with a primary care career choice (Bland, Meurer, and Maldonado 1995, 620-641). This finding was supported by two other systematic reviews of literature from 1980 through 1993 (Meurer 1995, 388-397) and from 1993 through 2002 (Senf, Campos-Outcalt, and Kutob 2003a, 502-512).

In a cross-sectional study of 1991 and 1992 medical school graduates nationally, Colquitt et al. found that expected income was significantly associated with primary care career choice, even after controlling for debt, SES of parents, and other financial and demographic factors (Colquitt et al. 1996b, 399-411). That is, graduating medical students with higher income expectations were less likely to choose general internal medicine, family medicine, and pediatrics than a non-primary care career (OR = 0.82, 0.79, and 0.71 respectively) (Colquitt et al. 1996b, 399-411). A smaller study from 1992 and 1992 also found that those with higher income expectations were more likely to choose a non-primary care career (Rosenthal, Marquette, and Diamond 1996, 675-677).

In an analysis of survey data from the 1995 GQ, Kiker and Zeh (Kiker and Zeh 1998, 152-167) found that students who indicated expected income was important and influential in their career choice were over three times as likely to select a surgical or support specialty over a primary care specialty as compared to those who did not indicate that expected income was important. While confounding bias is possible, the authors' thorough multivariable analysis makes this less likely.

In an empirical modeling study analyzing data from 1988 through 1998, Thorton and Eposto (Thornton and Esposto 2003, 67-73) determined that medical students increasingly choose specialties with higher earnings. While the authors controlled for length of training and lifestyle, they did not control for any other economic factors (such as debt level) that might confound the relationship. This study therefore does not provide convincing evidence of the importance of expected income in career decision making.

Based on a comprehensive analysis of survey data over the last 20 years, Phillips et al. (Phillips et al. 2009) found that expected income was a significant negative predictor of primary care choice and concluded that the physician income disparities are very influential in career decision-making.

These studies provide convincing and consistent evidence that lower income expectations are likely associated with a choice of primary care. However, the strength of this effect should be considered with other financial and personal factors.

Loans and Scholarships: The quantity of data on the associations of loans and scholarships is much less and therefore it is more difficult to draw conclusions.

A cross-sectional study of 1991 and 1992 medical school graduates found that both the type of loan and the receipt of financial aid had little influence on the specialty choice of medical students, after controlling for debt, expected income and other financial and demographic factors (Colquitt et al. 1996a, 399-411). However, in a multivariable analysis of the 1995 GQ survey data, Kiker and Zeh (Kiker and Zeh 1998, 152-167) found that students receiving scholarships or a subsidized loan are less likely to choose a surgical subspecialty and more likely to choose a primary care specialty (general family medicine, general internal medicine, and general pediatrics). And, based on extensive survey data, Phillips et al. (Phillips et al. 2009) found that receipt of a National Health Service Corps scholarship was significantly associated with a primary care career choice.

The data, therefore, does not provide convincing evidence that loans and scholarships directly affect primary care career choice; although certainly the receipt of loans and scholarships may reduce debt and may have some indirect effect.

Lifestyle

Studies of various types have assessed the association between lifestyle and specialty choice. Several ecological and modeling studies have been done to study a possible increased attention to lifestyle based on specialty choice. In an economic modeling study using data from 1988 through 1999, Thorton and Esposto (Thornton and Esposto 2003, 67-73) found that medical students increasingly chose specialties with predictable and certain work schedules, longer vacation time, and shorter length of residencies. Confounding may limit this analysis, and no causal implications can be drawn from these results.

Dosey et al. designed an ecological study comparing the specialty preferences of medical student graduates from 1996 through 2002 and lifestyles of specialties to determine influence of the lifestyle on medical student career choice (Dorsey, Jarjoura, and Rutecki 2003, 1173-1178). The authors classified specialties as controllable lifestyle specialties and uncontrollable lifestyle specialties, according to a system designed in 1990 based on validated characteristics (personal time free for leisure and family, and control of weekly work hours). Internal medicine, family medicine, and pediatrics were all classified as uncontrollable lifestyle specialties (Dorsey, Jarjoura, and Rutecki 2003, 1173-1178).

From 1996 until 2002, the percentage of medical students choosing controllable lifestyle specialties increased. In addition, more students chose careers with higher incomes, higher than average work hours, and with a minimum of four years of training. After controlling for income, hours worked, and years of training, controllable lifestyle as a factor explained 55% of the variability in specialty choice from 1996 until 2002 (Dorsey, Jarjoura, and Rutecki 2003, 1173-1178).

In a similar ecological study, Dorsey et al. examined specialty preferences from 1996 through 2003 to determine the influence of lifestyle, while controlling for gender (Dorsey, Jarjoura, and Rutecki 2005, 791-796). The authors found that a higher percentage of both men and women chose controllable lifestyle specialties (as defined in the previous article) from 1996 through 2003. After controlling for income, hours worked, and length of training, 41% and 45% of the change in specialty preferences for women and men, respectively, from 1996 through 2003 was explained by controllable lifestyle specialty choices (Dorsey, Jarjoura, and Rutecki 2005, 791-796).

While national data was used for both of these studies, the potential for bias by confounding and by measurement bias (the classification of controllable and uncontrollable lifestyle factors may have changed since 1990) may limit the results of these studies. In addition, causality cannot be inferred from this study design.

Newton et al. (Newton, Grayson, and Thompson 2005, 809-814) conducted a survey assessing the importance of several factors in career decision-making from 1998 through 2004 to identify the influence of lifestyle and income on specialty decisions. They found that, from 1998 to 2004, both lifestyle and income became significantly more important, although the absolute importance remained relatively low.

In addition, based on the specialty choice and the relative importance rating of lifestyle, the authors concluded that family medicine, general internal medicine and general pediatrics were in the "lifestyle intermediate" (Newton, Grayson, and Thompson 2005, 813) group. That is, students pursuing careers in one of these specialties were likely to rank lifestyle as less important than students pursuing careers in radiology, physical medicine and rehabilitation and emergency medicine and more important than students pursuing careers in general surgery or obstetrics/gynecology. Finally, the authors found that students choosing family medicine and general pediatrics valued lifestyle more than income. This study was limited by the small

sample size and by fair generalizability (data collected from two schools). In addition, there is the potential for confounding bias.

In another cross-sectional study surveying 668 fourth-year medical students from 32 medical schools, Bazargan et al.(Bazargan et al. 2006, 1460-1465) found that students who rated children or family responsibility, marriage or spouse, and hours and lifestyle of specialty as highly influential in their decision were slightly more likely to choose primary care over surgery (1.2 to 1) and over support services (1.3 to 1).

Hauer et al. (Hauer et al. 2008, 1154-1164) concluded from a cross-sectional study examining the factors associated with choosing a career in internal medicine that students reporting a good impression of the lifestyle of internists were more likely to choose internal medicine (OR = 2.0; 95% CI 1.39-2.87). This suggests that lifestyle influenced career decisions.

A cross-sectional qualitative study requested that graduating medical students (class of 1995) from the University of Washington and the University of North Carolina indicate the five most important factors influencing their career decisions (Ellsbury et al. 1996, S16-8). Comfortable lifestyle was among the top five most common factors with 31% of students indicating this as an important factor; however comfortable lifestyle was negatively associated with a primary care career choice (Ellsbury et al. 1996, S16-8). This study is significantly limited by the potential for recall bias and the limited external validity.

In a longitudinal study examining the factors influencing career decisions of students who “switched” from a non-primary care specialty intention at matriculation to a primary care specialty (internal medicine, family medicine, and pediatrics) choice at graduation and who did not “switch” from a primary care specialty intention at matriculation, Fincher and Lewis found that “time for family and personal activities” was an influential factor for both groups (Fincher and Lewis 1999, S121-3). In fact, this was one of the most important factors associated with those who “switched to a primary care specialty” (Fincher and Lewis 1999, S121-3). This study

is limited by poor generalizability (students at one medical school were included in the study) and by the potential bias associated with confounding, as it is unclear which other factors were included in the regression analyses.

A qualitative study of focus groups found that students choosing non-primary care specialties identified lifestyle and controllable hours as important factors in their decision-making whereas students choosing primary care specialties did not (Burack et al. 1997, 534-541). However, this study is significantly limited by internal validity and external validity, and, therefore, it is difficult to draw conclusions from the results.

In summary, while the modeling and ecological studies suggest that lifestyle has become more influential in medical students' specialty choices, there are limitations to these studies—especially in the classification of specialties by lifestyle. The cross-sectional studies are relatively small, have limited external validity and the potential for bias by confounding. While interesting, the longitudinal study also has limited generalizability.

Therefore it is difficult to conclude the effect of lifestyle on career choice. While study designs certainly contribute to difficulty, it is likely due to the relatively vague definition of lifestyle and the difficulty in grouping specialties according to lifestyles. While some specialties may easily be categorized as having a good lifestyle (radiology, PM&R), the diversity of how one specialty may be practiced (e.g. part-time, shift work) likely complicates these analyses.

Medical School Characteristics

Public versus Private: Evidence from both cross-sectional and ecological trends suggest that students attending a public medical school are more likely to choose a primary care specialty. However, the potential for bias in these studies may skew these results.

In their systematic review of literature published from 1987 through 1993, Bland et al. (Bland, Meurer, and Maldonado 1995, 620-641) concluded that one of the strongest associations between producing primary care physicians and medical school characteristics is the ownership of the medical school—that is, if the medical school if public or private. Public

medical schools graduated a greater percentage of primary care physicians as compared to private schools (Bland, Meurer, and Maldonado 1995, 620-641). Another systematic review of literature from 1980 through 1990 also found that students attending a public school were more likely to choose a primary care career (Meurer 1995, 388-397). Additionally, a systematic review of literature from 1993 through 2003 found that attending a public school was associated with a family medicine specialty choice (Senf, Campos-Outcalt, and Kutob 2003a, 502-512).

Data from surveys also generally supports conclusions from systematic reviews. In an analysis of national data from 1993 medical school graduates, Mengel and Davis (Mengel and Davis 1995, 652-657) found that students attending a public school were more likely to choose a family medicine career, as compared with students attending a private school and after controlling for other medical school characteristics and curriculum factors. This study is limited by the potential for confounding bias, as students may select a public school because they are interested in primary care.

While an analysis of the MSQ and GQ data from 1995 graduating students found that school ownership was not associated with career choice (Kassebaum, Szenas, and Schuchert 1996, 198-209), another multivariable analysis of the 1995 GQ survey data (Kiker and Zeh 1998, 152-167) found that students attending a public medical school were more likely to choose a primary care career.

Furthermore, in an analysis of survey data from the MSQ and GQ from 1997 through 2006, Jeffe et al. found that students attending private medical schools were less likely to choose family medicine or obstetrics and gynecology as compared to those attending public medical schools (Jeffe, Whelan, and Andriole 2010, 947-958). And, based on 20 years of survey data, Phillips et al (Phillips et al. 2009) conclude that attending a public school was positively associated with a primary care specialty choice.

The evidence is consistent that students attending public schools are more likely to choose a primary care specialty (with only one exception). However, it is difficult to control for

bias in these studies, as students interested in primary care might select a public medical school and other factors may account for this association. For example, this association is likely due to the differences in the mission, cultures, faculty, and funding of public schools versus private schools (Bland, Meurer, and Maldonado 1995, 620-641). The mission of public schools likely attract a certain type of faculty, encourage the presence of a family medicine department, and may affect research dollars (e.g. National Institutes of Health)—all of which contribute to the culture of a medical school and perhaps the career decisions of students (Bland, Meurer, and Maldonado 1995, 620-641).

Faculty Composition: The evidence of the influence of faculty composition on specialty choice is scant. Only one systematic review addressed this association. Based on the relevant literature published from 1987 to 1993, Bland et al. concluded that faculty composition influences school culture and therefore student career decisions. Specifically, representation of primary care faculty in the curriculum and everyday operations of the school was associated with more students choosing primary care as a career (Bland, Meurer, and Maldonado 1995, 620-641). Having a high family medicine faculty to student ratio was not associated with primary care career choices of medical students (Bland, Meurer, and Maldonado 1995, 620-641). While the systematic review was good quality, additional (and more recent) evidence is needed to make conclusions about faculty composition.

Biomedical Funding: The evidence of the effect of biomedical funding on medical student specialty choice is also limited. Campos-Outcalt et al. conducted a good quality systematic review of literature from 1987 through 1993 examining the effect of biomedical funding on medical student career choices (Campos-Outcalt et al. 1995, 611-619). Although the review was limited by the quality of the studies included, the authors concluded that, while schools receiving more federal funding for research graduated a lower proportion of students choosing primary care, this association disappeared in a multivariate analysis. Therefore, the amount of

federal biomedical funding is unlikely to be associated with generalist career choices (Campos-Outcalt et al. 1995, 611-619).

Department of Family Medicine: Although plagued by the potential for confounding bias and the heterogeneity of a department of family medicine (in terms of strength), studies generally suggest—even if slightly—that the presence of a family medicine department is associated with an increased percentage of graduates choosing primary care.

A thorough systematic review of the literature from 1980 through 1993 concluded that the presence of a strong family medicine department was positively associated with a primary care choice (Meurer 1995, 388-397). This review was only limited by the quality of studies included.

However, in a longitudinal study assessing the effect of the addition of a family medicine department on medical student career choice of family medicine, Campos-Outcalt and Senf found no significant difference in the proportion of students selecting family medicine as a career within three years following the addition of a department (Campos-Outcalt and Senf 1999, 1016-1020). Bias by confounding and limited external validity limit the conclusions of this study. In addition, the effect of the addition of a department may not be seen within three years.

In a national study of 1993 medical student graduates, Mengel and Davis (Mengel and Davis 1995, 652-657) found that, after controlling for other medical school characteristics (including curriculum), the presence of a family medicine department, division or section at a school was associated with a greater percentage of students choosing family medicine as a career.

Kassebaum et al. conducted a multivariable analysis of the MSQ and GQ survey data for the national 1995 graduating class and found that students attending a school with a department of family medicine were more likely to choose a primary care specialty as compared to those students attending a medical school without a department of family medicine (OR

1.48), even after controlling for faculty composition, curriculum, and school ownership (Kassebaum, Szenas, and Schuchert 1996, 198-209).

Therefore, the evidence does seem to suggest that the presence of a family medicine department is associated with an increased percentage of students choosing a primary care specialty. However, it may be that a department of family medicine influences or is influenced by the culture of a medical school or that students interested in primary care at matriculation choose schools with departments of family medicine. Or, perhaps having a family medicine department allows for more primary care professors to teach medical students. More details about this association should be studied.

Medical Education

First and Second Year Experiences and Courses: Systematic reviews, retrospective cohort studies and cross-sectional studies have all examined the relationship between first and second year experiences and primary care career choice.

In a systematic review of literature published from 1987 through 1993, the authors found only four studies examining the effect of primary care experiences in the first two years of medical school. All four of these studies found no association between these experiences and career choice of primary care (Bland, Meurer, and Maldonado 1995, 620-641). Meur's review of the literature from 1980 through 1993 also found that first and second year curriculum experiences had no effect on primary care career choice (Meurer 1995, 388-397). After reviewing literature from the same time period, Campos-Outcalt et al. (Campos-Outcalt et al. 1995, 611-619) also concluded that first and second year exposures to primary care faculty—specifically family medicine faculty—did not influence medical students' career decisions.

Two retrospective cohort studies came to different conclusions. Grayson, Klein and Frank designed a retrospective cohort study to determine if a first year longitudinal primary care experience influenced career choice (Grayson, Klein, and Franke 2001, 860-863). Students matriculating at New York Medical College from 1988 through 1993 were studied as three

groups: those who applied for and took the longitudinal primary care elective, those who applied for and were not selected for the elective, and those who did not apply for the elective. After controlling for gender, students who took this elective had 40% higher odds of choosing a primary care career (internal medicine, family medicine, and pediatrics) compared to those students who had not been selected for the elective (Grayson, Klein, and Franke 2001, 860-863). This study is limited by significant potential for confounding and poor external validity.

Stimmel and Serber (Stimmel and Serber 1999, 117-126) designed a retrospective cohort study to examine the effect of different preclinical curriculums on specialty choice. Graduates from Mount Sinai School of Medicine from 1970 through 1990 were included, and divided into three groups based on the different preclinical curriculums: preclinical training at Mount Sinai, preclinical training with a primary care emphasis and training at a foreign medical school. They found no significant difference in primary care career choice among the three groups (Stimmel and Serber 1999, 117-126). This study is limited by poor external validity and a great potential for confounding.

Two multivariable analyses also came to different conclusions. An analysis of national medical student data from 1993 found that a required first-year generalist course increased the number of graduates choosing family medicine as a career by 3.5%, after adjusting for medical school characteristics and curriculum (Mengel and Davis 1995, 652-657). However, this study is limited by the potential for confounding and by the likely heterogeneity of these first year courses. A multivariable analysis of the MSQ and GQ survey data from the 1995 graduating class of medical students found no association between first and second year clinical experiences and primary care choice (Kassebaum, Szenas, and Schuchert 1996, 198-209).

The quality of the retrospective cohort studies is threatened by confounding bias and poor external validity, and the multivariable analyses only indicate a slight (if any) effect of the first and second year curriculum on primary care choices. In contrast, the systematic reviews

present good evidence of no association. Therefore, the effect of first and second year curriculum experiences does not likely effect career choice.

Third and Fourth Year Experiences: There is some evidence that third and fourth year clinical experiences influence primary care career choice, but the heterogeneity of these experiences and confounding bias likely limits this evidence.

In a multivariable regression analysis of the MSQ and GQ survey data for 1995 graduates, Kassebaum et al. found that three medical school experiences were significantly associated with choosing a primary care career: outpatient third year rotation/experience with a primary care preceptor (OR=1.28), interdisciplinary primary care experience with two or more primary care specialties (OR=1.18), and a pediatrics clerkship with at least 25% outpatient experience (OR=1.17) (Kassebaum, Szenas, and Schuchert 1996, 198-209). In addition, students who took a family medicine elective, a pediatric elective, a third year ambulatory care rotation, and a rural rotation were more likely to choose a primary care career, even after adjusting for primary care interest at matriculation (although confounding bias likely contributes to this result) (Kassebaum, Szenas, and Schuchert 1996, 198-209).

A cross-sectional survey of a representative sample of medical school students graduating in 1990 evaluated the effect of an ambulatory internal medicine rotation on career choice (Schwartz et al. 1995, 542-549). Thirty percent of those who had done an ambulatory internal medicine rotation chose an internal medicine career compared with 19% of those who had not done an ambulatory internal medicine rotation (OR = 1.8 with CI 1.3 to 2.4). This association was significant for those choosing a career in general internal medicine or in subspecialty internal medicine and remained significant when controlling for debt, information about internal medicine, and honors in clerkships. However, the potential for bias by confounding (e.g. interest in internal medicine) limits these results significantly.

A cross-sectional study done by Haur et al. examined the factors associated with choosing internal medicine as a career. Favorable educational experiences in internal medicine

were associated with choosing a career in internal medicine (OR 4.57; 95% CI 3.01-6.93) (Hauer et al. 2008, 1154-1164). However, confounding bias and the heterogeneity of the internal medicine experiences limit the results of this study.

In a cross-sectional study, Ellsbury et al. asked 320 fourth-year medical students from the University of Washington and the University of North Carolina to list up to five factors that most significantly influenced their specialty decisions (Ellsbury et al. 1996, S16-8). The highest percentage of students (43%) indicated that clinical experiences and role models were important factors in their decision-making. Those students choosing primary care specialties (general internal medicine, family medicine, and general pediatrics) were more likely to identify clinical experiences and role models as important factors in their decision-making, as compared to those not choosing primary care specialties (Ellsbury et al. 1996, S16-8). This study is limited by recall bias, bias from introspective causal reporting and by poor generalizability.

Gazewood, Owen and Rollins conducted a retrospective cohort study to determine the effect of a primary care clerkship on University of Virginia medical students' career choices (Gazewood, Owen, and Rollins 2002, 673-677). They examined the specialty choices of those medical students graduating within the four years prior to the implementation of the primary care clerkship and the specialty choices of the first four classes of medical students to complete the clerkship. The percentage of students choosing a generalist career did not differ in the four years following the initiation of the clerkship as compared to the four years prior to the initiation (Gazewood, Owen, and Rollins 2002, 673-677). The quality of this study is limited by the potential for confounding bias (no multivariate analysis was done) and the poor external validity.

Undoubtedly, clinical experiences influence career choice of medical students. The multivariable regression analysis—likely the strongest study—found that certain clinical experiences influence primary care choices. The heterogeneity of these experiences in this analysis likely weakens the results. Therefore, general outpatient, primary care experiences

during the clinical years likely influences career choice, but the strength of the effect is unknown.

Required Family Medicine Clerkships: The evidence that attending a school with a required family medicine clerkship is associated with a greater proportion of primary care graduates is consistent; however, the association may be a proxy for an institution that values primary care, which may be the more important factor (Campos-Outcalt et al. 1995, 611-619).

Three systematic reviews all concluded that a required family medicine clerkship was positively associated with primary care career choices. In a systematic review if the relevant literature from 1987 through 1993, Bland et al. found that attending a school with a required family medicine clerkship was positively associated with choice of a primary care career (Bland, Meurer, and Maldonado 1995, 620-641). Meur (Meurer 1995, 388-397) reviewed literature from 1980 through 1993 and also found this positive association. After reviewing literature from 1987 through 1993, Campos-Outcalt et al. also found that schools with a required family medicine clerkship graduated a greater proportion of primary care physicians (Campos-Outcalt et al. 1995, 611-619). A more recent review of literature from 1993 through 2002 found that a required family medicine clerkship was associated with the choice of a family medicine career (Senf, Campos-Outcalt, and Kutob 2003a, 502-512).

Campos Outcalt and Senf designed a longitudinal study examining the effect of adding a required family medicine clerkship to the curriculum of U.S. medical schools from 1980 through 1996 (Campos-Outcalt and Senf 1999, 1016-1020). The authors found that the addition of a required family medicine clerkship significantly increased the proportion of graduates who chose family medicine as a career within the three years following the addition (Campos-Outcalt and Senf 1999, 1016-1020). However, the potential for confounding limits the quality of the study (e.g. other changes that might have occurred with the addition of the clerkship).

Mengel and Davis (Mengel and Davis 1995, 652-657) analyzed national data for medical students graduating in 1993 and found a significant, positive association of a required family

medicine clerkship and family medicine career choice, even after controlling for other medical school characteristics and curriculum. While limited by confounding and measurement bias, this study did have good external validity.

Senf et al (Senf et al. 1997, 524-533), in an analysis of GQ and MSQ data for medical students graduating in 1994, found that the number of required weeks of a family medicine clerkship was positively associated with a career choice of family medicine. While limited by the potential of confounding and the outcome measure (percentage of graduates estimated to be in primary care in 2002 based on previous trends), this study has good external validity.

Therefore, given the strength and consistently of the evidence, there is likely a positive association between a required family medicine clerkship and primary care specialty choice. This may be an important factor or may be a proxy for other more important factors associated with specialty choice (Campos-Outcalt et al. 1995, 611-619). Studies have not yet illuminated how a required clerkship influences student choice.

Longitudinal Primary Care Experiences and Separate Primary Care Tracks: The evidence for the effect of these experiences is significantly limited by selection bias. In addition, most of the evidence is not recent.

In a systematic review encompassing literature form 1987 through 1993, the authors discovered that two of three studies examining the effect of longitudinal primary care experiences found a positive association between the experience and the proportion of primary care doctors (Bland, Meurer, and Maldonado 1995, 620-641). In addition, the studies examining the effect of separate primary care tracks on career choices of medical students generally concluded a positive association. However, confounding bias and selection bias (as many of these experiences selected for students interested in primary care) prohibited Bland et al. from concluding a definite positive association (Bland, Meurer, and Maldonado 1995, 620-641).

Campos-Outcalt et al. concluded from a systematic review of literature from this same time period that the effects of special programs designed to promote primary care could not be ascertained from the literature, as studies were unable to control for initial interest in primary care (selection bias) (Campos-Outcalt et al. 1995, 611-619). In addition, they found that longitudinal experiences in primary care were not associated with primary care career choice (Campos-Outcalt et al. 1995, 611-619).

However, another systematic review from 1980 through 1993 concluded that continuity experiences in PC and longitudinal primary care and family medicine tracks were all associated with primary care career choice (Meurer 1995, 388-397).

It is difficult to conclude how longitudinal care experiences and separate primary care tracks affect the specialty choice of medical students not only because of the potential for confounding and selection bias, but also because the likely heterogeneity of these experiences.

Role Models: The evidence for the effect of role models and mentors on primary care career choice is limited. Only a systematic review and focus group data are available.

In a good quality systematic review of the literature from 1987 through 1993, Campos-Outcalt et al. concluded that the literature did not support role models as an influential factor in career choice (Campos-Outcalt et al. 1995, 611-619). The literature did not provide a clear picture of how role models influence career choice and how students choose role models (Campos-Outcalt et al. 1995, 611-619).

In a series of focus groups conducted for 47 University of Washington graduating medical students, those students who chose a primary care career (family medicine, internal medicine, and pediatrics) identified role models and mentors as influential in their decision-making process, whereas students choosing non-primary care specialties did not (Burack et al. 1997, 534-541). It is difficult to draw conclusions from these results however, based on limited external validity and the potential for bias introduced by peer pressure during the conversations.

In addition, a cross-sectional study surveyed 320 fourth-year medical students from the University of Washington and the University of North Carolina to list up to five factors that most significantly influenced their specialty decisions (Ellsbury et al. 1996, S16-8). The highest percentage of students (43%) indicated that clinical experiences and role models were important factors in their decision-making, and students choosing a primary care specialty were more likely to list these as important factors. This study is limited by recall bias, bias from introspective causal reporting and by poor generalizability (small size, one school).

Therefore, the evidence is insufficient to determine an effect of role models and mentors on primary care specialty choice.

Rural Training: A thorough systematic review of studies evaluating, among other outcomes, the effect of rural training experiences on medical students' career choices (Barrett, Lipsky, and Lutfiyya 2011, 259-263). Of the 72 articles reviewed, 37 articles evaluated the effect of rural training experiences on career choices, and 89% of these articles found a significant positive association between a rural training experience and choosing a primary care specialty. However, the poor quality of the included articles and the lack of detail about the setting of each study (e.g. one medical school or all medical schools), the rural training experiences, and the strength of association limit the strength of this review. Yet, a number of different articles do report a positive association. This may suggest there is some type of positive association, though the strength of that association is unclear.

Bad-Mouthing: Only one study evaluated the effect of specialty bad-mouthing on career choice. This study surveyed 1114 students from nine medical schools and found that specialty bad-mouthing had little effect on eventual career choice and had equal effects on changing primary care career choices and specialty career choices (Hunt et al. 1996, 665-669). This study is limited by the potential for confounding and questionable external validity. Therefore, it is difficult to conclude how badmouthing may influence primary care specialty choice.

Summary

Many diverse factors, therefore, influence the specialty choice of medical students and, more specifically, the primary care specialty choices of medical students. The literature is challenging to assess not only because of the potential for bias, heterogeneity of both the factors assessed and the outcome assessed, and limited external validity, but also because the studies are limited to associations. That is, causality cannot be inferred from most of these studies. While theoretical perspectives can help guide these associations into thinking about causality, interpretations of these associations must be viewed with caution.

Interpretation of the literature is also challenging because the decision-making process is complex and trying to understand what influences these decisions is even more complicated. In fact, Pathman and Agnew (Pathman and Agnew 1993, 203-207) argued that not even medical students can accurately understand their decision-making process.

However, as popularity of primary care specialties continues to decline among medical students, it is worth facing the challenge of understanding why. And, using and learning from the literature is an important first step.

Appendix B: Survey Instrument

[This presentation shows the general layout and the questions, but it is not an exact reproduction of the survey I administered, which was on two pages, back to front].

Good morning. I am asking you to help me determine why medical students choose the specialty they do. This is the subject of my master's paper in the MPH program. Your participation is completely voluntary and anonymous, and I will only use aggregated information from this survey in my master's paper.

1. Congratulations! What are you hoping to match in today? Don't think of the transitional year, think of the residency you expect to complete.

Anesthesiology	Dermatology	Emergency Medicine	Family Medicine
General Surgery	Internal Medicine	Med-Peds	Neurosurgery
Neurology	OB/GYN	Ophthalmology	Orthopaedic Surgey
Otolaryngology	Pathology	Pediatrics	Physical Medicine & Rehab
Plastic Surgery	Psychiatry	Radiation-Oncology	Radiology
Urology	Other (please specify: _____)		

2. After this residency, do you plan to sub-specialize?

Yes No

3. How important was each of these in making your specialty decision. Please rank them (1= most important to 6= least important), using each number only once.

____ Financial Compensation

____ Intellectual Satisfaction

____ Work Satisfaction—that is, satisfaction with the circumstances and climate of work

____ Lifestyle

____ Sense of being able to do good

____ Length of Training

4. Did we leave something out? Did something else factor into your decision-making? If so, please specify.

5. Did you consider other specialties before your final decision? Yes No

6. If so, which ones? Please circle the specialties you considered (you may circle more than 1).

Anesthesiology	Dermatology	Emergency Medicine	Family Medicine
General Surgery	Internal Medicine	Med-Peds	Neurosurgery
Neurology	OB/GYN	Ophthalmology	Orthopaedic Surgey
Otolaryngology	Pathology	Pediatrics	Physical Medicine & Rehab
Plastic Surgery	Psychiatry	Radiation-Oncology	Radiology
Urology	Other (please specify: _____)		

PLEASE CONTINUE TO THE OTHER SIDE

7. Why *didn't* you select one of the specialties in question 6? That is, what things made you change your mind?

8. When you started medical school, what specialty did you *think* you would choose? Even if you were genuinely undecided, please indicate what you were leaning towards.

Anesthesiology	Dermatology	Emergency Medicine	Family Medicine
General Surgery	Internal Medicine	Med-Peds	Neurosurgery
Neurology	OB/GYN	Ophthalmology	Orthopaedic Surgey
Otolaryngology	Pathology	Pediatrics	Physical Medicine & Rehab
Plastic Surgery	Psychiatry	Radiation-Oncology	Radiology
Urology	Other (please specify: _____)		

9. Did anything in your medical school experiences change your original intent? If so, what?

10. Imagine your career ten years from now. How would you like to be spending your time? Please distribute your time across any combination of these so that your percentages total 100%. Even if you are still figuring this out, please give me your best guess.

_____% Training/Fellowship

_____ % Bench Research

_____ % Clinical, Health Services, or Health Policy Research

_____ % Patient Care

_____ % Teaching

_____ % Administration/Management

_____ % Policy-Making or Policy-Advocacy

_____ % Other (please specify):
_____

11. To help me make comparisons of this UNC medical class to current physicians, I need to ask just three demographic questions.

Are you : Male or Female

Is your background: Rural Urban Suburban

What do you consider to be your ethnicity?
_____

Appendix C: Comments Detailing Additional Influential Factors (in response to survey question 4)

CATEGORY 1: LOCATION

Location
Location
Location
Area for living
Geographic limitations of practice environment

CATEGORY 2: FAMILY

Family
Family
My choice would affect my family

CATEGORY 3: FUTURE OPPORTUNITIES AND CAREER FLEXIBILITY

Ability to do international medicine, ease of moving between hospitals
Research opportunities
Type of training for future goals (i.e. international work)
future of the field, as in, how necessary/in demand doctors in this specialty will be in the future
Travel and research opportunities
Flexibility in career options
Intellectual--quality of program, training, residents

CATEGORY 4: CHARACTERISTICS OF PRACTICE

Breadth of knowledge and skills
Comfort with the patient population
Ability to do procedures
Ability to have patient continuity
Independence i.e. can operate w/o hospital or 3rd person involvement
Patient population

CATEGORY 5: ENJOYMENT AND PERSONAL INTEREST AND PEOPLE

interactions with residents and faculty, if I left feeling like I could work with these people, I ranked them highly
personal interest
it's what I enjoyed (is that work satisfaction?), I liked the people
personality/personal fit
it's what I most enjoyed
mentors

Appendix D: Comments Explaining Final Specialty Choice (in response to survey question 7)

[Please note that some comments were placed in multiple thematic categories based on content. Each comment is written as the complete comment, and italics indicates that portion of the comment resulted in the comment being placed in an additional thematic category.]

CATEGORY 1: INTELLECTUAL SATISFACTION

Otolaryngology was more interesting, *options for improved lifestyle*. Perceived by me to be more exciting field

Boring

not enough intellectual stimulation

lifestyle, intellectual satisfaction

picked what I find most interesting

intellectual stimulation

research not as interesting, pts not as intellectually stimulating, *lifestyle of gensurg*

intellectual stim—PMR

boring

1) lifestyle, 2) intellectual satisfaction

pathology was the best niche for me: intellectual satisfaction *and that I will be home in time to put my kids to bed most nights*

not as intellectually stimulating, *did not like basic day to day activities, not directly involved in patient care*

not as intellectually stimulating, *less opportunity to talk with patients*

intellectual (lack of) and research opps

I knew I loved internal medicine but was still considering peds/radiology. But the intellectual challenge and *friendly residents swayed me.*

CATEGORY 2: LIFESTYLE

I prefer the lifestyle and *day to day activities of* my specilty of choice

Otolaryngology was more interesting, options for improved lifestyle. *Perceived by me to be more exciting field*

work satisfaction-and lifestyle

lifestyle, *intellectual satisfaction*

lifestyle

research not as interesting, pts not as intellectually stimulating, lifestyle of gensurg

lifestyle i.e. time for family, # work hours

I just considered them--work schedule above all else

1) lifestyle, *2) intellectual satisfaction*

pathology was the best niche for me: *intellectual satisfaction* and that I will be home in time to put my kids to bed most nights

lifestyle, *lack of patient continuity*

lifestyle, wanted to care for adults and kids, wanted more excitement

hours, *residents seemed unhappy*

hours of work, *nature of work*

lifestyle, *length of training, patient population*

patient population, lifestyle, *coworker temperament*

my family

CATEGORY 3: WORK ENVIRONMENT AND SATISFACTION (i.e. specialty characteristics)

I prefer *the lifestyle* and day to day activities of my specilty of choice

work environment/what I want to do day to day
work satisfaction and *lifestyle*
work satisfaction
Female-dominated nature of OB/GYN, I didn't like how orthopods are proud of being idiots
grueling training, patient population
wanted diverse chief complaints from pts
couldn't choose between internal medicine and pediatrics so decided to do both, Did not want to deal with liability in OB/GYN and was not all that interested in the surgical aspects
gen surg was *best fit*, love broad scope of surgical practice
like being able to treat children & adults, *availability of programs*
lifestyle, lack of patient continuity
I want to treat patients
diversity within field
radiology: liked patient interaction, ENT: got bored in the OR, Peds: just liked working with adults better
would be happy doing either but in the end preferred working with kids and their families
I love working with kids
not as intellectually stimulating, did not like basic day to day activities, not directly involved in patient care
desire to surgery, but do primary care; desire for some freedom
desire to manage chronic diseases, pt population, breadth of fiedl
Not enough pt continuity, not enough solving pt's problems
lifestyle, wanted to care for adults and kids, wanted more excitement
didn't like the surgeries
patient type, surgery
training atmosphere "felt right" in family, commitment to primary care, want to do "whole patient care" not only women's health
love for cardiology
patient type, surgery
mentors, desire to learn full spectrum medicine well, *be prepared to practice in a very rural area*
wanted to do surgery and have long term pt follow up
medicine was a better fit, urology doesn't really know medicine, med/peds is too much info, fam med is overwhelmed/not respected
family med--breadth of specialty too much, afraid not be able to do peds/ob which is my favorite part of medicine; ob/gyn--didn't love surgery, *malpractice concerns (so much litigation hightens cost)*, med/peds--*not that many programs*, couldn't do ob
hours of work, nature of work
patient population--didn't like males FM; work sat--psych, length of training/lifestyle--gen surg,
I wanted pt F/U
wanted to focus more on adult medicine, *wanted more in depth training*
b/c the other specialties didn't satisfy my desire to do procedures
no patients
not as intellectually stimulating, less opportunity to talk with patients
I want to work with entire families
ortho is more fun
too many patients, too little time
OB/GYN--more hands on than internal medicine; anesthesia--didn't have enough insight
duration of training, lifestyle during training, opportunities for creativity, continuum of care

wanted to take care of the whole family and was interested in doing OB (deliveries)
ability to do surgery, ability to have continuity of care, diversity of day/week (clinic, surgery, inpt, outpt)
wanted to follow pts as outpatient
hands on nature of surgery
did not like patient population
lifestyle, length of training, patient population
patient population, *lifestyle, coworker temperment*
more job satisfaction with ortho and more *financial freedom to work out in practice*
OB/GYN--could not tolerate surgery, Pediatrics--*financial compensation limited*
discovered I enjoyed procedures but did not enjoy the length of procedures and personalities in surgery
couldn't take doing something non-surgical
med-peds--*in reality usually practice in either/or, not both;* internal medicine--not enough emphasis on prevention; peds--no adults, ever

CATEGORY 4: TRAINING
grueling training, *patient population*
like being able to treat children & adults, availability of programs
competitiveness
the interviews I got
training atmosphere "felt right" in family, *commitment to primary care, want to do "whole patient care" not only women's health*
family med--breadth of specialty too much, afraid not be able to do peds/ob which is my favorite part of medicine; ob/gyn--didn't love surgery, malpractice concerns (so much litigation hightens cost), med/peds--not that many programs, *couldn't do ob*
med-peds is more specific, intense training; no desire for OB training
wanted to focus more on adult medicine, wanted more in depth training
training too long
duration of training, lifestyle during training, *opportunities for creativity, continuum of care*
lifestyle, length of training, *patient population*
felt like something was missing, length and *personality types of specialist*

CATEGORY 5: MEDICAL SCHOOL
Clerkships
hours, residents seemed unhappy
mentors, *desire to learn full spectrum medicine well, be prepared to practice in a very rural area*
after 3rd year rotations, I decided this was a better fit
liked IM rotations more
third year clerkship in surgery
I knew I loved internal medicine but was still considering peds/radiology. *But the intellectual challenge and* friendly residents swayed me.
I didn't like them when I did these rotations, people working in that field did not seem happy

CATEGORY 6: GENERAL PERSONAL FIT AND ENJOYMENT
everything else didn't compare in the end
PM&R has everything I wanted
better fit
I just "fit in" better, from a personality and common interest standpoint, in my chosen field

see #3, overall best fit was peds
felt like something was missing, length and *personality types of specialist*
not the best fit
peds is what I most enjoyed
patient population, lifestyle, coworker temperment
gen surg was best fit, *love broad scope of surgical practice*
liked the other specialty better
medicine was a better fit, *urology doesn't really know medicine, med/peds is too much info, fam med is overwhelmed/not respected*
b/c OB/GYN was the only one that made me happy
discovered I enjoyed procedures but did not enjoy the length of procedures and personalities in surgery

CATEGORY 7: FUTURE GOALS
concern about long-term job prospects in the field
didn't want to subspecialize, only minimally (6 month subspecialty)
because I felt I would be a better psychiatrist than I would ENT physician
med/peds a better fit for specialty interests
more job satisfaction with ortho and more financial freedom to work out in practice
OB/GYN--could not tolerate surgery, Pediatrics--financial compensation limited
working in a situation with poor access to women's health services (Kenya) and encountering women with severe, life-threatening disease as a result of this i.e. sepsis from home abortion (??)
mentors, *desire to learn full spectrum medicine well*, be prepared to practice in a very rural area
family med--breadth of specialty too much, afraid not be able to do peds/ob which is my favorite part of medicine; ob/gyn--didn't love surgery, malpractice concerns (so much litigation hightens cost), med/peds--not that many programs, couldn't do ob
intellectual (lack of) and research opps
med-peds--in reality usually practice in either/or, not both; *internal medicine--not enough emphasis on prevention; peds--no adults, ever*

Appendix E: Comments Detailing Influential Medical School Experiences (in response to survey question 9).

[Please note that some comments were placed in multiple categories based on content. Each comment is written as the complete comment, and italics indicates that portion of the comment resulted in the comment being placed in an additional category.]

CATEGORY 1: CLERKSHIPS AND ROTATIONS

my clinical rotations
Rotation on peds surg & plastic surg
rotation in optho
amazing pediatric rotation at moses cone
didn't like ortho rotation, MS3 year really crystallized things for me
lots of great experiences 3rd year made me consider other specialties
3rd year clerkships
rotations, experiences abroad
rotations during 3rd year
yes, I HATED my medicine rotation
community week and trauma surgery rotation
rotations
pathology rotation
wards
surgery clerkship
yes. 3rd year and realizing I was too ADHD for residency clinical rotations
experiences 3rd year--learning more about what I needed to be satisfied with my career
4th year exposure to the specialty
clinical rotations
yes, rotation experiences
3rd yr. internal medicine experience
3rd year clinical experiences
3rd year clerkship experience
rotations
clerkship and *working with residents (both good and bad)*
clinical rotations
clerkships, *talking to physicians in various specialties*
radiology rotation--didn't lilke it
my rotation experience in ENT
yes, 2 weeks of orthopedic surgery and I knew I couldn't be happy doing that
yes. When I was doing my EM shifts in Asheville, I realized that the specialty was not for me because of the lack of continuity
almost turned off by UNC peds rotation
community week and clerkships
yes, I didn't like my psych rotation and liked my ENT rotation
dissatisfaction with surgical rotation
third year rotations
clerkship experiences
graduate school, electives
yes--*anatomy (loved it)*, medicine rotations (hated them), surgical rotations (loved them)
I had some poor rotation experiences on my specialty of choice but was not ultimately dissuaded by them
rotating on CT surgery

subspecialty peds rotation, other 3rd year clerkships
yes, internal medicine rotation
surgery rotation
yes, *anatomy--didn't really like it*; surgery--liked surgery, didn't like pt interaction part
clinical experience
my internal medicine rotation changed my mind
third year rotations, *faculty and resident mentors, more time to figure out what I wanted to achieve in my career*
outpt med/fam med, I liked pt relationships a lot
the attitude and persona of surgery
personalities and general atmosphere in OB/GYN
Exposure to different fields
being in the ICU!
it was so monotanous & boring
yes, the *personnel* and complexity of problems in urology
shadowing in the OR at WakeMed
exposure to urology
internal was a better intellectual fit
learning about what the specialty actually entails on a daily basis
yes. I actually liked everything and thought about doing many other specialties
exploring the different specialties
I discovered that ED doctors only complete initial work-ups, often by algorithm, ??the opportunities to learn from the patient's case as it progresses
lack of interesting medicine pts

CATEGORY 2: PRECLINICAL:
community week and *trauma surgery rotation*
community week and *clerkships*
yes--anatomy (loved it), *medicine rotations (hated them), surgical rotations (loved them)*
yes, anatomy--didn't really like it; *surgery--liked surgery, didn't like pt interaction part*

CATEGORY 3: RESIDENTS AND FACULTY
clerkship and working with residents (both good and bad)
clerkships, talking to physicians in various specialties
seeing resident work patterns and apparent satisfaction with work
great mentors at UNC in the pathology department
yes, the personnel and *complexity of problems in urology*
third year rotations, faculty and resident mentors, *more time to figure out what I wanted to achieve in my career*
the attitude and persona of surgery
personalities and general atmosphere in OB/GYN

CATEGORY 4: OTHER EXPERIENCES
rotations, experiences abroad
MPH
international field experience confirmed family me to be best choice
leave of absence--1 year longitudinal study Dr. Chuang
graduate school, *electives*

CATEGORY 5: OTHER

third year rotations, faculty and resident mentors, more time to figure out what I wanted to achieve in my career
realizing the low yield of special needs in gen peds
pt experience
having a baby