Improving the uneven distribution of the health workforce worldwide: a perspective from the pharmacy workforce.

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Abstract

Background

The World Health Organization (WHO) currently estimates a shortage of approximately 18 million health workers worldwide, potentially impacting the achievement of the United Nations (UN) Sustainable Development Goal on health. One of these goals is to stimulate and guide the creation of at least 40 million new jobs in the health and social sectors and reduce the projected shortage of 18 million health workers, primarily in low- and lower-middle-income countries, by 2030. However, since 2006, there have been few surveys conducted of internationally trained pharmacists worldwide, while surveys of internationally trained nurses and doctors are being conducted by the OECD, WHO and World Bank Group.

Methods

A global survey on intention to migrate was conducted through International Pharmacy Students’ Federation (IPSF), Young Pharmacists Group (YPG) at International Pharmaceutical Federation (FIP) members. The questionnaire was distributed via email with a cover letter to all IPSF and YPG members with a survey URL.

Results

This study showed some differences in “intention to migrate”, “the motivation to migrate”, “the length of stay in the host country”, “the satisfaction with initial pharmacy education, home country and home country pharmacists’ work” among the income levels as defined by the World Bank classification.

Conclusion

To improve the uneven distribution of pharmacists, an education system that connects initial pharmacy education and lifelong education might need to be created or altered to address the role of pharmacists in each country. To that end, we need to share knowledge and practices related the development and implementation of lifelong learning systems and the role of pharmacists in various countries worldwide through studies and the work of international organizations.

Background

The World Health Organization (WHO) currently estimates a shortage of approximately 18 million health workers worldwide, potentially impacting the achievement of the United Nations (UN) Sustainable Development Goal on health. One of these goals is to stimulate and guide the creation of at least 40 million new jobs in the health and social sectors and reduce the projected shortage of 18 million health workers, primarily in low- and lower-middle-income countries, by 2030 (1). The relationship
between the worldwide health workforce shortage and workforce migration is well known (2–6).
Generally, migration issues are complicated and include considerations of safety, economy, and other factors such as training qualification, education and higher social status (2, 5). We also know that the current issues relating to the patterns and flows of the professional internationally trained health workforce relate to patient safety, the competency of practitioners, health economies, and continuing and further professional education; other factors include personal motivations, perceived opportunities and cultural influences. The WHO recognized the increase in health worker migration globally and the implications surrounding this trend, hence producing the WHO Global Code of Practice on the International Recruitment of Health Personnel in 2010, which aims to promote established voluntary principles and practices that can guide members states on the ethical international recruitment of health workers (4). In 2016, an International Platform on Health Worker Mobility was established by the WHO to advance cooperation, dialogue and knowledge in the area. This was followed closely in 2017 by the publication of the National Health Workforce Accounts (NHWA), which aims to facilitate the standardization of health and workforce information systems around the world; the NHWA also includes indicators on the migration and emigration of health workers. Achieving the Sustainable Development Goals 3 (SDG3) on health requires that the capacity of health workers, including pharmacists, meets health needs (1).

In a previous study of 57 countries with critical shortages of health workers, 36 of the countries were sub-Saharan African countries (1, 4, 7, 8, 9). In many populations, the total number of health workers is incapable of meeting the demands for access to required health care. To improve the uneven distribution of the health workforce, it is important to predict future migration trends and survey young pharmacists’ and students’ intentions to migrate. Indeed, surveys on students’ intentions to migrate have been undertaken by some countries (10–13). In Ghana, a low-income country, a survey indicated that students viewed their pharmacy degree as just a first step, with further education being a distinct component of their short- or medium-term goals (14). Additionally, a prominent theme that was expressed in all interviews was the desire to work in a situation in which they, and their profession, were valued and respected (14). Therefore, it is essential to understand the current trends in the global pharmacy workforce and the implications of these trends for the future supply of pharmacists since these changes will affect the health workforce in terms of achieving an adequate size and skill mix. However, since 2006, there have been few surveys conducted of internationally trained pharmacists worldwide (15), while surveys of internationally trained nurses and doctors are being conducted by the OECD, WHO and World Bank Group (3, 4, 5). Clearly, data related to the migration of pharmacists are insufficient to inform policy recommendations (16–18). As a first step, we have already indicated that surveys of the pharmacist workforce worldwide is required (19). In this paper, to better estimate future migration patterns among pharmacists, we describe why students and young pharmacists want to migrate to other countries.

Methods

We created a questionnaire in English using Qualtrics, an online survey platform. Then, with the help of the International Pharmacy Students' Federation (IPSF), Young Pharmacists Group (YPG) at International
Pharmaceutical Federation (FIP) members, we translated the English questionnaire into French, Spanish, Portuguese, Arabic, Chinese, Indonesian and Japanese to allow it to be distributed across the world. A global survey on intention to migrate was conducted through IPSF or YPG. The questionnaire was distributed via email with a cover letter to all IPSF and YPG members with a survey URL. All data received via Qualtrics were anonymous, and all data files were stored in a password-protected format. Respondents were not identifiable, and individual responses have not and will not be published. The survey period was conducted from May 2019 to March 2020. Respondents were IPSF or YPG the respondents’ response to the survey after they read the instructions was assumed to indicate their agreement to participate in this research and their understanding of the research purpose. Therefore, the authors did not record refusal of consent and could not calculate a valid response rate for this survey. We also explained to the respondents that even if they did not answer these questions, they would not suffer any negative consequences. The questionnaire survey was submitted to the UCL ethics committee and received ethics approval (ethics identification number 14103/001). The final number of respondents was 1423 (751 pharmacists and 672 students), and the pharmacy workforce data were collected from 99 countries (Table 1). All data were originally stored in Microsoft® Excel and were extracted to SPSS Statistics 25.0 (IBM, Chicago, IL) for analysis. Correspondence analysis and Kruskal Wallis Test was used to determine whether there was any significance in the link between the students’ and young pharmacists’ intentions to migrate and factors such as the World Bank income classification, which defines 4 different income levels based on the gross national income (GNI) per capita: high income (≥ $12,056), upper-middle income ($3,896 - $12,055), lower-middle income ($996 - $3895) and low-income (≤ $995) (20). And significance level set to p < 0.05. To identify the competencies that pharmacy students and young pharmacists would like to learn more about in initial pharmacy education, we presented the competencies listed based on the global competency framework in the questionnaire and asked them to choose all applicable items (21). Moreover, we also explored their satisfaction with their initial pharmacy education, satisfaction with their home country and satisfaction with their home country pharmacists’ work using a Likert scale. Table 1 provides the characteristics of the respondents in our survey.
| Respondents                  | Categories                                      | Cases (%) |
|------------------------------|-------------------------------------------------|-----------|
| Gender                       | Male                                            | 513 (36.1) |
|                              | Female                                          | 896 (63.0) |
|                              | Prefer not to say                               | 14 (1.0)  |
| Countries                    | 99 Countries                                    |           |
| WHO Classification           | African Region                                  | 218 (15.3) |
|                              | Eastern Mediterranean Region                    | 211 (14.8) |
|                              | European Region                                 | 139 (9.8)  |
|                              | Region of the Americas                          | 137 (9.6)  |
|                              | South-East Asia Region                          |           |
|                              | Western Pacific Region                          | 52 (3.7)   |
|                              |                                                 | 666 (46.8) |
| World Bank Classification    | High-income economies countries                 | 683 (48.0) |
|                              | Upper-middle income economies countries         | 223 (15.7) |
|                              | Lower-middle income economies countries         | 460 (32.3) |
|                              | Low income economies countries                  | 57 (4.0)   |
| Which of these best describes your current situation? | Single                                         | 979 (68.8) |
|                              | In a stable relationship                        | 260 (18.3) |
|                              | Married                                         | 184 (12.9) |
| Respondents                                                                 | Categories                          | Cases (%) |
|-----------------------------------------------------------------------------|-------------------------------------|-----------|
| **Do you have any connections or relationships that would encourage you to move to another country?** | Yes                                 | 710 (49.9) |
|                                                                             | No                                  | 713 (50.1) |
| **Students**                                                                | Total                               | 672 (47.2) |
|                                                                             | Year 1 student                      | 72 (10.7)  |
|                                                                             | Year 2 student                      | 72 (10.7)  |
|                                                                             | Year 3 student                      | 133 (19.8) |
|                                                                             | Year 4 student                      | 125 (18.6) |
|                                                                             | Year 5 student                      | 153 (22.8) |
|                                                                             | Year 6 student                      | 108 (16.1) |
|                                                                             | Others                              | 56 (8.3)   |
|                                                                             |                                     | 25 (3.7)   |
| **What is the general title of your pharmacy study programme?**              | Bachelor of Pharmacy                | 417 (62.1) |
|                                                                             | Diploma of Pharmacy                 | 60 (8.9)   |
|                                                                             | Master of Pharmacy                  | 31 (4.6)   |
|                                                                             | Pharm. D                            | 164 (24.4) |
| **Do you want to work as a pharmacist, or as a pharmacy specialist, after graduation?** | Yes                                 | 475 (70.7) |
|                                                                             | Not decided                         | 173 (25.7) |
|                                                                             | No                                  | 24 (3.6)   |
| Respondents | Categories | Cases |
|-------------|------------|-------|
| Which field or sector would you most like to work in? | Community | 99 (14.7) |
| | Hospital Pharmacy | 158 (23.5) |
| | Academic Research | 61 (9.1) |
| | Industry / or Marketing | 108 (16.1) |
| | Others | 49 (7.3) |
| Do you know of any students from your home country who have moved to another country? | Yes | 422 (62.7) |
| | No | 250 (37.2) |
| Pharmacists (Under 35) | | 751 (52.8) |
| Do you currently work as a pharmacist, or as a pharmacy specialist, now? | Yes | 635 (84.6) |
| | No | 116 (15.4) |
| Which field or sector do you now work? | Community | 362 (48.2) |
| | Hospital Pharmacy | 134 (17.8) |
| | Academic Research | 31 (4.1) |
| | Industry / or Marketing | 53 (7.1) |
| | Others | 55 (7.3) |
| Have you ever worked as a pharmacist in another country? | Yes | 46 (6.1) |
| | No | 705 (93.9) |
| Do you know of any pharmacists from your home country who have moved to another country? | Yes | 430 (57.3) |
| | No | 321 (42.7) |
Results

1. Intention to migrate and length of stay in the host country

We asked the respondents (pharmacy students or young pharmacists) if they wanted to migrate to another country (Table 2) and, if so, their migration motivation (Table 3) and their desired length of stay in the host country (Table 4). We categorized the respondents using the World Bank classification. More than 80% of respondents from upper-middle-, lower-middle- and low-income countries showed a desire to conduct further study outside of their country and a desire to work outside of their home countries (Table 2). Approximately 60% of respondents from these three categories of countries desired to move from their home country to another country “soon after they graduated” or “within next 5 years” (Table 2, item3) (Appendix Fig. 3). The motivations to migrate to another country that were chosen by more than 50% of respondents in each income category were as follows (Table 3): “to gain new experiences” (52.0%) in high-income countries; “to gain new experiences” (64.6%), to have “better professional development and training opportunities” (72.2%) and to have a “better lifestyle and quality of life” (57.8%) in upper-middle-income countries; to have a “better pay/salary” (59.6 %), “to gain new experiences” (81.7%) to have “better job opportunities” (57.1%), to have “better professional development and training opportunities” (81.7%), to have “better carrier pathways” (52.6%) and to have a “better lifestyle and quality of life” (54.8%) in lower-middle-income countries; and “to gain new experiences” (75.4%) to have “better job opportunities” (54.3%), to have “better professional development and training opportunities” (75.4%), and to have “better carrier pathways” (50.9%) in low-income countries (chi-square test, \( p < 0.01 \)) (Table 3). The proportion of respondents who reported “I don't want to migrate to another country”, was the highest in high-income countries (33.7%), followed by upper-middle-income countries (5.4%), low-income countries (1.8%) and lower-middle-income countries (1.7%) (chi-square test, \( p < 0.01 \)) (Table 3). Regarding the length of stay in the host country, 34.3% of respondents from high-income countries and 49.1% of respondents from low-income countries chose “intermediate-term migration”. Meanwhile, 42.6% of respondents from upper-middle-income countries, 48.3% of respondents from lower-middle-income countries and 38.6% of respondents from low-income countries chose “long-term or permanent” migration (chi-square test, \( p < 0.01 \)), and 25.5% of respondents from high-income countries chose “I don’t want to migrate to another country” (Table 4). As to “intention to migrate”, a total of 43.1% of students and 47% of pharmacists in high-income countries agreed or strongly agreed with the statement, “I don’t have a strong desire to move to migrate to another country in the future” (Table 2, item4).
Table 2

Students and Pharmacists’ “intention to migrate”

| Likert Scale | WHO Classification | High: n = 683 | Upper Mid: n = 460 | Lower Mid: n = 57 | Low: n = 57 | Kruskal Wallis Test S / P |
|--------------|---------------------|--------------|-------------------|------------------|-------------|--------------------------|
|              | S (n = 281), cases (%) | 52 (18.5) / 54 (13.4) | 83 (61.0) / 45 (51.7) | 120 (54.5) / 141 (58.8) | 24 (68.6) / 18 (81.8) | 0.00** / 0.00 |
|              | / P (n = 402), cases (%) | 85 (30.2) / 93 (23.1) | 33 (24.3) / 26 (29.9) | 77 (35.0) / 85 (35.4) | 8 (22.9) / 3 (13.6) | |
| 1. I desire to conduct further study outside of my home country. | Strongly Agree | 51 (18.1) / 91 (22.6) | 14 (10.3) / 9 (10.3) | 15 (6.8) / 10 (4.2) | 2 (5.7) / 0 (0.0) | |
|              | Agree | 69 (24.6) / 83 (20.6) | 42 (30.9) / 24 (27.6) | 78 (35.5) / 92 (38.3) | 15 (42.9) / 7 (31.8) | **0.00** / 0.00** |
|              | Neither | 71 (25.3) / 82 (20.4) | 20 (14.7) / 17 (19.5) | 43 (19.5) / 26 (10.8) | 6 (17.1) / 1 (4.5) | |**|
|              | Disagree | 33 (11.7) / 68 (16.9) | 0 (0.0) / 1 (1.1) | 2 (0.9) / 2 (0.8) | 0 (0.0) / 0 (0.0) | |
|              | Strongly Disagree | 60 (21.4) / 96 (23.9) | 6 (4.4) / 6 (6.9) | 6 (2.7) / 2 (0.8) | 1 (2.9) / 1 (4.5) | | |
| 2. I desire to work outside of my home country. | Strongly Agree | 44 (15.7) / 53 (13.2) | 56 (41.2) / 34 (39.1) | 82 (37.3) / 106 (44.2) | 13 (37.1) / 11 (50.0) | 0.00* / 0.00* |
|              | Agree | 69 (24.6) / 83 (20.6) | 42 (30.9) / 24 (27.6) | 78 (35.5) / 92 (38.3) | 15 (42.9) / 7 (31.8) | |
|              | Neither | 71 (25.3) / 82 (20.4) | 20 (14.7) / 17 (19.5) | 43 (19.5) / 26 (10.8) | 6 (17.1) / 1 (4.5) | | |
|              | Disagree | 33 (11.7) / 68 (16.9) | 0 (0.0) / 1 (1.1) | 2 (0.9) / 2 (0.8) | 0 (0.0) / 0 (0.0) | |
|              | Strongly Disagree | 60 (21.4) / 96 (23.9) | 6 (4.4) / 6 (6.9) | 6 (2.7) / 2 (0.8) | 1 (2.9) / 1 (4.5) | |

- High : High-income economies countries’ respondents
- Upper- Mid: Upper Middle-income economies countries’ respondents
- Lower-Mid : Lower Middle-income economies countries’ respondents
- Low : Low-income economies countries’ respondents
- S: Students
- P: Pharmacists

** **: p < 0.001
** *: p < 0.01
** : p < 0.05
| Likert Scale | WHO Classification | S / P | S / P | S / P | 
|--------------|---------------------|-------|-------|-------|
|             | High: n = 683       |       |       |       |
|             | S (n = 281), cases (%) |       |       |       |
|             | / P (n = 402), cases (%) |       |       |       |
| Disagree    | 58 (20.6) / 99 (24.6) |       |       |       |
| Strongly Disagree | 39 (13.9) / 85 (21.1) |       |       |       |
| 3. Students: I desire to move from my home country to another country soon after I graduate. |
| Pharmacists: I desire to move from my home country to another country within the next 5 years. |
| Strongly Agree | 18 (6.4) / 38 (9.5) |       |       |       |
| Agree        | 35 (12.5) / 37 (9.2) |       |       |       |
| Neither      | 55 (19.6) / 80 (19.9) |       |       |       |
| Disagree     | 95 (33.8) / 124 (30.8) |       |       |       |
| Strongly Disagree | 78 (27.8) / 123 (30.6) |       |       |       |
| 4. I don't have a strong desire to move to another country in the future. |
| Strongly Agree | 50 (17.8) / 85 (21.1) |       |       |       |
| Agree        | 4 (2.9) / 9 (10.3) |       |       |       |
| Neither      | 9 (4.1) / 6 (2.5) |       |       |       |
| Disagree     | 2 (5.7) / 1 (4.5) |       |       |       |

**High**: High-income economies countries’ respondents

**Upper-Mid**: Upper Middle-income economies countries’ respondents

**Lower-Mid**: Lower Middle-income economies countries’ respondents

**Low**: Low-income economies countries’ respondents

S: Students

P: Pharmacists

**: p < 0.01

*: p < 0.05
| Likert Scale | WHO Classification | Kruskal Wallis Test |
|--------------|---------------------|--------------------|
| High: n = 683 | S (n = 281), cases (%) | S / P |
| / P (n = 402), cases (%) | | |
| Upper Mid: n = 223 | S (n = 136), cases (%) | |
| / P (n = 87), cases (%) | | |
| Lower Mid: n = 460 | S (n = 220), cases (%) | |
| / P (n = 240), cases (%) | | |
| Low: n = 57 | S (n = 35), cases (%) | |
| / P (n = 22), cases (%) | | |
| Agree | 71 (25.3) / 104 (25.9) | 17 (12.5) / 12 (13.8) |
| | 25 (11.4) / 33 (13.8) | 4 (11.4) / 3 (13.6) |
| Neither | 54 (19.2) / 84 (20.9) | 21 (15.4) / 16 (18.4) |
| | 45 (20.5) / 40 (16.7) | 8 (22.9) / 1 (4.5) |
| Disagree | 77 (27.4) / 77 (19.2) | 59 (43.4) / 27 (31.0) |
| | 88 (40.0) / 93 (38.8) | 16 (45.7) / 11 (50.0) |
| Strongly Disagree | 29 (10.3) / 52 (12.9) | 35 (25.7) / 23 (26.4) |
| | 53 (24.1) / 68 (28.3) | 5 (14.3) / 6 (27.3) |

High: High-income economies countries’ respondents

Upper-Mid: Upper Middle-income economies countries’ respondents

Lower-Mid: Lower Middle-income economies countries’ respondents

Low: Low-income economies countries’ respondents

S: Students

P: Pharmacists

**: p < 0.01

*: p < 0.05
**Table 3**
The motivations to migrate to another country

| Motivations                                                      | World Bank Classification | Kruskal Wallis Test |
|----------------------------------------------------------------|---------------------------|---------------------|
|                                                                 | High (n = 683)            |                     |
|                                                                 | Upper Mid (n = 223)       |                     |
|                                                                 | Lower Mid (n = 460)       |                     |
|                                                                 | Low (n = 57)              |                     |
| Better pay / Salary                                             | 146 (21.4)                | 24 (42.1)           | 0.00**              |
| To gain new experiences                                         | 355 (52.0)                | 43 (75.4)           | 0.00**              |
| Better job opportunities                                        | 172 (25.2)                | 31 (54.3)           | 0.00**              |
| Better professional development and training opportunities      | 232 (34.0)                | 43 (75.4)           | 0.00**              |
| To compare how pharmacy is practices in my home country         | 137 (20.1)                | 24 (42.1)           | 0.00**              |
| Better professional status                                      | 92 (13.5)                 | 12 (21.0)           | 0.00**              |
| Better carrier pathways                                         | 134 (19.6)                | 29 (50.9)           | 0.00**              |
| Familiarity with that country                                   | 40 (5.9)                  | 3 (5.3)             | 0.13                |
| Family and Friends                                              | 71 (10.4)                 | 1 (1.8)             | 0.03*               |
| Better security and Safety                                      | 34 (5.0)                  | 14 (24.6)           | 0.00**              |
| To better serve that country                                    | 23 (3.4)                  | 5 (8.8)             | 0.02*               |
| Better lifestyle and quality of life                            | 177 (25.9)                | 25 (43.9)           | 0.00**              |
| Other                                                           | 24 (3.5)                  | 3 (5.3)             | 0.13                |
| I don’t want to move to elsewhere                               | 230 (33.7)                | 1 (1.8)             | 0.00**              |

*High : High-income economies countries

*Upper Mid: Upper-Middle-income economies countries

*Lower Mid: Lower-Middle-income economies countries
2. Barriers and important factors in intention to migrate to another country.

More than 80% of respondents from upper-middle-, lower-middle- and low-income countries, desired to migrate to another country (Table 2, items 1 and 2), while more than 50% of them perceived many barriers
to migration to another country (Table 5). The largest barrier identified by these respondents (58.3% of respondents from upper-middle-income countries, 67.4% of respondents from lower-middle-income countries and 75.4% of respondents from low-income countries) was the “high economic cost of moving” (Table 5), the next larger barriers were “leaving behind family and friends” or “the legal or regulatory systems”. On the other hands, the largest barrier identified by respondents from high-income countries was the “language” (65.0%), the next larger barrier was unfamiliarity with culture and environment (Table 5).

In high-income countries, “important factors in intention to migrate to another country” (as assessed by a total percentage of “very important” and “somewhat important” responses of ≥ 80%) were “There will be access to professional specialist in my chosen carrier / specialization area” (84.4%), “Clear regulatory and legal mechanisms for licensing as a pharmacist” (85.6%) and “I will be comfortable or familiar with the language” (80.8%) (Table 6). In addition, among respondents from upper-middle-, lower-middle- and low-income countries, “important factors in intention to migrate to another country” were the “There will be access to professional specialist in my chosen carrier/specialization area” (88.3% of respondents from upper-middle-income countries, 94.4% of respondents from lower-middle-income countries and 98.2% of respondents from low-income countries), “Clear regulatory and legal mechanisms for licensing as pharmacist” (94.1% of respondents from upper-middle-income countries, 91.0% of respondents from lower-middle-income countries and 93.0% of respondents from low-income countries), the desire to live in “A higher-income countries compared to my home country” (85.8% of respondents from upper-middle-income countries, 95.5% of respondents from lower-middle-income countries and 89.5% of respondents from low-income countries) and “I will be comfortable or familiar with the language” (85.9% of respondents from low-income countries) (Table 6).
Table 5
Barriers in intention to migrate to another country.

| Likert Scale | WHO Classification | World Bank Classification | Kruskal Wallis Test |
|--------------|---------------------|---------------------------|--------------------|
|              | High: n = 683        | Upper Mid: n = 223        | S / T               |
|              | S (n = 281), cases (%) | S (n = 136), cases (%) | / P (n = 87), cases (%) |
|              | / P (n = 402), cases (%) | / P (n = 240), cases (%) |                   |
| I would like to move to another country, but there are too many barriers preventing me. | | | |
| Strongly Agree | 26 (9.3) / 30 (7.5) | 21 (15.4) / 19 (21.8) | 40 (18.2) / 47 (19.6) | 7 (20.0) / 5 (22.7) | 0.00* |
| Agree | 81 (28.8) / 82 (20.4) | 58 (42.6) / 33 (37.9) | 83 (37.7) / 95 (39.6) | 9 (25.7) / 10 (45.5) | / 0.00** |
| Neither | 89 (31.7) / 124 (30.8) | 24 (17.6) / 16 (18.4) | 40 (18.2) / 45 (18.8) | 9 (25.7) / 2 (9.1) | |
| Disagree | 65 (23.1) / 86 (21.4) | 30 (22.1) / 13 (14.9) | 47 (21.4) / 38 (15.8) | 8 (22.9) / 4 (18.2) | |
| Strongly Disagree | 20 (7.1) / 80 (19.9) | 3 (2.2) / 6 (6.9) | 10 (4.5) / 15 (6.3) | 2 (5.7) / 1 (4.5) | |
| Barriers | World Bank Classification | | |
|          | High (n = 683) Cases (%) | Upper Mid (n = 223) Cases (%) | Lower Mid (n = 460) Cases (%) | Low (n = 57) Cases (%) | |
| The legal or regulatory systems | 256 (37.5) | 91 (40.8) | 213 (46.3) | 27 (47.4) | 0.02* |
| High economic costs of moving | 285 (41.7) | 130 (58.3) | 310 (67.4) | 43 (75.4) | 0.00** |
|                                           | High       | Upper Mid | Lower Mid | Low        |      |
|------------------------------------------|------------|-----------|-----------|------------|------|
| Leaving behind family and friends        | 283 (41.4) | 116 (52.0)| 225 (48.9)| 17 (29.8)  | 0.00**|
| Unfamiliarity with culture and environment| 303 (44.4) | 26 (11.7) | 103 (22.4)| 4 (7.0)    | 0.00**|
| Language                                 | 414 (65.0) | 41 (18.4) | 81 (17.6) | 9 (15.8)   | 0.00**|
| Others                                   | 48 (7.0)   | 20 (9.0)  | 32 (7.0)  | 3 (5.3)    | 0.70-|

*High* : High-income economies countries

*Upper Mid* : Upper-Middle-income economies countries

*Lower Mid* : Lower-Middle-income economies countries

*Low* : Low-income economies countries.

**: $p < 0.01$

*: $p < 0.05$
| Questionnaire                                                                 | World Bank Classification | Kruskal Wallis Test |
|------------------------------------------------------------------------------|---------------------------|---------------------|
|                                                                              | High (n = 683)            | Upper Mid (n = 223) | Lower Mid (n = 460) | Low (n = 57) |
|                                                                              | Cases (%)                  | Cases (%)           | Cases (%)           | Cases (%)    |
| There will be access to professional specialist in my chosen carrier / specialization area | Very important 275 (40.3) | 126 (56.5)         | 335 (72.7)         | 46 (80.7)   | 0.00** |
|                                                                              | Somewhat important 301 (44.1) | 71 (31.8)         | 100 (21.7)         | 10 (17.5)   |
|                                                                              | Neutral 83 (12.2)          | 17 (7.6)          | 20 (4.3)           | 0 (0.0)     |
|                                                                              | Not important 24 (3.5)     | 9 (4.0)           | 5 (1.1)            | 1 (1.8)     |
| Clear regulatory and legal mechanisms for licensing as pharmacist            | Very important 388 (56.8) | 162 (72.6)        | 353 (76.7)        | 41 (71.9)   | 0.00** |
|                                                                              | Somewhat important 197 (28.8) | 48 (21.5)        | 66 (14.3)         | 12 (21.1)   |
|                                                                              | Neutral 72 (10.5)          | 8 (3.6)           | 35 (7.6)          | 4 (7.0)     |
|                                                                              | Not important 26 (3.8)     | 5 (2.2)           | 6 (1.3)           | 0 (0.0)     |
| Geographically nearby my home country                                       | Very important 85 (12.4)  | 26 (11.7)         | 68 (14.8)         | 11 (19.3)   | 0.18   |
|                                                                              | Somewhat important 203 (29.7) | 57 (25.6)        | 124 (27.0)        | 18 (31.6)   |
|                                                                              | Neutral 191 (28.0)         | 61 (27.4)         | 140 (30.4)        | 12 (21.1)   |
|                                                                              | Not important 204 (29.9)   | 79 (35.4)         | 128 (27.8)        | 16 (28.1)   |
| A higher-income country compared to my home country                          | Very important 153 (22.4) | 112 (50.2)        | 308 (67.0)        | 36 (63.2)   | 0.00** |

High: High-income economies countries, Upper Mid: Upper Middle-income economies countries, Lower Mid: Lower-Middle-income economies countries, Low: Low-income economies countries.

**: p < 0.01

*: p < 0.05
### A similar income country to the country where I am living

| Importance       | Very Important | Somewhat Important | Neutral | Not Important |
|------------------|----------------|--------------------|---------|---------------|
| **Income**       |                |                    |         |               |
| High             | 112 (16.4)     | 285 (41.7)         | 210 (30.7) | 76 (11.1)    |
| Upper Mid        | 23 (10.3)      | 63 (28.3)          | 86 (38.6) | 51 (22.9)    |
| Lower Mid        | 35 (7.6)       | 86 (18.7)          | 181 (39.3)| 158 (34.3)   |
| Low              | 5 (8.8)        | 12 (21.1)          | 17 (29.8) | 23 (40.4)    |

### A lower-income country than my own country, but other factors are more important

| Importance       | Very Important | Somewhat Important | Neutral | Not Important |
|------------------|----------------|--------------------|---------|---------------|
| **Income**       |                |                    |         |               |
| High             | 41 (6.0)       | 119 (17.4)         | 320 (46.9) | 203 (29.7) |
| Upper Mid        | 18 (8.1)       | 40 (17.9)          | 63 (28.3) | 102 (45.7)   |
| Lower Mid        | 37 (8.0)       | 61 (13.3)          | 136 (29.6)| 226 (49.1)   |
| Low              | 5 (8.8)        | 11 (19.3)          | 17 (29.8)| 24 (42.1)    |

### Where there are friends, family and relations in my choice of country

| Importance       | Very Important | Somewhat Important | Neutral | Not Important |
|------------------|----------------|--------------------|---------|---------------|
| **Income**       |                |                    |         |               |
| High             | 134 (19.6)     | 240 (35.1)         | 162 (23.7) | 147 (21.5) |
| Upper Mid        | 45 (20.2)      | 66 (29.6)          | 51 (22.9) | 61 (27.4)    |
| Lower Mid        | 101 (22.0)     | 150 (32.6)         | 117 (25.4)| 92 (20.0)    |
| Low              | 10 (17.5)      | 18 (31.6)          | 12 (21.1)| 17 (29.8)    |

### The country has a similar culture to my own country

| Importance       | Very Important | Somewhat Important | Neutral | Not Important |
|------------------|----------------|--------------------|---------|---------------|
| **Income**       |                |                    |         |               |
| High             | 80 (11.7)      | 242 (35.4)         | 147 (21.5) | 147 (21.5) |
| Upper Mid        | 19 (8.5)       | 50 (22.4)          | 61 (27.4)| 61 (27.4)    |
| Lower Mid        | 36 (7.8)       | 130 (28.3)         | 92 (20.0)| 92 (20.0)    |
| Low              | 8 (14.0)       | 17 (29.8)          | 12 (21.1)| 17 (29.8)    |

*High: High-income economies countries, Upper Mid: Upper Middle-income economies countries, Lower Mid: Lower-Middle-income economies countries, Low: Low-income economies countries.

****: p < 0.001

***: p < 0.01
3. Desired competencies in initial pharmacy education

The pharmacy students and young pharmacists were asked to indicate which competencies listed in the global competency framework they would have liked to have learned more about in their initial pharmacy education. In high-income countries and upper-middle-income countries, the only competency chosen by more than 40% of the respondents was “patient consultation and diagnosis” among the pharmaceutical care competencies (Table 7, item 1). In lower-middle-income countries, 5 out of 6 of the pharmaceutical care competencies (Table 7, item 1), all of the pharmaceutical public health competencies (Table 7, item 2), 5 out of 6 of the professional/personal competencies (Table 7, item 3) and 2 out of 6 of the organization and management competencies (Table 7, item 4) were chosen by more than 40% of respondents (Table 7). In low-income countries, “patient consultation and diagnosis” among the
pharmaceutical care competencies (Table 7, item 1), “quality assurance and research in the workplace” and “continuing professional development” (CPD) among the professional/personal competencies (Table 7, item 3) and “improvement of pharmacy service” and “supply chain and management” among the organization and management competencies (Table 7, item 4) were chosen by more than 40% of the respondents (Table 7).
Table 7
Desired competencies in initial pharmacy education

| Competency                        | WHO Classification                      | Kruskal Test |
|-----------------------------------|-----------------------------------------|--------------|
|                                   | High: n = 683                           | S / P        |
|                                   | S (n = 281), cases (%) / P (n = 402), cases (%) |              |
| 1. Pharmaceutical Care Competencies |                                        |              |
| Patient consultation and diagnosis | 133 (47.3) / 173 (43.0)               | 0.00** / 0.00** |
| Monitor medicines therapy         | 113 (40.2) / 143 (35.6)                | 0.00** / 0.00** |
| Medicines use optimization        | 103 (36.7) / 146 (36.3)                | 0.00** / 0.00** |
| Assessment of medicines           | 73 (26.0) / 113 (28.1)                 | 0.00** / 0.00** |
| Compounding medicines             | 64 (22.8) / 46 (11.4)                  | 0.00** / 0.00** |
| Dispensing                        | 66 (23.5) / 69 (17.2)                  | 0.04* / 0.14  |
| 2. Pharmaceutical Public Health Competencies | |              |

**Competency: Domain from the GbCFv1 for pharmaceutical services, International Pharmaceutical Federation.

**High**: High-income economies countries

**Upper Mid**: Upper-Middle-income economies countries

**Lower Mid**: Lower-Middle-income economies countries

**Low**: Low-income economies countries.

****: p < 0.01

*:** p < 0.05

S: Student, P: Pharmacist
## 3. Professional / Personal Competencies

| Competency                                      | WHO Classification | Kruskal Wallis Test |
|------------------------------------------------|--------------------|---------------------|
| **Competency:** Domain from the GbCFv1 for pharmaceutical services, International Pharmaceutical Federation. |                    |                     |
| **High:** High-income economies countries      |                    |                     |
| **Upper Mid:** Upper-Middle-income economies countries |                    |                     |
| **Lower Mid:** Lower-Middle-income economies countries |                    |                     |
| **Low:** Low-income economies countries.        |                    |                     |
| Medicine information and advice                 |                    |                     |
| S (n = 281), cases (%)                         |                    |                     |
| / P (n = 402), cases (%)                       |                    |                     |
| High: n = 683                                  |                    |                     |
| S (n = 281), cases (%)                         |                    |                     |
| / P (n = 402), cases (%)                       |                    |                     |
| Upper Mid: n = 223                             |                    |                     |
| S (n = 136), cases (%)                         |                    |                     |
| / P (n = 87), cases (%)                        |                    |                     |
| Lower Mid: n = 460                             |                    |                     |
| S (n = 220), cases (%)                         |                    |                     |
| / P (n = 240), cases (%)                       |                    |                     |
| Low: n = 57                                    |                    |                     |
| S (n = 35), cases (%)                          |                    |                     |
| / P (n = 22), cases (%)                        |                    |                     |
| **Medicine information and advice:**           | 0.00 / 0.00        |                     |
| **Health promotion:**                          | 0.00 / 0.00        |                     |
| Communication Skills                           |                    |                     |
| S (n = 198), cases (%)                         |                    |                     |
| / P (n = 308), cases (%)                       |                    |                     |
| High: n = 683                                  |                    |                     |
| S (n = 281), cases (%)                         |                    |                     |
| / P (n = 402), cases (%)                       |                    |                     |
| Upper Mid: n = 223                             |                    |                     |
| S (n = 136), cases (%)                         |                    |                     |
| / P (n = 87), cases (%)                        |                    |                     |
| Lower Mid: n = 460                             |                    |                     |
| S (n = 220), cases (%)                         |                    |                     |
| / P (n = 240), cases (%)                       |                    |                     |
| Low: n = 57                                    |                    |                     |
| S (n = 35), cases (%)                          |                    |                     |
| / P (n = 22), cases (%)                        |                    |                     |
| **Communication Skills:**                      | 0.11 / 0.00        |                     |
| **Quality assurance and Research in the work place:** | 0.00 / 0.00        |                     |
| S (n = 246), cases (%)                         |                    |                     |
| / P (n = 416), cases (%)                       |                    |                     |
| High: n = 683                                  |                    |                     |
| S (n = 281), cases (%)                         |                    |                     |
| / P (n = 402), cases (%)                       |                    |                     |
| Upper Mid: n = 223                             |                    |                     |
| S (n = 136), cases (%)                         |                    |                     |
| / P (n = 87), cases (%)                        |                    |                     |
| Lower Mid: n = 460                             |                    |                     |
| S (n = 220), cases (%)                         |                    |                     |
| / P (n = 240), cases (%)                       |                    |                     |
| Low: n = 57                                    |                    |                     |
| S (n = 35), cases (%)                          |                    |                     |
| / P (n = 22), cases (%)                        |                    |                     |
| **Quality assurance and Research in the work place:** | 0.00 / 0.00        |                     |
| **Continuing Professional Development (CPD):** |                    |                     |
| S (n = 236), cases (%)                         |                    |                     |
| / P (n = 402), cases (%)                       |                    |                     |
| High: n = 683                                  |                    |                     |
| S (n = 281), cases (%)                         |                    |                     |
| / P (n = 402), cases (%)                       |                    |                     |
| Upper Mid: n = 223                             |                    |                     |
| S (n = 136), cases (%)                         |                    |                     |
| / P (n = 87), cases (%)                        |                    |                     |
| Lower Mid: n = 460                             |                    |                     |
| S (n = 220), cases (%)                         |                    |                     |
| / P (n = 240), cases (%)                       |                    |                     |
| Low: n = 57                                    |                    |                     |
| S (n = 35), cases (%)                          |                    |                     |
| / P (n = 22), cases (%)                        |                    |                     |
| **Continuing Professional Development (CPD):** | 0.00 / 0.00        |                     |
| **Legal and regulatory practice:**             |                    |                     |
| S (n = 246), cases (%)                         |                    |                     |
| / P (n = 416), cases (%)                       |                    |                     |
| High: n = 683                                  |                    |                     |
| S (n = 281), cases (%)                         |                    |                     |
| / P (n = 402), cases (%)                       |                    |                     |
| Upper Mid: n = 223                             |                    |                     |
| S (n = 136), cases (%)                         |                    |                     |
| / P (n = 87), cases (%)                        |                    |                     |
| Lower Mid: n = 460                             |                    |                     |
| S (n = 220), cases (%)                         |                    |                     |
| / P (n = 240), cases (%)                       |                    |                     |
| Low: n = 57                                    |                    |                     |
| S (n = 35), cases (%)                          |                    |                     |
| / P (n = 22), cases (%)                        |                    |                     |
| **Legal and regulatory practice:**             | 0.00 / 0.00        |                     |
| **Self-management:**                           |                    |                     |
| S (n = 250), cases (%)                         |                    |                     |
| / P (n = 402), cases (%)                       |                    |                     |
| High: n = 683                                  |                    |                     |
| S (n = 281), cases (%)                         |                    |                     |
| / P (n = 402), cases (%)                       |                    |                     |
| Upper Mid: n = 223                             |                    |                     |
| S (n = 136), cases (%)                         |                    |                     |
| / P (n = 87), cases (%)                        |                    |                     |
| Lower Mid: n = 460                             |                    |                     |
| S (n = 220), cases (%)                         |                    |                     |
| / P (n = 240), cases (%)                       |                    |                     |
| Low: n = 57                                    |                    |                     |
| S (n = 35), cases (%)                          |                    |                     |
| / P (n = 22), cases (%)                        |                    |                     |
| **Self-management:**                           | 0.1 / 0.00         |                     |

- Competency: Domain from the GbCFv1 for pharmaceutical services, International Pharmaceutical Federation.
- High : High-income economies countries
- Upper Mid : Upper-Middle-income economies countries
- Lower Mid : Lower-Middle-income economies countries
- Low : Low-income economies countries.
- ****: p < 0.01
- ***: p < 0.05
- S: Student, P:Pharmacist
| Competency: Domain from the GbCFv1 for pharmaceutical services, International Pharmaceutical Federation. |
|---------------------------------------------------------------|
| High: High-income economies countries |
| Upper Mid: Upper-Middle-income economies countries |
| Lower Mid: Lower-Middle-income economies countries |
| Low: Low-income economies countries. |
| p**: p < 0.01 |
| p*: p < 0.05 |
| S: Student, P: Pharmacist |
| 4. Organization and Management Competencies |

| Competency                          | WHO Classification | Kruskal Wallis Test |
|-------------------------------------|---------------------|---------------------|
| Professional and Ethical practice   |                     |                     |
| High: n = 683                      | S (n = 281), cases (%) / P (n = 402), cases (%) |                      |
| Upper Mid: n = 223                 | S (n = 136), cases (%) / P (n = 87), cases (%) |                      |
| Lower Mid: n = 460                 | S (n = 220), cases (%) / P (n = 240), cases (%) |                      |
| Low: n = 57                        | S (n = 35), cases (%) / P (n = 22), cases (%) |                      |
| Improvement of pharmacy service    | 73 (26.0) / 80 (19.9) | 0.00** / 0.00** |
| Supply chain and management        | 44 (32.4) / 17 (19.5) |                      |
| Human Resource management          | 93 (42.3) / 109 (45.4) |                      |
| Work place management              | 12 (34.3) / 2 (9.1) |                      |
| Budget and reimbursement           |                     |                     |
| Procurement                        |                     |                     |
| 49 (17.4) / 69 (17.2)              | 31 (22.8) / 23 (26.4) |                      |
| 108 (49.1) / 136 (56.7)            | 64 (29.1) / 100 (41.7) |                      |
| 19 (54.3) / 12 (54.5)              | 17 (48.6) / 3 (13.6) |                      |
| 50 (17.8) / 76 (18.9)              | 31 (22.8) / 17 (19.5) |                      |
| 55 (25.0) / 78 (32.5)              | 10 (28.6) / 1 (4.5) |                      |
| 56 (19.9) / 65 (16.2)              | 28 (20.6) / 11 (12.6) |                      |
| 47 (21.4) / 65 (27.1)              | 12 (34.3) / 4 (18.2) |                      |
| 38 (13.5) / 34 (8.5)               | 13 (9.6) / 7 (8.0) |                      |
|                                    |                     |                     |
Competency: Domain from the GbCFv1 for pharmaceutical services, International Pharmaceutical Federation.

**High : High-income economies countries**

**Upper Mid : Upper-Middle-income economies countries**

**Lower Mid : Lower-Middle-income economies countries**

**Low : Low-income economies countries.**

****: p < 0.01  
**: p < 0.05  
*S: Student, P: Pharmacist

### 4. Satisfaction with initial pharmacy education or the home country among pharmacy students and young pharmacists

Respondents’ satisfaction with their initial pharmacy education was explored using a Likert scale; more than 50% of respondents from upper-, upper-middle- and lower-middle strongly agreed or agreed that they were satisfied, while respondents from low-income countries were polarized between those who agreed (students: 34.3%, pharmacists: 36.4%) and those who disagreed (students: 28.6%, pharmacists: 22.7%) (Table 8, item 1).

Similarly, respondents’ satisfaction with their home countries was also explored using a similar method. Respondents from upper-middle-, lower-middle- and low-income countries were polarized between those who agreed and those who disagreed that they were satisfied with their home countries, while more than
70% of respondents from high-income countries either strongly agreed or agreed that they were satisfied (Table 8, item2).
Table 8
The satisfaction with initial pharmacy education / home country / home country pharmacists’ work

| Likert Scale | WHO Classification | Kruskal Wallis Test |
|--------------|--------------------|---------------------|
|              | High: n = 683      |                     |
|              | S (n = 281), cases (%) |                     |
|              | / P (n = 402), cases (%) |                     |
|              | Upper Mid: n = 223 |                     |
|              | S (n = 136), cases (%) |                     |
|              | / P (n = 87), cases (%) |                     |
|              | Lower Mid: n = 460 |                     |
|              | S (n = 220), cases (%) |                     |
|              | / P (n = 240), cases (%) |                     |
|              | Low: n = 57        |                     |
|              | S (n = 35), cases (%) |                     |
|              | / P (n = 22), cases (%) |                     |

1. Your initial pharmacy education (Students + Pharmacists)

| Strongly Agree | 43 (15.3) / 59 (14.7) | 16 (11.8) / 41 (47.1) | 36 (16.4) / 63 (26.3) | 5 (14.3) / 4 (18.2) | 0.434 / 0.00 |
| Agree          | 122 (43.4) / 173 (43.0)| 70 (51.5) / 25 (28.7) | 99 (45.0) / 110 (45.8)| 12 (34.3) / 8 (36.4)|                     |
| Neither        | 62 (22.1) / 89 (22.1)  | 23 (16.9) / 6 (6.9)   | 30 (13.6) / 36 (15.0) | 4 (11.4) / 4 (18.2) |                     |
| Disagree       | 43 (15.3) / 64 (15.9)  | 22 (16.2) / 12 (13.8) | 34 (15.5) / 27 (11.3) | 10 (28.6) / 5 (22.7) |                     |
| Strongly Disagree | 11 (3.9) / 17 (4.2)      | 5 (3.7) / 3 (3.4)    | 21 (9.5) / 4 (1.7)   | 4 (11.4) / 1 (4.5)  |                     |

2. Your home country (Students + Pharmacists)

| Strongly Agree | 89 (31.7) / 87 (21.6) | 12 (8.8) / 10 (11.5) | 20 (9.1) / 12 (5.0)  | 5 (14.3) / 2 (9.1)  | 0.00** / 0.00 |
| Agree          | 119 (42.3) / 190 (47.3)| 50 (36.8) / 27 (31.0)| 72 (32.7) / 57 (23.8)| 15 (42.9) / 6 (27.3)|                     |
| Neither        | 37 (13.2) / 72 (17.9)  | 25 (18.4) / 17 (19.5)| 57 (25.9) / 94 (39.2)| 3 (8.6) / 5 (22.7)  |                     |
| Disagree       | 28 (10.0) / 45 (11.2)  | 34 (25.0) / 20 (23.0)| 50 (22.7) / 56 (23.3)| 6 (17.1) / 7 (31.8) |                     |

- **High**: High-income economies countries
- **Upper Mid**: Upper-Middle-income economies countries
- **Lower Mid**: Lower-Middle-income economies countries
- **Low**: Low-income economies countries.
- ****: p < 0.01
- *: p < 0.05
| Likert Scale         | WHO Classification       | Kruskal Wallis Test |
|----------------------|---------------------------|--------------------|
|                      | High: n = 683             | S / P              |
|                      | S (n = 281), cases (%)    |                    |
|                      | / P (n = 402), cases (%)  |                    |
|                      | Upper Mid: n = 223        |                    |
|                      | S (n = 136), cases (%)    |                    |
|                      | / P (n = 87), cases (%)   |                    |
|                      | Lower Mid: n = 460        |                    |
|                      | S (n = 220), cases (%)    |                    |
|                      | / P (n = 240), cases (%)  |                    |
|                      | Low: n = 57               |                    |
|                      | S (n = 35), cases (%)     |                    |
|                      | / P (n = 22), cases (%)   |                    |
| Strongly Disagree    | 8 (2.8) / 8 (2.0)         |                    |
| Strongly Agree       | 35 (8.7)                  | 0.00 [**]          |
| Agree                | 157 (39.1)                |                    |
| Neither              | 92 (22.9)                 |                    |
| Disagree             | 94 (23.4)                 |                    |
| Strongly Disagree    | 24 (6.0)                  |                    |

3. Your home country pharmacists’ work (Pharmacists)

5. Satisfaction with the work of pharmacists in the home country among young pharmacists

Young pharmacists’ satisfaction with the work of pharmacists in their home countries was explored using a Likert scale. Among respondents from high-income countries, 47.8% agreed (selected either “Strongly agree” or “Agree”) and 29.4% disagreed (selected either “Strongly disagree” or “Disagree”) that they were satisfied. In upper-middle-income countries, 34.5% agreed, and 49.4% disagreed. In lower-middle-income
countries, 22.9% agreed, and 51.3% disagreed. In low-income countries, 13.6% agreed, and 59.1% disagreed (Table 8, item 3).

Discussion

It is well known that the health workforce is unevenly distributed worldwide, and the World Health Organization has presented this issue as the basis for one of the sustainable development goals (SDGs) to progress towards global health goals (22). Predicting the intention to migrate in the future among the health workforce, including pharmacists, worldwide will be the first step to improve the worldwide uneven distribution of the health workforce. This study describes some differences in intention to migrate among respondents from countries with different income levels as defined by the World Bank classification.

Regarding the length of stay in the host country, the present results might be related to the motivation to migrate. The findings on the motivation to migrate to another country chosen by more than 50% of respondents showed that respondents from upper-middle-, lower-middle- and low-income countries chose many of the motivation items, while respondents from high-income countries chose only one, i.e., “to gain new experiences” (Table 3). And “to gain new experiences” choose by high-income countries might be able to get them in short term such as travel less than other motivation, such as “better pay/salary”, “better job opportunities”, “better professional development and training opportunities”, “better carrier pathways” and “better lifestyle and quality of life”.

Because “Better pay/salary” or “job opportunity” or “professional development” require a substantial amount of time, and a “better lifestyle and quality of life” require living in the host country, it’s mean the “long term or permanently”. Therefore, differences in motivation might be related to the length of stay in the host country (Table 3 and Table 4). In a previous study, these motivations were reported to be “push-pull factors”, and our findings on motivation were similar (11, 23). However, our study has shown that the length of stay in the host country is related to motivation.

Respondents’ satisfaction with their initial pharmacy education (assessed as the number of respondents who answered “Strongly agree” or “Agree”) was similar in countries of all income levels, while satisfaction with the work of pharmacists in the home country among respondents from upper-middle-, lower-middle- and low-income countries was low. Satisfaction with the home country was also low, except for among respondents from high-income countries, and was polarized. Therefore, the degree of satisfaction might relate to an intention to migrate. In fact, a migration survey in South Africa in 2015 showed that the health workforce was dissatisfied with government economic policy and government health sector policy, which were the top rated reasons for wanting to migrate (9). A survey of pharmacy students in Ghana in 2008 showed that the students were disillusioned by pharmacy and that they perceived barriers to the achievement of professional aspirations in Ghana (14). These results were similar to the results in our study. Therefore, to improve the uneven distribution of the health workforce, countries that lack a health workforce might need to review government health policies or career development systems related to the health workforce. Moreover, the health workforce generally requires professionalism, including self-development (24). If members of the health workforce cannot develop their competencies in their home
countries, they will naturally seek to migrate to countries where they can acquire or develop competencies. Almost all pharmacy students learn of the need for lifelong learning in initial pharmacy education. And their satisfaction with initial pharmacy education was not low in this survey. Therefore, to improve the uneven distribution of pharmacists, an education system that connects initial pharmacy education and lifelong education might need to be created or altered to address the role of pharmacists in each country. To that end, we need to share knowledge and practices related the development and implementation of lifelong learning systems and the role of pharmacists in various countries worldwide through studies and the work of international organizations (21).

Regarding satisfaction with the home country, there are many issues, such as salary, security and safety. All people have the agency or personal resources to establish their own goals, but no one can choose where they are born. If an individual aspires for a better salary, a better lifestyle and better safety, we cannot stop their ambitions. Therefore, we might need to provide political or economic support across the world as described by the UN development goals.

According to the World Bank classification, essentially, there are 80 high-income countries, 60 upper-middle-income countries, 47 lower-middle-income countries, and only 31 low-income countries (20). In our study, there were only 57 students and pharmacists from low-income countries. A limitation of our study was the number of respondents from low-income countries was small, and thus, the results might not accurately reflect the status of low-income countries. Further studies are needed in low-income countries, although a previous study showed similar results to ours.

**Conclusion**

The reasons for the uneven distribution of the health workforce are complex, and we know it will be a difficult problem to solve. Our study provides new insight into factors that might improve the uneven distribution of the pharmacy workforce. However, some issues related to countries’ income levels as classified by the World Bank classification are very difficult to resolve or assess, and the pharmacy workforce shortage in low- and lower-middle-income countries might not be able to be quickly addressed. Nevertheless, we need to continue to conduct migration surveys of various viewpoint and share the results to constantly raise these issues. The present survey targeted pharmacy students and young pharmacists, and next steps will be need to send the survey to regulatory bodies and stakeholders, aiming to improve these issues or an even distribution of the health workforce will be hard to achieve.

**Abbreviations**

WHO: World Health Organization; UN: United Nations; NHWA: National Health Workforce Accounts; SGD3: Sustainable Development Goals 3; IPSF: International Pharmacy Students’ Federation; YPG: Young Pharmacists Group; FIP: International Pharmaceutical Federation.

**Declarations**
Ethical approval and consent to participate
The questionnaire survey was submitted to the UCL ethics committee and received ethics approval (ethics identification number 14103/001).

Consent for publication
Not applicable.

Availability of data and materials
The data base for this study are available for the corresponding author upon reasonable request.

Competing interests
The authors declare that they have no competing interests.

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Authors’ Contributions
Kayoko Takeda Mamiya (K.M.) and Ian Bates conceptualised and developed this study. And K.M wrote the initial draft of the paper. Christopher John and Saja A. Alnahar was involved in the systematic review and Lina Bader managed this study.

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Note
The Appendix and Figures were not provided with this version