Medical specialists in Mexico

Gerhard Heinze-Martin, Víctor Hugo Olmedo-Canchola, Germán Bazán-Miranda, Napoléon Andrés Bernard-Fuentes and Diana Patricia Guízar-Sánchez

Universidad Nacional Autónoma de México, Division of Postgraduate Studies, Faculty of Medicine, Ciudad de México, Mexico

Abstract

Introduction: There are no recent data in Mexico about the state of medical specialists that allow the design of policies for training and use of human resources for health. **Objective:** To analyze the current state of medical specialists in Mexico: number, distribution (geographical, by gender and specialty), certification validity (by gender and specialty) and the rate of specialists per 100 000 population. **Method:** Cross-sectional, descriptive study. Multiple sources available in Mexico were consulted: councils, associations, schools, hospital institutions, universities, and others. **Results:** A total of 147,910 specialists were counted for a total population of 123,518,272 inhabitants; 69 % had current specialty certification. A rate of 119 specialists per 100 000 population was obtained; 54.2 % are in Mexico City and in the States of Mexico, Jalisco and Nuevo León. On average, there are 1.7 male specialists per female specialist. **Conclusions:** The number of specialists is lower than that internationally recommended and insufficient to cover the health needs of the country. Gender distribution is shifting towards a more equitable one. Specialists are mainly grouped in urban areas. This is the first census of specialists based on total verifiable number of physicians, which will allow the design of policies for human resources planning in health.

KEY WORDS: Medical specialists. Human resources in health. Certified specialists. Mexico.

Introduction

World Health Organization (WHO) 2015 statistics refer that there are 139 physicians per 100 000 population in the world.¹ In Latin America, the Pan American Health Organization (PAHO) suggests there are 176 physicians per 100 000 population.² In Mexico, according to the last census carried out in 2011 by the National Institute of Statistics, Geography and Informatics, there were 157 doctors per 100 000 population.³ The number of physicians per capita has increased from 160 per 100 000 in 2000 to 220 in 2014;⁴ however, it is still below the average of 320 in countries belonging to the Organization for Economic Cooperation and Development (OECD).⁴ In 2015, the OECD reported the existence of more medical specialists (MS) than primary care physicians (PCP) and family doctors (65 versus 35 %, respectively),⁴ a similar figure than that of other OECD countries, such as the

United Kingdom (MS = 71.4 % versus PCP = 28.6 %), but contrasting with those of Chile (MS = 51.8 % versus PCP = 48.2 %) and France (MS = 49.8 % versus PCP = 50.2 %).

The Inter-institutional Commission for the Training of Human Resources for Health (CIFRHS – *Comisión Interinstitucional para la Formación de Recursos Humanos para la Salud*), through the Post-degree Committee, is the coordinating agency of the National Exam for Medical Residence Aspirants (ENARM – *Examen Nacional para Aspirantes a las Residencias Médicas*). In 2016, 38 077 general physicians contested for the 7805 available posts to start specialization training.⁵ The National Health System has 81 specialty courses available,⁵ out of which 78 are offered by the National Autonomous University of Mexico (UNAM – *Universidad Nacional Autónoma de México*).⁶

According to Zurn et al.,⁷ in the Mexican health system there are 5 types of evident inequities:

Correspondence:

Diana Patricia Guízar-Sánchez

E-mail: guizar.diana@comunidad.unam.mx

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geographical, by gender, in the relationship of general physicians and specialists, in public and private care, as well as institutional and per departments.

To the extent covered by this review, there are no recent data in Mexico on MS current status whereby to design and promote new policies on training and use of human resources for health. There is only one study by Heinze et al.,⁸ where challenges are laid out on the number, distribution (geographic and gender-wise) and certification validity of a single medical specialty (psychiatry).

Objective

To know total number of medical specialists in Mexico, their distribution (geographical and by gender and specialty), the percentage with valid certification (by gender and specialty); to estimate the rate of specialists per 100 000 population (whether it is in accordance with health requirements) and to establish a comparison with international standards, and thereby indirectly assessing specialists' current status in Mexico.

Method

A descriptive, cross-sectional study was carried out by consulting the records of the General Directorate of Professions of the Ministry of Public Education, the records of the different councils belonging to the National Regulatory Committee of Medical Specialty Councils (CONACEM – *Comité Normativo Nacional de Consejos de Especialidades Médicas*), databases of the different colleges, societies or associations of each specialty, records of institutes and hospitals with posts to practice or study the different medical specialties (Mexican Institute of Social Security, Institute of Social Security and Services for State Workers, *Petróleos Mexicanos* and the Ministry of Health) and the directories of health insurance companies. These sources were taken into account because they are regarded as the most reliable for data obtainment; the response rate was higher than 90 %. The database was reviewed, corrected and validated. In addition to total number of medical specialists, their distribution by gender was obtained and the percentage of certified specialists was calculated.

With National Council of Population data,⁹ the rate of specialists per 100 000 population was determined, both in the country and by State. Those states where the number of specialists was below the average

Table 1. Medical specialists in 4 countries belonging to the Organization for Economic Cooperation and Development

Country	Population	Total specialists (n)	Specialists/100 000 population (n)
(n)	Total specialists	130 563	201
(n)	Specialists/100 000 population	120 107	181
(n)	123 518 272	147 910	119
Chile	18 121 818	19 934	110

Created based on available information: http://stats.oecd.org/Index.aspx?DataSetCode=HEALTH_REAC#

recommended by international organizations were determined.

This investigation was approved by the Committee of Research and Ethics of the UNAM Faculty of Medicine, with the results being presented according to the 78 specialties offered in this institution.

Results

In 2017, 147 910 medical specialists practiced their profession in Mexico (37.4 % of women and 62.6 % of men). Table 1 shows a comparison with other OECD countries.⁴ Gender ratio was 1.7 males per one female, and it varied depending on the specialty (Table 2). On average, 69 % had certification validated by the medical council of the respective specialty (73.5 % of females versus 64.5 % of males) at the moment of the study. Gynecologic urology (97.5 %) and reproductive biology (97.4 %) were the specialties with the highest number of MS with valid certification, while occupational medicine (20.2 %) and neuropathology (9.5 %) were the specialties with the lowest percentages (Table 3).

With regard to geographical distribution, 54.2 % of medical specialists were concentrated in Mexico City, State of Mexico, Jalisco and Nuevo León; the remaining 45.8 % of MS were found to be distributed in the other 28 States. Of the 32 federal entities of the Mexican Republic, Mexico City had the highest rate of medical specialists (505.7/100 000 population), followed by Nuevo León (185.3/100 000 population) and Jalisco (172/100 000 population) (Fig. 1). The lowest rates were shown by Chiapas (35.9/100 000 population), Guerrero (39.2/100 000 population) and Tlaxcala (51.7/100 000 population).

Table 4 shows the nation-wide estimated rate (per 100 000 population) of the 30 medical specialties with the highest number of professionals, where an important contrast was observed, with specialties such as

Table 2. Specialties with higher contrast in the male/female ratio

Specialties with higher number of males	M:F ratio	Specialties with higher number of females	M/F ratio
Urology	45:1	Pediatric dermatology	4:1
Neurosurgery	18:1	Audiology, otoneurology and speech therapy	3:1
Orthopedics and traumatology	14:1	Pediatric hematology	3:1
Adult oncological surgery	10:1	Pediatric endocrinology	2:1
Cardiothoracic surgery	10:1	Dermatology	2:1

State	Population (inhabitants)	Number of medical specialists	Rate
CDMX	8811266	44562	505.7
Nuevo León	5229492	9689	185.3
Jalisco	8110943	13950	172.0
Yucatán	2172839	2934	135.0
Querétaro	2063148	2449	118.7
San Luis Potosí	2801839	3191	113.9
Aguascalientes	1321453	1484	112.3
Baja California	3584605	3692	103.0
Sonora	3011810	2882	95.7
Durango	1799320	1718	95.5
Morelos	1965487	1865	94.9
Coahuila	3029740	2854	94.2
Sinaloa	3034942	2802	92.3
Colima	747801	684	91.5
Campeche	935047	854	91.3
BCS	809833	736	90.9
Nayarit	1268460	1152	90.8
Tamaulipas	3622605	3213	88.7
Chihuahua	3782018	3298	87.2
Puebla	6313789	5443	86.2
Guanajuato	5908845	4924	83.3
Tabasco	2431339	1941	79.8
Quintana Roo	1664667	1234	74.1
Hidalgo	2947206	2178	73.9
Michoacán	4658159	3269	70.2
Edo. Mex	17363387	11997	69.1
Veracruz	8163963	5295	64.9
Oaxaca	4061497	2602	64.1
Zacatecas	1600412	991	61.9
Tlaxcala	1313067	679	51.7
Guerrero	3607210	1414	39.2
Chiapas	5382083	1934	35.9

Figure 1. Distribución de ME por entidad federativa. Tasa por 100 000 habitantes.

neonatology, with 76.7 (MS/100 000 population), while others such as nephrology have less than one (MS/100 000 population).

Discussion

Currently, the demand for medical specialists is a subject of constant discussion and debate. Gaps corresponding to the distance between what is needed and what is offered are pointed out. The generation of human resources for health in adequate amounts and with appropriate characteristics is one of the basic functions of health systems. With the present work, the following challenges are identified:

- Number of MS not according to migration, population aging and chronic-degenerative diseases transition.
- Inequitable geographical distribution of specialists in the country.
- Specialties with less than 50 % of physicians with valid certification, even when since 2011 it is a requirement for the specialist license to be issued by the Ministry of Public Education (article 81 of the General Statute of Health)¹¹ and CONACEM establishes validity renewal every 5 years.

With regard to medical specialists' total number, it is necessary for the planning process for their training to be comprehensively reviewed.

As for general medical training, it should be pointed out that, in Mexico, more physicians graduate every year than the average of countries that belong to the OECD (12 versus 10 per 100 000 population, respectively).⁴ Mexico is one of the countries with higher number of medical schools:¹² according to the Education Official Validity Recognition¹³ of the Ministry of Public Education, currently there are 160 medical schools in the country, out of which only 70 are certified by the Mexican Council for Medical Education Certification

Table 3. Total hombres y mujeres especialistas con certificación vigente

Specialty	Male specialists (n)	Males with valid certification (%)	Female specialists (n)	Females with valid certification (%)	Total specialists (n)	Specialists with valid certification (%)
Allergy and immunology (adult and pediatric)	633	52.7	482	54.5	1115	53.6
Anatomic pathology	779	62.2	732	57.1	1511	59.7
Anesthesiology (adult, pediatric and neuroanesthesiology)	7889	43.9	6565	56.4	14454	50.4
Angiology and vascular surgery	500	49.8	106	80.1	606	55.1
Audiology, otoneurology and speech therapy	151	60.2	464	74.1	615	70.7
Human reproductive biology	151	96.6	86	98.8	237	97.4
Cardiology (adult and pediatric)	2473	70.25	519	73.1	2992	70.7
Cardiothoracic surgery (adult and pediatric)	394	79.4	40	90.5	434	80.8
General surgery	9714	34.3	1268	47.4	10982	35.8
Pediatric surgery	874	65.8	166	84.9	1040	68.8
Surgical oncology	794	95.4	82	89.9	876	94.8
Plastic and reconstructive surgery	1550	86.3	266	85.7	1816	86.4
Coloproctology	397	71.8	64	68.8	461	71.3
Dermatology (adult, pediatric and dermatopathology)	620	60.6	1164	90.6	1784	82.1
Endocrinology (adult and pediatric)	675	57.7	644	61.9	1319	61
Epidemiology	430	58.9	259	93.1	689	75.9
Gastroenterology (adult and pediatric)	827	79.8	458	72.2	1285	74.3
Medical genetics	107	71	181	91.7	288	84
Gynecologic oncology	237	95.7	185	96.2	422	95.9
Obstetrics and gynecology	91	98	60	95	151	97.3
Hematology (adult and pediatric)	9654	36	6035	50.6	15689	41.6
Diagnostic-therapeutic imaging	310	95.3	350	93.1	660	90.9
Infectology	2282	92.1	1537	89.5	3819	91
Critical medicine (adult and pediatric)	391	49.6	204	75	595	58.3
Physical activity and sports medicine	1285	44.1	644	52.4	1929	47.4
Family medicine	115	93	47	89.3	162	91.9
Internal medicine	7831	27.6	9064	44.5	16895	36.7
Rehabilitation medicine	7123	29.8	2778	39.8	9901	32.7
Emergency medicine (adult and pediatric)	680	46	1156	70.3	1836	61.3

(continue)

Table 3. Total hombres y mujeres especialistas con certificación vigente (*continued*)

Specialty	Male specialists (n)	Males with valid certification (%)	Female specialists (n)	Females with valid certification (%)	Total specialists (n)	Specialists with valid certification (%)
Forensic medicine	1387	72.7	1186	69.2	2573	73.5
Maternal-fetal medicine	201	74.1	126	75.4	327	74.6
Nuclear medicine	132	51.5	119	89	251	69.3
Occupational medicine	142	80.9	79	84.8	221	82.3
Nephrology (adult and pediatric)	833	18.5	453	23.4	1286	20.2
Neonatology	694	89.5	423	97.5	1117	93.9
Pulmonology (adult and pediatric)	743	60	973	67.4	1716	64.2
Neurosurgery	720	76.5	351	96.1	1071	83
(adult, pediatric and neurological endovascular therapy)	1076	71.9	70	89.9	1146	73.3
Clinical neurophysiology	83	72.3	52	90.3	135	79.2
Neurology (adult and pediatric)	906	49.5	439	68.3	1345	54.8
Neuropathology	13	7.7	8	12.5	21	9.5
Neuroradiology	75	48	28	32.1	103	43.7
Clinical nutrition	49		74		123	
Ophthalmology and neurological ophthalmology	2649	61	1782	71.5	4431	65.2
ORL and head and neck surgery (adult, pediatric and neurotology)	1675	82.7	1064	83.8	2739	83.1
Medical oncology (adult and pediatric)	331	87.2	279	88.4	610	86.7
Orthopedics and traumatology	6775	48.3	481	53	7256	48.5
Clinical pathology (adult and pediatric)	445	46.9	313	61.9	758	53.2
Pediatrics	9499	47.6	9272	64.1	18771	55.8
Psychiatry (adult and pediatric)	2836	35.2	1593	38.5	4429	35.1
Radio-oncology	167	94.6	71	98.5	238	95.7
Rheumatology (adult and pediatric)	521	56.4	379	73.3	900	78.4
Urology	1663	68.2	37	81	1700	68.5
Urogynecology	44	95.4	36	97.2	80	97.5

(<http://www.comaem.org.mx/>), without a national policy in place to regulate the number of new students, the training quality or for such increase to respond to a strategic planning according to the epidemiological and demographic needs of the States or the country. On the other hand, the medical degree is often seen as paperwork that is necessary to become a specialist rather than an option of professional practice.

With regard to the number of specialists, in spite of the important graduation of general physicians in Mexico, the rate of specialists is lower than the average in other countries (178 versus 119 per 100 000 population),⁴ higher than that in countries such as Chile (119), but lower than that in the United Kingdom (201) and France (181). It would be important for the differences in the planning for specialists to be assessed:

Table 4. Medical specialists in Mexico per 100 000 population¹²

Specialty	Rate per 100 000
Neonatology*	76.71
Pediatrics**	49.55
Obstetrics and gynecology†	30.33
Family medicine	14.08
Anesthesiology	11.51
General surgery	8.89
Internal medicine	8.02
Orthopedics and traumatology	5.87
Ophthalmology	3.56
Psychiatry	3.4
Geriatrics††	3.25
Diagnostic and therapeutic imaging	3.09
Pediatric surgery*	2.75
Cardiology	2.16
Otorhinolaryngology and head and neck surgery	2.08
Rehabilitation medicine	1.49
Plastic and reconstructive surgery	1.47
Urology	1.38
Emergency medicine	1.25
Endocrinology	0.80
Maternal-fetal medicine‡	0.73
Nephrology	0.72
Surgical oncology	0.71
Pulmonology	0.69
Human reproduction biology‡	0.69
Pediatric oncology*	0.60
Epidemiology	0.56
Infectology	0.48
Medical oncology	0.31
Gynecologic oncology†	0.29

*Rate calculated based on births.¹⁰**Rate calculated based on 0 to 16-year population.¹⁰†Rate calculated based on female population older than 10 years.^{10,11}††Rate calculated based on population older than 60 years.¹⁰

‡Rate calculated based on child-bearing age female population.

- **United Kingdom:** Decentralized planning at the local and regional levels through the National Council for the Development of Health Personnel, which analyzes the demands and needs for specialized personnel and training of specialists, in

a consistent manner with the approach that prevails in the European Union.¹⁴

- **France:** The Ministry of Higher Education and the Ministry of Health determine the list of available specialties, depending on the needs in terms of health and health research; the French government adjusts the number of provisions proposed by said ministries for each specialty in coordination with the different committees and areas of the Faculty of Medicine.¹⁵
- **Mexico:** Health institutions submit every year the available number of residence posts for each specialty to the CIFHRS, which takes care for the ENARM planning. After having passed the exam, the residents are assigned to the available positions according to their score.¹⁴
- **Chile:** A methodology that considers the available workforce was developed, thereby estimating the number of specialists that are required. The responsible for planning is the Ministry of Health together with the universities of the country that have programs for the training of medical specialists.¹⁴

It is important for the number of specialties that are recognized in a country to be analyzed, since the more specialties or specialty nomenclatures there are, the higher their deficit will be. A review of the medical-surgical specialty programs in Latin America refers a large difference in the number of recognized specialties, which ranges from 6 (El Salvador) to 82 (Colombia).¹⁶ In turn, the American Association of Medical Colleges (<https://www.aamc.org/>), on its specialty aspirants report, refers 45 specialties, which is a similar number than that in Costa Rica and Argentina,¹⁶ while the Ministry of Public Health, Social Services and Equality of Spain and the European Union of Medical Specialists report 50 medical specialties (<https://www.uems.eu/>).

Not only is it important for total number of specialties to be reviewed, but their increase has been inertial and bears no relation to population growth or modifications in the epidemiological profile, which hinders healthcare coverage adequate planning.¹⁷

In Mexico, non-communicable diseases have increased over the last 30 years: diabetes, chronic respiratory diseases, cardiovascular conditions, chronic kidney disease,¹⁷ liver disorders, musculoskeletal, mental health disorders (depression) and disability due to lumbar problems.¹⁸

In Mexico there is a larger number of pediatricians (49/100 000 children) and gynecologists (30/100 000

women), in spite of the fertility rate having importantly been reduced (from 6.7 to 2.1 over the last 50 years).¹⁹ With regard to psychiatrists, even when mental disease represents 13 % of disease global burden,²⁰ in the country there are only 4195 psychiatrists, i.e., 3.4 per 100 000 population (a figure that is lower than the 5/100 000 recommended by the WHO).²⁰ According to data obtained in this study, an apparent shortage of physicians is identified in some specialties:

- 9901 internists (8/100 000 population) and 2671 cardiologists (2/100 000 population) were counted for the care of cardiovascular conditions, the second health problem of the country.
- There are 895 nephrologists, in spite of the increase renal problems has had.
- In spite of chronic obstructive pulmonary disease and lung cancer exhibiting increasing mortality rates, and their combination significantly surpassing ischemic heart disease as overall cause of death (16.7 % versus 12.8 %),²¹⁻²³ one pulmonologist was found per 200 000 population, a figure that is lower to that recommended by WHO (3.5 to 4 pulmonologists/100 000 population).
- In Mexico, older adults constitute a rapidly growing group (by 2050, it will account for 27 % of the population).¹⁷ International standards recommend one geriatrist per 50 000 population (<http://www.bgs.org.uk/>) or one geriatrist per 2000 older adults (<http://www.americangeriatrics.org/>), which is a figure 15-fold higher than that found in this study with 3 geriatrists per 100 000 older adults.

In view of this scenario, first of all (prior to increasing the number of specialists, which would turn out to be expensive and wouldn't solve the underlying problem), implementing chronic-degenerative diseases early detection is required in order to prevent high-cost complications such as kidney failure or cardiovascular conditions. As we can observe, non-communicable diseases share 4 risk factors: tobacco consumption, excessive consumption of alcohol, unhealthy diet and physical inactivity; therefore, investing in aspects of promotion, minimization of exposure to risk factors, maximization of exposure to protecting factors, prevention and opportune detection, will set the bases to strengthen the change towards a primary health care model, where family doctors and primary care physicians play the most relevant role.

Health institutions urgently need to regulate productivity, improve the quality of care and establish a balance between the number of specialists and family doctors (according to the study, 14/100 000 population).

Data from the Ministry of Health show that productivity indicators of the last 10 years are considerably low among medical specialists (2 daily patient consultations per doctor), but comparatively high among primary care physicians and family doctors (13 daily patient consultations per doctor).²⁴

Adequate communication is required between educational and health institutions since, currently, medical specialists provide care to the population by applying the clinical-curative method, establishing appropriate diagnosis and treatment for each case, but the rest of actions such as education, promotion of a healthy lifestyle, prevention, control and patient follow-up are carried out by health personnel trained on technical areas such as nursing, nutrition and psychology, among others. Therefore, it is crucial the transformation of a purely curative model into a preventive-curative one. In turn, reconsidering for some specialties, such as pediatrics and obstetrics and gynecology, a reduction in the number of working posts and increasing those of trained family doctors and primary care physicians. Finally, a rearrangement or an important increase of posts in specialties required to address emergent pathology is required, for which changes in admission requirements and duration of some specialties would be helpful.

According to data reported by CIFRHS in 2016, 75 % of newly admitted residents are distributed in 6 main medical specialties: family medicine (21.8 %), internal medicine (13.5 %), anesthesiology (10.8 %), pediatrics (10.8 %), obstetrics and gynecology (9.9 %) and surgery (9.1 %) (<http://www.cifrhs.salud.gob.mx/>). Currently, within the UNAM Faculty of Medicine student population, these specialties represent 47 % of students.⁶ The change in the way of admission, from indirect to direct, has previously solved the deficit in the number of aspirants in some specialties and, on the contrary, changing from direct to indirect admission has discouraged applicants' requests.²⁵

Medical specialists' geographical distribution is rather inequitable, similar to what occurs in other countries,²⁵⁻²⁷ with a clear centralization and inequity in resource assignment for the training of specialists, which might be related to the following aspects:

- 9626 out of 26 789 specialty students and 78 of 81 programs correspond to the UNAM Faculty of Medicine,⁶ the population of which was concentrated in Mexico City in 2016 (8644 out of 9626 students). Therefore, adequate planning of medical residence posts is required, which not necessarily implies increasing the number of posts

in existing sites, but opening new specialty sites in different sates of the country.

- Lack of job offers, recognition and stimuli to graduate specialists to achieve their retention in cities of small and medium populations.
- Economic and social development concentration; i.e., in some states of the country there is lower per capita income, scarce or no access to quality basic education (thinking on graduate MS families), low availability of basic services (food, housing, etc.), lack of physical infrastructure for adequate practice of the profession and little or no possibilities to exercise private practice in conjunction with public practice of the profession. Therefore, creating conditions to make practice in semi-urban and rural areas more attractive to MS should be sought.
- There are states of the country with high rates of violence and scarce or no guarantee of safety. According to the National Medical Survey on Risk, Mexico City, Chihuahua, Coahuila, Hidalgo, Guerrero, Morelos, Nuevo León, Tamaulipas, Oaxaca and Veracruz are the federal territory entities with the highest reported violence.²⁸

Another important aspect is medical work feminization, which constitutes a global phenomenon. In several OECD country members, the proportion of female doctors is almost equal to that of male doctors (46 % in the United Kingdom and 43 % in France).⁴ Levinson and Lurie²⁹ propose that females and males practice medicine differently; females can improve doctor-patient relationship and promote more teamwork owing to characteristics attributed to the female gender such as compassion, empathy, response capability to patient needs and communication skills.^{30,31} On the other hand, there are studies that refer that some patients prefer being attended to by a male in primary care services, which would generate problems in the search for opportune diagnosis and treatment.³²⁻³⁴ Internationally, there is a more ambivalent vision on the implications of the increasing number of women in medicine. On the one hand, they are willing to work in positions that are less well compensated and practice on primary care specialties, but, on the other, they prefer practicing in urban zones, probably owing to the need for more support to be able to combine maternity with their profession, avoid burnout and earn representation with the leadership and academics.³⁵

As regards gender distribution in Mexico, the population of women that are admitted to study medicine

and that later study a medical residence is known to have gradually increased, but with differences in the male-to-female ratio: depending on the medical specialty; these differences have been suggested to be owing to the perception on the specialty lifestyle, with certain tendency being observed in males towards those with a non-controllable lifestyle:³⁵ internal medicine, obstetrics and gynecology, orthopedics, general surgery and urology; and on females, towards those with controllable lifestyle: anesthesiology, dermatology, neurology, pathology, psychiatry and radiology.

In Mexico, not all physicians that graduate from training as residents get certified, and those who have been certified often do not get re-certified. Specialties such as urogynecology and reproductive biology have nearly 100 % of MS with valid certification, whereas in general surgery, internal medicine, psychiatry and neuropathology, there are less than 40 %. Such variation can be secondary to various factors:

- In internal medicine and general surgery it can be because specialists chose a second specialty or sub-specialty and did not re-certificate as internists or general surgeons anymore.
- In specialties with a high number of specialists with valid certification (gynecologic oncology, reproductive biology and urogynecology), probably due to their degree of over-specialization.
- Owing to the variations in promotion there are with regard to specialists' training and updating by each one of the specialty medical councils.

Among the strengths of the study we can mention that it is the first census of specialists performed based on total verifiable number of physicians rather than on a count taking occupied posts as reference, which generates duplicate data.¹⁴ It is the first study to establish a distribution by gender, specialty, state of the republic and certification validity of more than 90 % of medical specialties available in the country.

The limitations lie in data availability: only specialists on whom there was information in any of the databases could be counted and located.

Prior to increasing the number of medical specialists, other actions should be carried out:

- Ensuring that higher education institutions graduate the personnel the population and health institutions require, both in quantity and educational approach (passing from a disease-centered to a preventive approach).
- Reinforce the importance of the primary care physician since, in contrast with medical

specialists, Mexico City has the lowest percentage of primary care physicians.³⁷

- Avoid physicians underuse by granting a space in the labor market to generalist physicians (family and general doctors) and specialists with equality of opportunities in different states of the country.
- Avoid medical over-specialization by means of regulation in educational programs (training approach, training requirements for admission and duration of each medical specialty).
- Limit the creation of new medical specialties that further fragment knowledge, which goes against global trend that points at an integrating and primary prevention model (which in the long term is less expensive than the current one).
- Medical work feminization has to be taken into account, since women need support and time in order to combine the practice of their profession with the care of children.

Therefore, articulating general medical training – shift to a preventive paradigm, reduction in the number of graduates and creation of bodies that regulate their academic quality–, the labor market (both for specialist and general and family physicians, at all levels of care and states of the country) and the mixed epidemiological pattern –chronic-degenerative diseases together with diseases of social deprivation and poverty– is required, with the purpose for strategic planning of medical specialization to be carried out, the final goal of which should be sufficient and balanced distribution of human resources for health.

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