

## MEDICAL WORKFORCE PLANNING IN A CHANGING HEALTH CONTEXT: COMPARISON BETWEEN ITALY AND EUROPE.

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### ABSTRACT

An increasing need for healthcare workers has been estimated worldwide. To provide a comprehensive framework of the medical workforce in Italy, we investigated the post-lauream medical workforce training supply and demand. Further, a comparison of the medical workforce between Italy and other European Countries with a similar epidemiological and/or demographic context was performed. The distribution of pre- and post-lauream medical educational providers and post-lauream resources in place in Italy was analyzed among Italian macro-areas in the academic years 2015-2016, 2016-2017 and 2017-2018. Italy and the European countries in study were compared in term of post-lauream funding and number of active physicians by specialization per 1,000 inhabitants. Open access data from official Italian and European institutional sources were used. The most of medical schools were distributed in the North, followed by South, islands and Central Italy, while the highest enrolment rate in the pre-lauream medical education was reported in Central Italy, followed by South & islands and North. The total number of active residency programs increased from 1092 to 1286 in the three considered academic years, while number of post-lauream training contracts decreased from 11.0 to 10.2 per 100,000 inhabitants. A misalignment between contracts assigned to residency programs and grants assigned to general practitioners specific courses was observed. When compared to the EU countries in study, Italy documented the lowest number of post-graduated training positions in 2015, with a rate of 12.1/100,000 inhabitants. Also, an excess of medical specialists (3.06 per 1,000 inhabitants) with a simultaneous shortage of general practitioners (0.89 per 1,000 inhabitants) was reported. On the contrary, Italy documented the highest number of paediatric practitioners. More efforts, including the implementation of adequate tools, are required both at national and regional level in order to provide a medical workforce planning in line with a continuously changing health context.

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### 1. Introduction

Globally, an additional need for healthcare workers of 7.2 million units (1 million units for European Union member states) has been estimated for 2020 [1].

National Health Systems from all over the world are struggling to keep pace with the challenges of rapid demographic and epidemiological transitions, technological innovation and all the implications of globalization. In particular, health workforce shortages are primarily driven by demographic changes in the population, an increasing demand

for healthcare, a growing number of chronically ill patients and an aging workforce [2]. In this context of rapid change and increasing complexity of health demands, both poor and rich countries are experiencing workforce shortages, imbalance and intermixing of skills, and misdistribution of health professionals [3].

On this basis, the health workforce issue has become increasingly crucial at a global and European level, highlighting a scarcity of a widespread capacity to meet national, educational and health demands with an effective workforce, missing the goal of integrating the education and labour markets, which is essential to address a complex healthcare system [4].

In order to strengthen the HRH planning, as part of a long-term national and broader health development strategy, an inter-sectorial approach involving health, occupational, educational and financial sectors, as well as professional associations, trade unions, civil society, private sector, local government authorities, and other stakeholders, should be sustained. At the same time, better HRH data and evidence are required to enhance advocacy, planning, policy-making, governance and accountability at regional, national and global levels [5]. For these reasons, in 2013, the World Health Organization (WHO) launched the “*Global Health Workforce Alliance*” followed by the “*Global Code of Practice on the International Recruitment of Health Personnel*” [6]. At the same time, a group of qualified experts representing health and academic professions emphasized the opportunity to evolve the health education system in order to strengthen and create a full integration of the education and labour market in order to meet and forecast the increasingly complex healthcare needs [3].

In Europe, the call to action “*A health worker for everyone, everywhere*” addressed to the “*Joint Action on Health Workforce Planning and Forecasting*” (JAHWPF), a 3-year project that began in April 2013, aimed at providing a platform for collaboration and exchange between countries to support them in planning the health workforce in Europe [7]. Later on, this Joint Action evolved to become the Support for the Health Workforce Planning and Forecasting Expert Network (SEPEN), that still continues to engage senior experts from all over Europe [8].

With an average of 3.95 physicians per 1,000 inhabitants, Italy takes seventh place for the number of doctors in activity, remaining stable over the EU average since 2010 (3.49 physicians per 1,000 inhabitants) [9]. Moreover, according to the Organization for Economic Cooperation and Development (OECD) health statistic in 2018 [10], estimates on Italy document 4 physicians per 1,000 inhabitants (OECD countries mean: 3.4 physicians per 1,000 inhabitants), with the highest proportion of medical doctors over 55 years old (49% versus 33% of the OECD29 mean), while with 40% female medical doctors it is under the OECD29 average of 45% [11]. In Italy, there is a growing debate on the shortage of medical professionals, particularly for certain medical specialties and in some healthcare settings, such as in emergency fields, predominantly documented in the Northern regions of the country [12]. Following the EU directives [13,14], in Italy, post-graduate medical education is provided by universities through residency programs, under the supervision of the University and Research Ministry (MIUR), and by region through general practitioners training regional courses [15].

In order to provide a comprehensive framework of the medical workforce in Italy, we investigated the post-lauream medical workforce training supply and demand. Furthermore, we performed a comparison of the medical workforce between Italy and other European Countries with a similar demographic and/or epidemiologic context.

## 2. Methods

We accessed institutional statistics to perform descriptive analysis and to make comparisons.

In order to perform an analysis by space and by time of the distribution of pre- and post-lauream medical educational providers (schools of medicine and residency programs) and resources in place in Italy, the rate of pre-lauream enrolment (number of medical students per 100,000 inhabitants) and the rate of post-lauream training contracts assigned to residency programs (per 100,000 inhabitants) were calculated. A geographical comparison was realized using the National Statistic Institute (ISTAT) classification of Italian macro-areas (Northern, Central, Southern Italy and islands) [16], while a temporal comparison was performed over three academic years (a.y.): 2015-2016, 2016-2017 and 2017-2018. To this end, data on the post-lauream medical population (training physicians) and post-lauream training supply were extracted by institutional fonts of the MIUR [17], while data on inhabitants were taken from ISTAT [18].

For every academic year (a.y.), from 2011-2012 to 2018-2019, a comparison between the number of medical graduates and the number of contracts assigned to residency programs and grants assigned to general practitioners' specific training regional courses was performed by accessing MIUR, Ministry of Health and Regional institutional fonts [17]. Lastly, to further compare the Italian medical workforce scenario with the ones in place in other European countries (France, Spain, Portugal, United Kingdom, Germany) with a similar epidemiological and/or demographic context, two different analyses were performed.

At first, we compared the post-lauream funding, both in term of contracts and grants assigned per year, in 2015 and 2018, to general practitioners' specific training and to residency programs using open access data from official institutional sources [19 - 28], while, secondly, the number of active physicians by specialization (excluding specialists working in the private sector) per 1,000 inhabitants was compared in the different EU countries using data elaboration from Eurostat 2016 Statistics Explained [29].

## 3. Results

Table 1 reports data on the geographical distribution of Italian schools of medicine and residency programs, rate of pre-lauream enrolment and rate of post-lauream training contracts assigned to residency programs, both calculated on the number of inhabitant residents in the different geographical macro-areas (Northern, Central, Southern Italy and islands) for the a.y.s. 2015-2016, 2016-2017 and 2017-2018.

As for the academic year 2015-2016, in Italy there were 42 Schools of Medicine, with a rate of enrolment of 14.4/100,000, while for a.y.s. 2016-17 and 2017-18, three schools were closed in the Center and two more were opened in the South, so that the total number was of 41 for both years, with a rate of medical students' enrolment of 16.2 and 15.0 per 100,000 inhabitants, respectively.

The geographic distribution of the medical schools documented the majority of them in the North of Italy, with 18 (44%) schools in all three academic years considered, followed by the South, islands and Central Italy, all with 12 medical schools (29%) during the 2015-2016 academic year, and 14 (34%) and 9 (22%) for the years 2016-17 and 2017-2018, respectively.

For the a.y. 2015-2016, the higher rate of enrolment in the pre-lauream medical education was reported in Central Italy with 20.5 medical students per 100,000 inhabitants, followed by the South & islands with a rate of 12.7/100,000 and the North with a rate of 12.5/100,000. The same trend was documented also for the academic years of 2016-2017 and 2017-18, with a rate of enrolment of 21.9/100,000 and 21.2/100,000 in the Centre, 15.5/100,000 and 14.0/100,000 in the South & islands and 14.2 and 13.1 in the North, respectively.

As showed in Table 1, the total number of active residency programs increased in the three academic years, ranging from 1092 to 1286, while the number of post-lauream training contracts decreased from 11.0 per 100,000 inhabitants in the a.y. 2015-2016 to 10.2 per 100,000 inhabitants in the a.y. 2017-2018.

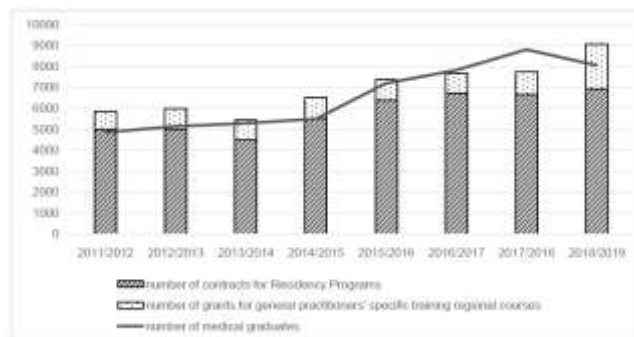
Italian macro-area	Academic Year	Resident population	Schools of medicine n. (%)	Rate of pre-lauream enrolment (per 100,000 inhabitants)	Residency programs (post-graduate medical schools) n. (%)	Rate of post-lauream training contracts assigned to residency programs (per 100,000 inhabitants)
Northern	2015/16	27,754,578	18 (44)	12.5	472 (43)	10.7
	2016/17	27,736,158	18 (44)	14.2	568 (45.3)	10
	2017/18	27,740,984	18 (44)	13.1	582 (45.3)	10.5
Central	2015/16	13,394,316	12 (28.6)	20.5	340 (31)	14.3
	2016/17	12,050,054	9 (22)	21.9	328 (26.1)	13.5
	2017/18	12,007,524	9 (22)	21.2	330 (26.1)	13.4
Southern & Islands	2015/16	19,516,657	12 (28.6)	12.7	281 (26)	9.3
	2016/17	20,097,761	14 (34)	15.5	359 (28.6)	8.1
	2017/18	20,780,937	14 (34)	14.0	368 (28.6)	8.1
Italy	2015/16	60,665,551	42 (100)	14.4	1092(100)	11
	2016/17	60,483,973	41 (100)	16.2	1255 (100)	10.1
	2017/18	60,589,445	41 (100)	15.0	1286 (100)	10.2

**Table 1. Distribution of schools of medicine and residency programs (post-graduate medical schools), rate of pre-lauream enrolment (number of medical students per 100,000 inhabitants), rate of post-lauream training contracts assigned to residency programs (per 100,000 inhabitants), by geographical macro-areas of Italy (North, Centre, South & islands). Italy, academic years 2015-2016, 2016-2017 and 2017-2018.**

The same tendency in geographic distribution was documented both in the number of schools of medicine and of residency programs, resulting in more concentrated numbers in the North of the country (43%, 45% and 45% respectively for the three a.y.'s), as compared to the Centre (31%, 26% and 26%) and South & islands (26%, 28.6% and 28.6%); by contrast, the number of post-lauream training contracts per 100,000 inhabitants assigned to residency programs was the highest in the Central regions of Italy (14.3/100,000, 13.5/100,000 e 13.4/100,000 inhabitants for a.y.'s 2015-16, 2016-17 and 2017-18, respectively).

As shown in Figure 1, over the period between a.y. 2011-12 and a.y. 2018-2019, a misalignment between contracts assigned to residency programs and grants assigned to GP specific training regional courses was observed.

Moreover, until a.y. 2017-2018 the number of medical graduates was higher than the total amount of post-lauream positions available in terms of contracts and grants, while in a.y. 2018-2019 supply and demand have been aligned.



**Figure 1. Comparison between number of medical graduates, contracts assigned to residency programs and grants assigned to general practitioners' specific training regional courses by academic year (from 2011-2012 to 2018-2019) in Italy.**

Furthermore, when comparing the EU countries in study for the available years, Italy documented the lowest number of post-graduated training positions per year in 2015, with a rate of 12.1/100,000 inhabitants. Data increased to 13.5/100,000 inhabitants in 2018, overcoming France (Table 2). With regard to the considered EU countries, the proportion of positions assigned to GP training regional courses on the total amount of post-lauream positions per year was the highest in France both in 2015 and 2018 (45% and 39%), followed by Portugal (31% in 2015 while, with a 26%, it shifted to the fourth place in 2018), UK (30% and 30%), Spain (28% and 27%), while in Italy only 14% and 15% of positions were dedicated to the training of new GPs in 2015 and 2018, respectively. Of interest, in Germany no limitation in the number of positions assigned to the medical post-lauream training was reported.

	ITALY**		SPAIN**		PORTUGAL**		UNITED KINGDOM**		FRANCE**		GERMANY**	
	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018
Contracts assigned to residency programs per year	6,101	6,004	4,807	4,701	3,570	3,220	2,540	6,411	4,712	5,100		
Grants assigned to GP training regional courses per year (%)	1,022	2,100	1,090	1,000	402	410	1,012	5,700	3,894	5,200	No limitation	
Total post-lauream training contracts per year (%)	7,123	8,104	5,897	5,701	3,972	3,630	3,552	12,111	8,606	10,300		
Proportion of positions assigned to GP training regional courses on total amount of post-lauream positions per year (%)	14%	18%	20%	27%	10%	26%	30%	30%	45%	39%		
Rate of total post-lauream training positions contracts per 100,000 inhabitants per year	12.1	13.5	11.1	11.0	10.2	10.2	10.7	18.7	18.7	12.0	12.0	

**Table 2. Post-lauream funding (contracts and grants) assigned to general practitioners' specific training and to residency programs: comparison between Italy and other European Union Countries, years 2015 and 2018.**

Lastly, Table 3 summarizes the comparison of active physicians in 2016 by specialty per 1,000 inhabitants in the different EU countries being studied. In Italy, as compared to the remaining EU countries being studied, considering all the typology aggregated, an excess of medical specialists (3.06 per 1,000 inhabitants) with a simultaneous shortage of GPs (0.89 per 1,000 inhabitants) was reported. On the contrary, with a rate of 0.29 per 1,000 inhabitants, Italy documented the highest number of paediatric practitioners.

	General Practitioners		Paediatric Generalists		Specialists	
	n.	n. per 1,000 inhabitants	n.	n. per 1,000 inhabitants	n.	n. per 1,000 inhabitants
FRANCE	102,250	1.52	8,099	0.12	121,474	1.81
SPAIN*	34,741	0.75	12,067	0.26	117,114	2.5
PORTUGAL	26,100	2.53	2,032	0.19	24,905	2.41
GERMANY	30,505	0.37	13,677	0.16	264,252	3.19
UNITED KINGDOM	50,080	0.76	10,135	0.15	132,657	2.02
ITALY	54,063	0.89	17,651	0.29	185,570	3.06

\* specialists working in the private sector are not included

**Table 3. Comparison of active physicians by specialties per 1,000 inhabitants in different European Union countries (Eurostat 2016, Statistics Explained).**

#### 4. Discussion

To the best of our knowledge, this paper represents one of the first attempts to investigate the planning of the post-lauream medical workforce in Italy. In particular, we have performed a comparative analysis of the medical workforce in place in Italy and in the other European countries with a similar epidemiologic and/or demographic context in order to highlight any difference of potential interest.

We have reported a heterogeneous distribution by geographical macro-areas of the rates of pre-lauream enrolment and of post-lauream training contracts assigned to residency programs (post-graduate medical schools), with an excess of post-lauream positions in the central Italian macroarea. These findings could be explained by a misalignment between the NHS's demand of health professionals, periodically defined by Health Ministry and Regional Health Authorities, and the post-graduate educational supply provided by university residency programs (post-graduate medical schools). Some inconsistencies have also been highlighted in the period of 2008-2014 with regard to the distribution of training contracts to residency programs, that only some years was consistent with what was required by Regional Health Authorities, while it diverged in the remaining years (data not shown). This dichotomy may have contributed to the lack of physicians predominantly

documented in some regions of northern Italy nowadays. More recently, it has contributed to generate on a larger scale the so called "educational funnel" [30], consisting of a higher number of medical graduates as compared to the limited available positions reserved for post-graduate training. Twenty years before, according to the lack of any health workforce planning approach, the opposite phenomenon of "medical plethora" – represented by an excess of physicians in activity – addressed political authorities to the introduction of a controlled access to medical schools [31, 32].

There has been much criticism documented over the years with regard to the medical workforce planning which has highlighted the need to build a bridge between universities and NHS, as stated by the current legislation [33-35], in order to overcome the existing dichotomy in the training process of post-graduate physicians, whereas the documented criticisms in healthcare workforce planning have had a negative impact on the quality of training and on the occupational expectations of medical doctors, potentially affecting the quality of care offered to citizens [36]. This is widely considered one of the reasons why an increasing demand for international experiences arose among Italian junior doctors [37]. Following the Joint Action taken at the European level, the Health Ministry addressed the Italian Health Regional Authorities to implement the tools developed to define the healthcare workforce demand, but unfortunately this planning methodology is still underutilized in the majority of Italian regions, often because of several limitations in the record-linkage of healthcare data flows, as indirectly confirmed by investigating the web with regard to the specific documents available from official websites [38]. Therefore, health workforce planning has been, essentially, based on historical data with a simple replacing of roles and positions within a hospital-centered health system. This is in contrast with the demographic trend and the epidemiological transition [39, 40], documenting the increase in aging and the burden of chronic diseases in the general population [41, 42]. That's why the horizon scanning approach has been implemented in health workforce planning and forecasting within the JAHWPF framework, aimed at exploring and describing the factors and forces, and their inter-relationships in workforce systems, so as to increase the collective knowledge of the drivers which may require changes to the skills and competences required from health workforces over the next 20 years [43].

This main criticism in health workforce planning can be further explained by two other pieces of evidence: the lack of nursing staff documented in Italy (6.2 nurses per 1,000 inhabitants) as compared to the EU28 average (8.4 nurse per 1,000 inhabitants) [44], which also reflects a cultural resistance against the physiological task-shifting [45]; the structural misalignment documented over the years between contracts assigned to medical residency programs and grants assigned to general practitioners' specific training. To this end, our comparative analysis in Italy documented a lower number of post-graduated training contracts than the other EU countries considered, together with a consistent lower rate of positions assigned to general practitioners' post-graduate training, which is in line with the opportunity missed for regional professional courses to evolve into general practice and primary care post-graduate medical schools [46].

This body of evidence is in contrast with the increasing need for integrated, patient-centred and inter-professional education [3, 47], and with the demand of high qualified professionals, trained to face the challenge of implementing innovative technologies in healthcare [48-51], which are mandatory to guarantee the sustainability of the Italian public NHS. The same effort should be dedicated to promote education during pre- and post-lauream medical courses with regard to prevention topics and strategies [52-54], whereas recent simulations, with regard to the implementation of the new levels of essential healthcare assistance, highlight important concerns [55]. In other words, a competent health workforce is a vital resource for delivery of health services, dictating the extent to which services are capable of responding to health needs [56].

All of the criticisms documented in the medical workforce planning can be considered in line with the differences highlighted when comparing Italy to the other European countries within the study.

The analysis of data aggregated by groups of specialists let us document in Italy, for 2016, an excess of specialists and paediatric generalists, as well as a simultaneous lack of GPs. Italy, as a partner of the JAHWPF, led the Working Package in charge to define the best practice to define a panel of indicators (minimum data set) to set the quantitative dimension of the health workforce. This allowed the Italian Health Ministry to estimate a total number of 378,478 medical doctors in the country, of which 292,888 were considered active (approximately 75%), including 30,467 specialized doctors (around 10%), 84,193 non-active (22%) and 10,397 seeking employment (around 3%) [57]. Even if the previous data do not lay down for medical workforce shortage in Italy, some important concerns remain for the next future with regard to the consistent cohort of medical doctors aged over 55 years old and the impact on the healthcare context of the recent implementation of a pension reform accelerating the retirement process [58].

Moreover, poor attention has been paid to the qualitative dimension of health workforce planning, so explaining the shortage of medical specialists in some critical healthcare settings, such as in emergency field, and of physicians trained to treat chronic diseases within the primary care framework or in the physiotherapy field, with an excess of physicians documented in some specialty typologies devoted to hospital care and the treatment of acute diseases.

As workforce planning represents a challenge in healthcare due to the number and mix of professions, the skills needed according to each profession, the wide range of healthcare services offered, the implementation of innovative and multiple methodologies, such as system dynamics, has been demonstrated to be effective in identifying the health workforce needed to answer to future health demands at the proper time: in the period it takes to train a medical workforce, the needs of the population may change drastically, and advances in technology may replace some of the workforce or require different skills [59].

Unfortunately, according to the existing limitations in the record-linkage of the different data flows on medical professionals and due to the lack of appropriate planning policies, we can conclude that in Italy the decision-makers are currently not able to appropriately estimate the health workforce needed to answer to future health demands.

Therefore, more efforts are required both at national and regional level in order to provide over space and time a medical workforce planning in line with a continuously changing health context.

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