

The Demand and Supply of Physicians in Puerto Rico:

Historical trends and forecasting 2013 to 2019

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Table of Contents

1. Introduction	2
1. A. Scope and Limitations.....	2
1. B. The General Framework of Demand and Supply	3
1. C. The social dimension of the demand of health and physicians in Puerto Rico	5
2. The Demand and Supply of Physicians	6
2. A. Issues in the supply side	6
2. B. The historical level of population and the demographic transition	7
2. C. The supply of physicians: historical values and forecasting	9
2. C. 1. The registered and the active physicians	9
2. C. 2. Comparing with the states of the United States	12
2. C. 3. Forecasting the number of Physicians	16
2. C. 4. Forecasting Supply of Primary Care Physicians	23
3. The Demand Side	23
3. A. Forecasting the Demand of Physicians	23
3. B. Estimating the demand of Primary Care Physicians.....	25
3. C. Demand and Supply of Physicians	25
4. The demand of specialists in Puerto Rico	26
4. A. Diabetes Type II	27
4. B. Overweight and Obesity	28
4. C. Alzheimer’s diseases	31
4. D. Depression	32
5. Conclusions and Recommendations	35
5. A. Conclusions	35
5. B. Recommendations	39
6. References	49

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1. Introduction

1. A. Scope and Limitations

The Puerto Rico Department of Health and the Office of Minority Health contracted Economist, José I. Alameda-Lozada, Ph.D., to assess the demand and supply of physicians in Puerto Rico, and to accomplish projections for the demand and supply of General Practitioners and Specialists. It also includes the forecast for the numbers of Primary Care Physicians for three periods 2010-13; 2013-16 and 2016-19. Likewise, this study examines the health ecosystem which includes dimensional areas such as social, economic, demographic and the new approaches on the health public policy or reforms.

There is no doubts that Puerto Rico's Health System is so far very complex, grouping private, local and U.S. Federal government institutions, aimed to identify the adequate mix of health care professionals necessary to meet optimally the needs of current and future patient populations. Puerto Rico faces both the health concerns of developing nations in treating malnutrition and infectious diseases, as well as the chronic health problems faced by developed nations, such as Cardiovascular Disease and Cancer. Due to such complexity, Puerto Rico's health care expenditures by 2010 amounted \$12,600 million for a per capita basis of \$3,324, a 21% of total per capita GNP¹. Internationally, Puerto Rico ranked at the most expensive health system, surpassing all countries including the United States that accounted for health expenditures of 17% of total gross per capita income.

Due to The Patient Protection and Affordable Care Act --signed into law on March 23, 2010 by President Barack Obama—the U.S. health care reform will do a number of important new approaches including setting up a Health Insurance Marketplace where citizens can purchase a federally regulated and subsidized health insurance. This plan is expected to provide health care coverage to 32 million of Americans by 2019. Then, demand for health care will expand and the needs for accurate data about the current and future physician workforce will remain paramount important.

With local and Federal health reforms underway across all nation and Puerto Rico, the main tasks will be reconsidered important improvement in the quality, efficiency and effectiveness of the health care systems. Therefore, efforts should be re-addressed to the present-day context of national budget deficit reduction strategies imposed by the U.S. Congress, but also, will be imperative to take a look of the entire health care workforce including that of Puerto Rico.

However, current task for this study is not limitless. Considering the availability of current data from the local government sources, it is difficult to offer both a complete and clear forecast of local health care workforce supply and assess its adequacy for meeting the demand of services in the forthcoming years. Traditional supply-demand analyses for the health care industry workforce fall short of our needs,

¹ Alameda Lozada, José I. Ph.D. and Luis O. Ramírez Ferrer. M.D. *El Costo De Los Servicios de Salud En Puerto Rico: Perspectiva Económica*. "XIII Foro Industria de la Salud: Prognosis del Sistema de Salud de Puerto Rico", Colegio de CPA 24 de febrero de 2012. http://www.easywebpr.com/josealameda/articulos2012/el_costo_de_los_servicios_de_salud_en_puerto_rico_perspectiva_economica.pdf

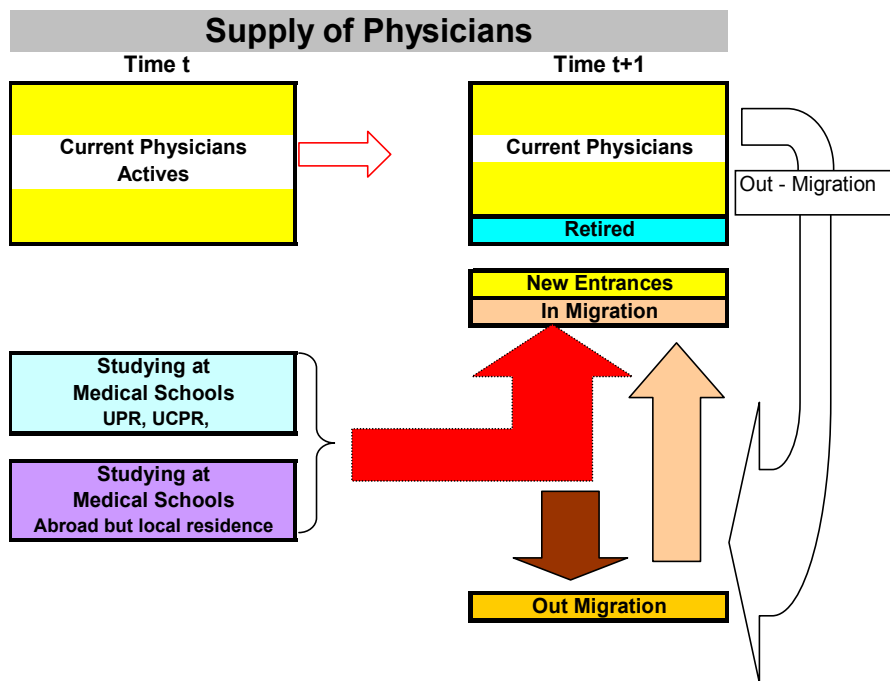
because, fragmented and inconsistent data collection; variance in methodological assumptions, data collection and definitions; mistrust between professional groups, and wide differences in regulatory and educational context, contribute to an incomplete and perhaps, bias understanding of workforce supply and demand. The lack of timely, available information further complicates accurate supply trend projections. Therefore, intellectual efforts and forecasting methodologies should be focused to make proper estimates but subject to limited forecast accuracy.

1. B. The General Framework of Demand and Supply

The analysis of supply and demand of physicians is an important tool to determine current and future workforce needs. It will also provide information for planning a health system that will promote general well-being for all citizens. Medical and technological advances improve outcomes, but they also often raise costs. For instance, less invasive options for cardiac care, for example, cardiac catheterizations, coronary artery bypasses and angioplasties with stents have emerged over the past few decades. However, the analysis of both supply and demand are characterize by uncertainties and difficulties in the identification and collection of suitable data. It is highly complex to develop universal acceptance of health care workforce model in order to ensure valid and reliable information.

In this study, the task is oriented toward the forecasting of the supply and the demand of physicians for Puerto Rico —General Practitioner, Primary Care Physicians and Specialists. Supply refers to the number of trained physicians working in any health care system or active in the labor market. As can be seen in Diagram 1, the supply of physicians in Puerto Rico depends primarily on the number of graduates of medical schools in a country or outside of our jurisdiction, those who continue to practice medicine as a career path and who remain in their country of origin, and the number of persons retired. According to Table 1, it is clear that current physicians available in any health system are a function of students joined in the system, as well as immigrants less out-migrants and retired.

Diagram 1:
Supply of Physicians in Puerto Rico



Supply, indeed, is strongly influenced by labor market factors that vary by profession including salary levels, work hours, licensure requirements, access to professions and the type of skills. Furthermore, structural workforce issues including an aging workforce, lifestyle and gender factors, have an impact on the supply of physicians. Other factor influencing supply is the technological innovations or advances that enhance productivity through diverse channels in workforce practice but also introduce new fields of medical endeavor.

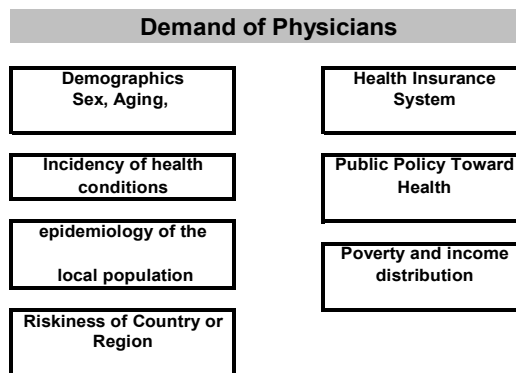
Table 1:
The supply side determinant at a given time frame

P - R + (I-O) + U	= Supply
All Physicians at time t	P = S (t)
Retired at time t +1	R
In-migration t+1	I
Out-migration t+1	O
Students already jointed t+1	U
Supply at time t +1	S (t+1)
(P +I +U) - (O +R)	= Supply

From the demand side, we have to examine different determinant factors *vis a vis* the supply. These factors include the demographics and epidemiology spectrum of the local population, the numbers and types of other health care workers in the system, poverty and income distribution as well as the policies and goals in place of such health care system (See Diagram 2). Meanwhile, demand of physician services depends on the health insurance coverage.

Nonetheless, if more physicians are trained than needed, then supply exceeds demand; conversely, if only few physicians are trained and retained, then some people may have difficulty accessing health care services. A **physician shortage** is a situation in which there are not enough physicians to treat all patients in a given needed of medical care diagnosis, either currently or in the future. This can be observed at the level of a health care facility, a province/state, a country, or worldwide.

Diagram 2



1. C. The social dimension of the demand of health and physicians in Puerto Rico

As can be seen in Table 2, and according to *Puerto Rico's Community Survey* of the U.S. Census, over 92% of local residents are covered by a health insurance. In fact, the percentage of persons under health insurance coverage jumped from 91.6% to 92.4% from 2007 to 2011. Nonetheless, the percentage covered by private insurance went down, 43.9% to 40.8%; while that for public insurance went up from 54.5% to 57.7%. Persons with no health insurance were 280,641 by 2011, a burden of near 8% of civilian non-institutionalized population. These pattern changes, will force local government to encourage local resources as well as federal expenditures to effectively accomplish the demand of physicians, especially that for primary care needs.

Table 2:
Health Insurance Coverage in Puerto Rico: 2007 and 2011

HEALTH INSURANCE COVERAGE	2007	2011	2011-2007 Changes	2007 % of total	2011 % of total
Civilian non- institutionalized population	3,938,846	3,680,339	-258,507	100.0%	100.0%
With health insurance coverage	3,608,547	3,399,698	-208,849	91.6%	92.4%
With private health insurance	1,727,394	1,500,631	-226,763	43.9%	40.8%
With public coverage	2,144,840	2,123,860	-20,980	54.5%	57.7%
No health insurance coverage	330,299	280,641	-49,658	8.4%	7.6%

Source: Puerto Rico Community Survey, U.S. Bureau of the Census, 2012 U.S. DEPARTMENT OF COMMERCE, Economics and Statistics Administration

Other determinants of the demand of physicians are the poverty level and income distribution. Persons with less income or wealth will demand health services from the governmental institutions or services financed by any public program. It is no surprise, that the economy of Puerto Rico has become a poor country and also that its civilian population is more dependent of federal funding with more disabled workers. Furthermore, the following facts disturb the dimension of all Puerto Rican society:

- There are 311,000 people who live alone, that is one in five of the 1.319 million households.
- A third of households are headed by women, and there are near 700,000 of children headed by a woman.
- In 42 percent of the families in Puerto Rico, lives a person over 65 years old, which means that this elderly population does not have sufficient income to live alone, but meanwhile he/she is highly dependent of public health services according to his/her age.
- There are 726,000 people with disabilities, equals to 20 percent of the population, and 52 percent of people over 65 have some form of disability.
- Children represent 7 percent of the disabled population, with 67,000 students participating in a special education program. Disabled adults and children account for 1.5 million people, or one third of the population.

- The labor force is 1.2 million, a third of the total population. The participation rate is one million, less than 40 percent of the total population.
- Almost half the population lives below the Census poverty level standard: 45 percent of 3.7 million. Less than 40,000 families have incomes more than \$100,000.
- 37 percent of the population benefits from the federal program of Nutritional Assistance Program (NAP). By 2011, 471,272 persons were under NAP in Puerto Rico.
- In the last decade, over half a million of Puerto Ricans left the island, mainly persons at productive age (the median age was 28 years, while the local resident median age is 37 year).
- Near 40 percent of the population receives only the 8 percent of the country's income, while the remaining 92 percent of income went to the 60% of the population. Clearly, this figure implies an unequal distribution of wealth and income.
- About 58% of local residents are under the state health insurance (called *La Reforma de Salud*, now *MiSalud*); that is 1.5 million of persons.
- In 2011, near 8% of top income families (over \$75,000 income), received one third of income, while 36% of bottom families (less than \$15,000), received only 8% of total income.

These previous facts present a disturbing picture of the society of Puerto Rico but also borne from the last two decade of economic development, and meanwhile, limit the future sustainable growth of Puerto Rico. It also sound like, the society of Puerto Rico has slowly becoming a nation absence of a skilled and well qualified working class; with more persons living under the poverty threshold but also highly dependent of government subsidies; and with a high segment of the population disabled and marginalized of the legal frame of the generation of income and employment of the society and its economy.

2. The Demand and Supply of Physicians

2. A. Issues in the supply side

According to the Association of American Medical College (AAMC), in the United States, a great number of studies have been released over the past decade by projecting future physician shortage. AAMC has stated the following recent health issues; (a) the Patient Protection and Affordable Care Act that will give access to 32 million of Americans to health insurance by 2014; (b) Baby Boomers increased needs for more medical care in the upcoming years; and (c) the likelihood of retirement for the aging physician workforce, concerns have only increased in recent years. In 2006, AAMC recommended a 30 percent increase over 2002 levels in U.S. medical school enrollment by 2015. Half of these shortages, addressed by AAMC, are projected to be in primary care specialties and that fewer students are choosing a career in primary care than a decade ago. Needless to say, it will be highly necessary to encourage institutional policies and practices to promote student interested in a career in primary care.

In Puerto Rico, there are some issues or controversies caused from the former conclusions: (a) the population trend is toward a continuous decline whereas the median age is increasing; (b) fertility rate is dropping and mortality rate is in a *plateau*; (c) life expectancy has been increasing; (d) there are a strong out-migration trend for many physicians explained partially by the United States physician shortage; (e)

physicians also are getting older and they are in the retirement process; and (f) the deteriorated standard of living in Puerto Rico acted as a push factor for many local residents including physicians as well as potential health workforce.

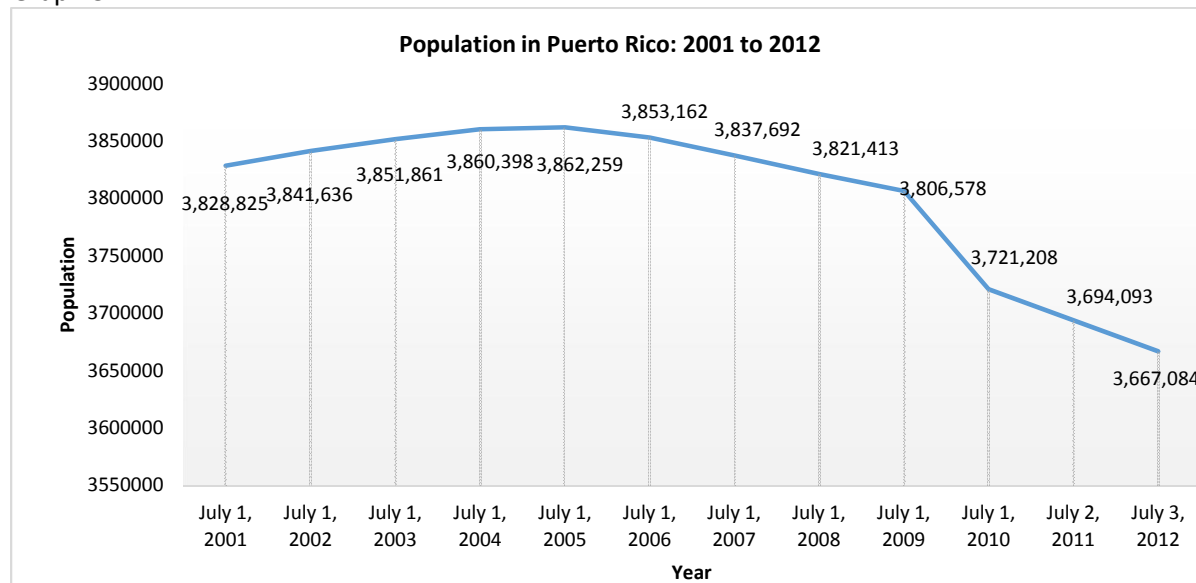
From the supply side, the number of active physicians in Puerto Rico increased per registration-cycle by an average of 526 since 1989-92 to 2007-10. Taking only the last three registrations, the average change was 600 new active physicians. However, the average board certified physicians since 2001 to 2005 was near 300 per year. Regardless the out-migration movement of physicians, this figure implies that there are near 300 new physicians moving-in to Puerto Rico. Anyway, for the next decade local authorities should look closely the migration movements, but especially the physicians.

2. B. The historical level of population and the demographic transition

The population level of Puerto Rico has been steadily declining since the mid-2000. In 2006, the population level was 3.86 million while at 2012, the level declined to 3.667 million (See Graph 3). That is, population dropped by 193,300 persons. From 2010 to 2012, population went down by 27,062. Two trends are determinant factors of such downsizing: (a) lower fertility rates coupled with a steady state of mortality rates; and, (b) higher out-migration rates, a continuation since the mid-2000. According to the *Instituto de Estadísticas de Puerto Rico*, for the year 2010, the median age of out-migrants was 28.0 years old, very similar for those in-migrant persons (28.1). However, the median age for all inhabitants was 37.2 years old.

As can be seen from Table 3, the higher level of population declines are experienced at the first five cohorts from 0 to 19 years old, but also at the 25 to 29 years old cohort. Conversely, a tremendous increase is observed for those segments 65 years old and ahead. The demographic consequences of this pattern are clearly significant: (1) migration had been accelerating the aging of Puerto Rico’s population, and (2) people who left Puerto Rico had a greater level of educational achievement than those who arrived. In fact, for the first-time ever in modern history, Puerto Rico’s population actually declined between the 2000 and 2010 Census. Despite such declining fertility rates, it is now clear migration was the main cause--but not the only one, of the overall population decrease.

Graph 3



Source: U.S. Bureau of the Census, <http://www.census.gov/popest/data/index.html>.

Given such trends, the population forecast for years 2015, 2020 and 2025 is been performed using the method of cohorts (See Table 4). Total population by 2015 is expected to be 3.5 million; by year 2020 is expected to amount 3.24 million, and by 2025, 3.036 million. Notwithstanding, the 65-74 years old is expected to decline due to current trends in lower population level at previous cohorts. Conversely, paramount increases were observed at the 75 years old and more. The better health technology and medical –clinical expenditures by private sector and government will drive the society to a higher level of life expectancy. Meanwhile, one can expect higher level of legal drugs, expenditures for medical and clinical conditions. **These demographic changes will have a tremendous impact over the medical and clinical conditions, technology and equipment and even to the infrastructure investment. Even though population tends to exhibit a better level of health and/or general standard of living, the segment cohorts over 65 years old, is exposed to a higher level of sickness and/or prevalence rates.**

Table 3
Population by age groups in Puerto Rico: 2010, 2011 and 2012.

Age groups	2010	2011	2012	2011-10	2012-11
Less than 18 years old	896,946	872,861	849,363	-24,085	-23,498
18-44 years old	1,348,146	1,332,021	1,317,229	-16,125	-14,792
45-64 years old	929,406	925,510	918,456	-3,896	-7,054
65-74 years old	314,277	324,590	335,504	10,313	10,914
75+ years old	232,433	239,111	246,532	6,678	7,421
Total Population	3,721,208	3,694,093	3,667,084	-27,115	-27,009

Source: U.S. Bureau of the Census, <http://www.census.gov/popest/data/index.html>.

Table 4
Population by age groups in Puerto Rico: 2013, 2015, 2020 and 2025.

YEARS	Less 18 years old	18-44 years old	45-64 years old	65-74 years old	75+ years old	Total Population
2010	896,946	1,348,146	929,406	314,277	232,433	3,721,208
2011	872,861	1,332,021	925,510	324,590	239,111	3,694,093
2012	849,363	1,317,229	918,456	335,504	246,532	3,667,084
2013	825,865	1,302,437	911,402	346,418	251,042	3,637,164
2014	811,139	1,300,744	888,077	333,273	231,292	3,564,525
2015	797,160	1,296,296	870,178	318,626	217,313	3,499,572
2016	782,644	1,288,446	853,927	307,975	207,624	3,440,615
2017	768,535	1,281,920	840,614	295,948	198,196	3,385,213
2018	756,185	1,276,189	825,432	283,468	192,917	3,334,191
2019	737,537	1,277,726	809,188	272,696	188,810	3,285,956
2020	724,005	1,272,274	794,425	263,874	185,601	3,240,180
2021	714,912	1,260,343	780,930	256,145	183,790	3,196,120
2022	704,553	1,250,496	767,913	247,355	183,673	3,153,990
2023	692,830	1,240,647	757,434	239,211	183,257	3,113,380
2024	678,892	1,233,136	748,298	231,820	181,899	3,074,044
2025	665,912	1,225,773	737,290	226,989	179,932	3,035,896

Note: The projections done by author were produced using a cohort-component method. The estimates are based on the 2010 Census and reflect changes to the April 1, 2010 population due to the Count Question Resolution program and geographic program revisions. U.S. Department of Commerce, U.S. Bureau of the Census. Forecast by author.

2. C. The supply of physicians: historical values and forecasting

2. C. 1. The registered and the active physicians

Using the three-years- registration cycle for health professionals in Puerto Rico, the growth patterns of registered and active physicians in Puerto Rico was assessed. Table 5 depicts the historical value of registered physicians, for General Practitioners and Specialists. The pattern is also shown on Graphs 4 and 5. The following conclusions are derived from Table 5 and, Graphs 4 and 5.

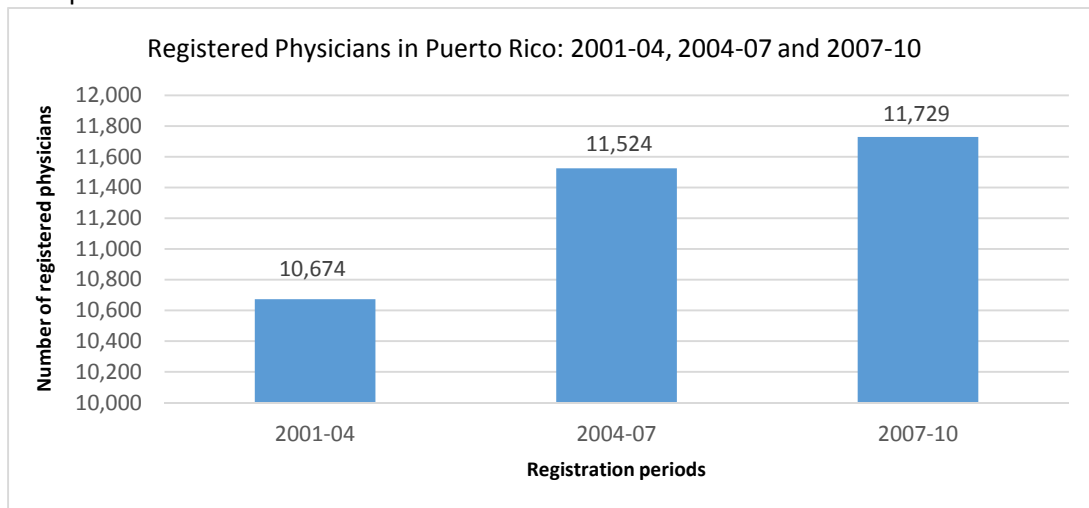
Table 5:

Registered physicians; General Practitioners and Specialists 2001-04, 2004-07 and 2007-10

Total Numbers			
Years-period registration	Total Physicians	General Practitioners	Specialists
2001-04	10,674	3,948	6,726
2004-07	11,524	4,467	7,057
2007-10	11,728	4,271	7,457
Per 100,000 inhabitants			
Years-period registration	Total Physicians	General Practitioners	Specialists
2001-04	277.6	102.7	174.9
2004-07	299.1	115.9	183.1
2007-10	308.9	112.5	196.4

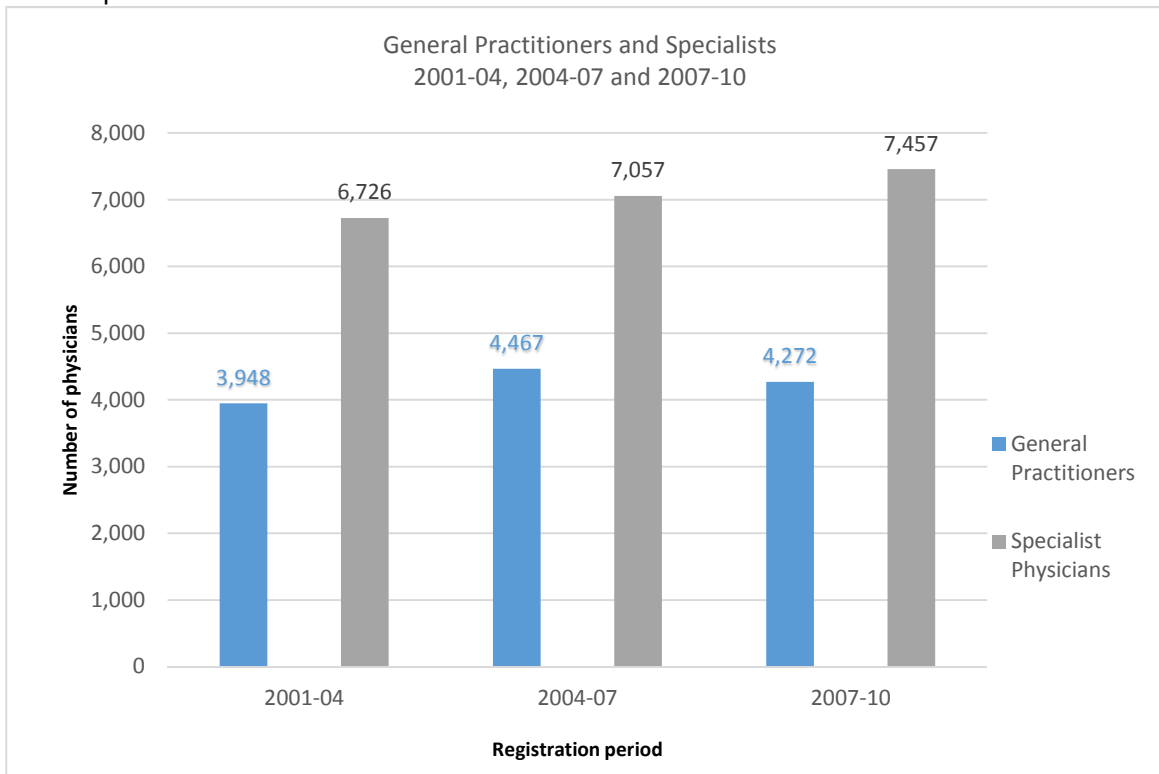
Source: Informe Estadístico de los Profesionales de la Salud, 2007-2010. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud.

Graph 4



Source: Informe Estadístico de los Profesionales de la Salud, 2007-2010. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud.

Graph 5



Source: Informe Estadístico de los Profesionales de la Salud, 2007-2010. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud.

1. According to the latest registration, total physicians amounted to 11,729, an increase of 205 given 9to the previous figure of 11,524. From 2001-04 to 2004-07, the total number of physicians jumped to 11,524 from 10,674, an increase of 850 physicians. Therefore, it is clear that total registration of physicians grew at a decreasing rate compare to the former years-period.
2. By 2007-10, General Practitioners reached 4,271, to account for a 36.4% of total. Specialists accounted for 63.6%. In fact, during the two former periods, these percentages were quite similar.
3. A declining trend is observed in the total number of General Practitioners. Total number of General Practitioners decreased to 4,271 from 4,467, a decline of 196 General Practitioners, at a rate of growth -4.4%. Conversely, Specialists depicted an increasing trend, from 7,057 to 7,457 —an absolute increases of 400 physicians -- between the two last registrations.
4. When total population is considered, the total registered physicians against the former periods, depicts an increase to 308.9 per 100,000 inhabitants from 299.1, for a rate of growth of 3.28%, Comparing to former periods, the rate of growth was 7.7%.

Table 6 and Graph 6 present an analysis of active physicians in Puerto Rico. During the 1998-01 registration cycle, there were 7,623 active physicians in Puerto Rico, an increase of 6.7% from the 1995-98 registration cycle. The number of active physicians in Puerto Rico increased from the 1989-92 to 1998-01 registration cycles by 12.7%.

Table 6:

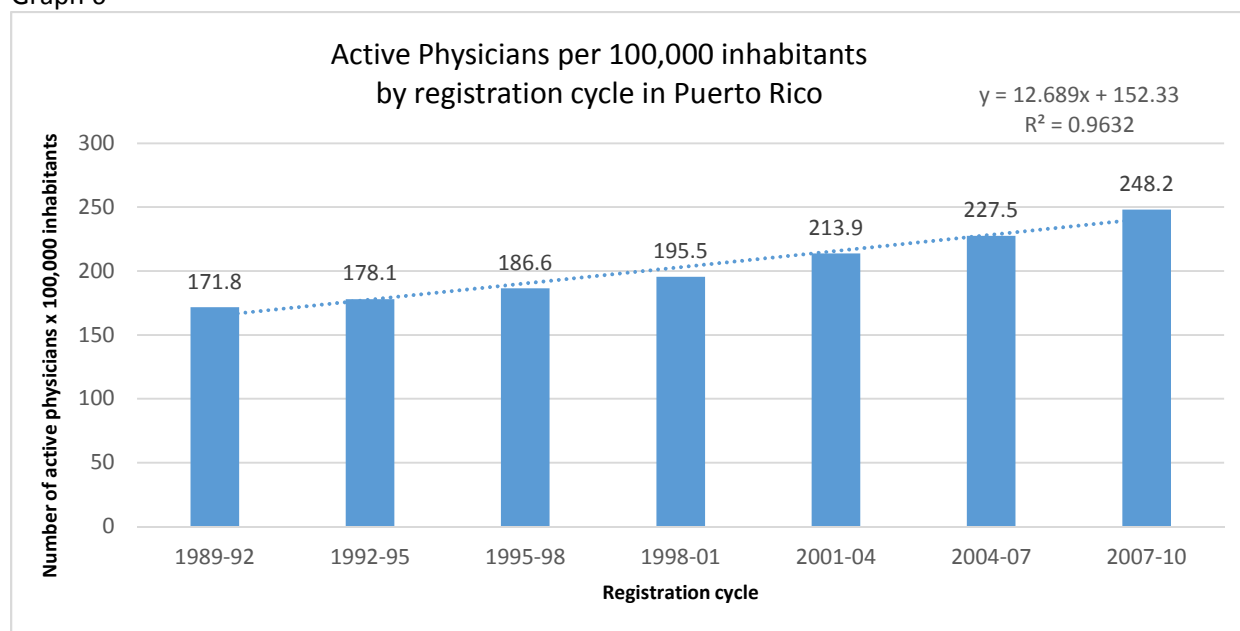
Actives Physicians by registration cycle 1989-92; 1992-95; 1995-98; 1998-01; 2001-04; 2004-07 and 2007-10

Years registration cycle	Actives Physicians	Rate of change	per 100,000	Rate of change
1989-92	6,269		171.8	
1992-95	6,764	7.9%	178.1	3.7%
1995-98	7,144	5.6%	186.6	4.8%
1998-01	7,623	6.7%	195.5	4.8%
2001-04	8,225	7.9%	213.9	9.4%
2004-07	8,765	6.6%	227.5	6.4%
2007-10	9,424	7.5%	248.2	9.1%

Source: Informe Estadístico de los Profesionales de la Salud, 2007-2010. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud.

5. During the 1998-01 registration cycle, there were 195.5 active physicians per 100,000 inhabitants in Puerto Rico, compared to the national rate of 228.4 active physicians per 100,000 in 2000. By 2007-10 the growth patterns per registration cycle for new active physicians was 12.7 per 100,000 inhabitants.
6. For the 1995-98 and 1998-01 registration cycles, more than 60% of active physicians working in Puerto Rico were under the age of 50 and over 70% of them were male.
7. Seventy percent of active physicians practicing in Puerto Rico during the last two registration cycles were Specialists; the remaining 30% were General Practitioners.
8. During the 1999-00 academic year, 348 new physicians graduated from Puerto Rico's five schools of medicine. While 27.2% of the active physicians practicing in Puerto Rico during the 1998-01 registration cycle were female, 43% of the 1999-00 physician graduates in Puerto Rico were female.
9. From 2001 to 2005, a total number of 3,115 students of medicine in Puerto Rico accomplished the basic examination on general sciences; and 2,706 students did so for the basic clinical medicine. A rate of approval of the former was 48% (1,501 students), and 49% (1,356) for the last.

Graph 6



Informe Estadístico de los Profesionales de la Salud, 2007-2010. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud.

Table 7 shows the historical values of registered versus active physicians. As can be seen, the active/registered ratio went up in the last two registrations to 80.4% from 76.1%, mainly because General Practitioners jumped from 58.6% to 67.8%. Specialists had a modest increase to 87.5% from 87.1%.

Table 7
Registered versus Actives Physicians by type: 2001-04; 2004-07 and 2007-10

Total Registered Numbers			
Year-period registration	Total Physicians	General Practitioners	Specialists
2001-04	10,674	3,948	6,726
2004-07	11,524	4,467	7,057
2007-10	11,728	4,271	7,457
Total Active			
Year-period registration	Total Physicians	General Practitioners	Specialists
2001-04	8,225	2,487	5,738
2004-07	8,765	2,619	6,146
2007-10	9,424	2,896	6,528
Total Active/Registered (%)			
Year-period registration	Total Physicians	General Practitioners	Specialists
2001-04	77.1%	63.0%	85.3%
2004-07	76.1%	58.6%	87.1%
2007-10	80.4%	67.8%	87.5%

Source: Informe Estadístico de los Profesionales de la Salud, 2007-2010. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud.

2. C. 2. Comparing with the states of the United States

Using the statistics from Henry J. Kaiser Foundation (HKF) and the U.S. Bureau of the Census, Tables 8 to 10 were prepared. However, information from HKF divided physicians into Primary Care and Specialists, a different classification than the local one. A Primary Care physician is defined as an original *check point* of the activity of any health care provider who acts firstly as a consultant for all patients. Then, Primary Care Physicians are the sum of Generalist Practitioner, Internal Medicine, Obstetric-gynecologists,

Family Medicine and Pediatricians. Thereby, for the period-year 2007-10, registered primary care physicians in Puerto Rico amounted 8,048 whereas actives 6,212. The registered specialists for the same period were 3,381 while actives 3,212.

Assessing the ratio active physicians by type to 100,000 inhabitants, the relative position of Puerto Rico to the U.S. states was compared. To begin with, Table 8 shows that Puerto Rico has a ratio of 257 active physicians per 100,000 inhabitants, which is very close to United States ratio of 266. In fact, Puerto Rico had more physicians per capita than 31 states, including Texas, Hawaii and Florida, among others. However, according to a 2011 report from the Organization for Economic Co-operation and Development (OECD), the number of physicians per person in the United States is 2.4 practicing physicians per 1,000 people, well below the OECD average of 3.1². Therefore, Puerto Rico exhibited 2.66 per 1,000 persons, also below the OECD average.

Nonetheless, the previous analysis changed dramatically when the active physicians are divided among Primary Care versus Specialists. Table 9 shows two types of ratio; Puerto Rico A/ includes General Practitioners to the Primary Care supply because they are able to practice medicine; Puerto Rico B/ excluded General Practitioners following the definition of Henry Kaiser Foundation. Puerto Rico B/ exhibited the lower ratio of primary care physicians relative to 100,000 inhabitants, indeed, 88 primary care physicians per 100,000 inhabitants. The average of United States is 129. However, Puerto Rico B/ ranked at fourth, because General Practitioners are included.

Table 10 includes those states with similar population size of Puerto Rico, except to Alabama which exhibited over 4.8 million of population. If Puerto Rico A/, for instance, would have the same ratio of, say, Oklahoma (106), the number of primary care physicians would be 3,898 rather than 6,212 at 2007-10. Meanwhile, if Puerto Rico would have the ratio of Connecticut (154), the number of primary care physicians would be 5,647 rather than 6,212. So far, the analysis found that Puerto Rico has enough numbers of Primary Care physicians (including General Practitioners) per capita *vis a vis* many states of the United States, including, U.S. as a whole. This result moves *in tandem* the previous conclusion stated at Table 1, which tells us that an increasing percentage of health insurance persons is been covered by the public sector, but also about the current administration health policy of a universal health plan system.

² Health at a Glance 2011, OECD INDICATORS, <http://www.oecd.org/health/health-systems/49105858.pdf>

Table 8:
Total Active Physicians per 100,000 inhabitants by states: 2012

Location	Rank	Population, 2012	Total Physicians per 100k
District of Columbia	1	632,323	987
Massachusetts	2	6,646,144	453
Rhode Island	3	1,050,292	386
New York	4	19,570,261	352
Connecticut	5	3,590,347	342
Maryland	6	5,884,563	341
Pennsylvania	7	12,763,536	325
Vermont	8	626,011	323
Michigan	9	9,883,360	315
Maine	10	1,329,192	309
Ohio	11	11,544,225	300
Delaware	12	917,092	290
Minnesota	13	5,379,139	287
New Jersey	14	8,864,590	283
Missouri	15	6,021,988	279
New Hampshire	16	1,320,718	279
Illinois	17	12,875,255	277
Washington	18	6,897,012	272
Wisconsin	19	5,726,398	266
Oregon	20	3,899,353	266
United States		313,914,040	266
Puerto Rico		3,667,084	257
West Virginia	21	1,855,413	256
Tennessee	22	6,456,243	256
Virginia	23	8,185,867	253
California	24	38,041,430	250
Hawaii	25	1,392,313	249
Colorado	26	5,187,582	247
Louisiana	27	4,601,893	243
Florida	28	19,317,568	242
Nebraska	29	1,855,525	242
North Carolina	30	9,752,073	238
North Dakota	31	699,628	236
Arizona	32	6,553,255	233
Kentucky	33	4,380,415	233
New Mexico	34	2,085,538	232
Iowa	35	3,074,186	232
Alaska	36	731,449	226
South Dakota	37	833,354	225
Indiana	38	6,537,334	224
Kansas	39	2,885,905	223
South Carolina	40	4,723,723	221
Georgia	41	9,919,945	217
Alabama	42	4,822,023	217
Oklahoma	43	3,814,820	211
Texas	44	26,059,203	209
Montana	45	1,005,141	206
Utah	46	2,855,287	201
Arkansas	47	2,949,131	195
Mississippi	48	2,984,926	190
Nevada	49	2,758,931	189
Wyoming	50	576,412	184
Idaho	51	1,595,728	172

Source: *Total Professionally Active Physicians*; Henry J. Kaiser Foundation. <http://kff.org/other/state-indicator/total-active-physicians/> and U.S. Bureau of the Census. U.S. Department of Commerce. Data for Puerto Rico from *Profesionales de la Salud en Puerto Rico, 2007-2010*, Secretaria Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud (Commonwealth Department of Health).

Table 9

Total Active Primary Care and Specialist Physicians per 100,000 inhabitants by states: 2012

Rank		Primary Care per 100k			Specialists per 100k
	United States	129		United States	142
1	District of Columbia	429	1	District of Columbia	608
2	Massachusetts	207	2	Massachusetts	252
3	Rhode Island	189	3	New York	200
4	Puerto Rico A/	167	4	Rhode Island	196
5	Maryland	157	5	Maryland	190
6	Maine	157	6	Connecticut	189
7	New York	156	7	Pennsylvania	173
8	Vermont	155	8	Vermont	168
9	Connecticut	154	9	Michigan	164
10	Pennsylvania	153	10	Ohio	161
11	Michigan	151	11	Delaware	155
12	Delaware	141	12	Maine	153
13	Minnesota	140	13	Minnesota	150
14	Illinois	139	14	New Jersey	149
15	Ohio	139	15	Missouri	148
16	New Jersey	137	16	New Hampshire	147
17	Washington	135	17	Washington	144
18	New Hampshire	133	18	Wisconsin	141
19	Missouri	132	19	Tennessee	139
20	Oregon	132	20	Oregon	139
21	North Dakota	130	21	Illinois	139
22	Wisconsin	128	22	Virginia	135
23	Hawaii	127	23	Louisiana	134
24	West Virginia	126	24	California	132
25	Nebraska	126	25	West Virginia	131
26	Colorado	126	26	Colorado	130
27	Virginia	124	27	Florida	128
28	California	123	28	Hawaii	127
29	Alaska	122	29	North Carolina	127
30	Tennessee	121	30	Kentucky	127
31	Iowa	121	31	Arizona	123
32	Florida	121	32	Nebraska	121
33	South Dakota	118	33	New Mexico	118
34	Kansas	118	34	Indiana	117
35	New Mexico	117	35	North Dakota	115
36	North Carolina	117	36	Utah	115
37	Arizona	116	37	Texas	114
38	South Carolina	112	38	Alabama	114
39	Louisiana	112	39	South Carolina	113
40	Georgia	110	40	Iowa	113
41	Indiana	109	41	Georgia	112
42	Kentucky	108	42	South Dakota	112
43	Oklahoma	108	43	Alaska	110
44	Alabama	105	44	Kansas	108
45	Texas	103	45	Montana	107
46	Montana	102	46	Oklahoma	107
47	Arkansas	99	47	Nevada	98
48	Mississippi	96	48	Arkansas	98
49	Wyoming	96	49	Mississippi	95
50	Nevada	95	50	Wyoming	92
51	Utah	93	51	Puerto Rico	86
52	Idaho	90	52	Idaho	85
	Puerto Rico B/	88			

Source: *Total Professionally Active Physicians*; Henry J. Kaiser Foundation. <http://kff.org/other/state-indicator/total-active-physicians/> and U.S. Bureau of the Census. U.S. Department of Commerce. For Puerto Rico we constructed the figure of primary care physicians using Registration from 2007-10. Information from Puerto Rico came *Profesionales de la Salud en Puerto Rico, 2007-2010*, Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud (Commonwealth Department of Health).

Table 10
 Primary Care Physicians per 100,000 inhabitants
 State with “similar” population to Puerto Rico

States	Population, 2012	Primary Care Physicians per 100k population, 2012
Mississippi	2,984,926	96
Alabama	4,822,023	105
Connecticut	3,590,347	189
Puerto Rico A/	3,667,084	167
Puerto Rico B/	3,667,084	88
Oklahoma	3,814,820	107
Oregon	3,899,353	139

Source: Table 9. a/ The number of Primary Care Physicians were estimated by the author. See text Table 19.

Notwithstanding, the picture changes when the Specialists are assessed (See Table 11). Specialists per capita are below the general average of the United States, but also to 49 states and Washington, D.C. The ratio in Connecticut is 189, once again, higher that Puerto Rico ratio of 86.

Table 11
 Specialists per 100,000 inhabitants
 States with “similar” population to Puerto Rico

States	Population, 2012	Total specialists per 100k population, 2012
Mississippi	2,984,926	95
Alabama	4,822,023	114
Connecticut	3,590,347	189
Puerto Rico	3,667,084	86
Oklahoma	3,814,820	107
Oregon	3,899,353	136
United States	---	139

Source: Table 9.

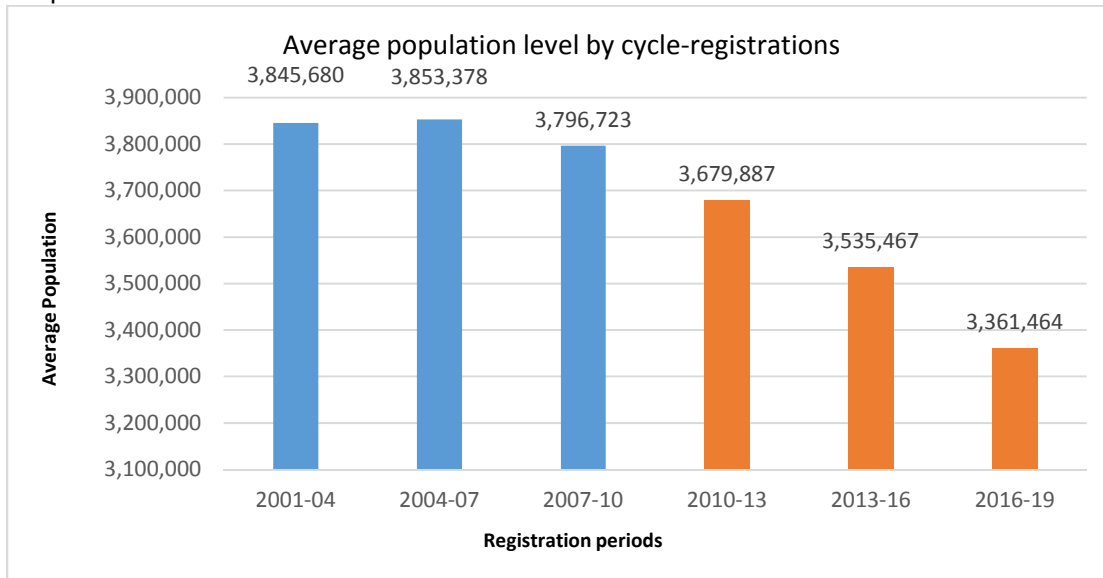
2. C. 3. Forecasting the number of Physicians

For this study, two methods were used for forecasting the supply of physicians for the three following registration cycles; 2010-13, 2013-16, and 2016-19. The first method relies upon the average growth rate of the absolute values of the number of physicians, including by type: General Practitioners and Specialists. This method will be identified as “Trend”.

The second method forecasted physicians using the rate of physicians per 100,000 inhabitants. Since this method recognized population trend, will be named “Trend & Population”. Of course, this method permits to capture long-run population trend but also its structure by age. Also, this approach permits to capture the trend for migration patterns of physicians coupled with the patterns of retirement process. It should be kept in mind that physicians belong also to the same population structure. Graph 7 depicts

the average population forecasted for the next three registration cycles. As can be seen, total forecasted population level evidenced a declining trend. By registration cycle 2007-10, the observed level of population was near 3.8 million whereas for last forecasted registration 2016-19, the level reached 3.361 million; for a total decline of 435,260 residents.

Graph 7



Source: See Table 4.

Using the *Trend method*, Table 12 shows the patterns of growth among the total and the General Practitioners and Specialists. Active physicians increased by 7.3%; General Practitioners by 8.2% and Specialists by 6.9%. If such average rate of growth persisted for the following registration cycles, the following forecasts are stated in Table 13.

Table 12

Average rate of growth of Registered and Active Physicians, by Type

	2001-04		2004-07		2007-2010		Average Rate of Growth 2001-04 to 2007-2010	
	<i>Registered</i>	<i>Actives</i>	<i>Registered</i>	<i>Actives</i>	<i>Registered</i>	<i>Actives</i>	<i>Registered</i>	<i>Actives</i>
T o t a l	10,674	8,225	11,524	8,765	11,729	9,424	4.9%	7.3%
General Practitioners	3,948	2,487	4,467	2,619	4,272	2,896	4.1%	8.2%
Specialists	6,726	5,738	7,057	6,146	7,457	6,528	5.4%	6.9%

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*, other periods from oficial Excel Spreadsheet. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud.

Table 13

Forecasting of Physicians, General Practitioners and Specialists, Trend Method Forecasting of Physicians

	2010-13		2013-16		2016-19	
	<i>Registered</i>	<i>Actives</i>	<i>Registered</i>	<i>Actives</i>	<i>Registered</i>	<i>Actives</i>
Total	12,309	10,111	12,917	10,848	13,555	11,639
General Practitioners	4,447	3,134	4,630	3,392	4,820	3,671
Specialists	7,862	6,977	8,289	7,458	8,740	7,971

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud de Puerto Rico (Commonwealth Department of Health). Forecasting by author.

Using the *Trend & Population method*, the rates of growth are shown at Table 14. Table 14 depicts the total physicians per 100,000 inhabitants; total, General Practitioners and Specialists. Average long-run rate of growth of total registered physicians is 8.7%, while General Practitioners 11.5% and specialists 7.1%. Actives physicians grew at an 11.1%, General Practitioners by 10.4% and Specialists 11.4%. This physicians-population ratio tends to increase twice *vis a vis* the absolute rate shown at Table 12.

Table 14

Total Physicians per 100,000 of population: Total, General Practitioners and Specialists.

Per 100,000	2001-04		2004-07		2007-2010		Average rate growth	
	<i>Registered</i>	<i>Actives</i>	<i>Registered</i>	<i>Actives</i>	<i>Registered</i>	<i>Actives</i>	<i>Registered</i>	<i>Actives</i>
Total	277.6	213.4	281.1	223.5	326.0	260.7	8.7%	11.1%
General Practitioners	102.7	64.5	104.0	67.6	126.3	77.9	11.5%	10.4%
Specialists	174.9	148.9	177.2	155.9	199.6	182.8	7.1%	11.4%

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. (Commonwealth Department of Health).

Table 15 depicts the forecasting values for physicians under the aforementioned method. Notice that forecasted values of physicians increased at a decreasing rate, because the method captured the current trend in population decline but also, supposed a strong pattern of out-migration and retired physicians.

Table 16 presents the comparison of the results from both methods. Meanwhile, Graph 8, 9 and 10 shows the patterns of growth under both methods. Table 17 and 18 shows the forecasting values for type of specialists under both methods. As can be seen, for 2016-19 registration, total active physicians forecasted are 11,639 under *Trend Method*, but 10,505 under *Trend and Population*.

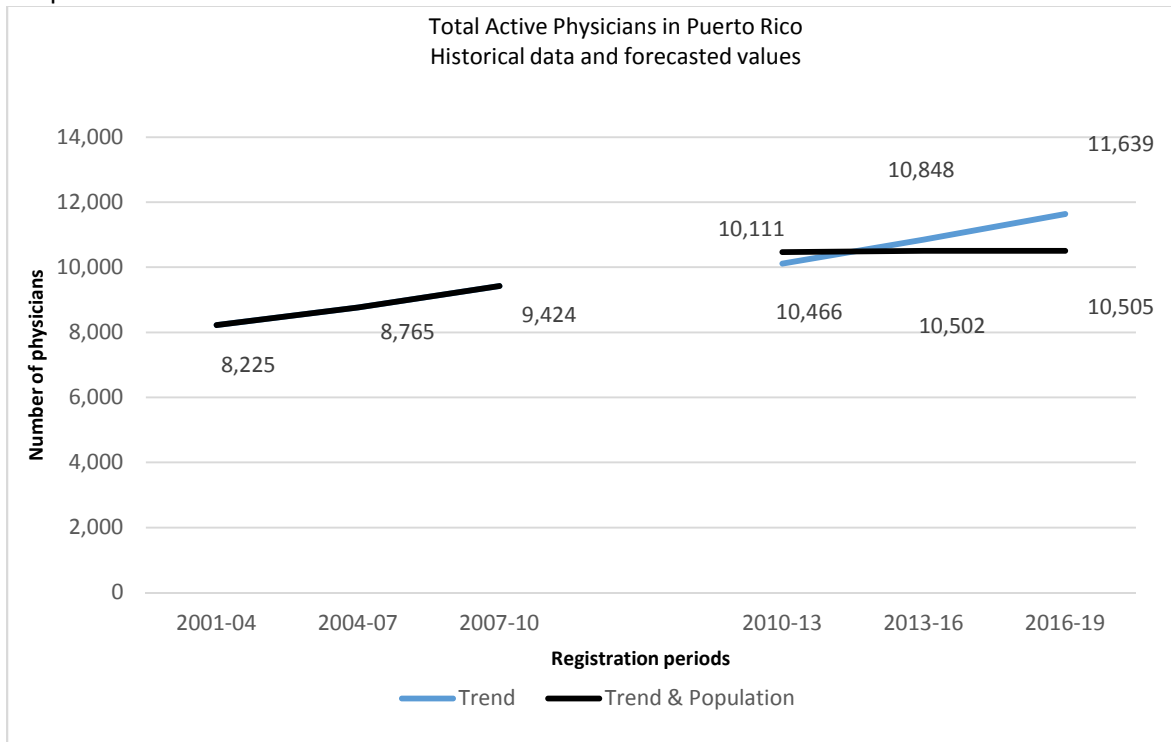
Table 16

Total forecasting for total Physicians, General Practitioners and Specialists

Total Physicians			General Practitioners		Specialists			
Actives	Trend & Population		Trend	Trend & Population		Trend	Trend & Population	
	Trend	Population		Population	Population			
2001-04	8,225	8,225	2,487	2,487	5,738	5,738		
2004-07	8,765	8,765	2,619	2,619	6,146	6,146		
2007-10	9,424	9,424	2,896	2,896	6,528	6,528		
2010-13	10,111	10,466	3,134	3,113	6,977	7,352		
2013-16	10,848	10,502	3,392	3,124	7,458	7,378		
2016-19	11,639	10,505	3,671	3,124	7,971	7,379		

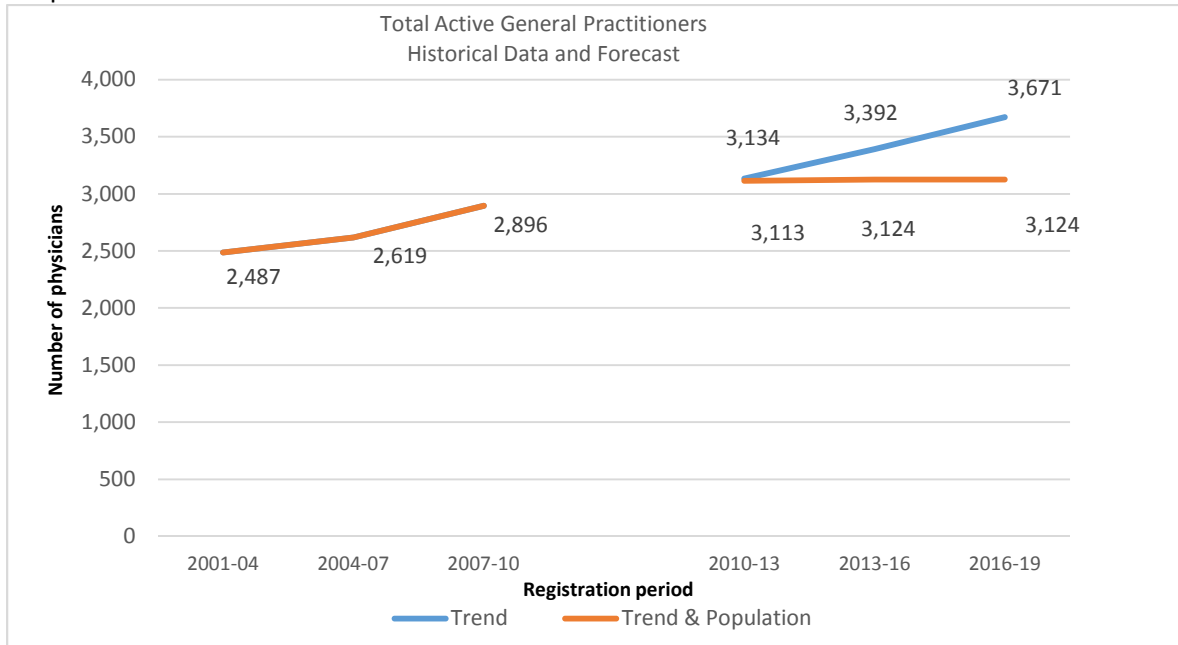
Source: Profesionales de la Salud en Puerto Rico, 2007-2010. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. (Commonwealth Department of Health). Forecast by author.

Graph 8



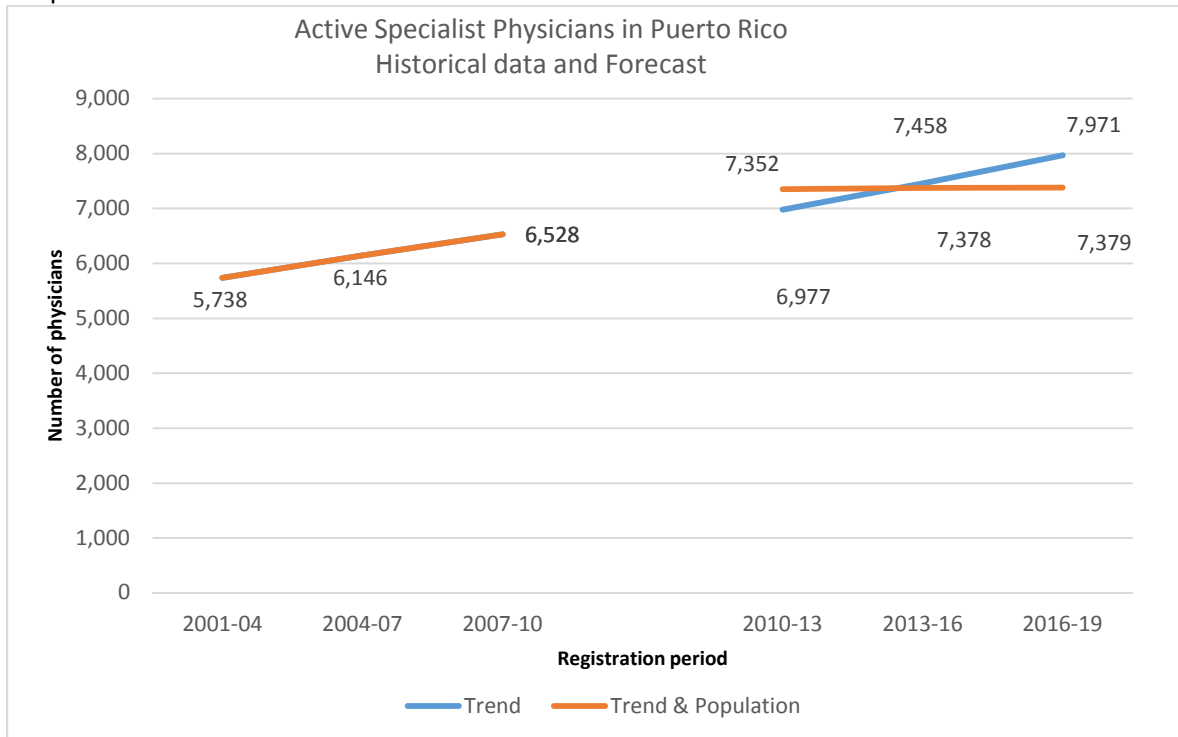
Source: Profesionales de la Salud en Puerto Rico, 2007-2010. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. (Commonwealth Department of Health).

Graph 9



Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. (Commonwealth Department of Health).

Graph 10



Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. (Commonwealth Department of Health).

Table 17

Forecasting Specialists by categories: Trend method

Forecast Specialists--Trend Method	2010-13		2013-16		2016-19	
	Registered	Actives	Registered	Actives	Registered	Actives
Internal Medicine	1,554	1,389	1,639	1,485	1,728	1,566
Pediatrics	1,242	1,115	1,310	1,192	1,381	1,256
Family Medicine	624	532	658	569	694	600
Obstetric-Gynecologist	561	508	591	543	624	572
Psychiatry	539	444	568	474	599	500
General Surgery	271	242	286	258	301	272
Anesthesiology	256	214	270	228	285	241
Emergency Medicine	216	193	228	207	240	218
Ophthalmology	193	186	203	199	214	210
Diagnostic Radiology	191	153	201	163	212	172
Preventive Medicine	178	162	188	174	198	183
Physical Medicine and Rehabilitation	170	156	179	167	189	176
Gastroenterology	138	127	146	136	154	143
Occupational Medicine	133	131	140	141	148	148
Neurology	129	117	136	125	143	131
Urology	90	88	94	94	100	99
Dermatology	83	77	88	82	93	87
Cardiovascular Diseases	75	68	79	73	83	77
Infectious Diseases	69	66	72	71	76	75
Anatomic and Clinical Pathology	65	52	69	56	73	59
Nephrology	54	48	57	51	60	54
Radiology	52	43	54	46	57	48
Rheumatology	52	48	54	51	57	54
Orthopedic Surgery	50	43	52	46	55	48
Otoraryngology	45	43	48	46	50	48
Child and Adolescent Psychiatry	45	34	48	37	50	39
Endocrinology	41	40	43	42	46	45
Nuclear Medicine	40	38	42	41	45	43
Orthopedics	39	35	41	38	43	40
Hematology	38	36	40	39	42	41
Anatomic Pathology	37	30	39	32	41	34
Otoraryngology- Head and Neck Surgery	35	34	37	37	39	39
Neurological Surgery	32	27	33	29	35	30
Geriatric Medicine	32	28	33	30	35	31
Physiatry	30	28	31	30	33	31
Cardiovascular and Thoracic Surgery	27	24	29	25	30	26
Orthopedic Surgery and Fracture	23	20	24	22	26	23
Cardiology	20	17	21	18	22	19
Adult and Pediatric Urology	19	18	20	19	21	20
Pediatric Hematology and Oncology	18	14	19	15	20	16
Unspecified	18	16	19	17	20	18
Neuroradiology	17	15	18	16	19	17
Allergy and Immunology	16	14	17	15	18	16
Plastic and Reconstructive Surgery	16	16	17	17	18	18
Endocrinology, Diabetes and Metabolism	16	14	17	15	18	16
Plastic Surgery	15	13	16	14	16	14
Pulmonary Diseases	15	14	16	15	16	16
Orthopedics and Traumatology	15	14	16	15	16	16
Gynecology	14	10	14	10	15	11
Hand Surgery	12	10	12	10	13	11
Hematology and Oncology	12	12	12	13	13	13
Urological Surgery	11	9	11	9	12	10
Pediatric Neurology	11	11	11	11	12	12
Colon and Rectal Surgery	9	7	10	8	11	8
Radiotherapy	9	7	10	8	11	8
Pediatric Surgery	8	7	9	8	9	8
Geriatric Psychiatry	8	6	9	7	9	7
Oncological Radiology	7	6	8	7	8	7
Pediatric Radiology	7	6	8	7	8	7
Therapeutic Radiology	7	7	8	8	8	8
Hand and Neck Surgery	6	5	7	6	7	6
Forensic Pathology	6	5	7	6	7	6
Pediatric Cardiology	5	2	6	2	6	2
Pediatric Orthopedics	5	5	6	6	6	6
Pathology	5	4	6	5	6	5
Clinical Neurology	4	4	4	5	5	5
Interventional and Vascular Radiology	4	4	4	5	5	5
Vascular Surgery	3	3	3	3	4	4
Pain Management	3	1	3	1	4	1
Pediatric Nephrology	3	3	3	3	4	4
Pneumology	3	3	3	3	4	4
Clinical Neurophysiology	3	3	3	3	4	4
Neuropathology	3	3	3	3	4	4
Forensic Psychiatry	3	2	3	2	4	2
Interventional Cardiology	2	2	2	2	2	2
Thoracic Surgery	2	2	2	2	2	2
Cytopathology	2	2	2	2	2	2
Sports Medicine	2	2	2	2	2	2
Undersea and Hyperbaric Medicine	2	1	2	1	2	1
Nephrology and Hypertension	2	2	2	2	2	2
Neonatology	2	1	2	1	2	1
Vascular Neurology	2	2	2	2	2	2
Neurotology	2	1	2	1	2	1
Obstetrics	2	2	2	2	2	2
Oncology	2	2	2	2	2	2
Child Psychiatry	2	0	2	0	2	0

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. (Commonwealth Department of Health). Estimates excluded those with one Physician or less. It is assumed the same proportion to the total of 2007-10.

Table 18

Forecasting Specialists by categories: Trend & population method

Specialists MD--Population Trend Method	2010-13		2013-16		2016-19	
	Registered	Actives	Registered	Actives	Registered	Actives
Internal Medicine	1,542	1,453	1,547	1,458	1,547	1,459
Pediatrics	1,232	1,161	1,236	1,166	1,237	1,166
Family Medicine	619	584	621	586	621	586
Obstetric-Gynecologist	556	525	558	526	558	526
Psychiatry	534	504	536	506	536	506
General Surgery	269	253	270	254	270	254
Anesthesiology	254	240	255	240	255	240
Emergency Medicine	214	202	215	203	215	203
Ophthalmology	191	180	192	181	192	181
Diagnostic Radiology	189	178	190	179	190	179
Preventive Medicine	177	167	177	167	177	167
Physical Medicine and Rehabilitation	168	159	169	159	169	159
Gastroenterology	137	129	138	130	138	130
Occupational Medicine	132	124	132	125	132	125
Neurology	128	120	128	121	128	121
Urology	89	84	89	84	89	84
Dermatology	83	78	83	78	83	78
Cardiovascular Diseases	74	70	75	70	75	70
Infectious Diseases	68	64	68	64	68	64
Anatomic and Clinical Pathology	65	61	65	61	65	61
Nephrology	53	50	54	50	54	50
Radiology	51	48	51	48	51	48
Rheumatology	51	48	51	48	51	48
Orthopedic Surgery	49	46	49	47	49	47
Child and Adolescent Psychiatry	45	42	45	43	45	43
Otoraryngology	45	42	45	43	45	43
Endocrinology	41	38	41	39	41	39
Nuclear Medicine	40	37	40	38	40	38
Orthopedics	39	36	39	37	39	37
Hematology	38	35	38	36	38	36
Anatomic Pathology	37	35	37	35	37	35
Otoraryngology- Head and Neck Surgery	35	33	35	33	35	33
Geriatric Medicine	31	30	31	30	31	30
Neurological Surgery	31	30	31	30	31	30
Physiatry	29	28	29	28	29	28
Cardiovascular and Thoracic Surgery	27	26	27	26	27	26
Orthopedic Surgery and Fracture	23	22	23	22	23	22
Cardiology	20	19	20	19	20	19
Adult and Pediatric Urology	19	18	19	18	19	18
Pediatric Hematology and Oncology	18	17	18	17	18	17
Unspecified	18	17	18	17	18	17
Neuroradiology	17	16	17	16	17	16
Allergy and Immunology	16	15	16	15	16	15
Endocrinology, Diabetes and Metabolism	16	15	16	15	16	15
Plastic and Reconstructive Surgery	16	15	16	15	16	15
Orthopedics and Traumatology	15	14	15	14	15	14
Plastic Surgery	15	14	15	14	15	14
Pulmonary Diseases	15	14	15	14	15	14
Gynecology	14	13	14	13	14	13
Hand Surgery	12	11	12	11	12	11
Hematology and Oncology	12	11	12	11	12	11
Pediatric Neurology	10	10	10	10	10	10
Urological Surgery	10	10	10	10	10	10
Colon and Rectal Surgery	9	9	9	9	9	9
Radiotherapy	9	9	9	9	9	9
Geriatric Psychiatry	8	8	8	8	8	8
Pediatric Surgery	8	8	8	8	8	8
Oncological Radiology	7	7	7	7	7	7
Pediatric Radiology	7	7	7	7	7	7
Therapeutic Radiology	7	7	7	7	7	7
Forensic Pathology	6	6	6	6	6	6
Hand and Neck Surgery	6	6	6	6	6	6
Pathology	5	5	5	5	5	5
Pediatric Cardiology	5	5	5	5	5	5
Pediatric Orthopedics	5	5	5	5	5	5
Clinical Neurology	4	4	4	4	4	4
Interventional and Vascular Radiology	4	4	4	4	4	4
Clinical Neurophysiology	3	3	3	3	3	3
Forensic Psychiatry	3	3	3	3	3	3
Neuropathology	3	3	3	3	3	3
Pain Management	3	3	3	3	3	3
Pediatric Nephrology	3	3	3	3	3	3
Pneumology	3	3	3	3	3	3
Vascular Surgery	3	3	3	3	3	3
Child Psychiatry	2	2	2	2	2	2
Cytopathology	2	2	2	2	2	2
Interventional Cardiology	2	2	2	2	2	2
Neonatology	2	2	2	2	2	2
Nephrology and Hypertension	2	2	2	2	2	2
Neurotology	2	2	2	2	2	2
Obstetrics	2	2	2	2	2	2
Oncology	2	2	2	2	2	2
Sports Medicine	2	2	2	2	2	2
Thoracic Surgery	2	2	2	2	2	2
Undersea and Hyperbaric Medicine	2	2	2	2	2	2
Vascular Neurology	2	2	2	2	2	2

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. (Commonwealth Department of Health). Estimates excluded those with one physician or less. We assumed the same proportion of 2007-10

2. C. 4. Forecasting Supply of Primary Care Physicians

This section shows the forecasts for the supply of Primary Care Physicians (See Table 19). Table 19 exhibits the forecast under the two methods considered. For registration period 2010-13, the total number of physicians amounted 6,678 under *Trend Method* whereas 6,836 under *Trend & Population*. Nonetheless, forecast for subsequence periods showed an increasing number of Primary Care Physicians, although under Trend and Population, almost the same figure for period 2013-16 and 2016-19. A Primary Care Physician provides direct patient care in the following professional areas: General Practice, Family Practice, General Internal Medicine, Pediatrics, and Obstetrics/Gynecologists.

Table 19

Supply of Primary Care Physicians; 2010-13; 2013-16, and 2016-19

Categories and Methods	2010-13	2013-16	2016-19
Trend Method			
General Practitioners	3,134	3,392	3,531
Internal Medicine	1,389	1,485	1,566
Pediatrics	1,115	1,192	1,256
Family Medicine	532	569	600
Obstetrics-Gynecologists	508	543	572
Total Primary Care	6,678	7,180	7,525
Trend & Population Method			
General Practitioners	3,113	3,124	3,124
Internal Medicine	1,453	1,458	1,459
Pediatrics	1,161	1,166	1,166
Family Medicine	584	586	586
Obstetrics-Gynecologists	525	526	526
Total Primary Care	6,836	6,860	6,861

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. (Commonwealth Department of Health). Forecast by author.

3. The Demand Side

3. A. Forecasting the Demand of Physicians

The demand of physicians in Puerto Rico was estimated considering two main sources of changes: (a) population growth (decline) net patterns and; (b) the implementation of the Universal Health Plans proposed by the U.S. Federal Government and the local government. It is clear, in the case of Puerto Rico, population forecast showed a decreasing pattern of growth, although demographic transition has driven to an older aging structure of the population pyramid. Under the segment (a) is excluded the segment (b), this is why it been called as “net”.

In United States, for instance, the Robert Graham Center for Policy Studies in Primary Care released a study projecting that the United States will need at least 52,000 additional primary care doctors by the year 2025 to meet the demands of three developments: overall population growth (33,000 new doctors), the aging of the Baby Boom generation (10,000) and Obama Care’s insurance expansion (8,000)³. Thereby, the main conclusion is that population growth will be the greatest driver of expected increases in primary care utilization. Aging and insurance expansion will also contribute to utilization, but to a smaller extent of changed. On the other hand, The Association of American Medical Colleges

³ Peterson, S.M., W. Liaw, R.L. Phillips, et al. 2012. *Projecting US Primary Care Physician Workforce Needs: 2010-2025*. Robert Graham Center for Policy Studies in Primary Care, nov/dic.

(AAMC) projected that universal coverage will increase the use of all physicians by 4%⁴, whereas the Bureau of Health Professions projected a 5.2% increase⁵. However, the level of total physician per capita was taken from the 2011 OECD Health Report, say 3.1 per 1,000 persons⁶. We assume this parameter as an *optimal* demand value of physicians in which the search for a better quality on health indexes is a main concern.

Table 20 shows the demand of total Physicians as well as Primary Care. In terms of the “optimal” demand level of total Physicians, the average level reached 11,283 for 2010-13; 10,973 for 2013-16 and 10,469 for 2016-19. This demand can be divided into two main sources; (a) due to population growth, net; and, (b) due to universal health plans. The former determined the declining trend of the demand of Physicians because the forecast of the population herewith depicted lower level every year since the mid of the decade of 2010 up to 2025. On the other hand, the demand of physicians will definitely increase due to the Universal Health Plan that expected to cover 281,000 new persons with no plan currently. It will also induce an increase of the visits to the physicians. By 2013-16, the demand of physicians will increase by 942 and 1,030 for 2016-19.

On the other side, we should kept in mind that surplus or shortage vary according to geographical regions. The Department of Health of Puerto Rico has designed seven regions for Puerto Rico; Arecibo, Bayamón, Caguas, Mayaguez/Aguadilla, Ponce, Fajardo and Metropolitan (See Appendix B for details). The Metropolitan and Fajardo regions usually are consolidated at one region, thereby, called herewith as Metro/Fajardo.

Estimates for supply and demand of Physicians by regions shows that all regions except Metro/Fajardo exhibited shortage of Physicians for all registration periods. Mayaguez region exhibited the largest shortage of Physicians for the three periods from -1,619 to -1,265. Secondly, Bayamón shows shortage of Physicians from -624 to -407. Metro/Fajardo, conversely, shows a surplus of physicians; that is supply exceeds demand. This is partly due to the location of Medical Centers, Hospital institutions, School of Medicine, Professional Offices, etc; in this region, acting as a health service-led attractions for residents abroad the Metro/Fajardo region. Then, the excess supply is a result of such demand of non-residents in the Metro/Fajardo region.

⁴ Dill MJ, Salsberg, ES. *The Complexities of Physician Supply and Demand: Projections Through 2025*. Association of American Medical Colleges; 2008. http://www.innovationlabs.com/pa_future/1/ .

⁵ U.S. Health Resources and Services Administration. *Physician Supply and Demand: Projections to 2020*. Department of Health and Human Services; 2006. <http://bhpr.hrsa.gov/healthworkforce/supplydemand/medicine/physician2020projections.pdf>

⁶ See Footnote 1. *Op. Cit.* 2011 OECD Health at Glance.

Table 20

The Demand of Physicians and Primary Care by sources of changes, 2007-2010; 2013-16; and 2016-2019:

Column	Demand of Total Physicians			Demand of Total Primary Care Physicians		
	Due to population growth	Due to Universal Health Plans a/	Total Demand	Due to population growth	Due to Universal Health Plans a/	Total Demand
	1	2	3	4	5	6
2007-2010	11,536	0	11,536	6,212	0	6,212
2013	11,283	0	11,283	7,447	0	7,447
2014	11,060	894	11,060	7,300	589	7,300
2015	10,862	941	10,862	7,169	620	7,169
2016	10,689	990	10,689	7,054	652	7,054
2017	10,531	992	10,531	6,951	654	6,951
2018	10,392	1,043	10,392	6,859	688	6,859
2019	10,266	1,097	10,266	6,775	723	6,775
Average						
2010-13 b/	11,283	0	11,283	7,447	0	7,447
2013-16	10,973	942	10,973	7,243	465	7,243
2016-19	10,469	1,030	10,469	6,910	679	6,910

a/ segment already included Column 1 & Column 4

b/ Only 2003

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. (Commonwealth Department of Health). Forecast by author. See Appendix A-1 to method of calculations.

3. B. Estimating the demand of Primary Care Physicians

A Primary Care Physician is an original *check point* of any health care activity of any provider who acts as a first gate in a consultation for all patients. Continuity of care is also a key element of primary care attention and it is also an important aspect for all health access, including patients of all ages; socioeconomic and geographic origins; and those with multiple chronic and common diseases. The Affordable Care Act (*Obama Care*), is supposed to increase the demand of Primary Care Physicians, due to the new health expenditures from federal government.

The projection for the demand of Primary Care physicians is 7,447 for 2010-13; 7,243 for 2013-16 and 6,910 or 2016-19. Likewise the main determinant for total physicians, the optimal demand for total Primary Care Physicians was population. The demand decreases due to the net population growth although increases due to universal plan extension; 465 for 2013-16 and 679 for 2016-19.

3. C. Demand and Supply of Physicians

This section summarizes the forecast of the supply and the demand of physicians for Puerto Rico for the period-years of 2010-13; 2013-16 and 2016-19. Table 21 shows that demand exceeds supply for period 2013-16 and 2016-19. The projected demand amounted 10,973, therefore, there is a shortage of physicians of 101 physicians. No shortage was found for 2016-19 when projected number amounted +601 physicians.

In term of Primary Care Physicians, the forecasted values have driven to a similar conclusion. Supply of physicians is far below the demand. For 2013-16, the supply of physicians averaged 7,107 while the demand is 7,243. So, there is again a shortage, of closely to 136 physicians. No shortage was found for period 2016-19; but rather a surplus of 283.

Table 21

Supply and Demand of Total Physicians and Primary Care 2010-13; 2013-16 and 2016-19.

Total Physicians					
Supply			Supply, Average	Demand	Shortage (-); Surplus (+)
	Trend Method	Trend and Population Method			
2010-13	10,111	10,466	10,678	11,283	-605
2013-16	10,848	10,502	10,873	10,973	-101
2016-19	11,639	10,502	11,071	10,469	601
Primary Care					
Supply			Supply, Average	Demand	Shortage (-); Surplus (+)
	Trend Method	Trend and Population Method			
2010-13	6,678	6,836	6,990	7,447	-457
2013-16	7,180	6,860	7,107	7,243	-136
2016-19	7,525	6,861	7,193	6,910	283

Source: the author.

However, the shortage of Physicians should be addressed by decomposing Puerto Rico into regions. The Department of Health of Puerto Rico has designed seven regions for Puerto Rico; Arecibo, Bayamón, Caguas, Mayaguez/Aguadilla, Ponce, Fajardo and Metropolitan (See Appendix B for details). The Metropolitan and Fajardo regions usually are consolidated at one region, thereby, called herewith as Metro/Fajardo. Physicians—based at working place—are highly concentrated at the Metro/Fajardo region. In spite of this region comprises one-fifth of population, it possesses 42% of total Physicians; 37% of Primary Care and 52% of total Specialists. Clearly, this region is over-represented of total physicians relative to its population. Conversely, the rest of the regions—Arecibo, Mayaguez and Ponce—having 42% of total residents, accounted for 33% of total Physicians; 37% of Primary Care and 25% of Specialists. Then, they are under-represented, so far, of all type of Physicians.

The Appendix B shows important results for the number of Physicians. Estimates for supply and demand of Physicians by regions showed that all regions except Metro/Fajardo exhibited shortage of Physicians for all registration periods. Mayaguez region exhibited the largest shortage of Physicians for the three periods from -1,619 to -1,265. Secondly, Bayamón shows shortage of Physicians from -624 to -407. Metro/Fajardo, conversely, shows a surplus of physicians; that is supply exceeds demand. This is partly explained by the location of Medical Centers, Hospital institutions, School of Medicine, Professional Offices, etc.; in this region, acting as a health service-led attractions for residents abroad the Metro/Fajardo region. Then, the excess supply is a result of such demand of non-residents in the Metro/Fajardo region.

4. The Demand of Specialists in Puerto Rico

In the following section the issue of the needs of specialists for some medical and clinical conditions is addressed. The medical conditions are: (a) Diabetes Type II; (b) Overweight and Obesity; (c) Alzheimer's diseases; and (d) Depression.

4. A. Diabetes Type II

Puerto Rico has the highest incidence of diabetes Type II in the United States, although incidence of the disease has been emerging very fast in many states over the past 15 years. Puerto Rico's diabetes rate rose from 11.7 percent in 1995 to 12.7 in 2010. This is almost twice the national average of 7.0 percent. Within the states, two southern states were on top 2010 rates; Mississippi (11.7 percent) and Alabama (11.3 percent). Diabetes is the third leading cause of death in Puerto Rico but the seventh leading cause of death in the United States.

Using the information from the *Centers for Disease Control and Prevention (CDC)*, the prevalence rate of diabetes Type II was forecasted. Table 22 depicts the prevalence rate of Diabetes Type II, while Table 23 shows the forecast, under the assumption of the same rate of growth per segment.

Table 22

Prevalence rate of Diabetes Type II: 1996 to 2010 by age groups.

Year	18-44 years old	45-64 years old	65-74 years old	75+ years old
1996	3.4	17.7	25.7	25.0
1997	3.2	16.7	24.7	28.1
1998	2.7	16.4	24.9	28.1
1999	2.5	14.8	25.3	26.6
2000	2.2	15.4	26.2	22.4
2001	2.3	15.4	27.1	22.4
2002	2.3	16.5	29.1	23.1
2003	2.5	16.8	28.8	23.2
2004	2.7	17.4	29.3	26.4
2005	2.9	17.6	28.9	28.2
2006	2.9	18.5	31.8	28.3
2007	3.0	18.4	32.1	27.5
2008	3.2	18.8	32.3	28.4
2009	3.5	18.4	31.5	30.6
2010	3.7	18.6	31.1	30.9

Source: Centers for Disease Control and Prevention <http://www.cdc.gov/diabetes/pubs/factsheet11.htm>.

Table 23

Prevalence rate of Diabetes Type II: 2011 to 2033 by age groups.

Year	18-44 years old	45-64 years old	65-74 years old	75+ years old
2011	3.9	18.7	30.8	32.0
2012	4.2	18.7	30.4	33.2
2013	4.4	18.8	30.1	34.3
2014	4.6	18.9	29.8	35.4
2015	4.9	18.9	29.4	36.6
2016	5.1	19.0	29.1	37.7
2017	5.3	19.1	28.8	38.8
2018	5.6	19.1	28.4	40.0
2019	5.8	19.2	28.1	41.1
2020	6.0	19.3	27.8	42.2
2021	6.3	19.3	27.4	43.4
2022	6.5	19.4	27.1	44.5
2023	6.7	19.5	26.8	45.6
2024	7.0	19.5	26.4	46.8
2025	7.2	19.6	26.1	47.9
2026	7.4	19.7	25.8	49.0
2027	7.7	19.7	25.4	50.2
2028	7.9	19.8	25.1	51.3
2029	8.1	19.9	24.8	52.4
2030	8.4	19.9	24.4	53.6
2031	8.6	20.0	24.1	54.7
2032	8.8	20.1	23.8	55.8
2033	9.1	20.1	23.4	57.0

Source: Centers for Disease Control and Prevention: National Diabetes Surveillance System.

<http://www.cdc.gov/diabetes/statistics>, and <http://www.cdc.gov/diabetes/pubs/factsheet11.htm> and forecast from author.

On Table 24, the demand for the Specialist that might attend a diabetic patient was estimated. The method is based upon the estimation of total volume of visits in terms of hours. Given a time for visits of 25 minutes, and the prevalence for year 2013, 2015, 2020 and 2025, this study was able to estimate the demand of specialists under the assumption of full time equivalent (FTE) of 2,080 hour per specialist per year. If so, the demand for, say, Endocrinologists is 20 in year 2013; 39 in year 2015; 42 in year 2020 and 47 in 2025. The supply of Endocrinologists is over 40 physicians, then, under these assumptions we expect a negligible shortage of supply in order to fulfill the gap of demand. In term of General Practitioners, there is no evidence of the shortage since General Practitioners overpassed 3,000 and the demand is from 100 to 230.

Table 24

Estimating the demand of specialists for Diabetes Type II; 2013, 2015, 2020 and 2025

	2013	2015	2020	2025
Number of prevalence patients	419,030	401,086	353,466	329,202
Number of visits per patients per year	2	4	5	6
Percentage				
General Practitioners	0.6	0.6	0.6	0.6
Endocrinologists	0.12	0.12	0.12	0.12
Cardiology	0.03	0.03	0.03	0.03
Internists	0.24	0.24	0.24	0.24
Pediatric	0.01	0.01	0.01	0.01
Time for visits	25	25	25	25
	2013	2015	2020	2025
Minutes/ year	20,951,501	40,108,625	44,183,224	49,380,348
minutes/one hour	60	60	60	60
Hours. Annual	349,191.7	668,477.1	736,387.1	823,005.8
Demand of Specialists	168	321	354	396
	2013	2015	2020	2025
General Practitioners	101	193	212	237
Endocrinologists	20	39	42	47
Cardiology	5	10	11	12
Internists	40	77	85	95
Pediatric	2	3	4	4

Note: For methodology and sources, see Appendix, Table A-2

4. B. Overweight and Obesity

In term of overweight and obesity, Puerto Rico exhibits a higher rate level of overweight than United States but lower for obesity (See Table 25). Mississippi is the state with the highest rate of obesity and New Jersey with overweight.

Table 25

Overweight and Obesity rates in Puerto Rico and other states/territories, 2011

States and territories	Overweight	Obesity
Puerto Rico	39.8	26.3
United States	35.7	27.8
Alabama	34.7	32.0
Arizona	37.2	25.1
Florida	36.7	26.6
Hawaii	33.8	21.9
Mississippi a/	34.0	34.9 a/
Louisiana	34.1	33.4 c/
Nueva Jersey b/	37.8 b/	23.7
Guam	36.6	27.4

a/ state with higher index obese; b/ state with higher index overweight; c/ Second higher index.
Source: Prevalence and Trends Data, <http://apps.nccd.cdc.gov/brfss/>.

The estimated number of forecasted persons under the status of overweight and obesity in Puerto Rico is shown at Table 26. Forecasted overweight rate is over 40% of total population with 18 years and more; obesity rate is from 25% to 26%. Table 26 presents the estimates of specialist physician's needs under the assumption of same physician's proportion to Diabetes. The estimates stated that the demand of Endocrinologists is 70 to over 100. These figures are clearly higher than the supply forecasted for such specialists, and then taking together the demand of Diabetes and Obesity, there would be a shortage of such specialist in Puerto Rico in order to take care of both conditions in the future.

Table 26

Estimating the number of patients with Overweight and Obesity in Puerto Rico

Age	2013	2015	2020	2025
18 to 24 years	101,332	101,523	102,097	102,814
25 to 34 years	160,908	154,492	139,614	126,255
35 to 44 years	196,537	191,820	180,524	169,901
45 to 54 years	220,233	216,927	208,881	201,140
55 to 64 years	188,101	186,681	183,442	180,627
65 +	267,991	285,648	335,231	393,728
Adult over weight	1,135,102	1,137,091	1,149,789	1,174,466
Over 18 years old	2,816,380	2,816,694	2,835,737	2,882,884
Prevalence rate global	40.3%	40.4%	40.5%	40.7%
Adult Obese				
Age	2013	2015	2020	2025
18 to 24 years	36,535	35,123	31,751	28,586
25 to 34 years	123,562	118,635	107,211	96,952
35 to 44 years	145,428	141,938	133,579	125,719
45 to 54 years	149,206	146,966	141,515	136,270
55 to 64 years	146,204	145,100	142,582	140,395
65 +	130,390	138,981	163,106	191,567
Adult Obese	731,325	726,743	719,744	719,490
Over 18 years old	2,816,380	2,816,694	2,835,737	2,882,884
Prevalence rate global	26.0%	25.8%	25.4%	25.0%

Note: For methodology and sources, see Appendix, Table A-2 Source: CDC and the author.

Table 27

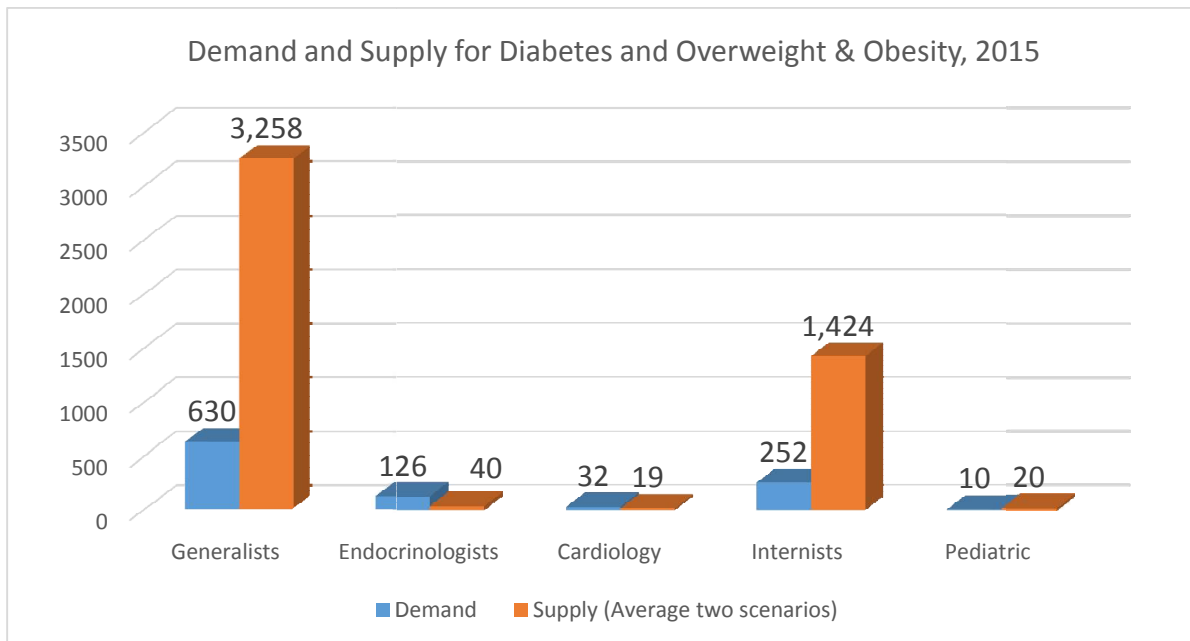
Estimating the number of patients with Obesity and Specialists needed

	2013	2015	2020	2025
Number of prevalence patients	731,325	726,743	719,744	719,490
Number of visits per patients per year	4	5	6	6
Percentage				
General Practitioners	0.6	0.6	0.6	0.6
Endocrinologists	0.12	0.12	0.12	0.12
Cardiology	0.03	0.03	0.03	0.03
Internists	0.24	0.24	0.24	0.24
Pediatric	0.01	0.01	0.01	0.01
Time for visits	25	25	25	25
Minutes	73,132,494	90,842,864	107,961,606	107,923,434
minutes/one hour	60	60	60	60
Hours. Annual	1,218,874.9	1,514,047.7	1,799,360.1	1,798,723.9
Demand of Physicians (FTE)	586	728	865	865
	2013	2015	2020	2025
General Practitioners	352	437	519	519
Endocrinologists	70	87	104	104
Cardiology	18	22	26	26
Internists	141	175	208	208
Pediatric	6	7	9	9

Source: CDC and author and Survey from Commonwealth Department of Health about the number of visits.

Note: For methodology and sources, see Appendix, Table A-2.

Graph 11



Source: See Table 24 and Table 27.

4. C. Alzheimer’s diseases

In 2013, United States has 5.2 million of Americans of all ages with Alzheimer's disease. This includes an estimated 5 million people age 65 and older and approximately 200,000 individuals younger than age 65 who have younger-onset Alzheimer's. The number of Americans with Alzheimer's disease and other dementias will grow as the U.S. population age 65 and older continues to increase⁷. By 2025, the number of people age 65 and older with Alzheimer's disease is estimated to reach 7.1 million—a 40 percent increase from the 5 million age 65 and older currently affected. By 2050, the number of people age 65 and older with Alzheimer's disease may nearly triple, from 5 million to a projected 13.8 million, barring the development of medical breakthroughs to prevent, slow or stop the disease.

A current estimate for Puerto Rico of total persons with Alzheimer’s conditions is 70,000. Using the information of United States, we estimate and forecast the Alzheimer’s incidence (See Table 27). For the year 2025, the incidence will be around 102,800 (65 years old and over), and 36,800 (85 years old and over). Table 28 depicts the forecast specialists that would be needed to treat Alzheimer patients. In terms of specialists, the geriatrics played an important role, the demand will increase from 17 in year 2013; 27 at year 2015; and to 53 in year 2025. The supply of such specialists ranges from 28 at 2010-13 to 31 at 2016-19. So, there are enough specialists to fulfill the demand.

Table 28

Estimates of persons under Alzheimer’s Diseases: 2013, 2015, 2020 and 2025 Puerto Rico

Targeted segments	2013	2015	2020	2025
Persons over 65 years (000)	601.0	640.5	751.6	882.8
Incidence (000) (=11.6%, U.S.)	70.0	74.6	87.6	102.8
Over 85 years (=33.0%, U.S.) (000)	23.6	25.4	30.6	36.8

Source: Alzheimer’s Association, 2013, *Facts and Figures*. http://www.alz.org/alzheimers_disease_facts_and_figures.asp and the author

⁷ Alzheimer’s Association, 2013, *Facts and Figures*. http://www.alz.org/alzheimers_disease_facts_and_figures.asp.

Table 29

Estimating the demand for specialists due to Alzheimer's diseases.

	2013	2015	2020	2025
Number of prevalence patients	70,000	74,612	87,563	102,843
Number of visits per patient per year	2	3	3	4
Percentage				
General Practitioners	0.0%	0.0%	0.0%	0.0%
Geriatrics	54.0%	54.0%	54.0%	54.0%
Neurologists	24.0%	24.0%	24.0%	24.0%
Neurophysiatrics	10.0%	10.0%	10.0%	10.0%
Families practice	12.0%	12.0%	12.0%	12.0%
Time per person/ visit/ year (minutes)	28	28	29	30
Minutes total	3,920,000	6,267,411	7,618,009	12,341,145
Minutes/one hour	60	60	60	60
Hours. Annual	65,333	104,457	126,967	205,686
Physicians FTE (2080 hours/year)	31	50	61	99
Demand for Alzeimer's				
General Practitioners	0	0	0	0
Geriatrics	17	27	33	53
Neurologists	8	12	15	24
Neurophysiatrics	3	5	6	10
Families practice	4	6	7	12

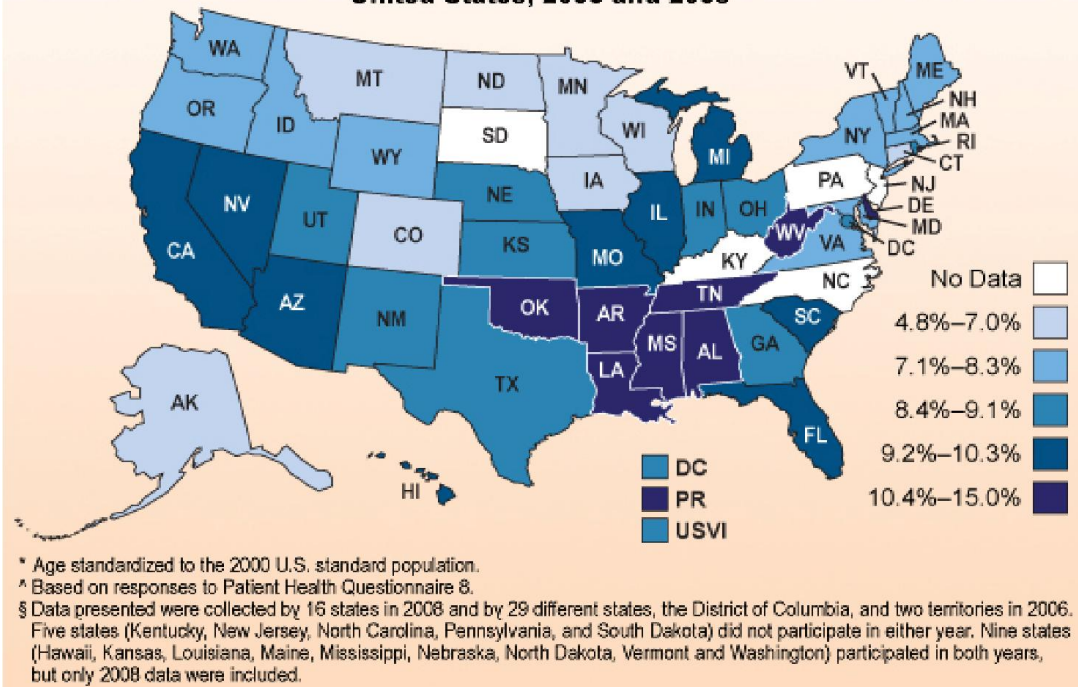
Note: For methodology and sources, see Appendix, Table A-2

4. D. Depression

Recent studies from CDC concluded that in United States one of ten adults report depression illness, which is 9.1%. If total population in U.S. over 18 years old amounted near 226 million, then about 20.6 million of Americans suffered such mental illness. Depression also has side-effects, because it can adversely affect other common chronic conditions such as arthritis, asthma, cardiovascular diseases, cancer, diabetes, and obesity. Meanwhile, it will also affect economic performances by increasing work absenteeism, short-term disability, and/or decreasing economic or labor productivity level.

In Puerto Rico, CDC concluded that aforementioned rate reached 15% of adult population. Since 2012 population over 18 years old amounted 2,817,721, the total number of persons approaches to 423,000. This CDC survey, found that in southeastern states, they had the greater prevalence of chronic conditions associated with depression. By state, age-standardized estimates for current depression ranged from 4.8% in North Dakota to 15.0% in Puerto Rico. The map below depicts prevalence of current depression among US adults by state and territories from *Behavioral Risk Factor Surveillance System's* data.

Age-standardized* percentage of adults meeting criteria for current depression,[^] by state/territory — Behavioral Risk Factor Surveillance System, United States, 2006 and 2008[§]



Data Source: CDC. Current Depression among Adults --- United States, 2006 and 2008. MMWR 2010;59 (38):1229-1235. (This map includes revised state estimates). <http://www.cdc.gov/features/dsdepression/>

Using the information from the CDC and local sources, we estimate and forecast the demand for specialists to treat Depression illness (See Table 29). As can be seen, Psychiatrists is the main specialist category. In terms of Specialists, the Psychiatrists played the most important role; the demand will be 378 for year 2013; 364 for year 2015; and to 339 in year 2020. The average supply of such specialist ranges from 474 at 2010-13 to 490 at 2013-16, and 503 for 2016-19 (See Table 30). So, there are enough specialists to fulfill the demand.

Table 30

Estimating the demand for Specialists due to Depression and other mental illness (prevalence rate 15%)

Total Population	3,637,164	3,499,572	3,240,180	3,035,896
Over 18 years	2,811,299	2,702,412	2,516,174	2,369,984
	2013	2015	2020	2025
Number of prevalence patients	421,695	405,362	377,426	355,498
Number of visits per patients per year	4	4	4	4
<i>Percentage</i>				
General Practitioners	12%	12%	12%	12%
Endocrinologists	1%	1%	1%	1%
Family Physicians	1%	1%	1%	1%
Psychiatry	80%	80%	80%	80%
Other	1%	1%	1%	1%
Time per visit (minutes)	35	35	35	35
	2013	2015	2020	2025
Minutes	59,037,279	56,750,650	52,839,663	49,769,663
minutes/one hour	60	60	60	60
Hours. Annual	983,954.7	945,844.2	880,661.0	829,494.4
Total FTE Physicians (1=2,080 hrs/annual)	473	455	423	399
	2013	2015	2020	2025
General Practitioners	57	55	51	48
Endocrinologists	5	5	4	4
Family Physicians	5	5	4	4
Psychiatry	378	364	339	319
Other	5	5	4	4

Source: CDC. Current Depression among Adults MMWR 2010;59 (38);1229-1235) <http://www.cdc.gov/features/dsdepression/>;**Note: For methodology and sources, see Appendix, Table A-2.**

Table 31

Demand and Supply of Psychiatry

Psychiatry	2013	2015	2020
Demand	378	364	339
Supply, average	474	490	503
Surplus (Shortage)	96	126	164

Source: Table 30, Table 17 and Table 18.

5. Conclusions and Recommendations

5. A. Conclusions

This study pursued the analysis of the demand and supply of physicians in Puerto Rico; assessing the current situation and then, forecasting the supply and the demand of General Practitioners and Specialists. The main findings are the following:

1. There are 311,000 people who live alone, that is one in five of the 1.319 million households.
2. A third of households are headed by women, and there are near 700,000 of children headed by a woman.
3. In 42 percent of the families in Puerto Rico, lives a person over 65 years old, which means that this elderly population does not have sufficient income to live alone, but meanwhile he/she is highly dependent of public health services according to his/her age.
4. There are 726,000 people with disabilities, equals to 20 percent of the population, and 52 percent of people over 65 have some form of disability.
5. Children represent 7 percent of the disabled population, with 67,000 students participating in a special education program. Disabled adults and children account for 1.5 million people, or one third of the population.
6. The labor force is 1.2 million, a third of the total population. The participation rate is one million, less than 40 percent of the total population.
7. Almost half the population lives below the Census poverty level standard: 45 percent of 3.7 million. Less than 40,000 families have incomes more than \$100,000.
8. 37 percent of the population benefits from the federal program of Nutritional Assistance Program (NAP). By 2011, 471,272 persons were under NAP in Puerto Rico.
9. In the last decade, over half a million of Puerto Ricans left the island, mainly persons at productive age (the median age was 28 years, while the local resident median age is 37 year).
10. Near 40 percent of the population receives only the 8 percent of the country's income, while the remaining 92 percent of income went to the 60% of the population. Clearly, this figure implies an unequal distribution of wealth and income.
11. About 58% of local residents are under the state health insurance (called *La Reforma de Salud*, now *MiSalud*); that is 1.5 million of persons.
12. In 2011, near 8% of top income families (over \$75,000 income), received one third of income, while 36% of bottom families (less than \$15,000), received only 8% of total income.
13. Over 92% of local residents are covered by a health insurance. The percentage of persons under health insurance coverage jumped from 91.6% to 92.4% from 2007 to 2011.

14. However, the percentage covered by private insurance went down 43.9% to 40.8%; while that for public insurance jumped from 54.5% to 57.7%.
15. Persons with no health insurance were 280,641 by 2011, a burden of near 8% of civilian non-institutionalized population.

In the demographic dimension, conclusions raised in the study are stated as:

1. The population trend is declining whereas the median age is increasing;
2. Fertility rate is dropping and mortality rate is in a *plateau*;
3. Life expectancy has been increasing;
4. There is a strong out-migration trend for many physicians explained partially by the United States shortage;
5. Physicians also are getting old and they are under a strong pressure to fulfill a retirement process;
6. The deteriorated standard of living in Puerto Rico acted as a push factor for many local residents including physicians as well as potential health workforce; and
7. Total population by 2015 is expected to be 3.5 million inhabitants; by year 2020 is amounted 3.24 million and by 2025, 3.036 million.

From the supply side of physicians:

1. Total physicians amounted to 11,728 in registration cycle 2007-10, an increase of 204 physicians regarding the previous figure of 11,524 in 2004-07. From 2001-04 to 2004-07, the total number of physicians jumped to 11,524 from 10,674, an increase of 850 physicians.
2. By 2007-10, General Practitioners reached the amount of 4,271, accounted for 36.4% of total. Specialists accounted for 63.6% of total. In fact, during the two former periods, these percentages tended to be quite similar.
3. However, total number of General Practitioners decreased to 4,271 from 4,467, a decline of 196 General Practitioners, a rate of growth of -4.4%. Conversely, Specialists depicted an increasing trend from 7,057 to 7,457—an absolute increase of 400 physicians from the two last registrations.
4. Comparing the ratio active physicians to 100,000 inhabitants by states, we examined the relative position of Puerto Rico to the U.S. states. Puerto Rico exhibited a ratio of 257 active physicians per 100,000 persons, which is very close to the United States average ratio of 266. In fact, Puerto Rico experienced more physicians per capita than 31 states, including Texas, Hawaii and Florida, among others.
5. In term of the supply of Primary Care Physicians, for registration period 2010-13, the total number of physicians amounted 6,678 under *Trend Method* whereas 6,836 under *Trend &*

Population. Projections for subsequent periods showed an increasing number of primary care physicians.

6. The demand of physicians in Puerto Rico was estimated considering two main sources of changes: (a) population growth (decline) net patterns and; (b) the Universal Health Plans proposed by the U.S. Federal Government and the local government. The former determined the declining trend of the demand of Physicians but also include those not covered by Health Plans which amounted closely to 281,000 persons.
7. The demand of total physicians averaged 11,283 for 2010-13; 10,973 for 2013-16 and 10,469 for 2016-19. Meanwhile, the demand of physicians is supposed to increase due to the Universal Health Plan that expected to cover 281,000 new persons. By 2013-16, the demand of physicians will increase by 942 and 1,030 for 2016-19.
8. The projection for the demand of Primary Care physicians is 7,447 for 2010-13; 7,243 for 2013-16 and 6,910 for 2016-19. Likewise the main determinant for total physicians, the optimal demand for total Primary Care Physicians was population. The demand decreases due to the net population growth although increases due to universal plan extension; 465 for 2013-16 and 679 for 2016-19.
9. Forecasting the expected surplus or shortage of physicians for Puerto Rico for the period-years of 2010-13; 2013-16 and 2016-19, this study found shortages for period 2013-16 and 2016-19. The projected demand amounted 10,973, but supply 10,872, for a shortage of 101 physicians for 2013-16. No shortage was found for 2016-19 when projected values gave a surplus of +601 physicians.
10. In term of Primary Care Physicians, the forecasted values have driven to a similar conclusion. Supply of physicians is far below the demand. For 2013-16, the supply of physicians averaged 7,107 while the demand is 7,243. So, there is again a shortage near 136 physicians. No shortage found for period 2016-19, rather a surplus of 283.
11. This study also estimated the supply and demand of Physicians by regions. There are seven regions for the local Department of Health. All regions except Metro/Fajardo exhibited shortage of Physicians for all registration periods. Mayaguez region exhibited the largest shortage of Physicians for the three periods, -1,619 to -1,265. Secondly, Bayamón shows shortage of Physicians from -624 to -407.
12. Metro/Fajardo, conversely, shows a surplus of physicians; that is supply exceeds demand. This is partly due to the location of Medical Centers, Hospital institutions, School of Medicine, Professional Offices, etc.; in this region, acting as a health service-led attractions for residents abroad the Metro/Fajardo region. Then, the excess supply is a result of such demand of non-residents in the Metro/Fajardo region.

At last, the study addressed the needs of specialists for some medical and clinical conditions. Especially, we estimate the demand and supply of physicians to treat medical conditions such as: (a) Diabetes Type II; (b) Overweight and obesity; (c) Alzheimer's diseases, and (d) Depression.

Diabetes Type II

1. Puerto Rico has the highest incidence of diabetes Type II *vis a vis* the U.S. Puerto Rico's diabetes rate rose from 11.7 percent in 1995 to 12.7 in 2010; almost twice the national average of 7.0 percent.
2. Using the information from Centers of Disease Control (CDC), we forecasted the prevalence rate of diabetes type II by age segments. The demand for endocrinologists is 20 in year 2013; 39 in year 2015; 42 in year 2020 and 47 in 2025. The supply of endocrinologists is over 40 physicians, then, under these assumptions we expect a negligible shortage of supply in order to fulfill the gap of demand. In term of General Practitioners, there is no evidence of any shortages since General Practitioners overpassed 3,000 and the demand is only from 100 to 230.

Overweight and Obesity

In term of overweight and obesity, Puerto Rico exhibits a higher rate level of overweight than United States but a lower for obesity. Mississippi is the state with the highest rate of obesity and New Jersey with overweight. The conclusions are as follow:

1. Forecasted overweight rate is over 40% of total population with 18 years and more; obesity rate is from 25% to 26%. We estimate the specialist physician's needs under the same assumptions and proportionality of Diabetes.
2. The estimates stated that the demand of endocrinologists is 70 to over 100. These figures are clearly higher than the supply forecasted for such specialists, and then taking together the demand of Diabetes and Obesity, there would be a shortage of such specialists in Puerto Rico in order to serve the population of patients with these conditions in the future.

Alzheimer's diseases

1. A current estimate for Puerto Rico of total persons with Alzheimer's conditions is 70,000. Using the information of United States, we estimate and forecast the Alzheimer's incidence. For the year 2025, the incidence will be around 102,800 (65 years old and over), and 36,800 (85 years old and over).
2. In terms of specialists, the Geriatrics played an important role, the demand will increase from 17 in year 2013; 27 at year 2015; and to 53 in year 2025. The supply of such specialists ranges from 28 at 2010-13 to 31 at 2016-19. So, there are enough specialists to fulfill the demand.

Depression

1. In Puerto Rico, CDC concluded that prevalence rate reached 15% of adult population. Since 2012 population over 18 year old amounted 2,817,721; then, the total number of persons under Depression approaches to 423,000.

2. Psychiatrists are the main specialists for Depression disease. Therefore, the number of specialists forecasted to take care of such incidence will be 378 for year 2013; 364 for year 2015; and to 339 in year 2020. The average supply of such specialist ranges from 474 at 2010-13 to 490 at 2013-16, and 503 for 2016-19. So, there is enough specialists to fulfill the demand.

5. B. Recommendations

Several recommendations can be made considering the main findings from the study. These recommendations can be divided in three following areas or topics: (1) Improving the Information system available for medical students, physicians and other ancillary personnel; (2) Avoiding shortages of physicians or mitigate the shortage of health workforce; and, (3) Providing technical advisory to the academic sector in order to align medical education with healthcare policies.

1. **Improve the information system regarding the students enrolled in Medical Schools; incoming and currently working physicians in Puerto Rico:**
 - a. Create a continuous registration process in order to raise a sustainable source of information about:
 - i. Students in the University of Puerto Rico, InterAmerican University, Catholic University et al, in biology or pre medical careers, mainly those potential students for any school of medicine.
 - ii. Local resident students enrolled in overseas universities, especially Dominican Republic, Mexico, United States and Europe, mainly Spain.
 - iii. Local resident students enrolled in local Medical Schools.
 - iv. Registered former local residents in Puerto Rico who currently work in the United States, aimed toward increase worth information of the physicians
 - b. The traditional registration cycle for health professionals in Puerto Rico should be performed biannually rather than every three years. For instance, the Puerto Rico Community Survey provides data every year – giving communities the current information they need to manage change. It is part of the Census Bureau's American Community Survey, but customized for Puerto Rico. The Department of Health should be able to manage a similar plan to improve the information system.
 - c. Incorporate workforce projections with different data resources (e.g., productivity, impact of behavioral factors, impact of innovation on productivity, and longitudinal career entry and trajectory studies). That is, realize every 10 year-period a comprehensive study embracing productivity level at the sector, social capital investment needed, relevant costs of services, new worldwide health service trends and the environmental including population dynamic, foodstuff output, nutritional guidelines and climate changes.
 - d. Include a wide range of relevant demand, supply and productivity scenarios, evidence-based care models that identify the balance of professionals and necessary skill-mix. The health services and workforce should be assessed within an economic model of sustainable development. Sustained development requires institutions of good governance that embody transparent and participatory processes and that encompass partnerships and other

arrangements among the government, the private sector, nongovernmental organizations (NGOs), and other elements of civil society. Then, health and its workforce is not a concern only of governmental institutions.

- e. Create an Internet consultant process of physicians. As a consultant chain of professional, local authorities would be able to encourage some sort of Physicians Care Collaborative Group, which be available to visits the Island and offers: technical assistants, seminars, conferences, etc. Internet consultant will provide an outlet for healthcare professionals to express their views and concerns about today's medical treatments, pharmaceuticals, diagnostics and healthcare products. This high-value information helps to guide product development, planning and priorities. A vast network of specialists provides an important voice in steering advances in medicine, but it will also help to build programs that ensure patients derive the greatest benefit from both new and existing treatment alternatives.

2. Avoiding shortages of physicians or mitigate shortages in the health workforce

- a. Potential solutions to the shortage, aside from the forthcoming dramatic changes into the healthcare system, include increased medical and nursing training in geriatrics and gerontology to increase interest, competency, and knowledge of health issues specifically pertaining to the elderly.
- b. Other solutions include monetary incentives for geriatric training for nurses and physicians. Any specific measures to remedy this growing problem should be implemented in a timely manner to reduce this critical shortage of healthcare workers that will only continue to grow in the coming decades.
- c. Medicine faculties should be expanding and modifying physician training at the undergraduate and postgraduate levels with the intention of producing more physicians and addressing long-standing challenges in the physician workforce.
- d. Faculties should promote physicians careers among young persons and students at the local high schools and universities.
- e. Health Governmental Reform is based upon more than 100 Independent Practice Associations (IPA's). This approach should be revised because new incoming general practitioner or primary care physicians are limited to perform optimally, say, attending a break-even number of patients, because previous physicians at IPAs, already attend a greater numbers of patients. This unbalance might push out the country some underutilized General Practitioners.
- f. Electronic medical records can also help increase efficiency. Since an entire patient's history, X-rays, and other information are in the EMR, physicians do not have to spend time tracking down charts from other locations.
- g. Encourage the cooperative movement for physicians under the Law 239 of September 1, 2004. All service cooperatives governed by the Law Number 239 of 1 of September of 2004, are able to acquire articles and services; and negotiate as a group the purchase of inputs for their services. The main objective of the law relies upon a better and a more effective health care but likewise to reduce costs and expenses.

- h. Develop an economic plan and/or strategy to encourage Medical Tourism. Services typically sought by travelers include elective procedures as well as complex specialized surgeries and/or only for cosmetic purposes. There is an economic potential of \$500 million per year for this type of business activity.
- **Providing technical advisory to the academic sector in order to align medical education with healthcare policies.**
 - a. Usually, a physician carrier in many medical schools in the United States and territories is almost absence of a comprehensive educational background on health policies. A 2011 study from Mou, Sama, Sethi and Merryman in *New England Journal of Medicine* for United States concluded from a survey to the Deans of medical school that *Most respondents believe that there is room for expansion of health policy education within the curriculum: 58% of respondents reported that their school currently has "too little" health policy education.*⁸
 - b. The study also concluded that half (52%) of medical schools reported are currently in the process of increasing health care policy education, although expanding health policy education will not be an easy task. Deans of medical schools identified two most important constraints on integrating health policy into medical education: (a) "curricular flexibility" and (b) "faculty interest". Likewise, other factors such as student interest and financial resources were found as relevant.
 - c. The study concluded.....*In order to provide comprehensive care for patients and effectively participate in health care reform, the medical community must be literate in health policy. Medical schools would never grant degrees without guaranteeing proficiency in the basic sciences and clinical skills. Similarly, health policy literacy should no longer be considered an ancillary skill, but rather a core competency of a 21st-century physician.*
 - d. Since the future of health lies in a proactive prevention policy *cum* a personalized medicine versus the reactive treatment of symptoms; medical schools have to be visionary and shift toward a more innovative, multidisciplinary collaboration, and investing in the new infrastructure-information based with a new trend nutritional culture.
 - e. It is paramount important to nurture an "*ecosystem for innovation*," which also requires investment and regulation, creating a sustained ecosystem in which government, public no-government institutions and the private sector work together to achieve such ecosystem efficiently.
 - f. Obama Care and local government Reforms will need substantial infrastructure reform and for physicians imply a new paradigm on health care system that will encourage greater integration in many areas. For instance, a redesign of delivery systems such as medical homes and accountable health care organizations. That is, medical schools should be aware about these changes in order to accomplish the social approach and provide the best results under the universal plan as well as optimized health care system.

⁸ Mou, David, Aartik Sarma, Roshan Sethi, and Reid Merryman; *The State of Health Policy Education in U.S. Medical Schools*, *New England of Medicine*, March 2011 36:e19.NEJMp1101603.
<http://www.nejm.org/doi/full/10.1056/NEJMp1101603>

Appendix A

Appendix A-1

Calculating Method for Tables 20: The Demand of Physicians and Primary Care by sources of changes: 2007-2010; 2013 to 2019

The following procedures were used in order to estimate the demand of physicians.

- 1) Column 1 measures the demand of physicians due to population changes. Data are from the 2011 OECD Health Report, states the OECD average of physicians per 1,000 persons at 3.1⁹. This figure was selected as an “optimal” demand value of physicians.
- 2) Column 2 measure the segment of the demand of physicians driven by the Universal Health Plans. Actually, near 281,000 persons—7.5% of total population—is the number of persons non-covered by health plans. This segment is already included in Column 1.
- 3) For these non-covered persons, we suppose a total number of visits equals to 5 per year, increasing at a rate of 10% annually. Also, we assume a time of visit equals 45 minutes (3/4 hours).
- 4) The number of hours spent yearly in the new incoming 281,000 patients to the health plan equals:

[Number of hours spent = the number of new patients x number of visits per year x time of visits x 1.04].
- 5) The total number of hours spent is then, divided by 2,080 hours, that is the full time equivalent (FTE) equals to one physician.
- 6) Column 3 is the sum of two segments of demand of physicians; (a) due to population growth and (b) due to universal plans.
- 7) Column 4 measures the demand of primary care due to population growth. It is assumed that Primary Care Physicians are 66% of total demand of physicians due to population growth. 66% is the empirical ratio of Primary Care to total physicians in Puerto Rico at 2007-10.
- 8) Column 5 measures the demand of Primary Care due to universal plans. This figure is been constructed by multiplying column 2 times 66%. By 2007-10, primary care physicians was 66% of total physicians.
- 9) Column 6 is the demand for both, due to population growth and due to health plans.

⁹ See Footnote 1. 2011 OECD Health at Glance.

Appendix A-2

Calculating Method for Tables 24, 26, 29 and 30.

The following procedure and data sources were considered to calculate the demand of specialist physicians (See Table A-2).

Table A-2
Calculating the demand of specialist physicians

Line	Categories
A	Number of prevalence patients
B	Number of visits per patients per year
C	Percentage
C 1	Generalists
C 2	Endocrinologists
C 3	Cardiology
C 4	Internists
C 5	Pediatric
D	Time for visits
E	Minutes
F	minutes/one hour
G	Hours Annual
H	Total FTE Physicians (1 = 2,080 hrs.)

Line A: The estimated number of patients under several medical conditions. This figure is the forecasted patients for the year 2013, 2015, 2020 and 2025 for medical conditions such as Diabetes Type II, Overweight and Obesity, Alzheimer's and Depression. The forecasted figures were done by the author.

Line B: The number of visits per patients per year: The basic information comes from the Center for Disease and Control and Prevention. Table 1: Annual number and percentage distribution of ambulatory care visits by setting type according to diagnosis group: United States, 2009-2010. http://www.cdc.gov/nchs/data/ahcd/combined_tables/AMC_2009-2010_combined_web_table01.pdf.

Line C: Percentage: refers to the number of patients taking care by each medical specialists. Data came from **Visitas a Médicos por los municipios de Puerto Rico, 2001**, from the *Commonwealth Department of Health*.

Line D: Information from *How much time do you spend with a patient in clinic?* Discussion in 'Practicing Physicians' started by Bobblehead, Nov 18, 2010. <http://forums.studentdoctor.net/threads/how-much-time-do-you-spend-with-a-patient-in-clinic.777004/>.

Line E: Number of total minutes spent on attending all patients by year. The resulting value is equal to Line A x Line B x Line D.

Line F: Minutes in one hour = 60 minutes.

Line G: Hours Annual equals Line E divided by Line F. Represented the total hours needed to attend patients.

Line H: Total Physicians needed for Medical Conditions. Is Line G divided by a full time equivalent (FTE) physician of 2,080 hours per year.

Appendix B

Demand and Supply of Physicians, Primary Care Physicians and Specialists by Regions

B.1 Physicians by regions

The Department of Health of Puerto Rico has designed seven regions for Puerto Rico; Arecibo, Bayamón, Caguas, Mayaguez/Aguadilla, Ponce, Fajardo and Metropolitan (See Table B.1 for details). The Metropolitan and Fajardo regions usually are consolidated at one region, thereby, called herewith as Metro/Fajardo. Metro/Fajardo is, by far, the most populated region accounted for 25.7% of total residents; Bayamón is the second with 16.6%, and third, Caguas with 15.8%. These three regions accounted for 58.2% of total population.

Nonetheless, Physicians—based at working place—are highly concentrated at the Metro/Fajardo region. In spite of this region comprises one-fifth of population, it possesses 42% of total Physicians; 37% of Primary Care and 52% of total Specialists. Clearly, this region is over-represented of total physicians relative to its population.

The three most populated regions (58% of total residents) -- Metro/Fajardo, Bayamón and Caguas-- accounted for 67% of total Physicians; 56% of Primary Care and 74.7% of Specialists. Then, they are over-represented at Total Physicians and Specialists (See Table B-2). Conversely, the rest of the regions—Arecibo, Mayaguez and Ponce—having 42% of total residents, accounted for 33% of total Physicians; 37% of Primary Care and 25% of Specialists. Then, they are under-represented, so far, of all type of Physicians.

Table B-3 shows the number of Physicians per 100,000 persons by regions and ranked from the smallest to the largest size. Assessing this ratio, the conclusions are:

- (a) Metro/Fajardo ranked at the top, so far, at the three categories. At total Physicians, it has 412.9 per 100,000 residents, then, over the general average of 252.9. Mayaguez follows at next with 216.4 per 100,000 residents.
- (b) Primary Care Physicians per 100,000 residents shown a similar picture. Metro/Fajardo portrayed the highest ratio with 239.0, over the general average of 166.7, but Mayaguez ranked secondly with 157.8.
- (c) Finally, the Specialists ratio Metro/Fajardo ranked at first with 173.9, significantly over the total average of 86.2. Caguas region ranked at second place with 64.6.

Table B-1
Municipalities and Regions from the Department of Health in Puerto Rico

Municipalities	Regions
Adjuntas	Ponce
Aguada	Mayaguez/Aguadilla
Aguadilla	Mayaguez/Aguadilla
Aguas Buenas	Caguas
Aibonito	Caguas
Añasco	Mayaguez/Aguadilla
Arecibo	Arecibo
Arroyo	Ponce
Barceloneta	Arecibo
Barranquitas	Bayamón
Bayamón	Bayamón
Cabo Rojo	Mayaguez/Aguadilla
Caguas	Caguas
Camuy	Arecibo
Canóvanas	Metro/Fajardo
Carolina	Metro/Fajardo
Cataño	Bayamón
Cayey	Caguas
Ceiba	Metro/Fajardo
Ciales	Arecibo
Cidra	Caguas
Coamo	Ponce
Comerio	Bayamón
Corozal	Bayamón
Culebra	Metro/Fajardo
Dorado	Bayamón
Fajardo	Metro/Fajardo
Florida	Arecibo
Guánica	Ponce
Guayama	Ponce
Guayanilla	Ponce
Guaynabo	Metro/Fajardo
Gurabo	Caguas
Hatillo	Arecibo
Hormigueros	Mayaguez/Aguadilla
Humacao	Caguas
Isabela	Mayaguez/Aguadilla
Jayuya	Ponce
Juana Díaz	Ponce
Juncos	Caguas
Lajas	Mayaguez/Aguadilla
Lares	Arecibo
Las Marías	Mayaguez/Aguadilla
Las Piedras	Caguas
Loíza	Metro/Fajardo
Luquillo	Metro/Fajardo
Manatí	Arecibo
Maricao	Mayaguez/Aguadilla
Maunabo	Caguas
Mayagüez	Mayaguez/Aguadilla
Moca	Mayaguez/Aguadilla
Morovis	Arecibo
Naguabo	Caguas
Naranjito	Bayamón
Orocovis	Bayamón
Patillas	Ponce
Peñuelas	Ponce
Ponce	Ponce
Quebradillas	Arecibo
Rincón	Mayaguez/Aguadilla
Río Grande	Metro/Fajardo
Sabana Grande	Mayaguez/Aguadilla
Salinas	Ponce
San Germán	Mayaguez/Aguadilla
San Juan	Metro/Fajardo
San Lorenzo	Caguas
San Sebastián	Mayaguez/Aguadilla
Santa Isabel	Ponce
Toa Alta	Bayamón
Toa Baja	Bayamón
Trujillo Alto	Metro/Fajardo
Utuado	Arecibo
Vega Alta	Bayamón
Vega Baja	Arecibo
Vieques	Metro/Fajardo
Villalba	Ponce
Yabucoa	Caguas
Yauco	Ponce

Source: Secretaría Auxiliar de Planificación y Desarrollo.

Estado Libre Asociado de Puerto Rico. Departamento de Salud.

Table B-2

Total Active Physicians, Primary Care Physicians and Specialists by Regions, 2007-10.

2007-10	Total	Arecibo	Bayamón	Caguas	Mayagüez	Ponce	Metro/Fajardo	Total regions	Unidentified
Total Physicians	9,424	824	1,152	1,199	1,159	1,119	3,958	9,411	13
Primary Care	6,212	637	803	818	845	807	2,291	6,201	8
Specialists	3,212	187	349	381	314	312	1,667	3,210	5
Percent of total	Total	Arecibo	Bayamón	Caguas	Mayagüez	Ponce	Metro/Fajardo	Total regions	Unidentified
Total Physicians	100.0%	8.7%	12.2%	12.7%	12.3%	11.9%	42.0%	99.9%	0.1%
Primary Care	100.0%	10.3%	12.9%	13.2%	13.6%	13.0%	36.9%	99.8%	0.1%
Specialists	100.0%	5.8%	10.9%	11.9%	9.8%	9.7%	51.9%	99.9%	0.2%
Population, 2010	3,725,789	456,036	620,110	589,795	535,488	565,683	958,677		
Per cent of total	100.0%	12.2%	16.6%	15.8%	14.4%	15.2%	25.7%		

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud

Table B-3

Total Active Physicians, Primary Care Physicians and Specialists per 100,000 residents. By Regions, 2007-10.

	Total Physicians		Primary Care		Specialists
Total	252.9	Total	166.7	Total	86.2
Arecibo	180.7	Bayamón	129.5	Arecibo	41.0
Bayamón	185.8	Caguas	138.7	Ponce	55.2
Caguas	203.3	Arecibo	139.7	Bayamón	56.3
Ponce	197.8	Ponce	142.7	Mayagüez	58.6
Mayagüez	216.4	Mayagüez	157.8	Caguas	64.6
<i>Metro/ Fajardo</i>	<i>412.9</i>	<i>Metro/ Fajardo</i>	<i>239.0</i>	<i>Metro/ Fajardo</i>	<i>173.9</i>

Note: regions with italic letters are over -global average

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud.

B.2. The Supply and Demand of Physicians

In this section, we will estimate the supply and the demand of Physicians for each of the six regions. We estimated the supply using the two approaches aforementioned; (a) **Trend Method**, and; (b) **Trend and Population**. For the demand of Physicians, we will use the ratio of 3.1 Physicians per 1,000 persons, similar to the average of OECD countries and stated in the 2011 report from the Organization for Economic Co-operation¹⁰. Therefore, Puerto Rico exhibited 2.5 per 1,000 persons, so far also below the OECD average. This ratio is supposedly sub-optimal relative to the population level, but 3.1 is the optimal point.

B.2.a. The supply of Physicians

Table B-4 depicts the supply of Physicians by regions for the registration periods of 2010-13; 2013-16 and 2016-19. Under the **Trend Method**, we suppose proportionally of the number of Physicians relative to the regions at the last registration 2007-10. The panel below shows the supply under the **Trend & Population Method**. The average figure for the supply is shown at the bottom line of Table B-4.

¹⁰ Health at a Glance 2011, *OECD INDICATORS*, <http://www.oecd.org/health/health-systems/49105858.pdf>

Table B-4

The Supply of Physicians by regions 2010-13; 2013-16 and 2016-19.

	2007-10	% of total	2010-13	2013-16	2016-19
Supply					
Trend Method	9,411	100.0%	10,111	10,848	11,639
Arecibo	824	8.8%	885	950	1,019
Bayamón	1,152	12.2%	1,238	1,328	1,425
Caguas	1,199	12.7%	1,288	1,382	1,483
Ponce	1,119	11.9%	1,202	1,290	1,384
Mayagüez	1,159	12.3%	1,245	1,336	1,433
Metro/ Fajardo	3,958	42.1%	4,252	4,562	4,895
Total Physicians	9,411		10,111	10,848	11,639
	2007-10	Physicians per 1,000	2010-13	2013-16	2016-19
Supply					
Trend & Population Method	9,411				
Arecibo	824	1.77	916	920	920
Bayamón	1,152	1.82	1,281	1,286	1,286
Caguas	1,199	1.99	1,333	1,338	1,338
Ponce	1,119	1.94	1,244	1,249	1,249
Mayagüez	1,159	2.12	1,289	1,293	1,294
Metro/ Fajardo	3,958	4.05	4,402	4,417	4,418
Total Physicians	9,411		10,466	10,502	10,505
Supply, Average			10,289	10,675	11,072

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. Estimations by the author.

B.2.b. The demand of Physicians

The demand of Physicians was estimated under the assumption of 3.1 physicians per 1,000 persons. This figure was adopted from the 2011 report from the Organization for Economic Co-operation and Development (OECD). Estimates for each regions were computed and then, adjusted for the previous demand figures computed at Table 21.

B.2.c. The supply and demand of Physicians

Table B-5 shows the estimates for supply and demand of Physicians by regions. As can be seen, all regions except Metro/Fajardo exhibited shortage of Physicians for all registration periods. Mayaguez region exhibited the largest shortage of Physicians for the three periods from -1,619 to -1,265. Secondly, Bayamón shows shortage of Physicians from -624 to -407.

Metro/Fajardo, conversely, shows a surplus of physicians; that is supply exceeds demand. This is partly due to the location of Medical Centers, Hospital institutions, School of Medicine, Professional Offices, etc; in this region, acting as a health service-led attractions for residents abroad the Metro/Fajardo region. Then, the excess supply is a result of such demand of non-residents in the Metro/Fajardo region.

Finally, the shortage of Physicians is been estimated in Puerto Rico as a whole, for the registration period of 2010-13, and 2013-16. The Puerto Rico's shortage for period 2010-13 is near 1,000 and for 2013-16 close to 300. However, the shortage is due to five regions deficits of physicians but not for Metro/Fajardo region.

Table B-5

Demand and Supply of Physicians 2010-13, 2013-16 and 2016-19

Regions	Demand		
	2010-13	2013-16	2016--19
Arecibo	1,383	1,349	1,291
Bayamón	1,883	1,840	1,762
Caguas	1,802	1,780	1,720
Ponce	1,621	1,577	1,504
Mayagüez	2,886	2,779	2,628
<i>Metro/ Fajardo</i>	1,706	1,648	1,564
	Supply, Average		
	2010-13	2013-16	2016--19
Arecibo	901	935	969
Bayamón	1,259	1,307	1,355
Caguas	1,311	1,360	1,411
Ponce	1,223	1,269	1,316
Mayagüez	1,267	1,315	1,364
<i>Metro/ Fajardo</i>	4,327	4,490	4,657
	Surplus (Shortage) = Supply less Demand		
	2010-13	2013-16	2016--19
Arecibo	-482	-415	-321
Bayamón	-624	-533	-407
Caguas	-492	-420	-310
Ponce	-398	-307	-187
Mayagüez	-1,619	-1,464	-1,265
<i>Metro/ Fajardo</i>	2,621	2,841	3,093
Surplus (Shortage)	-994	-298	603

Source: *Profesionales de la Salud en Puerto Rico, 2007-2010*. Secretaría Auxiliar de Planificación y Desarrollo. Estado Libre Asociado de Puerto Rico. Departamento de Salud. Estimations by the author.

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