

RESEARCH ARTICLES

Pharmacoeconomic Education in Colleges of Pharmacy Outside of the United States

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Objective. To determine the extent of pharmacoeconomic education offered by colleges and schools of pharmacy outside the United States.

Methods. A total of 291 colleges and schools of pharmacy in 103 countries were surveyed via e-mail about the type and extent of pharmacoeconomic training offered to their professional and graduate level students.

Results. Ninety colleges and schools of pharmacy from 43 countries provided usable responses. Fifty-two percent of the colleges and schools of pharmacy provided pharmacoeconomics education (Europe, n=19; Asia, n=10; North America, n=7; Oceania, n=6; and other, n=5). Of the 47 colleges and schools responding, 9 provided pharmacoeconomics education at the professional level only, 16 at the graduate level only, and 22 at both levels. More professional students had access to pharmacoeconomics education than graduate students; however, graduate students were offered more pharmacoeconomics class hours than professional students.

Conclusions. Many colleges and schools of pharmacy outside the United States offer pharmacoeconomics in their curriculum. Current trends in global pharmacoeconomics education seem to mirror trends that occurred in the United States in the 1990s.

Keywords: pharmacoeconomics, education, international, colleges of pharmacy, curriculum

INTRODUCTION

Pharmacoeconomics is a relatively new and rapidly changing discipline. Originating from health economics in the late 1970s, pharmacoeconomic research examines and measures the inputs and outcomes of drug therapy and pharmaceutically related health care interventions. Pharmacoeconomics research "identifies, measures, and compares the costs (ie, resources consumed) and consequences (ie, clinical, economic, humanistic) of pharmaceutical products and services."¹ The field of pharmacoeconomics overlaps with 2 scientific disciplines: health economics and outcomes research (Figure 1). Training received in health economics includes but is not limited to understanding the supply and demand for health care resources, the effects of third-party payers on healthcare, and the economic evaluation of medical products and services.² Analytical tools commonly used in health economics include cost-minimization, cost-benefit, cost-effectiveness, and cost-utility analyses. Outcomes research is a multifaceted discipline that includes clinical

and humanistic outcomes.³ The field of outcomes research has been used to assess clinical outcomes of treatments, examine issues affecting health expenditures such as health resource utilization, and understand the benefits of treatments as they relate to quality of life.¹ Individuals properly trained in pharmacoeconomics should be able to evaluate studies involving economic, clinical, and humanistic outcomes (ECHO) associated with pharmaceutical products and/or services.⁴

Currently, several methods are available to train individuals in pharmacoeconomics. These include short

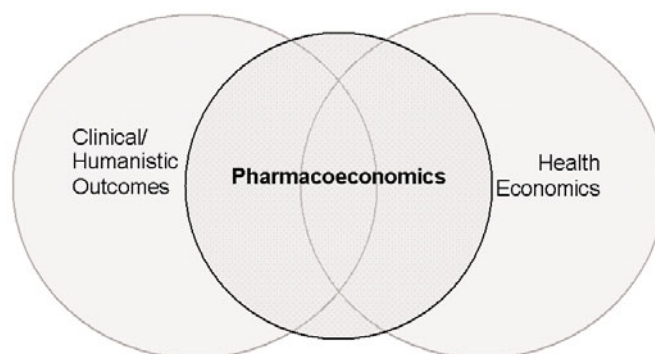


Figure 1. Schematic representation of the overlap between pharmacoeconomics, health outcomes and clinical/humanistic outcomes research. Source: Rascati et al, 2004.

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courses, workshops, internships, undergraduate courses, fellowships, and graduate degree programs.^{2,5} Colleges and schools of pharmacy are important providers of pharmacoeconomics education, offering pharmacoeconomics instruction at both the professional level (students enrolled in BS of pharmacy or PharmD degree programs) and the graduate level (MS and/or PhD degree programs).

US Based Studies

Over the last 20 years in the United States, more health care administrators, medical practitioners, and governmental policymakers have turned to pharmacoeconomics analytical tools to assist them in making health care decisions.³ Several surveys were conducted during the 1990s to determine the extent of pharmacoeconomics education in US colleges and schools of pharmacy. A 1990 survey found that less than half of schools offered training in their curriculum to professional level students on cost-effectiveness, cost-benefit, and cost-utility analysis techniques.⁶ A subsequent 1997 survey found that 81% of the colleges and schools of pharmacy offered pharmacoeconomics education at either the professional level or graduate level (80% at the professional level and 70% at the graduate level).⁷ By 1998, 90% of US colleges and schools of pharmacy provided curriculums that included pharmacoeconomics.⁸ Results of these studies indicated that pharmacoeconomics education among colleges and schools of pharmacy in the United States has increased. However, few studies have been conducted to assess the extent of pharmacoeconomics education among colleges and schools of pharmacy in the global community.²

International Need

During the past 15 years, a substantial international interest has developed in the "economic evaluation of healthcare and medical technologies."⁹ Researchers from various countries have expressed concern with respect to the academic community and pharmaceutical industry's ability to train enough individuals to meet the growing demand for international professionals trained in pharmacoeconomics.² Speakers at the 2002 annual congress of the European Pharmaceutical Student Association (EPSA) discussed the increased importance of pharmacy students receiving a basic level of training in health economics.¹⁰ Meeting dialogue described a number of roles pharmacists were playing when it came to economic decision-making in health care. Among the roles discussed were pharmacists' ability to explain issues such as drug allocation to patients and their involvement in

examining health economic data at the national and local levels.¹⁰ Results from a 2002 survey conducted by the EPSA examined pharmacoeconomics taught in 22 European countries and found that of the 781 pharmacy students who responded, 64% were not aware of the term *pharmacoeconomics*. Further, 56% of respondents indicated "that the level of education they received in pharmacoeconomics was poor."¹¹

As the global need for pharmacoeconomics increases, so will the need for qualified individuals trained to analyze and interpret findings from pharmacoeconomics studies. Previous studies have shown that a clinician's level of education in health economics can affect formulary decisions and their ability to translate research results from health economic studies into clinical practice guidelines.⁹ The governments of countries such as Australia and Canada require economic evaluation of new drugs in order for government committees to establish policy guidelines for assessing data and reimbursement. However, these types of economic evaluations are not mandated in a majority of countries. Pharmaceutical corporations are free to undertake and disseminate the results of their own economic evaluations. Consequentially, concerns regarding potential bias exist among researchers in relation to industry-sponsored economic and outcomes-based research studies.^{12,13}

Internationally Based Study

A 1997 global survey assessed pharmacoeconomics education in colleges and schools of pharmacy throughout the world.¹⁴ Over a 1-month period, a questionnaire was sent via e-mail to 112 colleges and schools of pharmacy outside the United States. Responses were received from 41 colleges and schools of pharmacy in 25 countries (37% response rate). Of the 41 colleges and schools responding, 17 (41%) indicated they provided pharmacoeconomics education at some level; 2 schools offered pharmacoeconomics courses at the professional level only; 4 schools offered pharmacoeconomics courses at the graduate level only; and 11 offered pharmacoeconomics courses at both levels (Table 1).¹⁴

The results of the original 1997 survey provided a baseline of pharmacoeconomics education offered among colleges and schools of pharmacy outside the United States. However, like previous studies of pharmacoeconomics education in US colleges and schools of pharmacy, continued research was required to examine changing educational trends. Continued assessment is needed to determine whether the trends seen among colleges and schools of pharmacy outside the United States follow those observed among US colleges and schools

Table 1. Questionnaire Responses

	1997*		2004‡	
	Professional Level	Graduate Level	Professional Level	Graduate Level
Schools offering pharmacoeconomics, n†§	13	15	31	38
Median Clock hours	10	23	12	15
Required course, %	61%	53%	84%	63%
Median number of students	80	5	100	15

*Questionnaire sent to 112 schools; 41 respondents; 17 schools offer pharmacoeconomics education

†N (1997 data) = 17 (2 professional level only, 11 both, and 4 graduate level only)

‡Questionnaire sent to 291 schools; 90 respondents; 47 schools offer pharmacoeconomics education

§N (2004 data) = 47 (9 professional level only, 22 both, and 16 graduate level only)

and to determine what level of education (undergraduate versus graduate) is being offered by which colleges and schools outside the United States.

The purpose of this 2004 exploratory follow-up study was to assess the current level of pharmacoeconomics education at colleges and schools of pharmacy outside the United States and to compare the results to those of the 1997 survey.

METHODS

Study Sample

This study used methods similar to the 1997 survey described previously.¹⁴ The same questionnaire was administered via e-mail. A listing of colleges and schools of pharmacy outside the United States was obtained from the Web site entitled, "World List of Pharmacy Schools."¹⁵ The list contained contact information for 678 colleges and schools of pharmacy, including faculty information, mailing addresses, phone numbers, Web sites, and e-mail addresses. Of the 678 schools listed, 384 had Web site and/or e-mail addresses posted. If a school had no contact e-mail address listed but a Web site address was given, the investigators contacted the college's Web site administrator to obtain the e-mail address of the appropriate contact person. E-mail addresses were considered invalid if e-mails were returned as undeliverable ("bounced back").

Questionnaire Description

An electronic Web questionnaire was created using html and *ColdFusion MX 6.1* (Macromedia, San Francisco, Calif). As in the 1997 questionnaire, participants were provided a definition of pharmacoeconomics at the beginning of the questionnaire. The following definition was used to describe pharmacoeconomics: "Pharmacoeconomics identifies, measures, and compares the costs and consequences of pharmaceutical products and services." The 2004 questionnaire assessed 4 principle items concerning the colleges and schools of

pharmacy: (1) whether the COP offered pharmacoeconomics education and at what degree level (professional or graduate), (2) the number of clock hours devoted to pharmacoeconomics education, (3) whether pharmacoeconomics was part of the required curriculum or the elective curriculum, and (4) the number of students completing the course(s) each year.

Colleges and schools offering pharmacoeconomics training at the BS or PharmD degree level were categorized as providing professional-level pharmacoeconomics education. Those offering pharmacoeconomics courses at the MS/PhD degree level were categorized as providing graduate-level education. The following explanation of how to calculate clock hours was provided: "if your school offers 2 lectures that are 90 minutes each, your response would be 3 clock hours. If your school offers a class that meets 3 hours per week for 15 weeks, your response would be 45 clock hours."

Survey Method

An e-mail containing a formal letter of introduction was sent to each college or school explaining the purpose of the study and providing a hypertext link to a questionnaire. E-mails were sent to a pharmacy faculty member or an administrator at each COP during a 4-month period from January 18, 2004, to May 18, 2004. Initial e-mails were written in English. Two follow-up e-mails were sent to nonresponders. The first follow-up e-mail was sent 2 to 3 weeks after the initial e-mail and included a specific person's name. The second follow-up e-mail was sent 5 to 7 weeks after the initial e-mail, included a specific name, and was translated from English to Chinese, French, Spanish, or Korean if appropriate. After the questionnaires were returned, some respondents were contacted via e-mail to clarify and validate specific responses.

Analyses

Data collected in this study were descriptive, so no inferential statistical tests were conducted. The authors

developed an online database using Microsoft *Access* to capture and analyze survey responses. The online questionnaire and database were hosted on a computer server at the University of Texas at Austin. Descriptive statistics were used to summarize responses.

RESULTS

Of the 384 e-mail addresses obtained from the "World List of Pharmacy Schools" web site, 291 were valid (meaning the investigators did not receive a returned e-mail message indicating an invalid or nonoperational e-mail address from the recipient's computer mail server). Faculty members or administrators at 90 colleges and schools of pharmacy (31% response rate) representing 43 countries provided usable responses. Table 2 lists the number of participants by country.

Provision of Pharmacoeconomic Education

Of the 90 schools that responded, 47 (52%) colleges and schools of pharmacy from 28 countries indicated that they provided some level of pharmacoeconomics education (Table 3). Of the 12 North American (non-US) colleges and schools that responded, 5 of the 6 respondents from Canada indicated that their programs offered some level of pharmacoeconomics education (428 students per year trained). Of the 6 respondents from Mexico, 2 schools indicated that they provided pharmacoeconomics training (50 students per year trained). No responses were received from schools in Central America. Only 1 school responded from South America; a college in Columbia indicated that they provided some level of pharmacoeconomics education (12 students per year trained). Refer to Figure 2 for a geographic illustration of pharmacoeconomics programs offered by colleges and schools located in Africa, Asia, Europe, Middle East and Oceania.

Of the 47 respondents indicating that they provided pharmacoeconomics education, 9 colleges and schools of pharmacy (19%) provided pharmacoeconomics courses at the professional level only, 16 (34%) at the graduate level only, and 22 (47%) at both levels (Figure 3). For schools that provided pharmacoeconomics education at both levels, responses to the remaining questions were provided for each education level, resulting in 31 responses pertaining to pharmacoeconomics education at the professional level (9 + 22) and 38 responses pertaining to pharmacoeconomics education at the graduate level (16+22).

Clock Hours

Among the 31 colleges and schools of pharmacy that offered courses in pharmacoeconomics at the professional level, the total number of class hours provided by each

ranged from 2 to 168 per year. The mean number of pharmacoeconomics class hours was 22.6 ± 34.4 hours, with a median of 12 hours. Among the 37 colleges and schools that offered pharmacoeconomics at the graduate level, the number of clock hours ranged from 1 to 468 per year, with a mean of 48.5 ± 92.6 hours and a median of 15 hours. One outlying response could not be validated and was removed from analysis.

Required vs. Elective

Of the 31 colleges and schools offering pharmacoeconomics education at the professional level, 26 (84%) reported that pharmacoeconomics was part of a required course and 5 (16%) indicated that it was offered as part of an elective course. Among the 38 colleges and schools of pharmacy indicating that pharmacoeconomics education was offered at the graduate level, 24 (63%) offered pharmacoeconomics as part of a required course and 14 (37%) offered it as part of an elective course.

Number of Students

The number of professional level students per school ($n = 30$) receiving pharmacoeconomics education per year ranged from 5 to 300 students, with a mean of 88 ± 67.6 students and a median of 100 students per school year. The number of graduate students per school ($n=37$) ranged from 1 to 185, with a mean of 31 ± 38.9 and a median of 15 students per school year. One outlying response for number of students (at both professional and graduate level) could not be validated and was removed.

Respondent Comments

A section was provided on the questionnaire for additional comments or suggestions. Of the 90 respondents, 22 schools recorded comments in this section of the questionnaire and an additional 4 respondents e-mailed their comments directly to the investigators. Four respondents indicated that the pharmacoeconomics education at their college or school was combined with other education topics such as pharmacoepidemiology, public health, health economics, and general economics. Of the 43 respondents who indicated that their institution did not provide pharmacoeconomics education, 5 requested information about establishing a pharmacoeconomics program at their respective institutions, such as what course materials would be needed. Three schools indicated they were planning to introduce pharmacoeconomics courses into their curriculum in the near future. One school official from Indonesia was interested in receiving additional information and felt that the materials would help their program develop "an international

Table 2. Questionnaire Responses From Colleges of Pharmacy Outside the United States

Country	Questionnaires		Country	Questionnaires		Country	Questionnaires	
	Sent*	Usable†		Sent*	Usable†		Sent*	Usable†
Afghanistan	1	0	Ghana	1	0	Philippines	9	3
Albania	1	0	Greece	2	0	Poland	4	2
Algeria	1	0	Hong Kong, PRC	1	1	Portugal	2	0
Argentina	3	0	Hungary	1	1	Republic of Macedonia	1	0
Australia	8	6	India	30	3	Republic of Singapore	1	1
Austria	3	0	Indonesia	7	1	Romania	4	1
Azerbaijan	1	1	Iran	3	0	Russian Federation	9	2
Bangladesh	2	0	Ireland	2	0	Brazil	1	0
Barbados, West Indies	1	0	Israel	1	0	Saudi Arabia	1	0
Belarus Republic	1	0	Italy	16	3	Scotland, UK	2	2
Belgium	6	4	Japan	24	7	Senegal	1	0
Bosnia Herzegovina	1	0	Jordan	4	1	Sierra Leone	1	0
Brazil	12	1	Kenya	1	0	Slovakia	1	1
Bulgaria	1	0	Kuwait	1	0	Slovenia	1	0
Canada	9	6	Lebanon	2	1	South Africa	7	3
Chile	4	0	Libya	1	0	South Korea	8	0
China, PRC	10	0	Lithuania	1	0	Spain	5	2
Colombia	4	1	Malaysia	2	0	Sri Lanka	1	0
Costa Rica	1	0	Mali	1	0	Sudan	1	0
Croatia	1	0	Malta	2	1	Sweden	1	1
Czech Republic	2	1	Mexico	22	6	Switzerland	5	1
Dem. Rep. of Congo	1	1	Mongolia	1	0	Syria	1	0
Denmark	1	0	Nepal	2	2	Taiwan, PRC	2	1
Dominican Republic	3	0	Netherlands	1	0	Tanzania	1	0
Ecuador	1	0	New Zealand	2	2	Thailand	6	1
Egypt	6	0	Nicaragua	1	0	Trinidad	1	1
El Salvador	2	0	Nigeria	5	1	Turkey	8	1
England, UK	13	4	Northern Ireland, UK	1	1	Uganda	2	0
Estonia	1	0	Norway	1	0	Ukraine	3	0
Ethiopia	1	0	Pakistan	4	0	United Arab Emirates	2	0
Fiji	1	0	Palestinian Territory	1	1	Uruguay	1	0
Finland	2	0	Papua New Guinea	1	0	Uzbekistan	1	0
France	16	4	Paraguay	1	1	Venezuela	2	0
Germany	16	4	Peru	3	0	Vietnam	1	0
						Yugoslavia	1	1
						Total Sent‡	384	90
						1997 Questionnaire§	112	41

*Questionnaires sent: e-mails sent to participants instructing them to go to online questionnaire

† Usable Responses: Respondents returning a completed questionnaire

‡ includes valid & invalid e-mail address

§Data presented are the results from the 1997 Questionnaire of Pharmacoeconomic Education in Non-US Colleges and Schools of Pharmacy

benchmark” for creating a pharmacoeconomics course. Another respondent from South Africa reported that pharmacoeconomics was a relatively new area of study in their region of the world, but that teaching it in developing countries was important so that it could be used for “planning and rendering of an equitable pharmaceutical service to all the citizens of the country.” Some European

respondents indicated that making the distinction between professional and graduate-level pharmacy programs was difficult since the European educational system was somewhat different from that in the United States. For example, one school from the United Kingdom and another from Belgium considered their Master’s program as a professional level of education.

Table 3. Colleges and Schools of Pharmacy Providing Pharmacoeconomic Education by Country

Country	COP*	Level of Education		Country	COP*	Level of Education	
		Professional [†]	Graduate [‡]			Professional [†]	Graduate [‡]
Australia	3	No	Yes	Malta	1	Yes	No
	1	Yes	Yes	Mexico	2	Yes	No
Belgium	1	Yes	No	Nepal	1	Yes	No
	2	No	Yes		1	No	Yes
	1	Yes	Yes	New Zealand	2	Yes	Yes
Canada	1	No	Yes	Nigeria	1	Yes	No
	4	Yes	Yes	N. Ireland, UK	1	Yes	Yes
Colombia	1	No	Yes	Poland	2	No	Yes
Czech Republic	1	No	Yes	Republic of Singapore	1	Yes	Yes
England, UK	1	Yes	No	Russian Federation	1	Yes	Yes
	1	No	Yes	Scotland, UK	1	No	Yes
France	2	Yes	Yes		1	Yes	Yes
Germany	1	Yes	Yes	Slovakia	1	Yes	Yes
Hong Kong, PRC	1	Yes	Yes	South Africa	2	No	Yes
Hungary	1	Yes	Yes	Sweden	1	Yes	Yes
India	1	No	Yes	Thailand	1	Yes	Yes
	1	Yes	Yes	Sub Total	9	Yes	No
Indonesia	1	Yes	No		16	No	Yes
Japan	1	Yes	Yes		22	Yes	Yes
Lebanon	1	Yes	No	TOTAL	47		

*COP: colleges/schools of pharmacy per country

[†]Professional level: colleges and schools of pharmacy that offer pharmacoeconomic education in a BS or PharmD curricula

[‡]Graduate level: colleges and schools of pharmacy that offer pharmacoeconomic education in an MS or PhD curricula

Respondents from 2 schools in 2 countries (New Zealand and Australia) clarified that a substantial number of the clock hours in pharmacoeconomics education they provided were through distance-learning courses. Another respondent from New Zealand indicated that their bachelor of pharmacy degree students study pharmacoeconomics in a joint project with medical students. They further noted that they found the interaction very useful. One respondent from Nepal indicated that their school was performing “research activities” similar to this study. Another respondent from the United Kingdom commented that including a survey question for determining the “type” of pharmacoeconomics training that was being offered to students around the world (eg, theory-based or application-based training) would have been interesting.

DISCUSSION

A larger number of colleges and schools of pharmacy were listed on the World List of Pharmacy Schools Web site in 2004 than in 1997, which likely resulted in the higher number of responses received (n = 90 in 2004 vs. n = 41 in 1997), even though the response rate was lower (31% in 2004 vs. 37% in 1997). Compared to the responses from the 1997 questionnaire, more of the

responding colleges and schools were offering pharmacoeconomics education in 2004 (52 % in 2004 vs. 41% in 1997; Table 1).

Among those surveyed, the majority of colleges and schools of pharmacy offering pharmacoeconomics education was in Europe (n = 19), followed by Asia (n = 10), North America (n = 7), and Oceania (n = 6). Graduate-level students took a median of 15 class hours of pharmacoeconomics education per school year and professional students took a median of 12 class hours. These findings were somewhat consistent with those from the 1997 questionnaire, in which medians of 23 class hours at the graduate level and 10 class hours at the professional level were reported.

More professional level students (median = 100) than graduate students (median = 15) received pharmacoeconomics education. The size of this difference was similar to that identified in the 1997 questionnaire (professional, median=80; graduate, median=10). Several of the colleges and schools surveyed were interested in establishing a pharmacoeconomics curriculum (refer to comments section). One issue worth noting, investigators found that the time of day at which the questionnaire e-mail was sent may have improved the response rate. Although e-mails

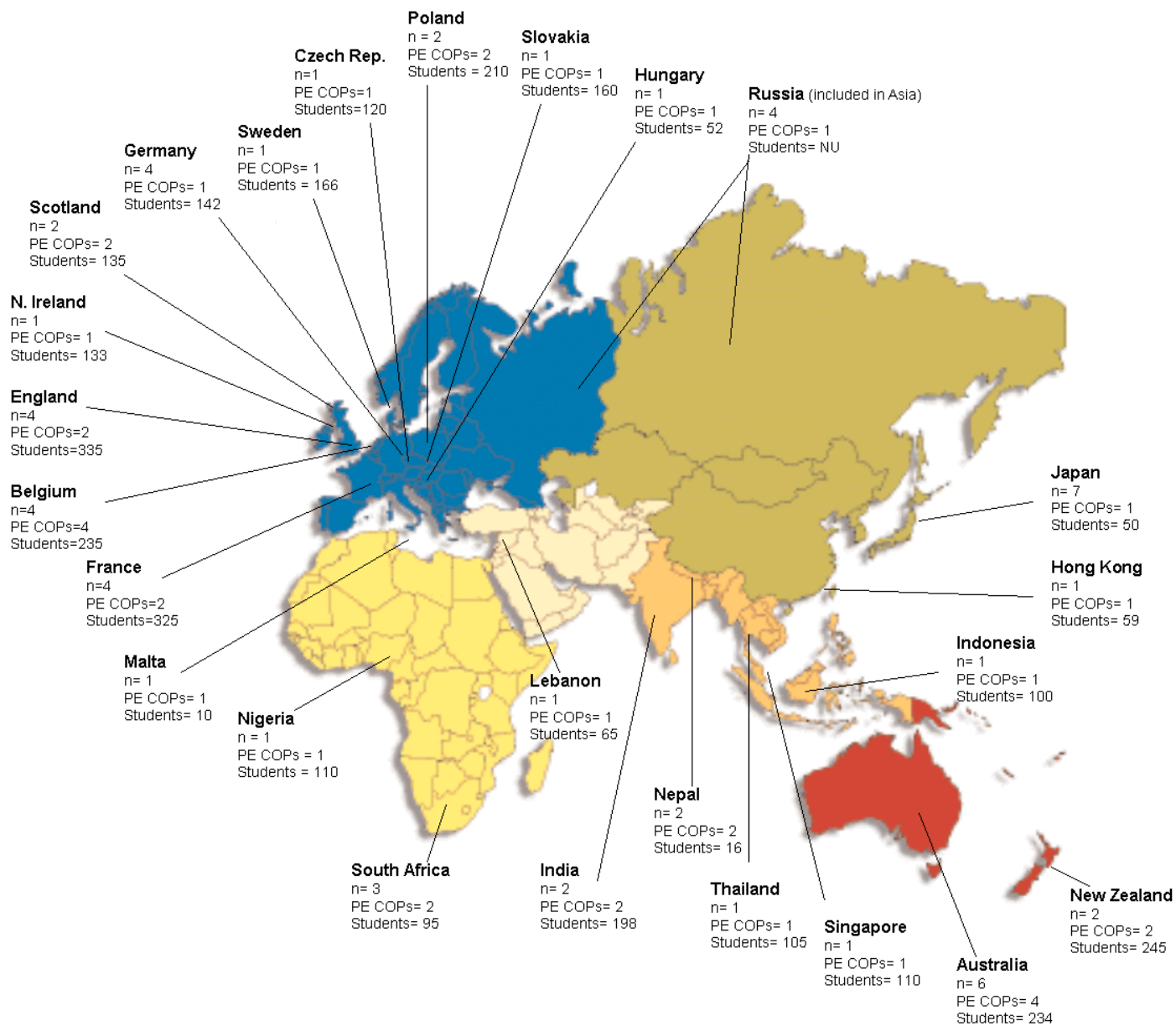


Figure 2. Geographical distribution of international pharmaco-economic education (includes countries in Africa, Asia, Europe, Middle East and Oceania). Readers may obtain more specific information by contacting authors. (n = survey respondents; PE COPs = number of schools/colleges of pharmacy (COPs) offering pharmaco-economic education; students = total number of students receiving pharmaco-economic education.)

were originally sent at various times of the day, and not with the intention of arriving at a specific time, a higher response rate was observed from those participants who received their e-mails when it was late morning or early afternoon in their respective time zone. Therefore, follow-up e-mails to non-respondents were timed to coincide with working hours in their respective time zones.

Limitations

This study was subject to a number of limitations. As with many surveys, because of the low response rate and

limited sample size, results of the questionnaire should be interpreted with some caution. First, a limited number of questions were asked. Since this was an exploratory study, the investigators believed keeping the number of questions to a minimum was important to avoid a lower response rate (with 4 questions in this survey, the response rate was 31%). Second, the survey was sent to over 100 different countries, so language barriers to completing the questionnaire may have existed. Although, in an effort to minimize language barriers, follow-up survey e-mails were sent in Chinese, English, French, Spanish, and

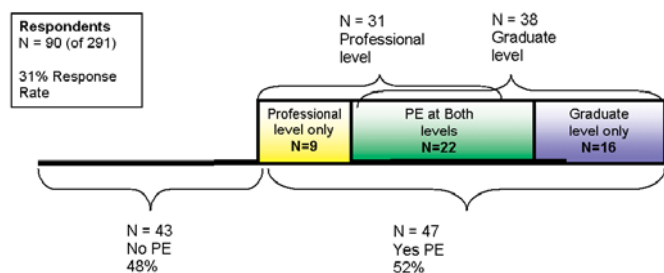


Figure 3. Number of responding institutions providing pharmacoeconomic education (professional vs. graduate level).

Korean. International graduate students in the University of Texas Pharmacy Administration program were asked to translate the survey into their native languages, but due to limited resources, back translation was not conducted and not all languages were translated. As a result, a response bias may have occurred among participants who received an e-mail written in their native language. Third, clarification may have been needed on what constituted a “professional level” course or education. Some schools had difficulty determining which of their programs were “professional” or “graduate” level. This may have caused some respondents to inaccurately report the level of program their college or school offered. Some respondents indicated that they experienced difficulty estimating the number of clock hours offered. And finally, we surveyed only colleges and schools of pharmacy. Pharmacoeconomics education is also provided through other venues (eg, medical schools, health policy schools, economic schools, and continuing education courses, and seminars)

CONCLUSIONS

Globally, the number of colleges and schools of pharmacy providing education in pharmacoeconomics has increased since 1997. A follow-up survey should be conducted to further assess pharmacoeconomics education worldwide. Future research should expand the scope of this study to examine the types of learning tools and instructional materials used by colleges and schools of pharmacy, since this information would assist schools that are planning or interested in incorporating pharmacoeconomics education into their curriculum. Data gathered could provide an improved picture of the type of training and real-world experience pharmacy students receive before they enter the workforce. In addition, the specific analytical techniques that are taught to students could be assessed in a follow-up questionnaire. As pharmacoeconomics continues to emerge as an important field in health outcomes assessment, future research should examine how much of this type of training is theoretical versus practical and how this knowledge is applied. Future research should also assess pharma-

coeconomics education in colleges and schools outside of pharmacy (such as medical, nursing, and other health professional schools) and nonacademic-based training areas (ie, internships, workshops, and education provided by professional organizations).

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