



# The number of ophthalmologists in practice and training worldwide: a growing gap despite more than 200 000 practitioners

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## ABSTRACT

**Background/aims** To assess the current number of ophthalmologists practicing worldwide in 2010 and to create a system for maintaining, collecting and improving the accuracy of data on ophthalmologists per population, ophthalmologists performing surgery, growth rate of the profession, and the number of residents in training.

**Methods** Between March 2010 and April 2010, the International Council of Ophthalmology emailed a standardised survey of 12 questions to 213 global ophthalmic societies. Missing data and additional information were gathered from direct correspondences with ophthalmologist contacts.

**Results** The total number of ophthalmologists reported was 204 909. Data are presented for 193 countries. Information was obtained from 67 countries on the number of ophthalmologists doing surgery, entering practice, leaving practice, rate of growth and resident training.

**Conclusion** The survey results show that despite over 200 000 ophthalmologists worldwide, there is currently a significant shortfall of ophthalmologists in developing countries. Furthermore, although the number of practitioners is increasing in developed countries, the population aged 60+ is growing at twice the rate of the profession. To meet this widening gap between need and supply, it is necessary to aggressively train eye care teams now to alleviate the current and anticipated deficit of ophthalmologists worldwide.

## INTRODUCTION

Skilled and motivated health workers in sufficient numbers at the right place and at the right time are critical to deliver effective health services and improve health outcomes.<sup>1</sup>

Despite worldwide recognition of its importance, there is a lack of data on the global state of human resources in eye care,<sup>2</sup> and there has been little investment in collection of accurate and timely data that could provide an overview of trends in ophthalmic personnel and inform policy.

To gain a better understanding of current and future ophthalmic trends, in 2010 the International Council of Ophthalmology (ICO) conducted a global survey to determine the current number of ophthalmologists in practice and in training and to assess the growth rate of the ophthalmic population at the country level. To date, only the International Agency for the Prevention of Blindness has conducted a study to identify eye care human resource gaps.<sup>2</sup>

The ICO survey attempted to capture the *dynamics* of the global ophthalmic population: Is this

population increasing or decreasing in each country or territory? What is the output of the global education and training programmes? Are developing countries filling their health workforce gaps?

## SUBJECTS AND METHODS

### Survey overview

The authors created a standardised English-language questionnaire designed to obtain the number of ophthalmologists currently in practice and in training worldwide. Translations were not necessary as recipients were known by the ICO to be fluent in English. In this survey, the broadest possible definition for an ophthalmologist was used; that is, a doctor of medicine (MD or equivalent degree) who specialises in the eye and visual system.<sup>3</sup>

In March 2010, the questionnaire was sent via email to 213 principal contacts of ICO member and non-member ophthalmic societies. For background information, the email provided a link to WHO Action Plan for the Prevention of Blindness and Visual Impairment.<sup>4</sup>

The survey consisted of 12 separate items: seven questions specific to ophthalmology data collection; one option for the responders to provide comments about their responses; and four questions to obtain information about the society contact. For questions specific to ophthalmology data collection, respondents were requested to rate their level of certainty on a scale from A to D with examples provided (table 1A web only).

### Data collection protocol

Society contacts were asked to email or fax data specific to their country or territory to the ICO no later than 10 April 2010, which was a 1-month response time frame.

Data collection was further complemented by information gathered from direct communications with ophthalmologist contacts, including personal acquaintances and colleagues of the ICO officers and staff.

A second standardised questionnaire identical to the first was distributed in August 2010 to countries that did not respond to the initial survey and/or whom the ICO was unable to reach directly.

There were no multiple sources of information. In cases where data were provided as a range, it was averaged.

### Accuracy of data

Data were checked for consistency and accuracy and compared with previously reported data from

the Agency for the Prevention of Blindness report. Numbers that appeared abnormally large or small, or inconsistent growth directions that did not match the data of entering/leaving ophthalmologists, were reconfirmed with other society leaders and various supplementary contacts.

## RESULTS

Surveys were sent to 239 countries and territories, and responses were received from 200 of these regions. Territories were subsequently integrated into the country to which they were attached, and so results are therefore presented for 193 countries.

### Response rate

Of the 193 countries surveyed, 192 provided data on the number of active ophthalmologists in their region. A more limited number of countries provided data on the percentage of ophthalmologists doing surgery; the number of ophthalmologists entering/leaving practice; and the number of ophthalmology residents. Not all countries graded the certainty of the data provided, but those that did indicated a high level of certainty in the data (table 1B web only).

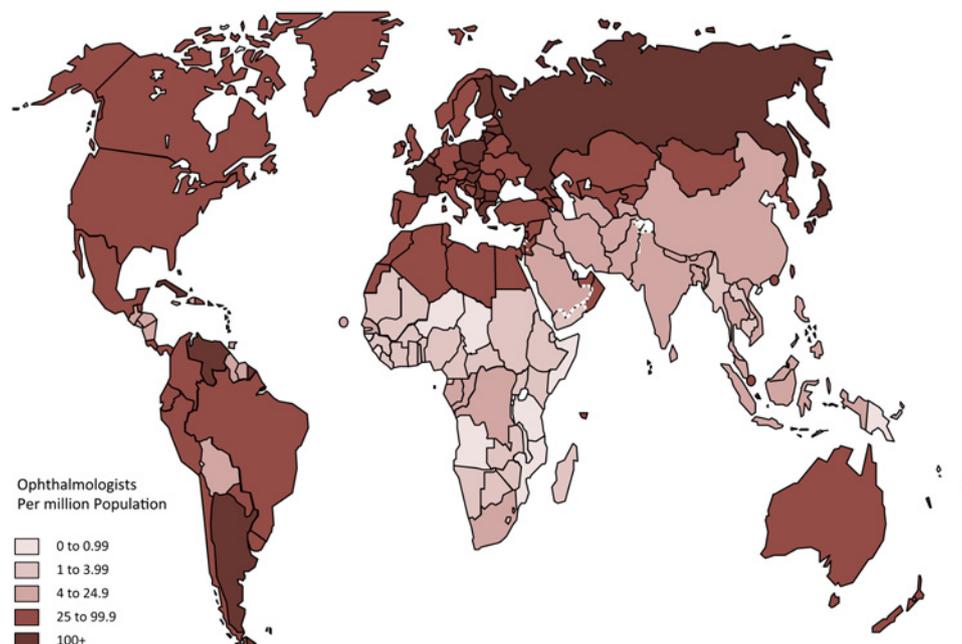
### Number of ophthalmologists

Of the 193 countries surveyed, 192 responded (99.5%), which represented 99.99% of the global population.

According to the survey, the total number of ophthalmologists in the world was 204 909. For this total, a third was found in three countries: China, USA and Russia and a half were found in six countries: China, USA, Russia, Japan, Brazil and India. The number of ophthalmologists by country ranged from 28 338 in China to 0 in some of the small island countries, with 131 countries representing <5% of the total number of ophthalmologists (table 2A web only).

A priority of the ICO is continuing to gather and maintain data on the number of ophthalmologists around the world. Societies are encouraged to update their information for 2012 online at: [icoph.org/ophthalmologists-worldwide](http://icoph.org/ophthalmologists-worldwide) (table 2B web only).

**Figure 1** There was less than one ophthalmologist per million population in 23 countries; one to less than four ophthalmologists per million population in 30 countries; four to less than 25 ophthalmologists per million population in 48 countries; 25 to less than 100 ophthalmologists in 74 countries, and more than 100 ophthalmologists per million population in 18 countries.



### Number of ophthalmologists per million population

There was <1 ophthalmologist per million population in 23 countries; 1 to <4 ophthalmologists per million population in 30 countries; 4 to <25 ophthalmologists per million population in 48 countries; 25 to less than 100 ophthalmologists in 74 countries, and more than 100 ophthalmologists per million population in 18 countries (figure 1).

The average number of ophthalmologists per million in population varied according to economic development as defined by the World Bank (<http://data.worldbank.org>), from nine per million in low-income countries to 79 per million in high-income countries, an eightfold difference (figure 2).

The lowest average number of ophthalmologists per million population was observed in Sub-Saharan Africa (2.7), while the highest average was observed in countries that were previously under socialist economic systems (83.8), a 30-fold difference (figure 3).

In Sub-Saharan Africa, the situation was particularly critical for Portuguese-speaking countries (on average one ophthalmologist per million population) compared with English-speaking and French-speaking countries (2.6 and 3.1 ophthalmologists per million population, respectively).

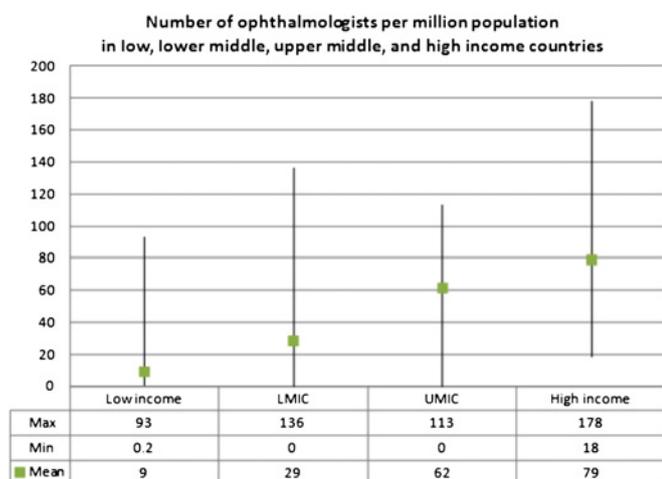
### Percentage of ophthalmologists doing surgery

Representing 53% of the global population, 67 countries provided information regarding the percentage of ophthalmologists doing surgery. Only a limited number of countries in Africa and Latin America were able to provide estimates.

The highest percentage of surgically-active ophthalmologists was observed in both low-income countries (71%) and high-income countries (72%), while the lowest percentage of surgically-active ophthalmologists was observed in lower middle-income countries (37%) and in nations that were previously under socialist economic systems (15%) (figure 1 web only).

### Ophthalmic population growth trends

Information on the number of ophthalmologists entering and leaving practice in 2009 (the year before the survey) was provided by 73 countries, which represent 55% of the global



**Figure 2** Average number of ophthalmologists per million population varied according to economic development from nine per million in low-income countries to 79 per million population in high-income countries, an eightfold difference.

population. Although all regions were represented, only a limited number of countries in Africa and Latin America were able to provide data.

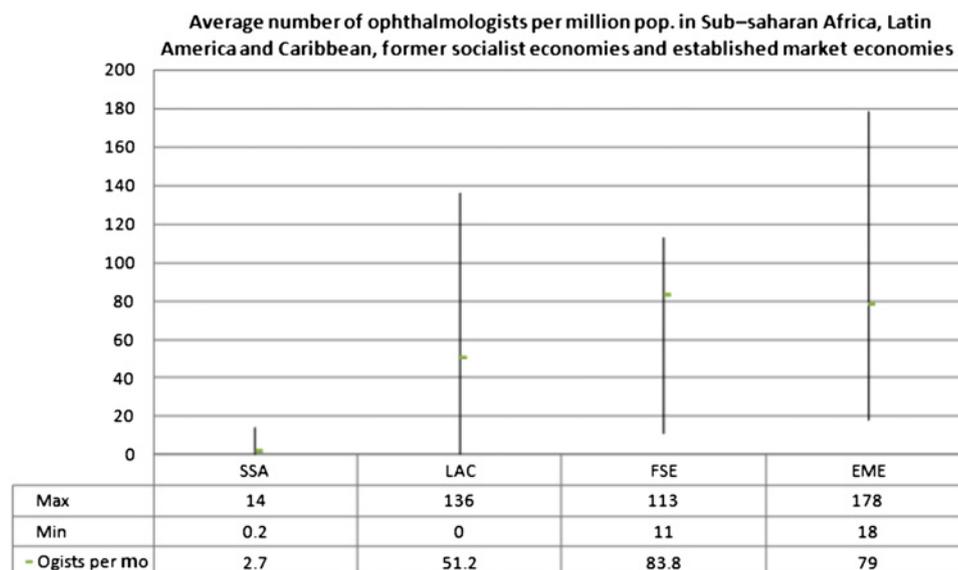
Out of these 73 countries, five countries (6.8%) demonstrated a decrease in the number of ophthalmologists, 20 countries (27%) showed no decrease or increase in the number of ophthalmologists, and 48 countries (66%) showed an increase in the number of ophthalmologists (figure 2 web only).

Overall, in 2010 the ophthalmic population increased by 1784 (ie, 1.2%). This increase occurred primarily in low-income countries (5.3% in low-income countries vs 0.2% in high-income countries). In lower middle-income countries and upper middle-income countries, the increase was more modest (1.8%).

During this same period (2009, the year before the survey), the general population growth rate was 0.77% in the 73 countries which provided growth trend information.

On average, the ophthalmic population is growing slightly faster than the general population. The average actual growth rate of the ophthalmic population is positive (0.43%).

**Figure 3** The lowest average number of ophthalmologists per million population was observed in Sub-Saharan Africa (2.7), while the highest average was observed in countries that were former socialist economies (83.8), a 30-fold difference.



**Table 1** Ophthalmic growth rate versus population growth rate

	All ages (%)	60+ (%)
Ophthalmologists growth rate	+1.2	+1.2
Population growth rate	+0.77	+2.9
Actual growth rate	+0.43	-1.7

The situation, however, varies according to the economic development: the actual growth rate is 3.79% in low-income countries, while it is negative (−0.33%) in high-income countries. In high-income countries the population is growing faster than the number of ophthalmologists (figure 3 web only).

An ageing population is a major risk factor for blinding diseases.<sup>5</sup> In this study, we calculated the 60+ population growth over a 1-year period (2009–2010) and then compared this growth with the growth of the ophthalmic population during the same 1-year time period, based on the data presented above.

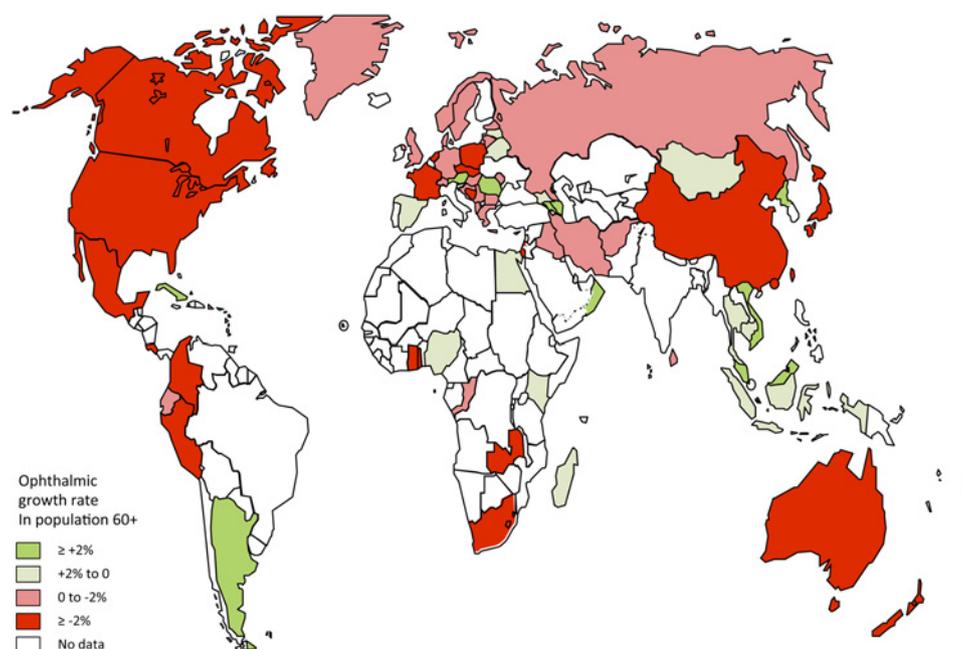
During this same period and with the same 73 countries, the population aged 60+ grew by 2.9% while the ophthalmic population grew by only 1.2%. On average, the population aged 60+ is therefore growing more than twice as fast as the number of ophthalmologists. This means that for the population aged 60+, the average actual growth rate of the ophthalmic population is −1.7% (ie, the ophthalmic population is declining 1.7% per year compared with the population aged 60+) (table 1 and figure 4).

The situation varies according to economic development: the actual growth rate is 2.83% in low-income countries, while it is negative in high-income countries (−2.27%), where the 60+ population is growing much faster than the number of ophthalmologists (figure 4 web only).

### Residents in training

Seventy-three countries (57% of the global population) provided information regarding the number of residents currently in training and the number of residents who will be entering practice in the next 5 years. Although all regions were represented, only a limited number of countries in Africa and Latin America were able to provide data.

**Figure 4** From 2009-2010 in the 73 countries able to provide data, the population aged 60+ grew by 2.9% while the ophthalmic population grew by only 1.2%.



The total number of ophthalmic residents expected to graduate and enter practice in the next 5 years is 22 607 for the 63 countries that responded.

Overall, there are 5.6 residents in training per million population, ranging from less than one resident per million population in nine countries to more than 10 residents per million population in 19 countries (out of the 73 countries providing information). The highest ratio was 60 residents per million population in Cuba, followed by 23 residents per million population in Hungary.

The number of residents per million population varies according to the economic development: 1.7 in low-income countries; 5.7 in lower middle-income countries; 7.8 in upper middle-income countries; and 8.5 in high-income countries (figure 5 web only).

## DISCUSSION

The ICO survey is about ophthalmologists. It does not address an important part of the ophthalmic team, which includes optometrists, orthoptists, ophthalmic nurses and technicians, and other personnel according to the legislation and the needs existing in each country. These healthcare team members provide a crucial bridge between the ophthalmologist and the community in blindness prevention and eye care.<sup>6</sup>

The ICO survey did not obtain data about skills, geographic distribution, quality, productivity and the equity of the services provided. The ICO survey did not assess either the current trends in retention or brain-drain migration from developing to developed countries. As the survey is on a national level, maldistribution within a country is not addressed.

Not all countries responded to questions pertaining to the percentage of ophthalmologists doing surgery, the number of ophthalmologists entering/leaving practice and the number of residents in training. Although the responding countries represent a large proportion of the world population, the results presented cannot be generalised beyond these countries.

Though the terms 'ophthalmologist' and 'surgery' are widely understood, they were not strictly defined in the survey. Therefore, strict comparisons among countries cannot be made

because definition of these terms may vary by country and respondent.

Despite these limitations, the results of the survey demonstrate that on average, the ophthalmic population is growing slightly faster than the general population with the average actual growth rate of the ophthalmic population being positive (0.43%). On average, the population aged 60+, however, is growing more than twice as fast as the number of ophthalmologists. The implication being that in a number of countries, both developing and developed, it will be extremely challenging to train enough ophthalmologists to provide the care that will be needed in the years to come.

## CONCLUSION

The data obtained by the ICO in their survey show that despite there being over 200 000 ophthalmologists worldwide, there is a current and anticipated future shortfall on the number of ophthalmologists in both developing and high-income countries. The data delineate a dire situation, dramatically impacting both developing and developed countries.

First, there is a significant lack of ophthalmologists in developing countries. Second, though the number of ophthalmologists in high-income countries is increasing, the population aged 60+ is growing more than twice as fast as the number of ophthalmologists.

Therefore, the gap between need and supply is widening in both developing and developed countries, a dual challenge that needs to be urgently addressed. In order to meet the continued growing need for ophthalmologists it is necessary to begin aggressively training eye care teams now to alleviate both the current shortfall in developing countries and the anticipated shortfall in developed countries.<sup>7</sup>

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**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data sharing statement** The complete ICO data set will be available online at [icoph.org/ophthalmologists-worldwide](http://icoph.org/ophthalmologists-worldwide), and ophthalmic societies are encouraged to participate in improving the accuracy of these data by reviewing and updating their information.

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