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Original article

# Genesis and prospects of the shortage of specialist physicians in Italy and indicators of the 39 schools of hygiene and preventive medicine

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**Abstract.** *Background and Aim*: In Italy, the number of physicians decreased in recent years due to retirements not being replaced by young specialists. To address this shortage of medical personnel, proper planning is needed, taking into consideration the number of accesses in medical schools and residency contracts. The main objective of this study is to deepen the data on the number of physicians, provide a prospective picture and make some suggestions for future planning. *Materials and Methods*: Estimates of the number of physicians, contracts, assignments, and abandonments for specialist schools are based on data from the General Medical Council, the Ministry of University and Research, Eurostat and the "Associazione Liberi Specializzandi". *Results:* Estimates of the number of physicians for the period 2023-2032 predict the minimum availability of active doctors between 2028 and 2029. While there has been an increase in the number of contracts for residents in recent years, there are concurrently high dropout rates and non-assignment of contracts, varying across Schools of Specialization. An examination of the available data for the 39 Schools of Specialization in Hygiene and Preventive Medicine shows lower than-average abundance rates. *Conclusions:* In recent decades, poor planning and early retirement have led to a shortage of doctors, particularly specialists, that will not be resolved until after 2030. Proposed solutions to this 'health emergency' include importing doctors from abroad, delaying the retirement age, recruiting junior doctors to the National Health Service and changing the distribution of junior doctor contracts. (www.actabiomedica.it)

**Key words:** physician shortage, specialization, hygiene and preventive medicine, health planning

## Introduction

An adequate number of general practitioners and specialist doctors is essential to meet the health needs of the population and to provide an appropriate level of care, both quantitatively and qualitatively. To ensure the efficiency of the health system in both normal and "exceptional" conditions, such as the recent COVID-19 pandemic, careful long-term planning is needed to achieve an appropriate balance of different health professionals. In particular, based on the numerical assessment of workforce needs, it is crucial to accurately and realistically estimate the future projection of the availability of different health professionals in order to implement incentive or disincentive systems in a timely manner. Educational planning plays a critical role in this regard.

According to a recent World Health Organization (WHO) report (1) on 53 countries in the European Region, Italy has the highest proportion of physicians with advanced average age (over 55 years), reaching almost 60%. The analysis shows that in Italian hospitals, 56.4% of doctors are over 55 years old, while the European average is 30.1%. In addition, one in five Italian

doctors is over 65. This situation is unique, although the problem of an ageing health workforce affects a significant number of countries surveyed by WHO, including Germany and France, where the proportion of doctors over 55 is around 45%.

In recent years, the number of permanent staff in the National Health Service ("Sistema Sanitario Nazionale", NHS) has been decreasing due to retirements which have not been replaced by young specialists due to insufficient numbers (2,3). This situation can be attributed to inadequate planning of admissions to medical schools and specialist training programmes, failure to account for dropouts, professionals leaving the country and graduates not entering the medical profession. The shortage of health workers was and remains one of the main reasons why our NHS was weak and vulnerable during the COVID-19 pandemic, and even more so post-COVID. In addition to staff shortages, underfunding of the NHS, budget cuts, restrictions on staff recruitment and often inadequate hospital planning all contribute to the weakened state of the health system.

The aim of this scientific study is to examine the available data on the number of active doctors, to provide decision-makers with a prospective overview based on scientific evidence, and to make suggestions for future planning.

The final in-depth analysis concerning the specialisation in Hygiene and Preventive Medicine (also known as Public Health) is suggested by previous studies carried out by the authors of this work (4,5) and an attempt to assess whether the attractiveness of this specialisation has changed after COVID-19. It is noteworthy that specialists in this field, both in hospital management and in community settings, have been more involved than others in crucial organisational activities for the NHS, activities that were previously given lesser recognition (such as surveillance, contact tracing, and vaccination).

## Materials and methods

Data on enrollments and available contracts for specialization schools were obtained from the official documents of the Ministry of University and Research (MUR). European data were sourced from Eurostat - European statistics and scientific studies on the subject (6-10). With regard to withdrawals and re-entries, data collected by the "Associazione Liberi Specializzandi" (ALS) were used. Retirement data were obtained from the website of the National Federation of Orders of Surgeons and Dentists ("Federazione Nazionale degli Ordini dei Medici Chirurghi e degli Odontoiatri"), which collects data transmitted by the Provincial Orders.

Two different estimates were conducted regarding the total number of doctors in Italy:

1. One estimate was calculated based on the number of active doctors registered with the Provincial Orders of Surgeons and Dentists, which includes both non-specialized newly graduated doctors and specialists.
2. The other estimate was calculated only on the basis of the number of doctors who had completed their training, i.e. specialists.

To estimate the number of trained doctors (i.e., specialists) potentially available to NHS in the years following 2022, the following approach was taken: those who would reach the age of 68 (considered to be the average retirement age) during the following year were subtracted, while the doctors completing their training each year (6 years of university and a variable duration of 3 to 5 years for the specialisation) were added to the sum. The latter group was therefore estimated:

- for the years 2023 to 2026: the estimate takes into account graduates from 2019 to 2022 in the respective four previous years, assuming an average of four years of specialisation;
- For the years 2027 to 2032: the number of admissions to the Medicine and Surgery degree courses in the previous ten years (assuming a total of 6+4 years of training) was examined, reduced by 5% on the basis of common estimates of dropouts (11).

It should be noted that Italian doctors studying abroad were not included in the count. However,

considering their negligible percentage and the fact that the estimate is based on the overall number, this was deemed a negligible data point. The total number of doctors in Italy, estimated based on active registrations with the Provincial Orders of Surgeons and Dentists, stands at 5.3 per 1,000 inhabitants on 31st December 2022 (Table 1). However, these data do not reflect the actual situation as they include doctors who are not practising, doctors who have moved abroad, and, most importantly, doctors who have not completed their training. For international comparisons, it is therefore the more appropriate data to consider, estimated based on the number of trained doctors (i.e., specialists) over the same period, which is estimated at around 4.6 practising doctors per 1,000 inhabitants (Table 2).

**Table 1.** Estimate of active doctors for the period 2020-2032.

| Years | Total number of doctors | Retirements | New Entrants | Doctors per 1000 inhabitants |
|---|---|---|---|---|
| 2020 | 324356 | 13192 | 11313 | 5,41 |
| 2021 | 322477 | 12857 | 10875 | 5,37 |
| 2022 | 320495 | 11493 | 9328 | 5,34 |
| 2023 | 318330 | 13161 | 9222 | 5,31 |
| 2024 | 314391 | 13727 | 9290 | 5,24 |
| 2025 | 309954 | 13054 | 10990 | 5,17 |
| 2026 | 307890 | 11828 | 12418 | 5,13 |
| 2027 | 308480 | 11140 | 13319 | 5,14 |
| 2028 | 310659 | 9729 | 14003 | 5,18 |
| 2029 | 314933 | 9035 | 14003 | 5,25 |
| 2030 | 319901 | 8305 | 14003 | 5,33 |
| 2031 | 325599 | 8220 | 14003 | 5,43 |
| 2032 | 331382 | 7917 | 14003 | 5,52 |

**Table 2.** Estimation of the number of trained doctors (specialists) for the period 2020-2032.

| Years | Total number of specialists | Retirements | New Entrants | Doctors per 1000 inhabitants |
|---|---|---|---|---|
| 2020 | 286831 | 13192 | 7935 | 4,78 |
| 2021 | 281574 | 12857 | 9101 | 4,69 |
| 2022 | 277818 | 11493 | 10085 | 4,63 |
| 2023 | 276410 | 13161 | 10509 | 4,61 |
| 2024 | 273758 | 13727 | 11313 | 4,56 |
| 2025 | 271344 | 13054 | 10875 | 4,52 |
| 2026 | 269165 | 11828 | 9328 | 4,49 |
| 2027 | 266665 | 11140 | 9222 | 4,44 |
| 2028 | 264747 | 9729 | 9290 | 4,41 |
| 2029 | 264308 | 9035 | 10990 | 4,41 |
| 2030 | 266263 | 8305 | 12418 | 4,44 |
| 2031 | 270376 | 8220 | 13319 | 4,51 |
| 2032 | 275475 | 7917 | 13319 | 4,59 |

## Results

*Estimates of the number of doctors*

By calculating the estimates, obtained by cross-referencing the projection of the number of doctors graduating from Italian universities with the projection of possible retirements of active doctors in the National Health Service, it was possible to determine the number of active doctors and trained doctors (specialists) expected by 2032 (Tables 1 and 2).

*The turnover rate and the 'retirement bulge'*

According to the estimates for the period 2023-2032, the number of active doctors in Italy will reach a historical low between 2028 and 2029 (Figures 1 and 2). The decrease in numbers will primarily affect trained doctors and, consequently, those working for the NHS, who will number only about 264,000 in 2029.

These data are easy to interpret if we compare them with the peak of recruitment in the period following the establishment of the NHS in 1978 and thus with the age of the doctors currently working. 118,745 doctors (29% of the total) are aged between 61 and 70 (Figure 3). There will therefore be a significant exodus in the coming years, with the projected number of new specialist doctors being insufficient to replace those retiring. The halt in recruitment has interrupted the regular replenishment of posts, leading to the so-called 'retirement bulge', where many retirees leave the workforce while few new professionals are available to take their place.

Currently, medical directors retire at an average age of 68. The retirement wave for those born in 1953 started in 2018. The retirement curve reached a high level between 2018 and 2022, with annual departures estimated at around 11,000-13,000, and will continue in the coming years.

Despite a clear trend reversal in the number of first-year medical and surgical training places available from the 2021/22 academic year, the number of graduates will not equal the number of planned retirements until 2026 (Figure 4). However, this reversal will occur three years later (2029) for trained doctors and specialists (Figure 5).

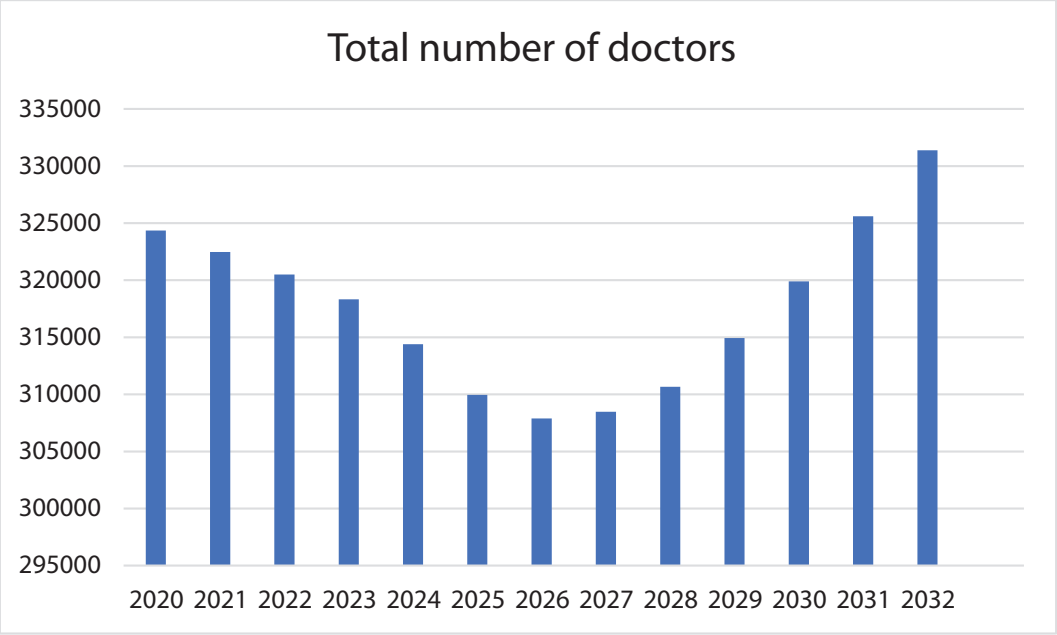


**Figure 1.** Estimate total number of doctors.

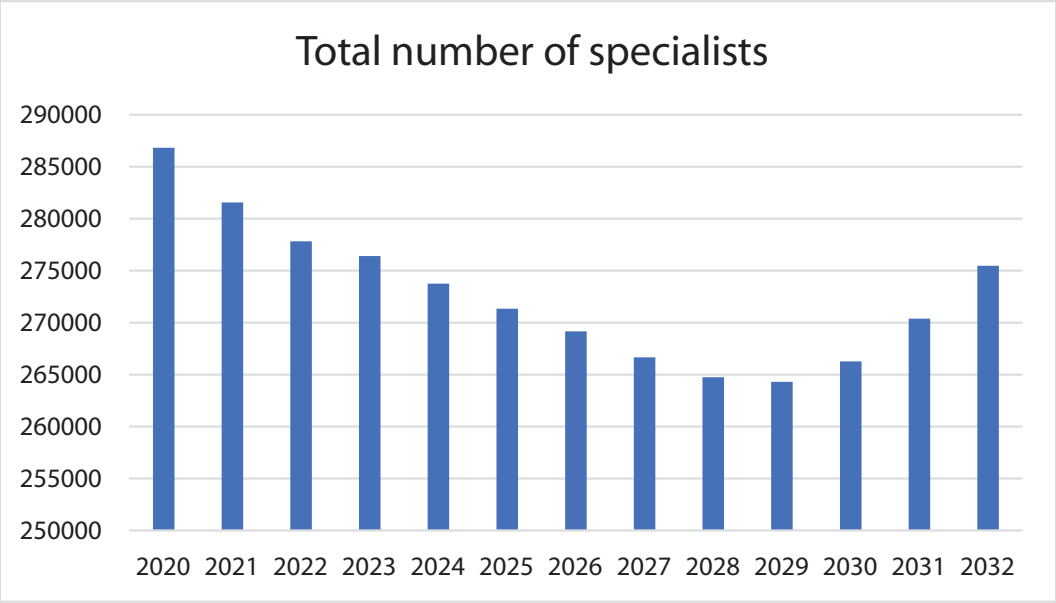


**Figure 2.** Estimate the number of specialised doctors (specialists).

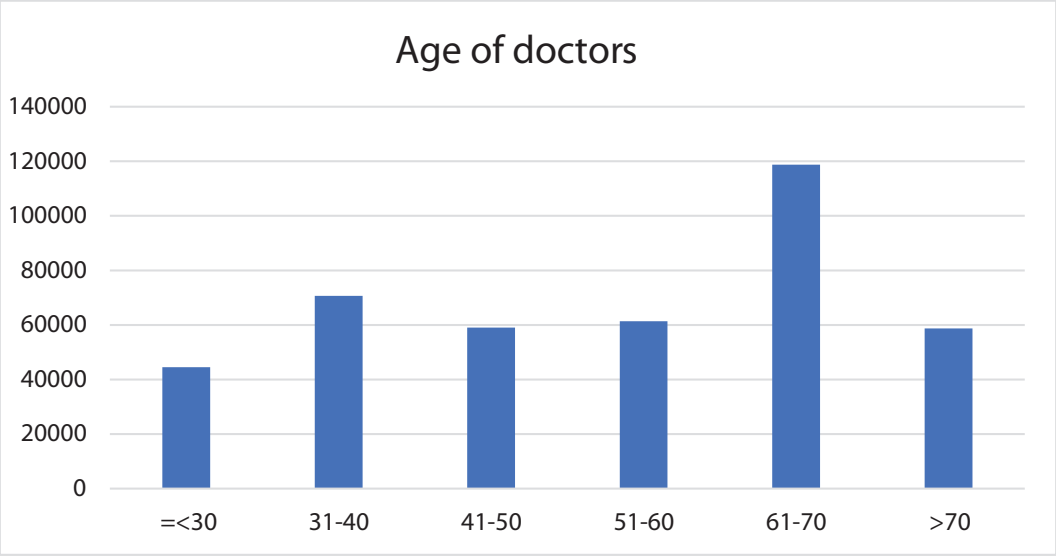


**Figure 3.** Age of doctors (Updated as of March 2023).

*Specialist medical schools*

The general data presented in the introductory part do not take into account the distribution of different specialists, including general practitioners (GPs) and freely chosen paediatricians.

Despite the significant shortages highlighted in the doctor supply system, there has been a steady increase in the number of specialist training contracts in recent years. The number has increased from 5,000 in 2015 to 18,847 in 2021 and then decreased to 14,378 in 2022. However, for the five-year period from 2022

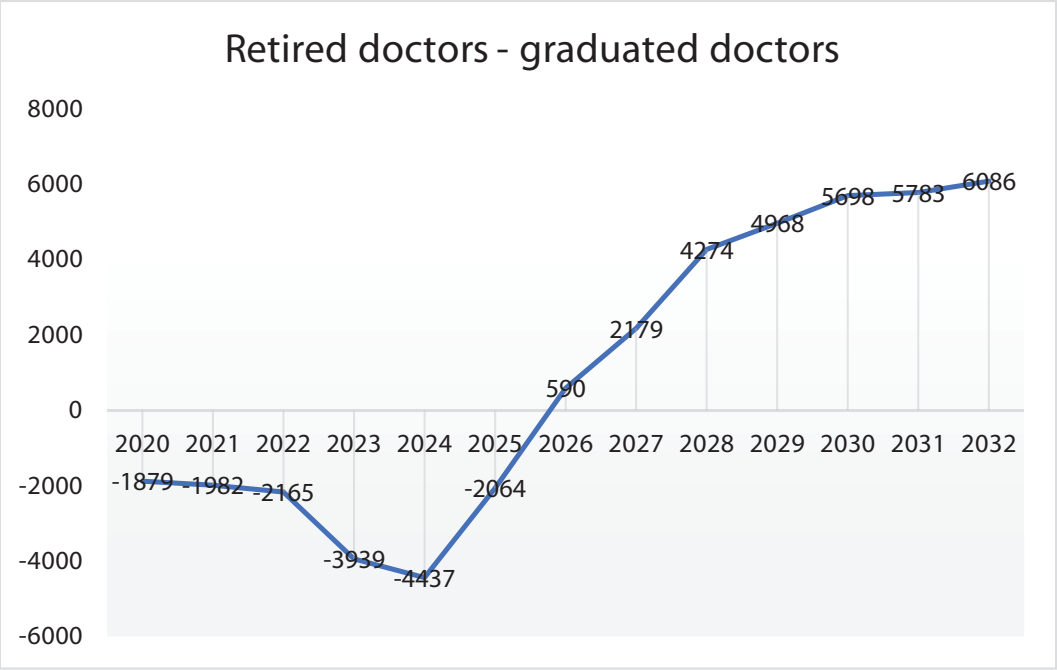


**Figure 4.** Difference between the number of retired doctors and the number of graduated doctors.

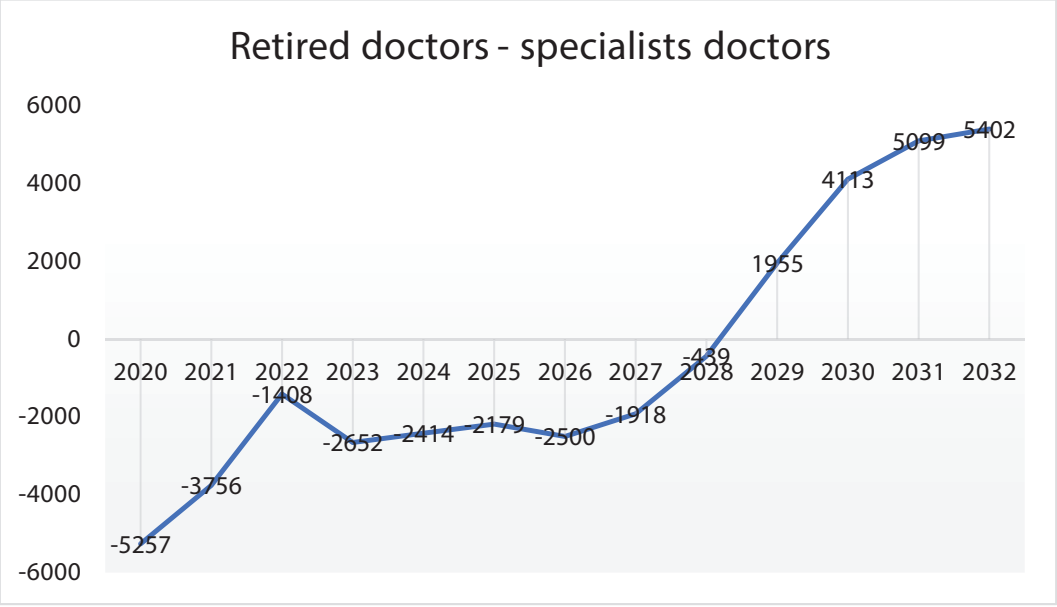


**Figure 5.** Difference between the number of retired doctors and the number of specialised doctors.

to 2027, the training offered by the various schools of specialisation will not be able, under current legislation, to cover the number of retirements expected for the same period.

However, the current problem is only partly related to the distribution of contracts among the 50 specialties, as it is burdened by unallocated positions, dropouts and lack of medical activity within the acquired specialty. It should also be noted that the loss

**Table 3.** Contracts of specialisation schools (updated March 2023).

| | 2021 | | | 2022 | | |
|---|---|---|---|---|---|---|
| **Specialisation schools** | **Tendered** | **non-allocation/ abandonment** | **%** | **Tendered** | **non-allocation/ abandonment** | **%** |
| Allergology and Clinical Immunology | 108 | 14 | 13,0% | 85 | 8 | 9,4% |
| Pathological Anatomy | 197 | 87 | 44,2% | 160 | 91 | 56,9% |
| Anesthesia, Resuscitation, Intensive Care, and Pain Therapy | 2.052 | 488 | 23,8% | 1.139 | 226 | 19,8% |
| Audiology and Phoniatrics | 44 | 16 | 36,4% | 20 | 4 | 20,0% |
| Cardiothoracic Surgery | 99 | 33 | 33,3% | 87 | 24 | 27,6% |
| General Surgery | 782 | 184 | 23,5% | 623 | 170 | 27,3% |
| Maxillofacial Surgery | 65 | 10 | 15,4% | 46 | 4 | 8,7% |
| Pediatric Surgery | 74 | 25 | 33,8% | 38 | 3 | 7,9% |
| Plastic, Reconstructive, and Aesthetic Surgery | 118 | 2 | 1,7% | 112 | 1 | 0,9% |
| Thoracic Surgery | 94 | 34 | 36,2% | 77 | 41 | 53,2% |
| Vascular Surgery | 142 | 33 | 23,2% | 117 | 30 | 25,6% |
| Dermatology and Venereology | 144 | 2 | 1,4% | 128 | 2 | 1,6% |
| Hematology | 262 | 46 | 17,6% | 199 | 26 | 13,1% |
| Endocrinology and Metabolic Disorders | 228 | 16 | 7,0% | 186 | 7 | 3,8% |
| Clinical Pharmacology and Toxicology | 112 | 71 | 63,4% | 94 | 63 | 67,0% |
| Medical Genetics | 86 | 33 | 38,4% | 74 | 38 | 51,4% |
| Geriatrics | 496 | 84 | 16,9% | 323 | 56 | 17,3% |
| Gynecology and Obstetrics | 582 | 61 | 10,5% | 513 | 31 | 6,0% |
| Hygiene and Preventive Medicine | 761 | 111 | 14,6% | 483 | 74 | 15,3% |
| Cardiovascular Diseases | 784 | 16 | 2,0% | 491 | 3 | 0,6% |
| Digestive System Disorders | 218 | 10 | 4,6% | 186 | 2 | 1,1% |
| Respiratory System Disorders | 374 | 34 | 9,1% | 285 | 13 | 4,6% |
| Infectious and Tropical Diseases | 329 | 64 | 19,5% | 278 | 83 | 29,9% |
| Occupational Medicine | 227 | 26 | 11,5% | 195 | 15 | 7,7% |
| Sports Medicine and Exercise | 84 | 7 | 8,3% | 75 | 2 | 2,7% |
| Emergency Medicine | 1.074 | 666 | 62,0% | 807 | 488 | 60,5% |
| Community Medicine and Primary Care | 78 | 26 | 33,3% | 112 | 84 | 75,0% |
| Palliative Medicine and Hospice Care | | | | 100 | 62 | 62,0% |
| Physical Medicine and Rehabilitation | 348 | 55 | 15,8% | 322 | 19 | 5,9% |
| Internal Medicine | 1.105 | 235 | 21,3% | 621 | 68 | 11,0% |
| Forensic Medicine | 184 | 12 | 6,5% | 151 | 9 | 6,0% |
| Nuclear Medicine | 96 | 53 | 55,2% | 85 | 47 | 55,3% |
| Thermal Medicine | 4 | 4 | 100% | 3 | 2 | 66,7% |

Table 3 (*Continued*)

| | 2021 | | | 2022 | | |
|---|---|---|---|---|---|---|
| **Specialisation schools** | **Tendered** | **non-allocation/ abandonment** | **%** | **Tendered** | **non-allocation/ abandonment** | **%** |
| Microbiology and Virology | 133 | 98 | 73,7% | 111 | 93 | 83,8% |
| Nephrology | 314 | 67 | 21,3% | 283 | 65 | 23,0% |
| Neurosurgery | 121 | 20 | 16,5% | 102 | 9 | 8,8% |
| Neurology | 327 | 22 | 6,7% | 286 | 2 | 0,7% |
| Child and Adolescent Neuropsychiatry | 269 | 21 | 7,8% | 251 | 7 | 2,8% |
| Ophthalmology | 244 | 7 | 2,9% | 199 | 2 | 1,0% |
| Medical Oncology | 349 | 61 | 17,5% | 289 | 28 | 9,7% |
| Orthopedics and Traumatology | 524 | 49 | 9,4% | 460 | 30 | 6,5% |
| Otolaryngology | 207 | 12 | 5,8% | 170 | 13 | 7,6% |
| Clinical Pathology and Clinical Biochemistry | 311 | 218 | 70,1% | 243 | 172 | 70,8% |
| Pediatrics | 902 | 39 | 4,3% | 778 | 11 | 1,4% |
| Psychiatry | 717 | 41 | 5,7% | 476 | 10 | 2,1% |
| Radiology | 932 | 59 | 6,3% | 539 | 14 | 2,6% |
| Radiotherapy | 178 | 111 | 62,4% | 150 | 113 | 75,3% |
| Rheumatology | 124 | 12 | 9,7% | 105 | 8 | 7,6% |
| Nutritional Science | 70 | 19 | 27,1% | 60 | 20 | 33,3% |
| Health Statistics and Biometrics | 36 | 17 | 47,2% | 29 | 17 | 58,6% |
| Urology | 291 | 36 | 12,4% | 254 | 50 | 19,7% |
| **Overall total** | **17.400** | **3.467** | **19,9%** | **13.000** | **2.460** | **18,9%** |

of posts is facilitated by the increase in available contracts, as it encourages individuals to leave their acquired posts in search of more suitable opportunities. Table 3 summarises the allocation and non-allocation/ abandonment of contracts in 2021 and 2022.

The Agenas report a drop-out rate from specialisation schools of around 5% once the programme has started (11), but actual data suggest that the percentage is much higher. In addition, these figures should be combined with all unallocated contracts, which are consequently lost. There are significant differences in dropout/non-allocation rates between specialties, ranging from less than 1% in dermatology to more than 70% in microbiology. Overall, only 17 specialties have a two-year contract placement rate of over 90%. Young trainees appear to be choosing more lucrative specialties with less professional risk. Plastic surgery, cardiology and dermatology are among the top ten specialties chosen in 2021.

In terms of specialties chosen in 2021, contracts for anaesthesia, resuscitation, intensive care and pain management were either not allocated or abandoned by 23.8% of assignees, equivalent to 488 contracts. General Surgery had a dropout rate of 23.5%, corresponding to 184 contracts; Emergency Medicine and Urgent Care had a dropout rate of 62%, corresponding to 666 contracts; Internal Medicine had a dropout rate of 21.3%, corresponding to 235 contracts; Clinical Pathology and Clinical Biochemistry had a dropout rate of 70.1%, corresponding to 218 contracts; Microbiology and Virology had a dropout rate of 73.7%, corresponding to 98 contracts, and so on. Therefore, a more reliable estimate is an average abandonment or non-allocation rate of 20% of the total number of funded contracts. Consequently, of the 30,400 government-funded contracts announced for the 2021-2022 biennium, approximately 24,473 future specialists will actually complete their training (Table 3).

Another consideration is that only a proportion of these specialists will accept employment within the NHS. This is the era of the 'big resignation', with the arrival of co-operatives on the job market and some newly qualified doctors preferring to move abroad in search of higher pay and greater professional prestige. As a result, hospital competitions often go unfilled and the most sought-after specialisations are those that offer job opportunities outside the NHS. These analyses should be taken into account when calculating the demand for medical staff, which is carried out annually by each region and determines the number of places in medical courses and the number of specialisation contracts to be announced. In this regard, we present the trend of advertised contracts for the Emergency Medicine specialization school from 2009 to 2022: the number of contracts has increased from 50 in 2009 to 1,074 in 2021 and 807 in 2022 to address a severe shortage of specialists (Figure 6).

Inadequate planning in recent years has led to an exponential increase in the number of contracts in order to cope with the resulting shortage. However, this solution will not be able to restore the system, as a high percentage of allocated posts, which varies according to the specialisation school, have remained unallocated or have been abandoned.

In conclusion, despite the trend, the mechanism of increasing the number of funded specialisation contracts does not seem sufficient to bridge the gap. In fact, unallocated or abandoned contracts are completely "lost" - they represent budgeted funds from the government that are not fully recovered and put back into circulation, thus depleting the funds for future specialisation training. It is necessary to consider alternative mechanisms that can redirect the system to support an increase in funded contracts. Simply removing the numerous clauses restricting medical degrees or increasing specialisation grants is not enough to strengthen the Italian health system with new personnel. Existing exclusivity restrictions lead doctors to leave certain public hospital departments. The resulting shortage of doctors worsens the service and drives patients towards private healthcare, which becomes even more attractive to doctors, who then leave public hospitals, creating further gaps in the service.

*Hygiene and preventive medicine specialisation contracts*

An analysis of the available data for the 39 schools of hygiene and preventive medicine shows a total of 761 contracts in 2021 and 483 in 2022. The dropout rate in the first year, combined with non-allocations, is 14.6% in 2021 and 15.3% in 2022, which is lower than the overall average for all schools. The percentages of dropouts and non-admissions vary widely between

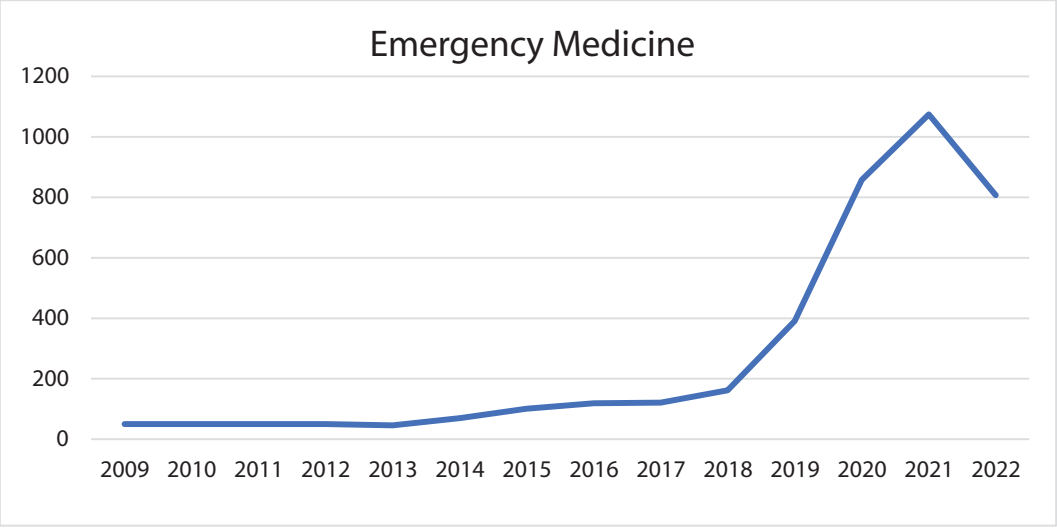


**Figure 6.** Contracts of the Emergency Medicine specialization school.

**Table 4.** Specialization contracts in Hygiene and Preventive Medicine.

| | 2021 | | | 2022 | | |
|---|---|---|---|---|---|---|
| | **Tendered** | **non-allocation/ abandonment** | **%** | **Tendered** | **non-allocation/ abandonment** | **%** |
| Bari | 21 | 2 | 9,5% | 13 | 0 | 0,0% |
| Bologna | 24 | 5 | 20,8% | 14 | 0 | 0,0% |
| Brescia | 17 | 6 | 35,3% | 11 | 2 | 18,2% |
| Cagliari | 14 | 0 | 0,0% | 9 | 0 | 0,0% |
| Campania - "L. Vanvitelli" | 23 | 3 | 13,0% | 16 | 3 | 18,8% |
| Catania | 18 | 3 | 16,7% | 11 | 0 | 0,0% |
| Catanzaro | 17 | 3 | 17,6% | 11 | 1 | 9,1% |
| Cattolica del Sacro Cuore | 25 | 3 | 12,0% | 16 | 0 | 0,0% |
| Ferrara | 16 | 8 | 50,0% | 10 | 4 | 40,0% |
| Firenze | 28 | 4 | 14,3% | 18 | 1 | 5,6% |
| Foggia | 13 | 1 | 7,7% | 8 | 0 | 0,0% |
| Genova | 21 | 2 | 9,5% | 13 | 0 | 0,0% |
| Insubria | 4 | 0 | 0,0% | 3 | 1 | 33,3% |
| L'Aquila | 20 | 1 | 5,0% | 13 | 0 | 0,0% |
| Messina | 13 | 1 | 7,7% | 7 | 0 | 0,0% |
| Milano | 30 | 3 | 10,0% | 19 | 6 | 31,6% |
| Milano Humanitas | | | | 3 | 0 | 0,0% |
| Milano-Bicocca | 25 | 2 | 8,0% | 16 | 8 | 50,0% |
| Modena e Reggio Emilia | 20 | 5 | 25,0% | 13 | 0 | 0,0% |
| Molise | 9 | 4 | 44,4% | 6 | 1 | 16,7% |
| Napoli "Federico II" | 34 | 4 | 11,8% | 23 | 1 | 4,3% |
| Padova | 32 | 4 | 12,5% | 20 | 9 | 45,0% |
| Palermo | 26 | 3 | 11,5% | 17 | 0 | 0,0% |
| Parma | 16 | 2 | 12,5% | 10 | 2 | 20,0% |
| Pavia | 17 | 2 | 11,8% | 11 | 5 | 45,5% |
| Perugia | 17 | 5 | 29,4% | 11 | 1 | 9,1% |
| Piemonte Orientale | 14 | 2 | 14,3% | 9 | 1 | 11,1% |
| Pisa | 17 | 0 | 0,0% | 10 | 0 | 0,0% |
| Politecnica delle Marche | 18 | 4 | 22,2% | 11 | 2 | 18,2% |
| Roma "Tor Vergata" | 18 | 1 | 5,6% | 11 | 0 | 0,0% |
| Roma La Sapienza F-M/M-O | 42 | 1 | 2,4% | 27 | 1 | 3,7% |
| S. Raffaele Milano | 21 | 1 | 4,8% | 11 | 2 | 18,2% |
| Salerno | 5 | 0 | 0,0% | 4 | 0 | 0,0% |
| Sassari | 14 | 1 | 7,1% | 9 | 0 | 0,0% |
| Siena | 20 | 7 | 35,0% | 12 | 5 | 41,7% |
| Torino | 33 | 5 | 15,2% | 21 | 2 | 9,5% |
| Trieste | | | | 3 | 1 | 33,3% |
| Udine | 24 | 8 | 33,3% | 11 | 5 | 45,5% |
| Verona | 35 | 5 | 14,3% | 22 | 10 | 45,5% |
| **Overall total** | **761** | **111** | **14,6%** | **483** | **74** | **15,3%** |

**Table 5.** Abandonment of specialisation contracts in Hygiene and Preventive Medicine.

| Years | Allocated | Abandoned | % Abandoned |
|---|---|---|---|
| 2016 | 200 | 8 | 4% |
| 2017 | 204 | 27 | 13% |
| 2018 | 195 | 30 | 15% |
| 2019 | 240 | 34 | 14% |
| 2020 | 559 | 88 | 16% |
| 2021 | 739 | 62 | 8% |

schools, and it is not possible to establish absolute criteria for higher or lower attractiveness (Table 4). In general, the larger university campuses in the central-northern regions and the three private university schools appear to have lower percentages. Moreover, the data for these two years are often inconsistent.

Looking specifically at contract abandonment over a longer period, from 2016 to 2021, a very low abandonment rate is observed in 2016. The abandonment rate is higher, albeit relatively stable, for the years 2017-2020 and decreases significantly in 2021 (Table 5).

A more in-depth analysis focused on enrolments in Hygiene and Preventive Medicine, following the abandonment of another specialisation in the previous year. The data show an increasing trend, despite the reduction in the number of contracts offered between 2020 and 2021 (Table 6).

**Table 6.** Enrolled in Hygiene and Preventive Medicine after having left another specialising school.

| Years | Scholarships acquired by giving up other scholarships |
|---|---|
| 2019 | 11 |
| 2020 | 19 |
| 2021 | 26 |

## Discussion and conclusion

The incorrect planning of the past decades, pre-retirements, and the "flight" to the private sector have led to a critical shortage of doctors on the national territory, which will not be resolved until after 2030. However, the lack of specialists within the NHS and the accelerated retirement of doctors are rapidly becoming a national emergency that requires rapid and appropriate corrective action to avoid the collapse of the system itself. The demographic phenomenon is well known and is an important factor in predicting a worsening of the current shortage of medical personnel over the next decade. There is also a risk that the overall quality of the system will decline because the speed of current and, above all, future processes will not allow sufficient time for the transfer of skills from more experienced doctors to younger ones. These are experiences, practical knowledge and sophisticated technical skills that require time and a period of osmosis between different professional generations to be adequately transferred. The solution to the problem could involve:

a. Importing doctors from abroad;
b. Extending the service beyond the retirement age;
c. Enlisting specialized trainees in their final years of training;
d. A different distribution of contracts in the coming years that considers abandonments and unassigned positions.

a) The Calabria region has planned to recruit Cuban doctors, which is technically not an easy operation due to the recognition of qualifications, different languages and types of contract. It does not seem to be an easily replicable operation in other contexts. The unattractiveness associated with lower salaries compared to equivalent European countries with higher incomes and economic situations weighs heavily on this option.

b) The voluntary extension of service beyond the retirement age (67 or 70 years) has recently been extended to general practice, which is perhaps the area with the most glaring shortcomings (Decree-Law No 24/2022, converted into Law No 52/2022). However, the numbers do not appear to be sufficient to remedy a significant shortage. In fact, the number of general practitioners has decreased in most countries in recent years (Agenas 2022: "Il personale del Servizio Sanitario Nazionale"). To address this problem, several countries have increased the number of postgraduate

training posts in general practice. However, the effectiveness of this measure has been limited, as it is becoming increasingly difficult to attract enough medical graduates to fill the available posts in general practice. The motivations appear to be related to remuneration and the perceived low prestige of the role of general practitioners (OECD, 2019). One solution could be to remove the exclusivity of general practice and allow certain specialists already working in the NHS (e.g. internal medicine specialists) to also perform this function, as was the case several years ago. In fact, until the introduction of the specialisation in general practice in the 1990s, the general practitioner was a figure without postgraduate training. At present, however, the doctor without postgraduate training is the "generic doctor," different from the general practitioner who, unlike the former, has specialised and specific postgraduate training, although not at university level.

The same problem recurs in certain types of specialisation: worsening working conditions, increased individual workloads, non-compliance with European regulations on rest periods, and fuelled by a lack of confidence in the possibility of improvement, have led many doctors to leave public hospitals in favour of the private sector or to emigrate to other regions in search of greater professional and economic satisfaction.

c) The recruitment of trainees is currently underway, although it is at the discretion of the school directors. The first result was achieved in the Budget Law for 2019 (insert number) with the provision allowing trainees in their final and penultimate year to participate in competitions for medical management positions in the NHS with 30-hour per week contracts. This initiative, which is commendable, has allowed early entry into the workforce and accelerated the planned competition system to ensure turnover in hospital departments, although this may have a negative impact on comprehensive training. Given the shortage of staff in hospitals, any delay in the replacement of retiring doctors leads to increasingly demanding workloads that are difficult to manage, resulting in increased clinical risk to health professionals and patients through a deterioration in patient safety.

d) It is reiterated that specialty training contracts should be based on real health needs, taking into account retirements, resignations and non-allocations, while ensuring harmonisation between undergraduate and specialist training places. As also reported in the Agenas study (11), interventions limited to increasing training capacity in other European countries have proven to be partially ineffective. The belief that simply introducing new doctors will be sufficient to replace those retiring risks being short-sighted: it is necessary to review delivery functions, roles, contracts and commitments. It is essential to define the need for doctors in each specialty and to plan for a balanced supply, taking into account the specialties that are currently in short supply. It is crucial to make working in hospitals and in the territorial services of the NHS attractive, in order to increase the option for neo-specialists to choose the NHS. Therefore, it is considered necessary to combine the current training offer with a system of incentives and recognition that can make medical work in the NHS attractive in terms of social and economic recognition, as well as the role within the health institutions.

A final consideration concerns the School of Specialisation in Hygiene and Preventive Medicine: prior to the 1992 reform (Decree-Law No. 502 of 30 December 1992), this school was often considered as a second specialisation for professionals who developed a passion for organisational and managerial activities. In the years following the 1992 reform, this made it less attractive than the clinical schools, to the extent that in 2015 it was included in the top 10 priority schools for the NHS in order to increase the number of places. The recent development of prevention and public health activities at national and international level, the revision of the educational objectives and the importance of the knowledge provided by this specialty during the pandemic have increased its attractiveness and related indicators, such as assigned contracts, abandonments and the choice of this School as a second option after abandoning another School. This provides recognition and an incentive to improve performance for the Directors and the relevant Department of Medical Sciences (MED/42).

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## References


1. WHO, Health and care workforce in Europe: time to act. Copenhagen: WHO Regional Office for Europe; 2022. Licence: CC BY-NC-SA 3.0 IGO.
2. Istat,http://dati.istat.it/viewhtml.aspx?il=blank&vh=0000&vf=0&vcq=1100&graph=0&view-metadata=1&lang=it&QueryId=31546#.
3. Colombo A, Bassani G. Carenza di medici: ma per quale SSN? Dati, riflessioni e proposte dalla formazione. Igiene e Sanità Pubblica 2019; 75:385-402.
4. Odone A, Privitera G, Signorelli C and the Board of Directors of the Schools of Hygiene and Preventive Medicine. Post-graduate medical education in public health: the case of Italy and a call for action. Public Health Reviews 2017; 38: 24. doi:10.1186/s40985-017-0069-0.
5. Bucci D, Rossi D, Croci R, et al. The campaign "This Is Public Health" in Italy, set up by a team of Public Health Schools in Northern Italy. Acta Biomed. 2020 Apr 10;91 (3-S):171-174. doi: 10.23750/abm.v91i3-S.9508.
6. Elmer D, Endrei D, Németh N, et al. Changes in the Number of Physicians and Hospital Bed Capacity in Europe. Value Health Reg Issues. 2022 Nov;32:102-108. doi: 10.1016/j.vhri.2022.07.003.
7. EUROSTAT, Health statistics. Eurostat database. https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=File:Practising_physicians,_2015_and_2020_(per_100_000_inhabitants)_Health20.png.
8. Eurostat, Practicing physicians, 2015 and 2020 per 100.000 inhabitants. European Commission 2022.
9. Elmer D, Endrei D, Németh N, et al. Changes in the number of healthcare professionals in European healthcare systems between 2000 and 2018. Orv Hetil. 2022 Oct 9;163(41):1639-1648. Hungarian. doi: 10.1556/650.2022.32580.
10. Winkelmann J, Muench U, Maier CB. Time trends in the regional distribution of physicians, nurses and midwives in Europe. BMC Health Serv Res. 2020 Oct 12;20(1):937. doi: 10.1186/s12913-020-05760-y.
11. Agenas, Il personale del Servizio Sanitario Nazionale. 2022. https://www.agenas.gov.it/images/agenas/In%20primo%20piano/personale/personale_ssn_2022.pdf.


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