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Practice outcomes for the first decade of Rural Pharmacy Education (RPHARM) Program graduates

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Abstract

Background The maldistribution of pharmacy services in underserved areas is a national issue. Analysis of data from the 2019 National Pharmacist Workforce Study indicated that 13.9% of pharmacists were working in a rural community. However, the percentage of people living in rural communities in the United States is 20.0%. Currently, there are 20 rural pharmacy programs in the United States, including the Rural Pharmacy Education (RPHARM) Program at University of Illinois Chicago (UIC) College of Pharmacy, which contain both didactic and experiential rural components. This research project examines the practice outcomes of the RPHARM Program graduates.

Methods Descriptive analysis was used to examine the practice outcome characteristics of RPHARM Program graduates between 2014 and 2023. The characteristics of the RPHARM graduates included the rurality of hometowns, practice locations and populations, and distance of practice locations to hometowns. Rural practice outcomes were described utilizing frequently used rural definitions. The practice locations of 54 of the 61 RPHARM graduates were used in the analysis.

Results Approximately 41% of the practicing RPHARM graduates were from rural hometowns and two-thirds were female. RPHARM graduates mostly work in either a community setting (44.4%) or a hospital setting (37.0%). Approximately 11% worked in a federal government organization and 5.6% worked in a long-term care pharmacy. When examining job location, 42.6% were working in a rural location based on Rural–Urban Commuting Area Version 3.0 and 35.2% of RPHARM graduates had always worked in a rural location. Approximately 57% of practicing RPHARM graduates are working in a location < 50 miles from their hometown, and 13% are working 50 to 100 miles from their hometown. Approximately 74% of RPHARM graduates are practicing in Illinois.

Conclusions Approximately 40% of RPHARM graduates practice in rural locations. A significant portion (35.2%) of RPHARM graduates have always practiced in rural locations, and many (57.4%) are practicing near their hometowns. Results indicate that the RPHARM Program is making meaningful contributions to increasing the rural pharmacy workforce. Due to the lack of information on rural pharmacy practice outcomes, all programs with rural pharmacy content are encouraged to track graduates' practice locations.

Keywords Rural pharmacy, Pharmacy practice outcomes, Practice location, Rural pharmacy program, Rural pharmacy curriculum

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Background

Disparities in pharmacy services often result from the presence of pharmacy deserts in the United States. A common definition of a pharmacy desert is being more than ten miles from a pharmacy. Approximately 71% (1406/1974) of the rural counties in the United States with a Rural–Urban Commuting Area (RUCA) code of 4.0 or more had two or more pharmacy deserts compared to 40.8% (476/1166) of the urban counties [1]. There are more urban counties with no pharmacy deserts (34.9%, 407/1166) than rural counties with no pharmacy deserts (8.2%, 162/1974). Limited pharmacy access in rural communities has been associated with an increase in hospital readmission rates [2].

The maldistribution of pharmacy services in underserved areas is a national issue. According to the Rural Policy Research Institute policy brief from August 2022, community pharmacies declined by 9.8% in non-core rural areas and declined by 4.4% in rural micropolitan areas but increased by 15.1% in metropolitan areas from 2003 to 2021. These changes were largely driven by the closure of independently owned pharmacies [3].

Thus, attracting and retaining pharmacists to work in rural communities is important. According to the 2022 Pharmacy Demand Report yearly summary, states with a higher percentage of rural populations indicated open positions for clinical and hospital pharmacists being 'much harder' or 'harder' to fill [4].

As the University of Illinois Chicago (UIC) Health Sciences Campus in Rockford, Illinois expanded to include the College of Pharmacy (COP) in 2010, the Rural Pharmacy Education (RPHARM) Program was created. The RPHARM Program is a concentration that was created to attract students interested in practicing pharmacy in a rural community and learning about rural healthcare needs. The goals of the RPHARM Program include recruiting students from rural populations, impacting the rural healthcare workforce through retention of rural pharmacists, and promoting quality programs and services for rural communities. The four-year RPHARM Program curriculum includes six interprofessional elective courses, three rural healthcare professional shadowing experiences, a community-based research project, and three advanced pharmacy practice experiences (APPEs) in a rural Illinois community. The curriculum is summarized in Table 1 and has been detailed previously [5]. As of May 2023 after the review of official websites for all US colleges of pharmacy, 56 out of 145 (39%) include rural pharmacy education content or concentrations as part of their Doctor of Pharmacy (PharmD) curriculum. Of those colleges with rural pharmacy content, 20 programs in 20 US states, including the RPHARM Program, contain both didactic and experiential rural education content (Personal communication, Heidi Olson, PharmD, tabulation of all US college of pharmacy websites, prepared in May 2023).

Until the RPHARM Program's inception, the UIC College of Pharmacy graduates were primarily practicing in urban and suburban communities even though 74 of the 102 counties in Illinois are considered rural according to the Federal Office of Rural Health Policy (FORHP) as of 2023 [6]. Analysis of all pharmacists living and licensed in Illinois in 2016 indicated that approximately 9% of Illinois pharmacists are practicing in a rural location, (Personal communication Martin MacDowell, DrPH, Analysis of the 2014–2015 Illinois Pharmacist Licensure Roster File. Illinois Department of Financial and Professional Regulation (IDFPR), Springfield, IL) while 11.4% of Illinois residents live in a rural area as defined by RUCA Version 3.0 [7]. Based on an analysis of data from the 2019 National Pharmacist Workforce Study (NPWS), 13.9% of pharmacists were working in a rural community as defined by RUCA Version 3.0 (Personal communication Martin MacDowell, DrPH, Analysis of 2019 NPWS data file. NPWS, Iowa City, IA) [7, 8]. However, in the United States the percentage of people living in a rural community is 20.0% according to the 2020 census [9].

According to a systematic review of factors contributing to the recruitment and retention of the rural pharmacist workforce performed by Terry et al., multiple themes were identified as enablers or barriers to rural practice [10]. Some enablers of rural practice include having a rural origin, quality of life associated with living in rural areas, rural training experiences during pharmacy school, and a desire to return to their hometown [10–12]. Some barriers to rural pharmacy practice seen in studies were less access to cultural and social activities, personal or professional isolation, and lack of privacy [10, 11]. Having a rural origin has also been observed in the literature for other health professions such as physicians and nurses as an important factor for predicting rural practice [13–16]. To help overcome these barriers and take advantage of the enablers, the 4-year RPHARM Program aims to: (1) attract students from rural backgrounds to consider a rural pharmacy career, (2) expose students, including those with non-rural backgrounds, to the benefits of rural practice and lifestyle, (3) offer clinical, community engaged, and didactic learning experiences specific to rural environments, and 4) support students' preferences to practice in a rural area after graduation. The structure of the RPHARM Program is designed to provide a rurally minded support system of peers, mentors, and dedicated faculty throughout their PharmD training that continues after graduation. The purpose of this project is to examine the practice outcomes of the RPHARM Program graduates.

Table 1 RPHARM Program Summary

Year & Course Structure	Topics Covered	Educational Activities
1st Year—One elective course each semester	-Population-based healthcare -Social determinants of health -Agricultural hazards & farm safety -Community health resources -Rural mental health -Community-based research	-Team building activity -Field trip to dairy farm to observe hazards, simulated grain bin entrapment, and simulated tractor rollover -Population health simulation/game -Visit to central Illinois community to learn about community health resources available -Interprofessional shadowing of rural pharmacist and rural physician -Panel discussion of rural pharmacy career options and patient case scenarios
2nd Year—One elective course each semester	-Introduction to community oriented primary care (COPC) research process -Introduction to community health needs assessment -Community-based health education -Rural healthcare ethics	-Team building activity -Community health improvement project aimed at providing targeted health-related education to elementary school students -Interprofessional simulated patient case -Visit to northern Illinois community to learn about available community health resources -Shadowing of third rural healthcare professional -Panel discussion of rural pharmacy career options and patient case scenarios
3rd Year—One elective course each semester	-Implementation of COPC research process -Process for completing a full community health needs assessment of a rural community	-Initiation of COPC capstone research project -Selection of rural community for fourth year rotation block and for implementation of COPC project -Completion of community health needs assessment for selected rural community -Obtain IRB approval of community-based research project -Interprofessional simulated patient case -Panel discussion of rural pharmacy career options and patient case scenarios
4th Year—One capstone project course over 2 semesters	COPC research project implementation and analysis	-Three consecutive, 6-week advanced pharmacy practice experiences (APPE) completed in selected rural community -Implementation of community-based research project -Creation & presentation of research poster

Methods

This research was conducted using descriptive analysis. Characteristics were chosen based on available data and their relevance to the practice outcomes of RPHARM Program graduates. The physical practice location details were assessed for 54 of the 61 RPHARM graduates between 2014 and 2023. Seven graduates were excluded from the analysis for the following reasons: a) one graduate is practicing, but whose location is unknown, b) two graduates practice virtually, and the patient population cared for is not geographically linked to their address, c) one graduate is not yet practicing, and d) another three graduates are completing postgraduate residency training. This study received IRB approval from the University of Illinois Health Science Campus IRB (reference # 20160054) in Rockford, IL.

Data on RPHARM Program graduates from 2014–2023, including year of graduation, hometown ZIP code, practice location ZIP code and population, and employer information were tracked by the program director. The program director collected graduate practice details in an on-going fashion using information available on social media platforms and various modes of personal communication. Hometown ZIP codes were classified as rural if the RUCA code was 4.0 or greater using the RUCA Version 3.0 data file based on the 2010 census [7]. The following definitions of rural were used to classify practice outcomes: 1) RUCA code of 4.0 or higher [7], 2) FORHP-designated rural ZIP code [6], 3) FORHP-designated rural county [6], 4) Office of Management of Budget (OMB) designated non-metropolitan Core Based Statistical Areas (CBSA) [17], and 5) population less than 50,000 [18]. Further discussion of rural definitions is provided by Long JC et al. [19] When looking at job movement, rural practice was defined as practicing in a location with RUCA code of 4.0 or greater and urban practice was defined as practicing in a location with RUCA code of less than or equal to 3.0. The four

Table 2 RPHARM Program Graduates by Year from 2014–2023 ($n=61$)

Graduation Year	Number of RPHARM Graduates	Percentage of Total RPHARM Graduates (%)
2014	6	9.8
2015	9	14.8
2016	3	4.9
2017	4	6.6
2018	6	9.8
2019	9	14.8
2020	4	6.6
2021	12	19.7
2022	4	6.6
2023	4	6.6
Total	61	100

categories of 'always rural', 'always urban', 'rural then urban' and 'urban then rural' were created to describe the graduate's practice location movement (if any).

Results

The number of graduates per year of the study period is shown in Table 2 and includes all 61 RPHARM Program graduates. The RPHARM Program graduates varied from 4–12 people per class based on the overall size of the Rockford PharmD class and number of students interested in rural pharmacy practice. As shown in Table 3, about 41% (22/54) of practicing RPHARM graduates were from rural hometowns, as defined by RUCA Version 3.0 and two-thirds were female. RPHARM graduates mostly work in either a community setting (44.4%) or a hospital setting (38.9%). Approximately 9% worked in a federal government organization (Veterans Administration, Indian Health Service, or Federal Bureau of Prisons) and 5.6% worked in a long-term care

Table 3 Characteristics of the 2014–2023 RPHARM Program Graduates in a Physical Location Practice ($n=54$)

Characteristic	Total n (%)	Rural Practice[a] n (%)	Urban Practice[a] n (%)
Grew up in a rural area based on RUCA Code ≥ 4.0 for hometown[b]:			
Yes	22 (40.7)	15 (65.2)	7 (22.6)
No	32 (59.3)	8 (34.8)	24 (77.4)
Gender:			
Female	36 (66.7)	18 (78.3)	18 (58.1)
Male	18 (33.3)	5 (21.7)	13 (41.9)
Practice type:			
Community (retail or specialty)	24 (44.4)	10 (43.5)	14 (45.2)
Hospital	21 (38.9)	9 (39.1)	12 (38.7)
Long term care	3 (5.6)	2 (8.7)	1 (3.2)
Government[c] – VA, IHS, BOP	5 (9.3)	2 (8.7)	3 (9.7)
Other	1 (1.9)	0 (0.0)	1 (3.2)
Job movement[d]:			
Always rural	19 (35.2)	19 (82.6)	0 (0)
Always urban	26 (48.1)	0 (0)	26 (83.9)
Rural then urban	5 (9.3)	0 (0)	5 (16.1)
Urban then rural	4 (7.4)	4 (17.4)	0 (0.0)
Distance from hometown to practice location:			
< 50 miles	31 (57.4)	15 (65.2)	16 (51.6)
50-100 miles	7 (13.0)	2 (8.7)	5 (16.1)
> 100 miles	16 (29.6)	6 (26.1)	10 (32.3)
Practice State:			
Illinois	40 (74.1)	19 (82.6)	21 (67.7)
Not Illinois	14 (25.9)	4 (17.4)	10 (32.3)

[a] Based on practice location ZIP code using RUCA Version 3.0 based on 2010 Census data

[b] Based on hometown ZIP code using RUCA Version 3.0 based on 2010 Census data

[c] *VA* Veterans Affairs, *IHS* Indian Health Services, *BOP* Federal Bureau of Prisons

[d] Rural and urban defined using RUCA Version 3.0 of work location ZIP code; Rural is defined as RUCA code ≥ 4.0; Urban is defined as RUCA code ≤ 3.0; 56.6% had worked in only one job location, 44.4% had worked in 2 or more job locations

pharmacy. When examining job movement, 35.2% of RPHARM graduates have always worked in a rural location as defined by RUCA Version 3.0. However, 48.1% of RPHARM graduates have always worked in urban areas. The remaining graduates had transitioned from rural to urban practice locations (9.3%) or from urban to rural practice locations (7.4%). About 52% of RPHARM graduates have practiced in a rural location at one point since graduation. Approximately 57% (31/54) of practicing RPHARM graduates are working in a location < 50 miles from their hometown, 13% (7/54) are working 50 to 100 miles from their hometown, and the remaining 29.6% (16/54) are working more than 100 miles from their hometown. Approximately 74% of RPHARM graduates are practicing in Illinois. Among RPHARM graduates, 57.4% (31/54) were working in towns with a population of less than 50,000 people. The mean population for the practice location of practicing RPHARM graduates was 166,111 people and the median population was 35,582 people.

When comparing graduates practicing in a rural location versus an urban location, those in a rural practice location were more likely to have grown up in a rural hometown (62.5%) than those practicing in an urban location (22.6%). Gender, practice type, and distance from hometown are similar between the two groups. When examining job movement, once graduates start practice in a rural area they tend to stay in a rural area (79.2% always practiced rurally). The same is true for graduates that started practice in an urban area (86.7% always practiced in an urban location). Graduates practicing in a rural location were more likely to be living in Illinois than those practicing in an urban location (82.6% and 66.7%, respectively).

Since there is no universally agreed upon method to measure practice outcomes for rural pharmacy programs and because the practice outcomes are impacted by how 'rural' is defined, multiple definitions were included for ease of comparison across rural pharmacy programs, as shown in Table 4. The rural practice outcomes for the RPHARM Program graduates are 42.6% using RUCA code of 4.0 or more, 44.4% using FORHP rural ZIP code, 44.4% using FORHP rural county, 33.3% using Core Based Statistical Areas (CBSAs) designated as non-metro, and 57.4% using practice location population of less than 50,000 people. Supplemental analysis (not shown) based on RUCA code of hometown and RUCA code of practice location indicate that 68.2% of graduates with a rural hometown ($n=22$) are practicing in a rural location and 31.8% are practicing in an urban location. Additionally, 78.1% of graduates with an urban hometown ($n=32$) are practicing in an urban location and 21.9% are practicing in a rural location.

Conclusions

Overall, these results indicate the structure and content of the RPHARM Program is making meaningful contributions to increasing the rural pharmacy workforce. Given the documented impact of having a rural background on selecting a practice location, it is rewarding that 33.3–57.4% of RPHARM graduates are practicing in rural locations (from Table 4) even though only 40.7% have a rural hometown (from Table 3). A significant portion (35.2%) of RPHARM graduates have always practiced in a rural location and 7.4% changed from an initial urban practice location to a rural practice location. A factor that may be influencing graduates to choose a rural practice location is the greater job satisfaction among pharmacists working in non-chain, independent pharmacies, which are more prevalent in rural areas, compared to large chain pharmacies [3, 20, 21]. Another indicator of RPHARM Program success and impact is found in the supplemental analysis that compares rurality of hometown to rurality of practice location. Just over 68% of graduates with a rural hometown currently practice in a rural location and 21.9% of the RPHARM Program graduates with an urban hometown are practicing in a rural location. For comparison, the most recent published results for the University of Illinois College of Medicine Rockford Rural Medical Education (RMED) Program show that 56.3% of graduates from 1997–2007 were practicing in a rural location defined as RUCA 4.0 or higher using RUCA Version 2.0 [22]. Since having the intention to practice rural

Table 4 Practice Outcomes for 2014–2023 RPHARM Program Graduates in a Physical Practice Location by Rural Definition ($n=54$)

Rural Status	ZIP Code RUCA code[a] (%)	FORHP ZIP Code Designation[b] (%)	FORHP County Designation[b] (%)	Core Based Statistical Areas (CBSA)[c] (%)	Practice Location Population < 50,000[d] (%)
Rural	42.6	44.4	44.4	33.3	57.4
Not Rural	57.4	55.6	55.6	66.7	42.6

[a] ZIP code using RUCA Version 3.0 based on 2010 Census data; RUCA code ≥ 4.0 is considered rural

[b] FORHP designation based on 2020 Census data

[c] Based on 2020 Census data; CBSA is considered rural if it is identified as Non-Metropolitan (Micropolitan and Noncore)

[d] Mean population was 166,111 and median population was 35,582

pharmacy was the focus of RPHARM student enrollment as opposed to rural hometown being the focus of RMED student enrollment, this may help explain the difference between rural practice location rates based on RUCA Codes for RPHARM graduates compared to RMED graduates (42.6% vs. 56.3%, respectively). Our results are consistent with other literature that shows having a rural background is a strong enabler of rural pharmacy practice. [10–12]

About 57% of graduates are practicing within 50 miles of their hometown and 13% are practicing 50–100 miles from their hometown. Fifty miles is about an hour-long drive and 100 miles is about a 2-h drive. Both of which seem to be acceptable distances for 'being near family'. This suggests that the 'grow your own' approach of training students from rural communities in rural healthcare settings helps facilitate rural practice outcomes [23]. These results suggest a high likelihood that graduates will practice pharmacy near their hometown, regardless of its rurality. Therefore, it is important to take this into account during the recruitment of students into rural pharmacy training programs. Based on faculty observations, other possible explanations for the pattern of RPHARM graduates returning to practice relatively close to their hometown are a) spending 18 weeks completing the APPEs in or near their hometown working as a health professional may further strengthen their intent to practice rurally, b) the extended period of time spent in rural APPEs can lead to new or strengthened relationships with potential employers which can results in job offers, and c) some graduates like the area near their hometown for various reasons (i.e. climate, surroundings, culture, etc.) and being near family. Although having a rural background and rural training experience are predictors of rural practice outcomes, these factors can be offset by other variables, such as urban spousal employment opportunities, the urban background of spouses, and availability of rural pharmacy positions relative to graduation.

With the continued aging of the rural pharmacy workforce, there will continue to be a need for pharmacists with training on how to meet the healthcare needs of rural communities. Until recently, there has been a lack of awareness of and communication among faculty and pharmacists involved in teaching didactic and experiential rural pharmacy content. As with many 'rural things', a grassroots effort to identify and collaborate with others teaching rural pharmacy has begun. The newly developed Rural Pharmacy Consortium, whose members are in states with substantial rural populations, will be a mechanism for sharing educational content, real-life rural pharmacy practice perspectives, and programmatic successes and challenges [24]. Initially, two or three rural programs collaborated on small educational events, presentations, or exchanged insights into the development of curricular components. It has recently grown to include planned efforts to share experiences and knowledge at a national level across multiple organizations.

Limitations of this study include that these findings are from one rural pharmacy program over a ten-year period in one state with a relatively low number of graduates thus far. The results cannot be generalized to other rural pharmacy programs in the United States. A more formal survey for capturing RPHARM Program graduate practice information may be helpful in addition to the informal, on-going collection of practice details currently used. An additional limitation of this study is the lack of information available for comparing RPHARM Program practice outcomes to rural practice outcomes for other pharmacy programs, both those with and without rural pharmacy content.

Due to the cost of developing rural pharmacy content within PharmD curricula, all programs with extra rural pharmacy content are encouraged to track their graduates' practice locations and work activities using a formalized process to identify the impact of rural pharmacy training on the rural health workforce.

Future research will continue to track the practice details of RPHARM graduates and examine the retention rates of RPHARM graduates at their initial practice locations. An examination of the barriers and facilitators to choosing a rural pharmacy practice location would be useful in developing rural pharmacy curricula. A survey of rural pharmacy program graduates to determine which curricular content is most useful and what content should be added could be insightful as rural pharmacy programs continue to develop.

Abbreviations

CBSA	Core Based Statistical Area
COP	College of Pharmacy
COPC	Community Oriented Primary Care
FORHP	Federal Office of Rural Health Policy
IDFPR	Illinois Department of Financial and Professional Regulation
PharmD	Doctor of Pharmacy
RMED	Rural Medical Education
RPHARM	Rural Pharmacy Education
RUCA	Rural-Urban Commuting Area
RUPRI	Rural Policy Research Institute
UIC	University of Illinois Chicago

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Authors' contributions

HO and MM made substantial contributions to study conception and design, data acquisition, interpretation of data, drafting of the background, results, and conclusions sections, revised critically, reviewed all drafts. MM analyzed all data and prepared summary results. AS and KR critically reviewed the final draft manuscript. All authors read and approved the final version and agreed to be accountable for the integrity of the work.

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Availability of data and materials
All data generated or analyzed during this study are included in this published article.

Declarations

Ethics approval and consent to participate
This study protocol, including waived informed consent, was reviewed and approved by the University of Illinois College of Medicine at Rockford Institutional Review Board and was determined to meet the criteria for exemption as defined in the U.S. Department of Health and Human Services Regulations for the Protection of Human Subjects 45 CFR 46.104 (d) (Reference number: 20160054).

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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