

World medical schools: The sum also rises

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Abstract

Objective: There is a worldwide shortage of doctors, which is true in most countries and on most continents. To enumerate the number of medical schools in the world at two different times, showing the trends and relating this to population is a beginning. The number is actually going up and has done so for some time; this has increased the supply of physicians and broadened healthcare delivery.

Design: The number to count for geographic and regional information about the medical schools relates directly to the supply of doctors. Regions were chosen from WHO and Foundation for the Advancement of International Medical Education and Research data to illustrate geographic distributions, physicians per patient and kinetics.

Setting: The number of medical schools has consistently been rising around the world. However, world order is reverting to disorder, considering wars, disease and beleaguered stand-offs.

Participants: None.

Main outcome measures: Eight countries contain 40% of medical schools; however, several locations are rising faster than the rest. Some regions are stable, but sub-Saharan Africa, the Caribbean, South Asia and South America have increased the most in percentage recently, but not uniformly.

Results: Medical schools are related not only by geography, political boundaries and population but are concentrated in some regions. Graduate Medical Education positions appear to be short on a worldwide basis, as well as in some regions and countries.

Conclusions: The number of medical schools is increasing worldwide and the identification of rapidly rising geographic areas is useful in exploring, planning and comparing regions. Controversy continues in a variety of locations, especially concerning Graduate Medical Education. In addition to funding, faculty candidates and accreditation, new schools are confronting a variety of choices in standards and quality, sizing and regional concerns.

Keywords

Medical schools, Graduate Medical Education, growth

and small – not prevented by treaty, agreements or adherence to peace – disrupt order and lead to disease, death, casualties and refugees. Countries at war soon confront the need for more physicians, all healthcare workers and institutions, supplies and resources.

An overview of the world's medical schools by John Boulet et al.² describes some quantitative data (from International Medical Education Directory) indicating a broad based and consistently rising number of medical schools in the world. The World Health Order is at least in some respects improving even though the world order is disrupted. The supply of doctors in the physician pipeline is not enough at any time; the shortage is made worse by wars, confrontation or by rogue nations. The population of the world is inexorably rising and varies considerably by regions, putting more pressure on the supply and mobility of physicians.

More and better trained healthcare workers need to be produced in practically every country in the world. The record recently showed an increasing number of medical schools, more medical students and more medical graduates. These gains are very different among the continents, regions and countries of the world.³ Therefore, we attempt to provide some numerical data to begin to characterise the recent trends to start and/or expand medical schools in some places in the world. The new (and some older) medical schools will have to provide more resources to navigate in a world not in order, particularly concerning cost, accreditation, quality, legal, sizing, continuity, etc. This paper, a short overview to illustrate medical school numbers and locations, is not a compendium of medical schools but charts some trends in regions of the world already under way. Data on GME are not found easily in a comprehensive study but appear short. Not addressed here are such important considerations as medical student selection, quality and standards regarding teaching and practice.

The largest problem in most regions once expansion is planned and implemented would appear to be creating and funding Graduate Medical Education and Post-Graduate Medical Education opportunities following medical school: quantity, availability, mobility,

Introduction

The present sad state of world order as historically lamented by Henry Kissinger¹ in his new book, touches on Medicine and Health. The wars large

Table 1. Gain in medical schools across regions and population per medical school.

	Number of medical schools in 2000	Number of medical schools in 2014	Gain in medical school between 2000 and 2014	Population per medical school (2000)	Population per medical school (2014)
United States	141	170	29	2,001,152	1,859,581
Caribbean region	35	68	33	981,942	565,279
North America	75	89	14	1,805,433	1,795,833
South America	175	337	162	1,984,766	1,203,821
Central America	20	34	14	1,786,122	1,325,149
Sub-Saharan Africa	67	127	60	8,907,866	6,732,361
Other African countries	32	49	17	5,522,479	4,378,729
East Asia	382	420	38	5,210,021	5,208,087
South Asia	184	441	257	7,511,933	3,788,681
Oceania/Pacific region	15	31	16	2,194,557	1,296,057
Central Asia and Eastern Europe	186	259	73	2,271,398	1,702,160
Europe	230	257	27	1,660,440	1,577,826
Middle East region	82	142	60	2,332,078	1,744,681

Medical school data source: World Health Organization (2000), World Directory of Medical Schools (7th ed.). Geneva; Foundation for Advancement of International Medical Education and Research (2014) International Medical Education Directory, <https://imed.faimer.org/> (accessed 12 November 2014).

Census Population Data Source: World Data Bank (2000–2013) Population estimates, <http://data.worldbank.org/> (accessed 12 November 2014).

quality and variety.^{3,4} The United States so far spends more on medical education, but this is still controversial on Graduate Medical Education with some limitations and shortages.^{4,5} The data in some areas are sparse or deficient. Much more needs to be done to appreciate a broader and deeper understanding of the complexities of medicine and health regionally.

The information on new schools and Graduate Medical Education is difficult to gather, continuously changing, incomplete and with uncertainties. The descriptions, however, from the WHO,³ show proportions, relative size and relationships regarding geography, population, expansion and correlations to other medical information. Some generalisations are included.

Materials and methods

Geographic region, country and medical school data are derived mainly from the International Medical Education Directory within the Foundation for Advancement of International Medical Education and Research, Philadelphia,

USA, Foundation for the Advancement of International Medical Education and Research and the seventh edition of WHO's World Directory of medical schools. Population estimation data for the countries were obtained from The World Bank's Population Estimates and Projections database. The main data sources for The World Bank's population estimates are from United Nations' World Population Prospects, census reports, data from International Classification of Functioning Disability and Health international, UNICEF, US CDC, Eurostat and other national and international agencies. The population estimate used here in this study is the mid-year population of that country.

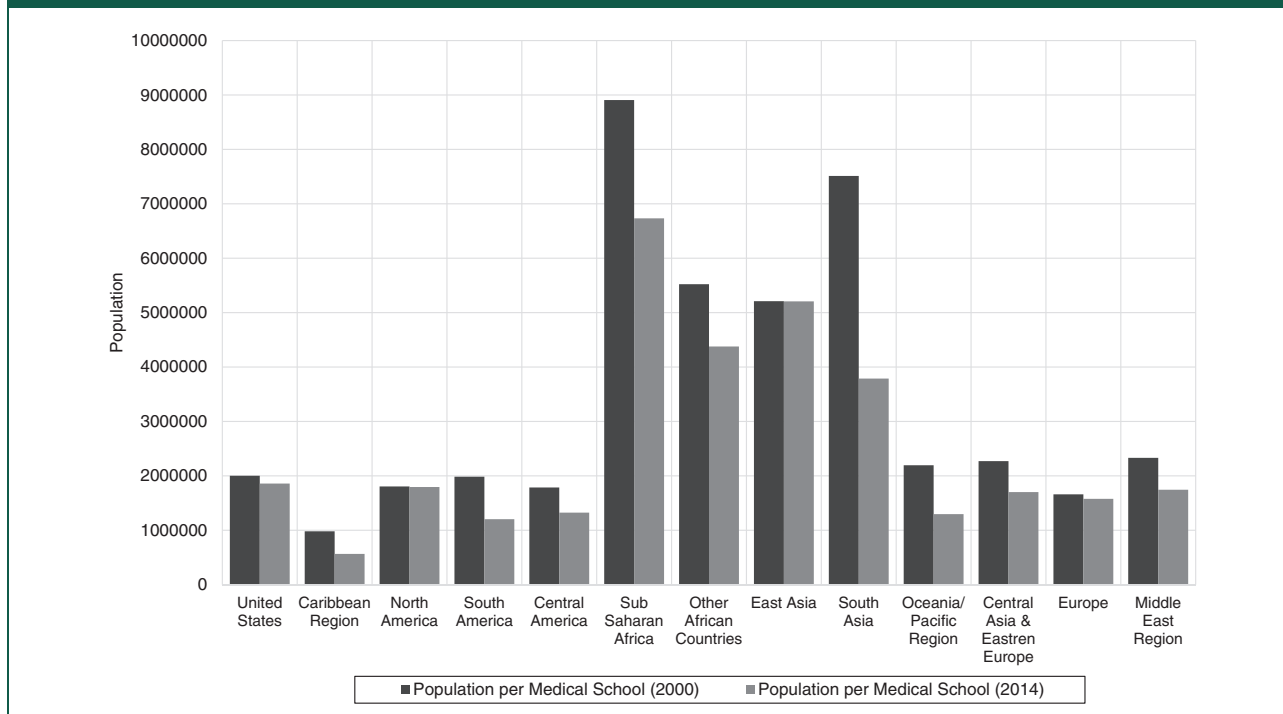
The recent book on world order, written by Henry Kissinger, with history brought up to date, implies subsets, such as a World Health Order. A starting place to consider healthcare needs, demand and supply up to date health history to enumerate the establishment of recent medical schools.

So we count them by region to find the current largest increases and provide some additional

Figure 1. Population per medical school across regions; comparison between 2000 and 2014.

Note: Medical school data source: World Health Organization (2000), World Directory of Medical Schools (7th ed.), Geneva; Foundation for Advancement of International Medical Education and Research (2014) International Medical Education Directory, <https://imed.faimer.org/> (accessed 12 November 2014).

Census Population Data Source: World Data Bank (2000–2013) Population estimates, <http://data.worldbank.org/> (accessed 12 November 2014).



numerical data as to number and trends. Numbers may be rounded. Allopathic and Osteopath medical schools are counted in the US.

Results

The largest, most populated regions and countries have, as expected, many medical schools (Table 1). India, US, China, Brazil, Japan, Mexico, Pakistan and Russia – eight countries have over 40% of the total (Figure 1), this is about 2409 recognised and operating medical schools in over 180 countries (Figure 2). The fastest growth since 2000 appears to be in sub-Saharan Africa and the Caribbean³ (Tables 2 and 3), South Asia and South America. Geographically, the Asian continent which has about 40% of the total is the largest continent in population as well as land mass.

The regions in Table 1 are chosen to include six continents with subdivisions to separate five of them into regions. The total schools in 2000 compared to 2014 give the change in number higher in every region. The largest countries are depicted in number of schools compared to the total general population.

Wide variations reflect a larger population per physician in some areas.

The number of medical schools is also a regional matter, with continuous variations in the steady state. Most regions are relatively stable with a small trend upward, but several stand out with recent accelerated growth.^{4,5} The largest regions are depicted in the number of schools compared to the total general population (Figure 2).

A detailed study of medical schools in sub-Saharan Africa was published in the *Lancet*^{6,7} (Table 2). Table 2 compares certain data from this paper with the US, showing some similarities in size, i.e. number of schools and first year enrollees, but otherwise marked differences. The proportionate growth in these numbers is leading other regions and does not include the rest of Africa. A discussion of findings includes methods of the study, effect on the countries' health provision, faculty, weakness in infrastructure, coordination between ministries, accreditation, research, curriculum innovations, significance of Graduate Medical Education, quality of secondary schools, private school number and international partnerships. Ten recommendations are provided.⁶

Figure 2. Number of medical schools vs. total general population by country: 2014.

Note: Medical school data source: World Health Organization (2000) World Directory of Medical Schools (7th ed.), Geneva; Foundation for Advancement of International Medical Education and Research (2014) International Medical Education Directory, <https://imed.faimer.org/> (accessed 12 November 2014).
 Census Population Data Source: World Data Bank (2000–2013) Population estimates, <http://data.worldbank.org/> (accessed 12 November 2014).

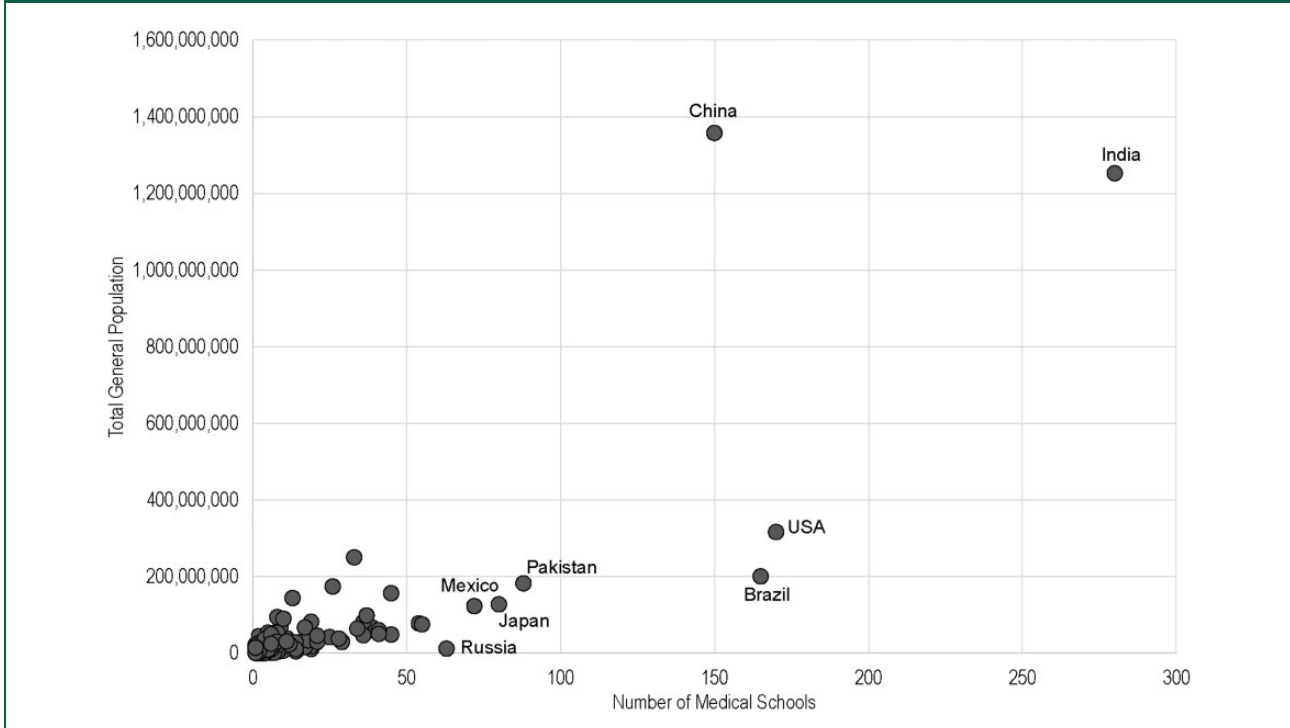


Table 2. Sub-Sahara African medical schools: Compared to United States medical schools.

Medical school	SSA	USA
Number of medical schools	168	171
Number of physicians	145,000	970,000
Population	821 m	308 m
#/100,000	18/100,000	308/100,000
New 1961–1979	29	40
1980–2000	31	
2000–2015	33	
First year enrolled	18,349	18,886
Per year grads	10–11,000	19–21,000
Private MS/total	43/168	50+/171

See Mullan et al.,⁶ p.1115.

The new medical schools in the Caribbean are quite different, recently increasing in numbers, with almost equal growth between 1960 to 1980 and 1980 to 2015 (see Table 3). In the area (in 2011), there is almost an equal number of regional (29) and offshore (31). Most offshore schools in the Caribbean are private, charge high tuition fees, students take junior and senior years elsewhere and they are a for-profit investment. All recognised medical schools are listed in the Foundation for the Advancement of International Medical Education and Research’s International Medical Education Dictionary and/or the Avicenna Dictionary for Medicine. Several different agencies or other institutions may accredit these schools.

These two regions are increasing in medical school numbers and are among the most rapid growth regions in the world. South Asia is now leading in both total number and rapid growth. Much more data are needed to compare and contrast by region or by individual schools. Agencies, such as WHO, are collecting and compiling these facts, and it remains to assess and publish information about the new medical schools and their effect on the World Health Order.

Table 3. Caribbean medical schools.

Location	All	Established	Established
	List	1960–1979	After 1980
Anguilla	1		1
Antigua and Barbuda	2	1	1
Aruba	2	2	
Barbados	2	1	1
Bonaire	3	1	1
Cayman Islands	1	1	
Cuba	14	13	1
Curacao	3	3	
Dominica	2	1	1
Dominican Republic	10	9	
Grenada	1	1	
Guyana	2	1	1
Haiti	4	1	2
Jamaica	2	1	
Montserrat	1	1	
Saba	1	1	0
Saint Kitts and Nevis	4	2	2
Saint Lucia	6	1	5
Saint Vincent and The Grenadines	3	3	
Saint Maarten	2	2	
Trinidad and Tobago	1	—	—
	67	35 ^a	27

^aSome numbers for a time comparison of founding date will construct the beginning of a picture of individual medical schools. Some schools were established before 1960.

Discussion

The number of medical schools is increasing in the world but much more so in some regions and/or countries than others. The largest countries gain slowly, a smaller percentage increase due to a large denominator. The growth includes more medical students and graduates, as well as institutions.

Many new ones are private as compared with public/government, reflecting recognition of the size of the problem and opportunities available. The US has created an initiative spearheaded by the American Association of Medical Colleges to expand.⁶ So far the number of new schools, both Allopathic and Osteopathic, is about 11 up to a total of 171. The goal is to increase US graduates eventually by 30%, including these schools which have enlarged.⁸

The data are less clear on Graduate Medical Education, also referred to as Post-Graduate Medical Education. The quantitative availability of education after medical school, as well as the quality, is presently insufficient to meet the rising numbers and needs of graduates. The number of graduates is rising in many countries and regions, and a high proportion of graduates move around to other places near and far to continue their education. Graduate Medical Education is supported in the US for the present 115,000 participants predominately from Medicare and Medicaid but it is capped.^{8,9} Migration also occurs from practice to practice based more on individual opportunity and preferences than strictly on perceived need.

Many regions across the world face the dilemma of a shortage of Graduate Medical Education slots, as well as insufficient funds and faculty. More practicing physicians will be produced given the present trends, but the continued rise in population in regions and countries, and the increase in average lifespan, will add more to the needed number (and location) of individual physicians.

When more and better information is available, trends and proportionate change will help predict the kinetics and direction of efforts to provide more healthcare services to a growing population. The cost and difficulties of Graduate Medical Education provision may change educational parameters, timing and expectations in regions and in different countries.^{8,10} Information for regional planning would be useful for looking at presently expanding areas or others contemplating more medical schools.⁹

The rising number of medical schools in the world is but one measure of the overall World Health Order. This rise is illustrated in the increase in recent years in sub-Saharan Africa, the Caribbean, South Asia and South America as well as the US. A comparison of these very different regions shows, in some, a similar trend in the number of medical schools and first year enrollees. Many discrepancies reflect the individual circumstances and the variety of schools.

Among the many problems in all regions yet to be solved are provisions for sufficient Graduate Medical Education with all of its requirements, the preparation and acquisition of faculty, as well as resources

including funds from recurring sources and in sufficient amounts.¹⁰ The attention to the World Health Order, including rising medical school numbers even in a time of turbulence and struggle, is heartening. Much more needs to be done in the realm of data, study, support and action to improve the quality as well as quantity.

Declarations

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