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Who enrols and graduates from web-based pharmacy education - Experiences from Northern Sweden

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Who Enrols and Graduates from Web-based Pharmacy Education – Experiences from Northern Sweden

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Abstract

Introduction: As a response to the shortage of prescriptionists in Northern Sweden, a web-based Bachelor of Science in Pharmacy program was introduced at Umeå University in 2003. This study explored who is likely to enrol and graduate from the web-based bachelor program and whether the program has addressed the shortage of prescriptionists in rural Northern Sweden.

Methods: Data from three different sources were included in this study; the initial cohort including students admitted to the program in 2003 (survey), the entire cohort including all people admitted to the program between 2003 and 2014 (university's admissions data) and the alumni cohort including graduates who participated in an alumni survey in 2015.

Results: A typical student of the web-based pharmacy program is female, over 30 years of age, married or in a de-facto relationship and has children. Furthermore, the students graduating before 2009 were more likely to live in Northern Sweden compared to those graduating later.

Discussion and conclusion: The results indicate that the introduction of a web-based bachelor of pharmacy program at Umeå University was to some extent able to address the shortage of prescriptionists in Northern Sweden. Web-based education may potentially help address the maldistribution of health professionals by providing flexible education opportunities.

Keywords: pharmacy; web-based education; graduates; prescriptionists; pharmacists; rural

Conflicts of interest

None

Financial disclosure statements

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Introduction

The maldistribution of health professionals in Sweden and elsewhere possesses a problem, leading to shortage of professionals in rural areas. There are two main issues: one of distance and one of highly disparate population trends in rural versus urban areas. In Northern Sweden the shortage of professionals in rural areas is particularly acute for doctors, specialised nurses, dentists and pharmacists/prescriptionists.[1] In this context "rural" refers to settlements and towns outside urban areas including regional centres.[2] Past research has shown that there are multiple, complex and overlapping issues for the recruitment and retention of health professionals in rural areas. Factors associated with higher probability of practicing in a rural area are: growing up in a rural community, rural background (origin), presence of family members, having a rural placement and preference for small communities and rural lifestyle.[3-5]

In order to overcome the maldistribution of healthcare professionals, countries such as Australia, the US and Canada have implemented a number of initiatives to increase the number of pharmacists working in rural areas. Initiatives have focused on two areas: increasing the pharmacy workforce and providing incentives for pharmacists to work outside major urban centres. In Australia incentives have been provided for pharmacy students to undertake placements in rural and remote areas of Australia and pharmacy schools have been established in regional and rural areas.[6] The latter incentive appears to have a positive impact on the pharmacist workforce.[4]

In Sweden, there are two different professional degrees within pharmacy: prescriptionists and pharmacists. Prescriptionists have a three-year degree (bachelor), mainly work in community pharmacies, and are typically involved in day-to-day dispensing and counselling with patients. Pharmacists have a five-year degree (master) and work in community pharmacies, hospitals, the pharmaceutical industry, universities and government. Both degree programs are offered at Umeå University in Sweden. However, this paper focuses on the bachelor program.

In the late 1990s, a shortage of prescriptionists was observed in Sweden. This shortage was especially pronounced in Northern Sweden. As a consequence of this shortage, pharmacies had to reduce their opening hours and in some cases even shut down.[7] As a response to the shortage of

prescriptionists in Northern Sweden, a web-based Bachelor of Science in Pharmacy program was introduced at Umeå University in 2003.[7] This was the first web-based pharmacy program in Sweden. A web-based approach was chosen partly to facilitate the future recruitment of prescriptionists to the northern part of the country. Apoteket AB, the state pharmacy monopoly at that time, supported the introduction of the program. Figure 1 shows the trends in number of registered prescriptionists in Sweden between 1999 and 2014, divided into Northern and Southern Sweden (see the map in Figure 3).[8] The trend in Southern Sweden is that the number of registered prescriptionists is decreasing, whereas in Northern Sweden the opposite is observed. The trends in the number of registered prescriptionists in three counties in Northern Sweden (Västerbotten County, Norrbotten County and Västernorrland County) are shown in Figure 2.[8] These counties were the primary targets when the pharmacy program was established with a particular focus on Västerbotten County.

In the web-based pharmacy program, education is mainly conducted online with some mandatory gatherings on campus in Umeå. The online material contains recorded and streamed lecturers, assignments, animations and simulations. Assessments are conducted through various methods, for example written exams and reports, online assessments/tests, oral assessments both online and during gatherings at campus and laboratory work on campus. The written exams can be undertaken at the university or at other universities and municipal learning centres. The rules and regulations established by the university regarding written exams apply irrespective of where the exam takes place. The Bachelor of Science in Pharmacy program has offered different forms of study over the years, including both local study groups and distance groups. The purpose of the local study groups was to facilitate the recruitment of students living in areas of Sweden where a shortage of prescriptionists was identified, with the aim that these students, upon graduating, would remain in those areas. The students belonging to a local study group would have face-to-face meetings with teachers on a regular basis at these specific locations. For students belonging to the distance group, these regular meetings were held online instead. All students followed the same curriculum and had regular on-campus meetings at the university (2-4 times each semester). When applying to the program, the students chose which local study group they wanted to belong to or if they wanted to belong to the distance group. Each group had a limited number of positions. Figure 3 shows the

location of the local study groups offered between 2003 and 2014. The Bachelor of Science in Pharmacy program at Umeå University is not offered as a campus-based alternative.

This study will report on the experiences of the first web-based pharmacy program, a bachelor program established in regional Northern Sweden. More specifically, the study explored who is likely to enrol and graduate from the web-based bachelor program and if the program has addressed the shortage of prescriptionists in rural Northern Sweden.

Methods

Ethics

All participants of the surveys were informed that data would be treated as strictly confidential and that all the information would be de-identified. According to Swedish law, ethical committee approval is not mandatory for this type of study.

Study participants

Three groups of participants from three different sources were included in this study. The first source was the initial cohort and included students admitted to the Bachelor of Science in Pharmacy program in 2003. The second source was the entire cohort and included all people admitted to the Bachelor of Science in Pharmacy program between 2003 and 2014. The third source was graduates who participated in an alumni survey.

Data collection

Initial cohort

All students admitted to the Bachelor of Science in Pharmacy program in 2003 (n=109) were asked to complete a survey at the beginning of the first semester (response rate 99%). The survey asked questions about their background, living conditions, choice and expectations of the education and expectations of the future work setting.

Entire cohort

Admission and graduation data of all students were collected from the university's administrative system in 2015 (2003-2014, n=493).

Alumni cohort

All students who had graduated with a Bachelor of Science in Pharmacy between 2006 and 2014 were invited to participate (n=493). Information about 200 people was obtained, which produces a response rate of 41%. The survey asked the graduates about their work setting, job satisfaction, education satisfaction and demographics. In the present study the results regarding work setting are included as well as demographic information about the graduates: sex, date of birth, marital status, if they had dependent children, country of birth and region where they lived. More detailed information about the alumni survey can be found elsewhere.[9, 10]

Data analysis

Descriptive statistics were used to summarise the data from all sources. In order to investigate whether the program had addressed the shortage of prescriptionists in Northern Sweden, a chi-square test was conducted to explore the associations between the regions where the graduates currently live and year of graduation. The regions where graduates live were dichotomised into Northern and Southern Sweden, and the year of graduation to early cohort (2006-2009) and late cohort (2010-2014). A p-value of <0.05 was considered statistically significant. Responses were analysed using Stata 11.0 for Windows (StataCorp LP, College Station, TX) and Statistical Package for the Social Sciences (SPSS) for Windows version 23.0.

Results

The results are structured as follows: the first section will describe the initial student cohort, which enrolled in 2003, the second section will describe the entire cohorts of students between 2003 and 2014 and the third section will describe the characteristics of the graduates between 2006 and 2014.

Characteristics of the initial cohort of students (2003)

The results from the survey showed that students were on average 32 years old at admission. The majority of the students were female (94%) and lived in Northern Sweden (83%). Over 80% of the students were married and more than half had children (55%) (Table 1). More than 60% of the students owned their home and the students had on average only moved to another address 1.4 times over the last 10 years. Nearly 60% stated that they would not have begun studying if the program had not been available as a web-based program. The factors of most importance to the students when choosing their education were that they considered it to be an interesting program, an education leading to an interesting job and that it gave them an opportunity to get a job close to their hometown. The majority of the students (82%) wanted to work in a community pharmacy after graduation. Regarding the question of where the students wanted to work after graduation (i.e. region), the results showed that to a great extent, the students wanted to work where they lived at the time of admission and that the economic compensation they would require to consider moving was in most cases unreasonable. [7]

Characteristics of the entire cohort (2003-2014)

A total of 601 students enrolled in the Bachelor of Science in Pharmacy program between 2003 and 2011 (those estimated to graduate between 2006 and 2014) and 493 students obtained a Bachelor of Science in Pharmacy degree from the university between 2006 and 2014. This gives an approximate throughput of 74%. Table 1 shows the characteristics of the cohort of students graduating between 2006 and 2014 based on admissions and graduation data from the university's administrative system. The majority of the students were female and living in Sweden. The average age at enrolment was 32 years and at graduation 35 years. Figure 4 shows the average age of the students as a function of enrolment year between 2003 and 2011. Figure 5 shows the number of students enrolled (2003-2011) and graduated (2006 and 2014) respectively. The average time to graduation for the students was 2.9 years with a range between 1.2 and 11 years. For comparison, Figure 6 shows the students' age at graduation at the four universities in Sweden currently offering Bachelor of Science in Pharmacy programs.

Characteristics of the graduates based on the alumni survey

The characteristics of the graduates participating in the alumni survey are shown in Table 1. The majority of respondents were female (96%), born in Sweden (80%), married or in a de-facto relationship (88%) and employed in community pharmacies (85%). The average age was 40 years and the mean time since graduation was on average 5.4 years. In order to investigate whether the program had addressed the shortage of prescriptionists in Northern Sweden, an analysis was conducted based on the region where they currently lived. The results showed that students who graduated between 2006 and 2009 were more likely to live in Northern Sweden compared to those who graduated between 2010 and 2014 ($p < 0.05$) (Table 2).

Discussion

This study describes the characteristics of students who enrolled and graduated from the first pharmacy distance program delivered in a web-based format in Sweden. The students who graduated before 2009 are more likely to live in Northern Sweden compared to those who graduated later.

The study showed that the typical student enrolling in the web-based Bachelor of Science in Pharmacy program was female and a little over 30 years of age. Compared to campus-based university students, distance students are older.[11] In Sweden, the median age of enrolled students irrespective of discipline/subject has been around 25 years for the last decade.[11] The median age of all graduates in Sweden is around 27 years, and a slight decrease in median age has occurred over the past ten years.[11] Additionally, compared with other pharmacy graduates, the age profile is somewhat different at Umeå University compared to the other universities (Figure 6).[12] The other universities have campus-based pharmacy education, except Linnæus University, which offers both campus-based and distance-based education. The fact that our students are older is likely to be due to the web-based format of the education. Previous studies have shown that older people are more likely to choose web-based programs than younger people.[13] Distance education has been shown to overcome the limitations of time and space; it is flexible and accessible around other life and work commitments.[14-16] This may be why web-based programs attract certain types of students, e.g. students with the need for greater flexibility in their studies because of work and/or family commitments. A previous analysis showed that students who chose to study pharmacy at Umeå University because it offered distance education were on average older, in a relationship and had

dependent children.[9] Several factors, e.g. older students and/or students with dependent children, indicate that other groups of students have enrolled in the program compared to those usually commencing higher education. Equity in terms of allowing different groups to access higher education was also one of the aims behind the introduction of the web-based program.[7]

The study showed that there is variation in both the number of enrolled and graduated students. The number of students admitted is governed by the state funding received by the university and consequently, the variation in graduates is a reflection of the variation in the number of admitted students. The number of students admitted to the program has decreased and has now settled at an annual intake of around 30 students. The overall throughput over the years, 74%, is rather high taking into account that the program is web-based and it is also in the same order as many campus-based programs.[17] Web-based programs generally have a lower throughput compared to campus-based programs.[18-20] The high throughput observed might be a reflection of the relatively mature students aiming for a professional degree where the job market is favourable, thus making the students highly motivated to complete their degree. Furthermore, the throughput is probably slightly underestimated since not all students admitted in 2011 graduated in 2014, but later. It was not possible to further investigate the reasons for student drop out in this study e.g. whether this was due to academic performance or personal reasons, because that information is not routinely and systematically collected. There is considerable variability in years to graduation. Some students may enrol in the program and start during a later semester due to having academic credits from e.g. a pharmacy program at another university, thus decreasing time to graduation. On the other hand, some students may need more time than the stipulated three years before they graduate, e.g. due to study breaks because of poor academic achievement, job opportunities or parental leave. Furthermore, the semester starts in early September and ends early June, thus making the on-time graduation time-frame a little less than three years.

When the program was first introduced in 2003, it offered students two forms of study: five local study groups located in strategic rural areas in Northern Sweden and a distance study group. As a consequence, the majority of students in the 2003 cohort lived in Northern Sweden since this was where the local study groups were located and people living in these regions were eligible to apply.

Furthermore, the university's marketing efforts were directed towards Northern Sweden in order to facilitate the recruitment of students. The analysis showed that the students graduating between 2006 and 2009 were more likely to live in Northern Sweden compared to students graduating later. Since the students enrolled in the first cohort generally wanted to work near where they lived, this could eventually counteract the identified shortage of prescriptionists in those areas. Furthermore, there has been an increase in the number of registered prescriptionists in the northern counties (Figure 2) suggesting that the purpose of facilitating the access of prescriptionists in those areas has been achieved. In 2009, the pharmacy market changed and went from one state-owned company to several privately owned companies. As a consequence, there has been an increase in the number of pharmacies in Sweden, especially in urban settings. In 2016, there were 1,392 pharmacies in Sweden, an increase of 50% since 2009.[21] Today there is a strong demand for prescriptionists in Sweden: the total number of graduates is not sufficient to cover the pharmacy market's demand for prescriptionists due to the increase in the number of pharmacies and retirements.[22] However, today the shortage is mainly identified in urban settings in the south of Sweden, where the increase in the number of pharmacies due to the changes in the pharmacy market have been most pronounced.

Over the years, different local study groups have been offered at different locations in the country (Figure 3). The university decided upon the location of these local study groups from year to year. The decision was based on the number of eligible students in a certain area: the application numbers in previous years, and where a shortage of prescriptionists was identified. A shortage of prescriptionists was for example identified in the southern part of Sweden in 2007-2013 and therefore local study groups were positioned there. Consequently, the cohort graduating between 2010 and 2014 was less likely to live in Northern Sweden. Since 2015 the local study groups are no longer offered, because it became more and more difficult to recruit a sufficient number of students to these groups. Therefore, the university decided to only offer a distance study group and consequently, the students are based in rural areas to a lesser extent, but elsewhere in the country. A shortage of prescriptionists has also been identified in Norway, and therefore a study group with Norwegian students in Norway has occasionally been offered. Furthermore, between 2011 and 2014, pharmacy technicians in Norway were trained to become prescriptionists through contract education in order to facilitate access to prescriptionists in rural parts of Norway.

This study reports on the experiences of developing and designing the first web-based pharmacy program in Sweden. The results may be of interest to those planning to start a web-based education or those already working with web-based education within pharmacy or other areas. Furthermore, by exploring who enrols and graduates from a web-based pharmacy program it is possible to better target the student group, which may be helpful in the recruitment process. Distance education in a web-based format may allow people living in rural areas to access higher education, thus posing as an alternative to more traditional campus-based education and perhaps alleviating the shortage of healthcare professionals in those areas. Future research may include a more in-depth study of those admitted to distance education today, their goals and expectations. This would be important when addressing issues around future planning and development of the program. In addition, further analysis of those dropping out of the program could be beneficial in this respect.

The official data obtained is on the number of registered prescriptionists; this is not necessarily the same as prescriptionists working in community pharmacies. However, considering that registration must be issued by the National Board of Health and Welfare in order to work in a community pharmacy and that the majority of prescriptionists in fact work in a community pharmacy, this is regarded as a good estimate of the pharmacies' access to prescriptionists. Another limitation of this study is selection bias. The graduates who chose to complete the alumni survey are different from those who did not complete it. However the characteristics of this group are similar to the ones described using the administrative data. Another limitation is that the alumni survey asked where the graduates currently live. This is not necessarily the same as the area in which they lived during their university studies. However, according to the initial cohort survey most students noted that they wanted to work where they lived once they completed their studies. Thus it is likely that upon graduation, the students remained in the same region to a great extent. Therefore, the establishment of the bachelor program with strategic local study groups in the northern part of Sweden in combination with a web-based approach was at least to some extent able to address the shortage of prescriptionists in this region. The web-based approach may potentially help address the maldistribution of health professionals by providing flexible education opportunities.[23, 24]

Conclusions

A typical student enrolling in the web-based pharmacy program is female, a little over 30 years of age, married or in a de-facto relationship and has children. The introduction of a web-based bachelor of pharmacy program at Umeå University was able to address to some extent the shortage of prescriptionists in Northern Sweden. A web-based program may potentially help address the maldistribution of health professionals by providing flexible education opportunities.

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References

1. Emilsson H. Labour migration in a Time of Crisis: Results of the New Demand-Driven Labour Migration System in Sweden. Vol 14:1. MIM Working paper series: Malmö Institute for Studies of Migration, Diversity and Welfare (MIM) Malmö University; 2014.

2. Durey A, Haigh M, Katzenellenbogen J. What role can the rural pipeline play in the recruitment and retention of rural allied health professionals? *Rural Remote Health.* 2015;15(3):3438-3440.

3. Campbell N, McAllister L, Eley D. The influence of motivation in recruitment and retention of rural and remote allied health professionals: a literature review. *Rural Remote Health.* 2012;12:1900-1912.

4. Smith JD, White C, Roufeil L, Veitch C, Point L, Patel B, Battye K, Luetsch K, Mitchell C. A national study into the rural and remote pharmacist workforce. *Rural Remote Health.* 2013;13(2):2214-2215.

5. Carson DB, Schoo A, Berggren P. The rural pipeline and retention of rural health professionals in Europe's northern peripheries. *Health Policy.* 2015;119(12):1550-1556.

6. 6th Community Pharmacy Agreement, Rural Support Programs. Published 2015. Available at: http://6cpa.com.au/rural-support-programs/rural-pharmacy-scholarship-scheme/ Accessed February 28, 2018.

7. Nordström A. Receptarier på nätet, hur gick det till?: En utvärdering av planeringen och utvecklandet av den nätbaserade receptarieutbildningen vid Umeå universitet. [Precriptionists online, how did it happen?: An evaluation of the planning and development of the web-based prescriptionist program at Umeå University]. *Cerum Working Paper* 2004;71 [in Swedish].

8. Statistical database - Health Care Practitioners, The National Board of Health and Welfare. Published 2017. Available at: http://www.socialstyrelsen.se/statistics/statisticaldatabase/healthcarepractitioners Accessed February 28, 2018.

9. Essling E, Mattsson S, Gallego G. Why Health Students Choose Web-Based Distance Education: Evidence from Pharmacy Education in Northern Sweden. *Eur J Open Dist E-learn.* 2017.

10. Gustafsson M, Mattsson S, Gallego G. Students' satisfaction with a web-based pharmacy program in a re-regulated pharmacy market. *Pharmacy*. 2017;5(3):47-55.

11. Higher Education. Students and graduates at first and second cycle studies 2015/16, Statistics Sweden. Published 2017. Available

at: https://www.scb.se/contentassets/103490f5ede146068052229e4ed8eab1/uf0205_2015l16_sm_uf20sm1701.pdf [in Swedish] Accessed February 28, 2018.

12. Statistical database - Education and research, Statistics Sweden. Published 2017. Available at: http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__UF__UF0205/ExaLasarOversikt/?rxid=f45f90b6-7345-4877-ba25-9b43e6c6e299 [in Swedish] Accessed February 28, 2018.

13. Delaney L. Who Graduates from Irish Distance University Education? *Eur J Open Dist E-Learn.* 2015;18(1):99-113.

14. Lewin LO, Singh M, Bateman BL, Glover PB. Improving education in primary care: development of an online curriculum using the blended learning model. *BMC Med Educ.* 2009;9:33-39.

15. Gray K, Tobin J. Introducing an online community into a clinical education setting: a pilot study of student and staff engagement and outcomes using blended learning. *BMC Med Educ.* 2010;10(1):6.

16. McCormack J, Easton C, Morkel-Kingsbury L. Educating Speech-Language Pathologists for the 21st Century: Course Design Considerations for a Distance Education Master of Speech Pathology Program. *Fol Phon Logop.* 2014;66(4-5):147-157.

17. Kartläggning av distansverksamheten vid universitet och högskolor [Mapping of distance education at universities]: Swedish National Agency for Higher Education. Published 2011. Available at: http://www.uka.se/download/18.12f25798156a345894e2bc4/1487841904947/1102R-distans-vid-universitet-högskolor.pdf [in Swedish] Accessed February 28, 2018.

18. Theme: Education; Distance learning in higher education, Statistics Sweden. Published 2012. Available at: https://www.scb.se/Statistik/_Publikationer/UF0543_2010T02_BR_A40BR1206.pdf [in Swedish] Accessed February 28, 2018.

19. Creelman A, Reneland-Forsman L. Completion Rates – A False Trail to Measuring Course Quality?: Let's Call in the HEROEs Instead. *Eur J Open Dist E-Learn.* 2013;16(2):40-49.

20. Lokken F, Mullins C. Trends in elearning: Tracking the impact of elearning at community colleges. Washington, DC: Instructional Technology Council, 2014.

21. Sveriges Apoteksförening, Branschrapport [Swedish Pharmacy Association, Pharmacy report]. Published 2017. Available at: http://www.sverigesapoteksforening.se/wp-content/uploads/Branschrapport2017.pdf [in Swedish] Accessed 28 February 2018.

22. SACO Sveriges Akademiker, Framtidsutsikter [Swedish Confederation of Professional Associations, Labour market foreecasts]. Published 2017. Available

at: https://www.saco.se/studieval/var-finns-jobben-i-framtiden/ [in Swedish] Accessed February 28, 2018.

23. George PP, Papachristou N, Belisario J, Wang W, Wark PA, Cotic Z, Rasmussen K, Sluiter R, Ribolo-Sasco E, Car LT, Musulanov EM, Molin JA, Heng BH, Zang YF, Wheeler EI, Al Shorbaji N, Majeed A, Car J. Online eLearning for undergraduates in health professions: A systematic review of the impact on knowledge, skills, attitudes and satisfaction. *J Glob Health.* 2014:4(1):010406.

24. Al-Shorbaji N, Atun R, Car J, Majeed A, Wheeler E. E-learning for undergraduate health professional education. A systematic review informing a radical transformation of health workforce development. World Health Organization (WHO) & Imperial College London, 2014.