10. Student Selection

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SUMMARY

Student selection for medical education worldwide cannot be isolated from local social, political, and economic contexts of medical care and education. The criteria and methods used for medical student selection usually emphasize academic and intellectual achievement. However, some medical schools also use candidates' ethnic group or community of origin as selection criteria to achieve ethnic balance and other social goals within the medical profession. Medical student selection, progress through the curriculum, and earning a medical degree have many consequences beyond the usual outcome of becoming a clinical doctor. The sequelae include shaping the current and future character of the medical profession, opportunities to acquire social status and personal wealth, and participation in formulation of national health and social policies and the scientific research agenda.

This chapter is a descriptive account of medical student selection. Its purpose is to broadly review medical student selection policies and practices. The chapter has six sections: 1. Goals of Selection, 2. Features of the Selection Problem, 3. Selection for Medical Education – National Examples, 4. Research on Student Selection, 5. Practical Recommendations, and 6. Coda – The "Convergence Hypothesis." International examples are presented throughout the chapter to amplify and illustrate the text.

INTRODUCTION

Policies that govern the selection of students for medical education have shaped the character of the medical profession throughout history. Medical knowledge and skill in ancient China (Deng Yizhong, 1990) and ancient Greece and Rome (Drabkin, 1944) were passed from father to son, usually based on primogeniture. The European Middle Ages featured formation of medical guilds. Entrance to these guilds was controlled by rigid rules and maintained by strict codes of moral

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conduct. By contrast, in the contemporary Western world student selection for medical education is highly competitive, governed chiefly by secondary school or college grades, psychometric measures of intellectual achievement, and to a lesser extent by signs of individual character and personal qualities. Features of the dominant Western model of medical student selection have been described and explained in detail in other writings (McGaghie, 1990a, 1990b; Powis, 1994; Powis, McManus, & Cleave-Hogg, 1992).

Student selection for medical education worldwide cannot be isolated from local social, political, and economic contexts of medical care and education. It is only a small piece of a much larger professional mosaic that includes historical, ethnic, and religious factors; differences in allocation of economic resources; variation in access to schooling and educational opportunity; and frequently discrimination against individuals judged by a variety of criteria to have low social desirability (Maxwell, 1987; Iliffe, 1998; Narula, 1999). Contextual variation by country and culture is matched by variation in methods used to select medical students. There is no single, uniform approach now in use internationally, nor is a standardized, worldwide mechanism to be expected in at least the next twenty years.

Just as the medical student selection *context* varies by nation and culture so will student selection methods. Selection in most countries represents a conservative force that seeks to perpetuate the professional *status quo* (Freidson, 1970). This has produced a tension in many places between maintenance of an upper class physician oligarchy *versus* broader distribution of opportunities for medical education by making student selection more democratic.

Medical student selection is a key social policy issue for at least four reasons. First, due to low rates of student attrition in many countries, medical student admission is often equivalent to student graduation. After matriculation, few medical students fail academically or leave voluntarily. The attrition rate from all causes in North America where medical schools require an undergraduate baccalaureate degree and evidence of other achievements for admission is approximately 1.4% (Barzansky, Jonas, & Etzel, 1999). Before the college degree requirement was imposed (Zapffe, 1937), North American failure and dropout rates were much higher (23–25%). The low North American attrition rate is mirrored in Japan where medical students are selected after secondary school (Otaki, 1998). Medical student attrition rates tend to be higher in other countries where students are selected after completing secondary education. Research shows that student attrition ("wastage" in the UK) ranges from 6% in Britain (Richards, 1997), to 8% for "regular" students in New Zealand (18% for minorities) (Collins, White, & Mantell, 1997), to 13% for South African medical students (Mitchell & Haupt, 1990). The attrition rate is assumed to be slightly higher for developing countries, as in the historical 20% attrition rate in colonial East Africa (Iliffe, 1998), although published data are not available. However, for most physicians the most important evaluative decision they receive during their careers is the decision to admit them to medical school.

The Israeli physician S. M. Glick (1994) notes:

> In a significant number of Western countries the attrition rate in medical school is sufficiently low so that the selection process represents the major threshold to be crossed for entry not only into medical school but for admission into that prestigious world, the exclusive club that is the medical profession. *(p. 265)*

Low medical student attrition underscores the point raised a decade ago that student selection is not equal to student prediction (McGaghie, 1990a). Measures used to screen and select medical trainees may be very different from measures that predict medical student school achievement and achievement in a physician's professional career: patient care, teaching, research, administration, public service (Forsythe, McGaghie, & Friedman, 1986; McGaghie, 1993; Samson, Graue, Weinstein, & Walberg, 1984). Since virtually all matriculants ultimately graduate and are licensed for medical practice, the "outcome" for "prediction" by selection variables is frequently a *fait accompli* (Algina, 1978).

Second, physicians are at the forefront of health care delivery, clinical and public health prevention, and health policy formulation for the nations and peoples they serve. Physicians fill these and other roles for an average career length of 45 to 50 years after medical school graduation. Thus, in most countries, today's decisions about medical student selection will cascade and shape the character of its medical profession for about one-half a century for each student cohort enrolled.

Third, physicians enjoy public trust, high social status, and very high income compared to worldwide national averages. In the United States, where reliable income data are published, the typical physician earns an annual income of approximately $200,000 (Gonzalez & Zhang, 1998). Specialist physicians earn much more. This contrasts with the approximate $24,000 annual earnings of an average U.S. wage and salary worker in 1997 (*World almanac*, 1998, p. 152). These figures are inexact yet suggest that, on average, American physicians earn incomes about ten times higher than the typical American worker.

Fourth, there are many personal and professional sequelae for persons who are selected for medical education and who graduate with a medical degree. They include membership on policy boards, contacts with government agencies and private foundations, access to mass media and the popular press, and opportunities to shape the biomedical, behavioral, and social research agenda within their home country and internationally.

The decision to select an individual to receive a medical education thus has consequences beyond the usual outcome of becoming a clinical doctor. The consequences involve shaping the current and future character of the medical profession, opportunities to acquire social status and personal wealth, and participation in formulation of national health and social policies and the scientific research agenda. Medical student selection carries much more weight than almost certain membership in the "exclusive club" cited earlier by Glick (1994).

This chapter is a descriptive account of medical student selection. Its purpose is to broadly review medical student selection policies and practices worldwide, including the research base that informs the policies and practices. The chapter has six sections:

1. Goals of Selection;
2. Features of the Selection Problem;
3. Selection for Medical Education – National Examples;
4. Research on Student Selection;
5. Practical Recommendations; and
6. Coda – The "Convergence Hypothesis".

GOALS OF SELECTION

Medical student selection aims to reach short-run and long-run goals. Short-run goals concern student progress through the curriculum while enrolled in medical school. Long-run goals are about providing clinical care, advancing public health, promoting biomedical and behavioral research, contributing to medical education, and serving the medical profession after graduation. Both sets of goals deserve attention when a medical school selection policy is newly created or revised from experience.

Short-run goals

There are at least three short-run goals of medical student selection.

1. Medical students who have a high probability of completing the curriculum successfully should be selected for enrolment. It makes no sense to select students for medical education who lack the educational history, intellectual fitness, ambition, work ethic, habits and values, and personal qualities needed for success in school. The challenge, of course, is to reliably measure these or other selection criteria, assemble the data into a profile for each candidate, set selection standards, and enrol students in medical school who meet or even surpass the standards (given there is generally a fixed quota and more applicants than places). Each of these issues is addressed in more detail later in this chapter. *Academic criteria* account for the largest part of medical student selection decisions around the world. The reasons are straightforward. Given the uniformly rigorous medical curriculum, an expensive educational experience that puts high demands on intellectual ability and physical stamina, and that frequently requires students to defer family life and social activities, it would be foolish to enrol students who have a marginal or low probability of school success. The increasing development and use of standardized tests of medical aptitude, which is discussed later, is testimony to the importance of selecting students who are likely to succeed academically.

2. Prospective medical students should be evaluated for *psychological fitness* and *stability*, ruling candidates in and out according to valid indices of personal competence. Medical schools have much to learn from research performed on candidates for the astronaut and cosmonaut corps, where rigorous psychological screening is now routine (Santy, 1994). Astronauts and cosmonauts are evaluated against a variety of psychological criteria including adaptability and flexibility, being a team player, ability to function despite imminent catastrophe or personal danger, ability to tolerate separation from loved ones, ability to tolerate isolation, and other stressors. Similar screening of medical school applicants is rarely performed. Research also shows that psychiatric *impressions* of medical student psychological fitness, in contrast with objective data, are useless as a screening device or as a predictor of how doctors will function professionally and personally later in their careers (Aldrich, 1986). The famous case of the notorious Dr. Michael Swango, a physician accused of poisoning scores of patients in the U.S. and Zimbabwe (Stewart, 1999), may have been averted if reliable and valid psychological assessment had been part of his medical school and postgraduate medical education selection package.
3. Medical students should be selected who fit or match school goals and who add value to the educational environment. Medical school goals vary in many ways that demonstrate professional richness. Schools may emphasize primary care, biomedical research, specialty care, military medicine, preventive services, religious goals, or other objectives. Choosing students whose career interests conform with school goals insures educational continuity and may boost student and faculty morale. Carefully selected students can also bring added value – tangible and intangible – to a medical school as suggested by Robert Klitgaard in his book, *Choosing elites* (1985). These may be cultural, social, or athletic; teaching contributions in the laboratory or clinic; financial contributions (e.g., tuition, later donations), and recruitment of students for subsequent classes.

Long-run goals

Selection of students for medical education may also address a set of long-run goals. Five long-run goals warrant attention.

1. Medical students and graduates are expected to *serve the public*, contributing to the fulfilment of national health care, preventive, and health policy goals. Public service is a reasonable expectation because, internationally, the costs of medical education are usually paid from the public purse. Public service is also a core value of the medical profession, a key feature of oaths and codes of conduct that physicians swear to uphold.
2. Selection and education of students for medical careers should also promote the profession through a *variety of outcomes*: patient care, patient advocacy, research, philanthropy, teaching, and administration. Medical competence can

be expressed in many ways. The profession is enriched by different kinds of contributions.

3. Selection results in the identification and training of individuals who will later *advance basic biomedical, behavioral, and social science research.* Outcomes of this research are the foundation of evidence-based clinical practice (Sackett, Richardson, Rosenberg, & Haynes, 1997). Progress in these basic sciences, and their applications to patient care, begins with careful selection of medical trainees.
4. *Clinical and educational science* also move forward due to the contributions of physicians who were selected from a candidate pool. For example, research on behavioral, genetic, and social risk factors for morbidity; effects of new surgical and pharmaceutical treatments; epidemiological studies of health and disease patterns; care for rapidly increasing pediatric and geriatric populations worldwide; and adoption and testing of new approaches to medical education are a fraction of the ways that physicians contribute to international health and welfare. Such progress also begins with careful selection of medical trainees.
5. Medical student selection also serves the long-run goal of advancing the *authority of the future*, not the hubris of the past. Throughout the world medical care and education are very different in the new millennium than they were a century ago. Scientific and technological developments will only accelerate, not slow down. Historical and current models for conducting medical education, care, and research will become obsolete and need replacement to accommodate the new science and technology. Appeals to history will not work in this rapidly changing environment.

FEATURES OF THE SELECTION PROBLEM

Psychologists L. G. Cronbach and G. C. Gleser (1965) noted 35 years ago that, *"Any situation where a person is confronted with alternative courses of action is a decision problem"* (p. 7). They also developed a framework for classification of personnel decision problems in education and industry. The framework has six facets, each having two elements. According to Cronbach and Gleser (1965) personnel decisions:

1a are *institutional* (e.g., made by a school) or **1b** *individual*;
2a are bound by a fixed-quota, or **2b** are quota-free;
3a assign persons to one condition, or **3b** assign persons to multiple conditions;
4a assume one of the conditions may be *rejected*, or **4b** assume all persons are *retained;*
5a specify the information used is *univariate* (one datum), or **5b** specify *multivariate* information (many data); and
6a assert decisions are *final*, or **6b** assert that decisions are *indefinite*, requiring more information for resolution.

These facets define 2^6 or 64 different patterns. The medical student selection problem in most situations is defined by the pattern: **1a** *institutional* (medical school) decision, bound by a **2a** *fixed-quota* (more candidates than places), where persons are assigned to **3a** *one condition* (admit or not admit), one of the conditions may be **4a** *reject*, the information used is **5b** *multivariate*, and the decision is **6a** *final* (although rejected candidates often apply again at a later date).

Most persons, educational institutions, or government agencies having responsibility to make personnel decisions would envy the medical student selection problem because it involves selecting the "best and brightest" candidates from a pool of highly qualified persons. The issue is how to enact a data collection and decision-making system that allows medical school decision makers to achieve fine discriminations among candidates with few distinguishable characteristics that can be measured reliably. This involves at least seven steps.

1. The medical school or its representatives must choose and employ the correct *criteria* for medical student selection: academic, economic, ethnic, historical, personal, social.
2. Policy makers must decide whether or not to *weight* the criteria differently. For example, are academic indices more important than, say, ethnic group membership?
3. *Measures* that yield reliable data about each selection criterion need to be developed, refined, or adopted. Illustrations include test scores, grades, and other measures of academic aptitude and achievement; ethnic, racial, or religious classification; residential records; tests of physical stamina; and interview-based observations of such candidate criteria as poise and tact.
4. *Minimum standards* must be set about fulfilment of each criterion separately, or in a compensatory way if high achievement on one or more criteria can offset low achievement on others.
5. *Decision rules* must be adopted for choosing among candidates. These can be highly quantitative statistical models (Dawes & Corrigan, 1974; Dawes, Faust, & Meehl, 1989) or qualitative judgements.
6. *Fairness and justice* issues may be considered throughout the selection process. At least two questions arise: (a) Does the approach used to select medical students treat all candidates fairly, without bias, and according to the same rules? (b) Should measures of criteria other than indexes of competitive merit be used for medical student selection, especially to compensate for historical injustice (Bowen & Bok, 1998; Davidson & Lewis, 1997; Sandel, 1996)?
7. How should the medical student selection process be *audited*, i.e., evaluated to insure its accuracy, integrity, and efficient operation?

The overall goal is for the medical school or its representatives to establish a system that maximizes accurate decisions (true positives [TP] and true negatives [TN]) while minimizing inaccurate decisions (false positives [FP] and false negatives [FN]). This is an imperfect circumstance that will always contain error. The problem, of course, is establishing a medical student selection system in the absence

of a "gold standard" to validate the selection decisions (Fletcher, Fletcher, & Wagner, 1996).

Criteria

Appendix A identifies nine criteria now in use to select prospective students for medical education. The criteria are historical, academic, ethnic and religious; they also concern personal qualities, life history and experience; they may tap skills including teamwork, and "cultural competence"; include personal interests; and favor geographic origins. Each criterion is matched with one or more common approaches to its measurement or classification. Indices of data quality are also noted for each criterion-measure link including strengths and benefits of each approach followed by a statement about potential problems. Entries in Appendix A are not exhaustive, yet provide a picture of the state-of-the-art in medical student selection in the year 2001.

There is no doubt that academic criteria predominate in medical student selection. All other conditions equal, candidates with strong premedical secondary school or college grades and portfolios containing high aptitude test scores are more likely to be selected for medical education. This underscores the prevailing worldwide definition of readiness for medical education as intellectual talent. The availability and ease of use of academic sorting and selection technologies including school grades, test scores, letters and endorsements from influential persons adds momentum to this construction of readiness.

The values and political philosophy that underlie the use of academic selection criteria often lie below the public horizon. Fixed-quota admission decisions, coupled with norm-referenced examinations like the American and Canadian *Medical College Admission Test* (MCAT), the German *Test of Medical Science* (TMS), the *Swedish Scholastic Aptitude Test* (SSAT), the Australian *Graduate Australian Medical School Admission Test* (GAMSAT), the Finnish *Learning from Text Test* (LFT), and the Israeli *Psychometric Entrance Test* (PET) that are used to inform the decisions, rest on a Western ideology of competitiveness, individualism, and self-reliance (Bowen & Bok, 1998; Hsu, 1972). Such an ideology may conform to the political and educational views of medical school and national leaders in non-Western countries, but they may not. Adoption of the dominant Western model of medical student selection should be done with great care. National and cultural preferences that shape decisions about medical student selection may be lost or distorted from outright acceptance of foreign selection criteria and norm-referenced measurement technologies.

Weighting criteria

Academic criteria predominate in medical student selection but rarely is the degree of academic emphasis studied scientifically or set deliberately as a matter of school policy. Scientific study of weights attached to academic selection criteria has been reported retrospectively outside of medicine in choosing students for slots at the prestigious University of the Philippines (Klitgaard, 1986). Linear regression analyses were used in this work to capture the selection policies of university admission officers and to predict student success. Academic criteria work well for both student selection and forecasting student success at the University of the Philippines providing the measures used as student achievement outcomes are also academic (i.e., grades, test scores). Similar outcomes have also been demonstrated longitudinally for medical students in Germany (Trost, Klieme, & Nauels, 1997), North America (Mitchell, 1990), and in the former Yugoslavia (Susec-Michieli & Kalisnik, 1983). This underscores earlier research findings that grades predict grades and test scores predict test scores although there is little convergence among these academic measures (Forsythe, McGaghie, & Friedman, 1986) and no tangible association between academic and occupational performance (Samson, Graue, Weinstein, & Walberg, 1984). The skills needed to be a successful student are very different from the skills needed to be a successful professional.

A formal study aimed at weighting criteria used to judge house staff candidates based on faculty judgements has also been reported (Greganti, McGaghie, & Finn, 1982). These investigators used the method of paired comparisons to weight quantitatively such qualitative candidate selection criteria as professional attitude, maturity, enthusiasm and energy, and perceived knowledge. This research demonstrates that systematic study and weighting of key qualitative selection criteria can be done and the results used for practical medical personnel selection decisions.

Medical student selection committees and individual decision makers frequently assume that selection criteria can be weighted and used on grounds of clinical judgement, without research input. However, scholarship on clinical judgement shows this is an illusion (Aldrich, 1986; Dawes, 1994; Dawes & Corrigan, 1974; Dawes, Faust, & Meehl, 1989). Unaided clinical judgement works better when all criteria are weighted equally (i.e., all weights equal 1), than when criteria are weighted differently.

Measures

Measures noted in Appendix A can yield data that are *continuous* like aptitude test scores, *rankings* such as scores recorded after interviews with prospective medical students, or in unordered *categories* including ethnic groups (e.g., Chinese, Malay, Melanesian) and athletic preferences (e.g., football, cricket, rugby, swimming). The

key ingredient in all measures is that the data they yield must be reliable (trustworthy) and valid (useful) for the decision at hand.

Measures of medical aptitude (e.g., MCAT, TMS, SSAT) and achievement are now in widespread use because they are relatively easy to create, can be administered efficiently to large numbers of candidates and computer scored, and produce objective data that can be analyzed statistically. These measures have the aura of science, even though their content and texture rely solely on judgement. Efficiencies of scale suggest that such standardized aptitude measures will continue to grow in popularity for medical student selection within individual countries and perhaps across national borders (Heyneman, 1988). For example, Spanish speaking countries in Central and South America, West African Francophone nations, and Arabic countries in the Middle East may choose to pool their intellectual and financial resources to create and use multinational standardized aptitude tests for medical student selection.

Interviews are a common approach to measurement in medical student selection although they are rarely recognized as measurements. However, when medical faculty and others interview candidates, they are evaluating the prospective doctors against a set of qualitative criteria (poise, self-confidence, maturity, etc.) and casting the judgements into categories (accept, reject) or scales (accept, reserve judgement, reject).

Doubts have been expressed about the utility of interviews as an approach to measuring the character and personal qualities of candidates for medical education. To illustrate, former Harvard University President Derek Bok noted:

> ... most medical schools do interview applicants and try to give weight to traits of character. ... While these efforts are commendable, their impact is unclear. The interviewing process is sufficiently unreliable and the traits involved sufficiently intangible and easy to simulate that we have no reliable evidence that such procedures can have much effect on the characteristics of a medical school student body. *(Bok, 1984)*

Interview data should be held to rigorous quality standards just like selection data from other sources. This usually means that interviewers need to be carefully trained and calibrated and receive regular feedback about the accuracy of their work (Edwards, Johnson, & Molidor, 1990; Elam, Studts, & Johnson, 1997; Van Susteren, Suter, Romwell, Lanier, & Hatch, 1999).

Research on the use of interviews for medical student selection also indicates that untrained interviewers can have biased tendencies (leniency or severity) or reach biased conclusions due to the applicant's appearance, gender, racial group, or perceived similarity to the interviewer (Edwards, Johnson, & Molidor, 1990; Shaw, Martz, Lancaster, & Sade, 1995). There is also strong evidence that to serve as an effective measure, the interview of prospective medical students should be structured, focused, and uniform. These research results have been demonstrated

independently in Australia (Powis, Neame, Bristow, & Murphy, 1988; Powis, & Rolfe, 1998; Tutton, 1994) and in the United States (Van Susteren et al., 1999).

Thus the weight of the research evidence shows that interviews can be a useful measurement tool for medical student selection when they (a) have a clear data gathering purpose; (b) involve prior training of faculty and layperson interviewers; and (c) are structured and uniform for all candidates. Faculty status and seniority alone are not enough to insure that interview data will be reliable and unbiased.

Minimum standards

Medical school decision makers must decide the achievement standards they plan to use for each of the student selection criteria that are part of the admission formula. Some of the minimum standards for measures of academic criteria like examinations are normative, i.e., only individuals who earn scores at the high end of the score distribution are considered for selection. Other minimum standards are cast as cut scores on ordinal or continuous measurement scales. Still other standards for student selection criteria are dichotomous, yes-no judgements about such personal qualities as social class, religious beliefs, ethnicity, or place of birth or residence. Discussions about minimum standards often start by posing questions. To illustrate:

- What is the minimum *gymnasium* grade point average (GPA) and TMS score that qualifies a German student for entrance into medical school?
- Does the medical school aspire to have an ethnic mix? If so, what is the right distribution of ethnic diversity to reach school goals? For example, medical student selection at the Univiersiti Sains Malaysia (USM) is based on, " ... *a government policy which imposes a specific racial composition among student intakes, which has to reflect the racial composition of the Malaysian population*" (Razali, 1996, p. 421).
- Is there a religious *litmus test* for medical student selection? Must an individual practice, say, Buddhism, Islam, or Christianity? May a candidate for medical education be agnostic?
- For personal qualities, does it matter if a prospective medical student has a history of dishonesty, criminal behavior, or drug abuse? If such a history exists, how much time in successful rehabilitation is enough for the individual to become a qualified candidate?

Each of these questions illustrates that minimum student selection standards are likely to exist for each measured criterion that a medical school considers to be important. However, these minimum standards are frequently not articulated clearly, except in a competitive, norm-referenced way. The next section describes how to address more clearly the interplay of measured criteria, minimum standards, and decision making about medical student selection.

Decision rules

Two decision making methods define extreme and opposing approaches to reach medical student selection decisions. One extreme involves quantitative, statistical methods like regression equations to fulfil student selection policies formed earlier. This approach is algorithmic or actuarial. Its primary advantage is consistency. Once selection criteria, criterion weights, measures, and minimum standards are chosen by school officials a regression equation can be used to select students to fill a medical school class strictly *by the rules*. Such a statistical equation will fulfil the goals of its designers with minimum variation and maximum efficiency.

An example of this method has been described in a research report by R. M. Dawes about selecting doctoral students for a highly competitive educational program in academic psychology (Dawes, 1971). This research demonstrates that if consistent application of *a priori* decision rules is the goal of a school admissions officer or committee, the regression equation clearly outperforms human faculty judges.

The second extreme is embodied in unaided, qualitative assessments about medical school candidates by judges – usually school faculty and administrative officials. This approach to student selection favors subjectivity, allows "exceptions" to selection policies, and encourages judgements about candidates on a case-by-case basis. Academic criteria may still be imposed along with expectations about character, personal qualities, skills, and interests yet each judge weighs and interprets data and impressions subjectively, without constraints.

Many physicians appreciate this qualitative approach to student selection because it mirrors their work with patients. Reasoned clinical judgement is widely held to be the hallmark of competent medical practice. However, a long research legacy shows that unaided clinical judgement is prone to misunderstanding, bias, and error (Meehl, 1954; Dawes, Faust, & Meehl, 1989). With very few exceptions clinical judgement displays inferior performance compared to actuarial methods when applied to clinical and educational decision problems. Student selection procedures that place great reliance on qualitative clinical judgements are also much more labor intensive (i.e. require more faculty time) than actuarial methods.

Persons responsible for medical student selection rarely use decision making procedures exclusively at either extreme. Instead, individuals and committees usually seek a middle ground that has quantitative, actuarial features and also leaves room for qualitative judgement. A common tactic is to use the "threshold concept" described at the Israeli Ben-Gurion University of the Negev (Antonovsky, 1987). Here, after candidates demonstrate adequate cognitive potential (60^{th} percentile on a "battery of what might loosely be called intelligence tests"), academic measures are ignored in the selection decision. By contrast, personal qualities hold sway, traits judged by physicians and laypersons on the admission committee to be essential for medical practice: maturity, community service aspirations, wide-ranging interests, racial and religious tolerance. The Ben-Gurion admission committee believes its

decision rules are improved by combining a quantitative, academic threshold with qualitative judgements about candidates' personal qualities.

An alternative to using qualitative judgements about candidates once an academic threshold has been surpassed is to rely on random selection (lottery) from the candidate pool. This position was endorsed by Reader (1982) in the U.S. nearly two decades ago and more recently in Britain by Goldbeck-Wood (1996). What these authors fail to acknowledge is that use of random selection encourages admission officers to avoid tough choices, to relegate decision making to a roll of the dice. This holds both for formulating selection policies embodied in actuarial regression equations and in clinical judgements about individuals.

Fairness and justice

I noted earlier that, "Student selection for medical education cannot be isolated from local social, political, and economic contexts of medical care and education." I also stated, "Medical student selection in most countries represents a conservative force that seeks to perpetuate the professional status quo ... maintenance of an upper class physician oligarchy versus broader distribution of opportunities for medical education by making student selection more democratic."

These issues frame and define the worldwide debate about fairness and justice in the context of student selection for medical education. Given a scarce resource (medical education), which is sought by many (candidates), whose access and completion have many desirable consequences (high income and standard of living, social status, public and private influence), it is not surprising that allocation of this resource often results in controversy and conflict. How shall readiness or merit for medical education (criteria) be defined and measured? How much merit is enough (minimum standards)? Which individuals or groups should control medical student selection and with what degree of accountability? Clearly, much is at stake beyond the opportunity to acquire basic scientific and clinical skills when places are filled in medical school classes.

A recent example highlights these issues. Lower-caste medical students from the University College of Medical Sciences in New Delhi, India, were attacked and beaten by upper-caste medical students in several violent campus incidents (Lloyd, 1999). The upper-caste students reportedly resent a government imposed quota system that reserves 22.5 percent of medical student placements for members of the so-called "backward classes", members of the "untouchable" caste (Narula, 1999) and other groups. Upper-caste students believe the quota system permits selection of students unfit for medical study due to an "ability gap" which encourages mediocrity. A similar quota for medical school faculty posts is being challenged in the New Delhi High Court.

This case report brings controversies associated with fairness and justice issues in medical student selection into sharp focus. The term *affirmative action* is now used to describe efforts by nations and by individual medical schools to increase

access to medical education for historically underrepresented social and ethnic groups. Less dramatic discussions of these and related issues, sometimes including research on discrimination in medical student selection, have been published about programs in several other countries including Malaysia (Linn, 1985; Razali, 1996), New Zealand (Collins, White, & Mantell, 1997), Pakistan (Zaidi, 1986), the United Kingdom (Esmail, Nelson, Primarolo, & Toma, 1995; McManus, Richards, & Maitlis, 1989), and the United States (Davidson & Lewis, 1997; Helms & Helms, 1998; Nickens & Cohen, 1996).

The fundamental question in the affirmative action debate concerns the extent (if at all) that governments should intervene into formerly professional decisions like medical student selection to distribute the economic and social benefits of medical education (and its sequelae) to a broader population base. Mechanisms used to accomplish affirmative action goals include racial, ethnic, and economic quotas; changing criteria and measures used for student selection; prematriculation preparation programs; and reducing reliance on competitive admissions standards in favor of minimum acceptable standards (i.e., "threshold" concept discussed earlier).

Scholarly reports have been published about affirmative action interventions aimed at addressing fairness and justice regarding access to medical education (Davidson & Lewis, 1997; Helms & Helms, 1998) and higher education (Tierney, 1997) in the United States. Balanced arguments which articulate the political philosophy for and against the "neutral state" (i.e., the idea that nations should *not* be involved in professional or personal issues) are found in the writings of Sandel (1996) and many other authors. A key point in this worldwide debate is that custom and culture bind definitions of fairness and justice. An equally important observation is that wide variations exist about perceptions of fairness even between Western European countries and the United States (Steiner & Gilliland, 1996). Different national and regional solutions are expected as questions of fairness and justice in medical student selection are addressed.

Audit of procedures

How can a medical school judge the success of its student selection process? How can a school receive feedback about the utility of current methods of student selection so that quality improvement can be undertaken to strengthen its procedures? These questions are about auditing the student selection process, evaluating its operations and outcomes toward the goal of selection program improvement.

Collins, White, and Kennedy (1995) published a research report describing an audit of the medical student selection process at the University of Auckland, New Zealand. These investigators performed a longitudinal study of 413 matriculants to determine the relationship between measures of medical school admission criteria (secondary school leaving examination) and annual medical school grade point averages (GPAs). The correlations were modest at best, and there was no

correlation between admission variables and measures of clinical competence during ward clerkships or with scores from an interdisciplinary Objective Structured Clinical Examination (OSCE) given as a final examination at the end of curriculum year 5.

Given these results the authors (Collins, White, & Kennedy, 1995) conclude, "*Selection of medical students on the basis of academic criteria alone is inadequate and should be accomplished by assessment of personal qualities*" (p. 22). The authors also state, "*This school no longer uses school leaving marks as the primary selection instrument*" (p. 22).

This audit of medical student selection procedures, derived entirely from "in-house" research, is a good example of how school faculty can use student admission data and curriculum performance data to obtain feedback for program improvement. While the conclusions of the audit agree with earlier research on the weak link between medical school admission and outcome variables (McGaghie, 1993) its usefulness for local decision making remains strong.

Researchers at the Universidad Nacional De Cuyo Medical Sciences School in Argentina (Binia, Ciccarelli, & Ortiz, 1997) have conducted another audit of medical student selection procedures. These investigators studied whether a policy change from unrestricted medical school admissions to selective admissions resulted in improved student academic performance. The outcomes of the policy change were fast and obvious. Medical students enrolled after selective admission outperformed unrestricted admission students by wide margins on final examinations in Normal Anatomy and Biochemistry and in advancement to second and third year courses. The authors conclude, "*These results clearly show that academic performance, as a group, improves significantly if admission involves a/n* [academic] *selection procedure*" (p. 637).

Medical schools in all nations can benefit from internal audits of the type described by the investigators in New Zealand and Argentina. The resources required to perform such audits are modest, while the benefits they may yield are significant.

SELECTION FOR MEDICAL EDUCATION: NATIONAL EXAMPLES

Appendix B gives eight national examples of medical student selection policies and procedures. The nations represented are Australia, Brazil, Egypt, Germany, Israel, Malaysia, Pakistan, and the United States of America. These countries were chosen to include a broad spectrum of worldwide regions and cultures and also due to the availability of reliable information about medical student selection.

Variation in selection methods is the hallmark of these national examples. While nearly every nation and their constituent medical schools rely on such academic criteria as secondary school or college grades and test scores on a standardized examination of medical aptitude (e.g., German TMS, American and Canadian MCAT), there are many differences in their selection practices. For example,

Pakistan gives explicit attention to geographic criteria (e.g., place of birth or residence), whereas Malaysia seeks broad ethnic representation in its medical student selection policies. Each of these countries, and many other countries not listed, shapes its approach to medical student selection to fulfil national educational goals and goals of public service. Systematic audits of these and other procedures will inform national leaders if the medical student selection practices are working as planned.

Readers are encouraged to use primary sources such as *Admission to medical schools in Europe* (Ebach & Trost, 1997), the *International handbook of medical education* (Sajid, McGuire, Veach, Aziz, & Gunzburger, 1994), and the *World directory of medical schools*, 7th edition (World Health Organization, 2000), to determine if medical student selection practices used in different world regions may be applicable to their situation.

RESEARCH ON STUDENT SELECTION

A primary limitation of this chapter is the lack of information and published research about medical student selection worldwide. For example, to my knowledge no prospective, controlled studies of variations in medical student selection policies have ever been attempted, much less completed. Social, political and financial constraints are simply too powerful to permit such educational experimentation. Instead, research on medical student selection is usually passive and predictive, looking at correlations among measures of student aptitude (e.g., school grades and aptitude examinations) and achievement (e.g., medical school examination scores, advancement in the curriculum, medical specialty choice) as students progress through school and into their careers. Many of these studies involve retrospective analyses of existing datasets where educational "interventions" are changes in medical school policies whose results can be studied systematically – before and after. The report from Argentina where a medical school policy changed from unrestricted to selective student admissions illustrates this approach (Binia, Ciccarelli, & Ortiz, 1997).

Selection research barriers

There are many reasons why it is difficult to conduct empirical research on medical student selection. Three reasons are especially noteworthy.

1. Research studies on student selection are obstructed due to the *politics* of choosing individuals for the high-profile medical profession. In addition, there is widespread reluctance among medical school officials to publicly reveal the specific policies that govern medical student selection.
2. Medical schools in developing countries simply *lack the research resources* and trained personnel to perform medical student selection studies. Maintenance of

existing educational programs consumes resources that might otherwise be used for educational scholarship.

3. Research on medical student selection in particular, and medical education in general, has *low priority* in academic medical centers (Ludmerer, 1985), especially in the Western World. Given constraints of time, money, and faculty resources research on medical education is judged less important than research addressing basic bioscience, clinical practice, or delivery of health services.

Selection research agenda

There is a compelling agenda for research on medical student selection, despite the existing barriers. The selection research agenda includes, but is not limited to, at least seven items.

1. The *academic readiness* of prospective students who seek medical education should be evaluated using a wide variety of measurement tools. Multiple-choice tests of factual knowledge must be supplemented with reliable measures that gauge academic abilities to solve scientific problems, recognize social and cultural dilemmas, and weigh ethical issues. Development of these academic measures requires a major scholarly effort.
2. Better measurement of *personal qualities and character attributes* needs increased research attention. Reliable, quantitative measures of such qualitative traits as empathy, honesty, reliability and "*cultural competence*" (Carrillo, Green, & Betancourt, 1999; Culhane-Pera, Reif, Egli, Baker, & Kassekert, 1997; Loudon, Anderson, Gill, & Greenfield, 1999) would improve student selection and research by replacing unreliable interview impressions that are made about these personal features. Reliable measures of personal qualities and character attributes will complement academic measures of candidate readiness for medical education.
3. The persistent *criterion problem* frequently prevents productive research on medical student selection. This is the difficulty in conceptualizing and reliably measuring important medical education *outcome* variables. Most selection research in medical education uses academic admission variables (e.g., grades, test scores) to forecast academic outcome variables (e.g., grades, test scores). Future research will be improved by using better measures of outcome criteria (e.g., clinical competence, cultural competence, lifelong learning) to more accurately represent how doctors perform professionally.
4. Student selection research is frequently hindered by the psychometric problem of *range restriction* on measured variables. Students who are admitted to medical school typically represent a very narrow range of talent – at the high end – on measures used for selection. Thus there is little variation on input academic variables which is needed to achieve high correlations with outcome measures like course or licensure examinations. This is the major reason why prediction studies in medicine and other learned professions yield equivocal

results (Klitgaard, 1986). The use of selection measures that produce a wider range of values will advance medical student selection research.

5. Research on medical student selection is rarely informed by research on *other professions* (McGaghie, 1993). This parochial focus is unfortunate given the informative research now underway about such learned professions as the international astronaut corps (Santy, 1994), the military (Ressler, Armstrong, & Forsythe, 1999), and the Christian clergy (Hunt, Hinkle, & Maloney, 1990).
6. Computer technology now makes it possible to establish statistical links between medical student selection measures and measures of short-run and long-run medical professional practice. *Longitudinal research* that connects these proximal and distal features of medical competence is both needed and useful (Gonnella, Hojat, Erdmann, & Veloski, 1993).
7. *Cross-cultural* research is needed to better understand the shared and unique goals, values, and procedures endorsed by different nations and peoples in their decisions about selecting future doctors. Selection formulae are not identical worldwide. Deeper understanding of the cultural foundations of approaches to medical student selection will enrich decision-making and acknowledge diversity.

Research on medical student selection will be advanced as these and other persistent problems are addressed and resolved.

PRACTICAL RECOMMENDATIONS

The research agenda cannot ignore the practical decisions that admission committees must make about those who are selected for medical education (and practice) and those who are rejected. These selection decisions are made at least annually at medical schools across the world. How can these important decisions be reached from the best available evidence? I have six suggestions.

1. Persons responsible for medical student selection at individual medical schools should become *educated about the issues, problems, and prospects of the enterprise.* Seniority and local status are not proxies for expertise. Study and reflection about ideas presented in this chapter, and in many other sources, are needed for informed selection of future generations of doctors, worldwide.
2. Selection decisions about candidates for medical education should be based on (a) *reliable data*, that (b) measure key selection *criteria*, which (c) express *local selection policy preferences.* Decision-makers should avoid judgements based on unreliable subjective impressions.
3. Medical student selection programs should be managed with a *spirit of experimentation*, not certainty. Such a spirit will acknowledge short-run imperfection in selection practices and seek constant improvement.
4. Local student selection problems require local solutions. Answers to student selection problems in Brazil or The Ukraine may or may not be useful in Senegal, Syria, or Sri Lanka. Local medical student selection policies may be

informed by policies used in other countries, but should not be *driven* by those policies.

5. It follows that medical student selection in individual schools and countries should be done recognizing the *social, political, and economic context* of the decisions. Decisions about future members of the medical profession are not made in isolation. These high stakes judgements have lasting consequences whose short- and long-run outcomes should be known.
6. Medical student selection should be done in recognition of its *evolutionary character.* Practices are modified over time in light of research data, practical experience, and changing values. Useful policies and practices in 2001 are very different from those of 1950. The way medical students are selected 50 years or 100 years in the future is unlikely to resemble today's methods. We should anticipate and value this change as a natural result of advancements in educational science and scholarship.

CODA: THE "CONVERGENCE HYPOTHESIS"

Intellectual capital worldwide is becoming increasingly homogeneous due to contemporary technologies, especially information technology (Satava & Jones, 1999). This is particularly the case among elite social and professional groups like physicians where the technical features of competent practice are becoming uniform. The term "convergence hypothesis" has been used to describe this situation. Is there a danger that increased technical standardization across the earth will erode the ethnic, cultural, national, and regional differences that are currently prevalent? Will a single, influential language of instruction such as English become a requirement for medical student selection and professional practice given its dominance in textbooks, scientific publications, and Internet transactions?

Western influences, including the widespread use of English for teaching and learning, increased adoption of norm-referenced testing technology, the gradual dissolution of gender differences in the medical communities of such traditional countries as Saudi Arabia (Gallagher, 1985, 1989, 1993, 1995), Pakistan (Zaidi, 1986, 1987), and Malaysia (Razali, 1996) and the slow reduction of traditional social class (caste) differences in such nations as India (Lloyd, 1999; Narula, 1999) are tangible signs that world-wide intellectual and technical convergence has social and cultural sequelae. Chief among the sequelae are reductions in cultural diversity, especially among highly educated professional groups such as physicians.

There is, however, a price to pay for increased intellectual and technical convergence around the world. The price is expressed as tension and conflict from attempts to preserve national and regional linguistic orders (Fishman, 1998-99) and other symbols of national and ethnic identity. Medical student selection is one of many professional and educational activities that contribute to worldwide convergence. Attention to and respect for local and regional prerogatives during student selection and other endeavors should be preserved.

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APPENDIX A. MEDICAL STUDENT SELECTION CRITERIA

Criterion	Measures / Classification	Strengths & Benefits	Potential Problems
1. Educational History or Background	1a. Extent of prior schooling	1a&b. Assurance of prior *academic* preparation.	1a&b. Narrow, bookish definition of readiness for medical education.
	1b. Quality of prior schooling (Astin, 1993).		1&2. Maintenance of social and professional hierarchy if academic criteria are used alone or given greatest weight in medical school admission (Brieger, 1993; Gallagher, 1985, 1995; Linn, 1985; Lloyd, 1999; Maxwell, 1975, 1987).
2. Scholastic Aptitude or Achievement	2a. School grades.		
	2b. Objective measure of medical school aptitude (e.g. U.S. and Canadian *Medical College Admission Test* [MCAT, Mitchell, 1990]; German *Test of Medical Science* [TMS, Trost, 1989]; *Swedish Scholastic Aptitude Test* [SSAT, Wedman, 1994]; Australian *Graduate Australian Medical School Admissions Test* [GAMSAT, Aldous et al., 1997]; Finnish *Learning from Text* [LFT] Test [Lindblom-Ylänne, Lonka, & Leskinen, 1996]: Israeli *Psychometric Entrance Test* [PET, Beller, 1994]).	2a&b. Competitive (norm-referenced) academic verification of readiness for medical education.	

Criterion	Measures / Classification	Strengths & Benefits	Potential Problems
3. Ethnicity[a]	3a. Racial groups in the U.S. [historically] (Brieger, 1993; Council on Graduate Medical Education, 1998; Jarcho, 1959) and the U.K. [currently] (Esmail, Nelson, & Everington, 1996; Esmail, Nelson, Primarolo, & Toma, 1995; McManus, Richards, & Maitlis, 1989; Vellins, 1982).	3a&b. Maintenance of ethnic *status quo* in medical school admissions, depending on national or school policies or quotas.	3. How to establish policies and procedures for underserved groups that either (a) provide equal access to medical education, or (b) compensate for historical ethnic discrimination (Davidson & Lewis, 1997)? Should preferential treatment be given to underserved groups (Bowen & Bok, 1998; Sandel, 1996)?
	3b. Caste/class preferences, India (Lloyd, 1999; Narula, 1999); Malaysia (Linn, 1985; Razali, 1996); and Pakistan (Zaidi, 1987, 1986).		
4. Religious Convictions[b], e.g., preference for Seventh-day Adventist Christians at a U.S. medical school (Loma Linda University, 1998)	4a. Admission application forms, schools of origin, testimonial letters and endorsements.	4. Religion can be a preference in selecting students whose beliefs conform with school philosophy.	4. In secular schools,discrimination is possible if religion is used to *exclude* potential students.
5. Personal Qualities, e.g., honesty, character, integrity; drive/hard work; intellectual currency; maturity; sobriety; keeps confidences; service orientation.	5a. Letters of recommendation.	5. Indicates that *nonacademic* criteria are assumed to contribute to success in medical school and in professional life.	5. How to measure personal qualities reliably and use the data systematically for selection decisions? Interviews and letters of recommendation are highly susceptible to bias.
	5b. Interviews (Bok, 1984; Tutton, (1994).		
6. Life History and Experience	6a. Military service (Antonovsky, 1987).	6. Broad-based experience in local and foreign cultures is assumed to contribute to success in medical school and professional life.	6. Similar to no. 5 (above) how to measure life history and experience reliably and use the data system-atically for selection decisions?
	6b. Work experience, e.g., Emergency Medical Technician (EMT), laboratory assistant		

Criterion	Measures / Classification	Strengths & Benefits	Potential Problems
	6c. Multilingual.		
	6d. Public Service.		
	6e. Travel.		
7. Skills, e.g., motor skills, teamwork, "cultural competence" (Loudon, Anderson, Gill, & Greenfield, 1999; Smith & Hayling, 1998), English Proficiency (Fishman, 1998–99; Heyneman, 1988).	7a. Practical skills examination, multicultural life experience, Test of English as a Foreign Language (TOEFL).	7. Manual dexterity, "cultural competence," and language proficiency are valuable professional skills.	7. Which skills should be considered and measured for medical student selection? Who decides about skills criteria and their measurement?
8. Personal Interests.	8a. Fine arts: music, theater, art, literature, dance.	8a&b. Added benefits for candidates who meet or surpass minimum educational, academic, and ethnic standards. Medical profession seeks broad-based, well-rounded individuals (McGaghie, 1987).	8. Which interests should be considered and measured for medical student selection? Who controls these decisions?
	8b. Athletics: sports, physical activities, outdoor pursuits.		
9. Geographic Origins, e.g., proportional urban and rural balance sought by the University of Illinois in the U.S. (University of Illinois, 1997) and nationwide in Pakistan (Jafarey, 1994).	9. Verified admission application forms.	9. Acknowledges value of geographic diversity and balance among state or national districts.	9. What formula should be used to select medical students on geographic grounds?

APPENDIX B: NATIONAL EXAMPLES OF MEDICAL STUDENT SELECTION

	General Description	Criteria / Measures	Selectivity	Graduation / Attrition Rate	Comment
Australia (Bandaranayake & Godwin, 1994; Buckley, Marley, Robinson, & Turnbull, 1998; Powis & Rolfe, 1998).	Admissions are governed by individual medical schools via a faculty selection or admissions committee. "Australia's [11] medical schools offer a six-year (Adelaide, Monash, New South Wales, Tasmania, Western Australia, James Cook) a five-year (Newcastle) undergraduate course or a four-year graduate course (Flinders, Queensland, Sydney). The University of Melbourne will be introducing dual school-leaver [postsecondary] and graduate [postbaccalaureate] streams from 2000. The programme for graduates will be 4½ years; school leavers will graduate in medicine after 6 years with an additional BMedSc" (Buckley et al., 1998, p. 1569).	Not identical across the ten medical schools. "All three graduate-entry courses select students by a ranking process based on a combination of the candidate's prior degree, performances in the GAMSAT, and a structured interview. The first degree can be from many disciplines. The undergraduate schools (except for New South Wales and Tasmania) select through a process which variously includes a threshold matriculation score, a medical admissions test, and a structured interview or oral assessment" (Buckley et al., 1998, p. 1570). One school (Newcastle) uses a broad range of academic and nonacademic selection criteria (Powis & Rolfe, 1998).	Generally, undergraduate medical schools have admitted the top 1% to 2% of examination performers. In recent years selection criteria have broadened. For example, Newcastle & Adelaide selects from the top 10% of examination performers, supplemented by other test and structured interview data.	Normally, 90% of selected students complete studies and receive medical degrees. Thus, attrition is approximately 10%.	Females account for 40-50% of medical students. Children of professional and managerial families are overrepresented in medical school classes. Various Australian ethnic groups are reflected in medical school classes and graduates. Recent changes in selection procedures are in part aimed at broadening the social, ethnic and rural/urban mix.

	General Description	Criteria / Measures	Selectivity	Graduation / Attrition Rate	Comment
Brazil (Ribeiro & Santini, 1994; Ossavo, 1999).	Each medical school defines its own admission criteria, measures, and standards. As of 1994, Brazil had 80 medical schools: 45 public, 35 private.	University entrance examinations for students who have completed secondary education.	Journalists express concern that "new [nonregulated] medical schools produce poorly trained graduates" (Osava, 20 October 1999).	No published information is available	Low income groups are poorly represented in medical school classes because student selection via university examinations favors upper income groups. Ethnic mix of schools is not reported.
Egypt (Hidayet, 1994).	Medical school admission is based on the number of students suggested by individual schools in consultation with the Ministry of Health. Final decisions are made by the National Supreme Council of the Egyptian Universities.	Secondary school grades and secondary school certification examination scores (esp. science section) are the only selection criteria. Candidates with the highest grades and test scores usually choose to study medicine. Geographic location affects student *distribution* among medical schools.	Estimates are that there are three candidates for every medical school seat. Competition among students for the places is fierce.	Approximately 85% of admitted students complete the program and receive a medical degree. Attrition is approximately 15%.	Admission to higher education (including medicine) is made without regard to a specific profession or program of study.

	General Description	Criteria / Measures	Selectivity	Graduation / Attrition Rate	Comment
Germany (Van Den Bussche, 1994; Pabst, 1995; Ebach & Trost, 1997).	Applicants are admitted to medical school by a national bureau for selection of university applicants for competitive disciplines, including medicine. The number of places is fixed by regional governments, bound by judicial considerations.	At each medical school places are awarded in 5 categories using different criteria. 1. Weighted combination of secondary school grades (55% of weight) and *Test for Medical Studies* (TMS) total score (45% of weight) [45% of places are filled by this quota]. 2. Total TMS score alone [10% of places by this quota]. 3. Secondary school grades and time spent on a waiting list [20% of places by this quota]. 4. Interview conducted by two faculty members involving a randomly selected pool of applicants not selected by other means [15% of places by this quota]. 5. "Special cases", e.g., foreigners, stateless applicants, hardship cases [10% of places by this quota].	The ratio of applicants to available places is approximately 2.5:1. Rejected candidates may apply again for admission.	Approximately 96% of admitted applicants complete the program and receive a medical degree. Attrition is about 4%.	Student selection is not affected by projected workforce need or educational standards.

	General Description	Criteria / Measures	Selectivity	Graduation / Attrition Rate	Comment
Israel Antonovsky, 1987; Beller, 1994; Prywes & Mirvis, 1994)	Students are admitted after completing secondary school and after completing compulsory military service. The number of students admitted annually is determined nationally by a Council on Higher Education.	Admission criteria vary slightly across medical schools. They generally include scores on secondary school matriculation examinations, standardized university entrance examinations, and general academic performance. One medical school, Ben-Gurion, emphasizes personal qualities assessed by interview. All schools require high-level English proficiency.	Admission to medical school is highly competitive. The ratio of applicants to available places is approximately 3.9:1.	"Virtually all students who enter complete the curriculum and graduate". Thus student attrition is essentially zero.	Many Israeli physicians were educated in other countries and either immigrated to the nation or returned to their homeland after training abroad.
Malaysia (Razali, 1996; Shahabudin, 1994)	"The national policy for student admission to university reflects the political climate and the social aspiration of [Malaysian] national integration." Admission to universities is managed by the university Processing Unit, an agency of the Ministry of Education.	Student admission is based on ethnic representation in Malaysian society. Academic criteria are used to select students sometimes accompanied by an interview. Selection decisions are made by the medical school named as the candidate's first choice.	No published information is available.	The overall attrition rate is approximately 20%, thus about 80% of selected students complete the program and receive a medical degree.	All three medical schools conduct two year matriculation programs for premedical students to insure equal access and preparation to all citizens. Women account for 50% to 65% of selected medical students.

	General Description	Criteria / Measures	Selectivity	Graduation / Attrition Rate	Comment
Pakistan (Jafarey, 1994; Zaidi, 1986).	Students are admitted to medical school after completing secondary education and obtaining the Higher Secondary Certificate (HSC). In 16 of 19 colleges under administrative control of the provincial governments, the major criterion for admission is the applicant's place of birth or residence. Only residents of that particular province are eligible for admission.	In government managed medical schools, criteria are place of birth or residence and HSC scores. These are termed "Merit" seats. Most medical schools also have reserved seats for foreigners, children of physicians, children of defense personnel, and other special interest groups. Two private medical schools and a military school use similar academic (not geographic) criteria with an interview.	No published information is available.	No published information is available.	The distribution of men and women in medical schools is approximately equal. Provincial and district-in-province quotas often produce distorted results. Applicants with high HSC scores in some provinces may not be selected while applicants with lower scores from other districts may be selected.

	General Description	Criteria / Measures	Selectivity	Graduation / Attrition Rate	Comment
United States of America (Barzansky, Jonas, & Etzel, 1999; Jones & Anderson, 1994).	Admission to American medical schools occurs *after* candidates have earned a baccalaureate college degree. Thus, entering American medical students are usually older (approx. 21-24) than medical students elsewhere in the world. Student selection is usually done by faculty committees with involvement by community leaders.	Faculty use broad-based criteria to select medical students. They include scores on the *Medical College Admission Test* (MCAT) (biological sciences, physical sciences, verbal reasoning, writing sample); undergraduate college grades; and personal qualities assessed by interview. Medical schools with religious affiliations give preference to candidates who endorse their views. Three schools educate mostly minority (African-American) medical students.	Admission to American medical schools is selective. The ratio of applicants to available places is approximately 2.8:1. About 16,000 medical students are admitted each year.	Almost all selected medical students complete the curriculum and earn a medical degree. Attrition for all causes is about 1.4%.	American medical schools are committed to increasing the number of underrepresented minorities in the medical profession despite political pressures to maintain the *status quo.* Women now account for 40% to 50% of each entering class, nationally.