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Original Research

Assessment of pharmacists' delivery of public health services in rural and urban areas in Iowa and North Dakota

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ABSTRACT

Background: The profession of pharmacy is expanding its involvement in public health, but few studies have examined pharmacists' delivery of public health services.

Objective: To assess Iowa and North Dakota pharmacists' practices, frequency of public health service delivery, level of involvement in achieving the essential services of public health, and barriers to expansion of public health services in rural and urban areas.

Methods: This study implemented an on-line survey sent to all pharmacists currently practicing pharmacy in Iowa and North Dakota.

Results: Overall, 602 valid responses were analyzed, 297 in rural areas and 305 in urban areas. Three practice settings (chain stores [169, 28.2%], independent community pharmacies [162, 27.0%], and hospital pharmacies [156, 26.0%]) comprised 81.2% of the sample. Both chain and independent community pharmacists were more commonly located in rural areas than in urban areas ($P < 0.05$). For some public health services, pharmacists in rural areas reported higher frequency of delivery than did pharmacists in urban areas ($P < .05$) that included: medication therapy management, immunizations, tobacco counseling, and medication take-back programs. For some essential services, pharmacists (particularly independents) in rural areas reported more frequent delivery than did pharmacists in urban areas ($P < .05$), these included: evaluate the services the pharmacy provides, partner with the community to identify and help solve health problems, and conduct needs assessments to identify health risks in my community.

Conclusion: Rural pharmacists more frequently deliver public health services than urban in both Iowa and North Dakota. These findings should be interpreted to be primarily due to differences in the role of the rural pharmacist and the quest for certain opportunities that rural pharmacists are seeking.

Keywords: Pharmacists; Pharmaceutical Services; Professional Role; Public Health; Rural Health; Rural Population; Surveys and Questionnaires; United States

INTRODUCTION

Successful application of pharmaceutical care and delivery of public health services by pharmacists are critical components of the future of pharmacy.¹ Patient-centered care is embodied in the pharmacists' abilities to work with patients and healthcare providers to ensure appropriate drug use, safety, and adherence.² This has been seen in the expanded role of the pharmacist in many areas in recent years, such as the chronic disease state management of diabetes^{3,4} and medication therapy management (MTM).^{5,6}

Public health delivery involves the coordinated efforts of health providers from multiple disciplines working together to meet the needs of patients and communities.⁷⁻⁹ The pharmacist is in a unique position to make essential public health contributions. Nearly 93% of U.S. residents live within five miles of a pharmacy, making the community pharmacy one of the most accessible healthcare institutions.¹⁰

Although there is a general understanding of the way the pharmacy community is delivering population-based services to the public, there is limited quantitative data on the specific areas in which pharmacists are involved and some of the crucial opportunities that exist.¹¹ This study identified pharmacist contributions to public health that are not widely reported. This may be partially due to some of these services not being framed within public health categories, so the population impact of their services goes unnoticed.

Practicing pharmacists' perspectives of public health are often limited to the application of public health within the confines of individual patient-focused care, as evidenced by the types of public health services which are cited as appropriate for pharmacy to deliver.¹² With regard to the role of pharmacists in public health, pharmacists have embraced deeper engagement in public health compared with 10 years previously.^{13,14} However, there is limited evidence that patient perspectives on the role of pharmacists has changed. So there is a need to change the expectations of the pharmacist in the public by clarifying the roles pharmacists are assuming, such as medication adherence counseling, MTM, and administering immunizations. In order to improve the public health

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services provided in the community pharmacy, training must aim to increase pharmacists' confidence in providing these services. This is an opportunity and a challenge.

The National Association of Boards of Pharmacy (NABP) District V is comprised of states and provinces with significant rural and/or remote communities. The role of the pharmacist as part of the interdisciplinary team is even more critical in these rural locations as many of them are healthcare worker shortage areas, and the pharmacist may be one of the few healthcare professionals in the community.¹⁵

The purpose of this study was to determine current involvement of NABP District V pharmacists (Iowa and North Dakota) in the delivery of public health services, the level of involvement in achieving the essential services of public health, and barriers to expansion of public health services in rural and urban areas. The primary study objective was to examine the differences in pharmacist response (public health services and essential public health services) in rural areas compared to urban areas in the two states.

METHODS

Study population

The U.S. population density is estimated at 80 persons/square mile. With a population density of 52.7 people per square mile, Iowa's population is more urban than rural, with 61% living in urban areas. Iowa has an estimated population of 3,123,899 people (US Census Bureau, 2015), making it the 30th most populated state in the country.

North Dakota is highly rural, with an estimated population of 756,927 people (US Census Bureau, 2015). North Dakota has only 9 persons/square mile and has more than 50% (27 of 53) of its counties categorized by the US Health Resources and Services Administration (HRSA) as "frontier counties" (6 persons or fewer per square mile).

While Iowa is more populous than North Dakota, the mixture of urban and rural areas is similar to those throughout the United States. The practice of pharmacy in North Dakota has been progressive but is unique in being one of the few states which limit pharmacy ownership to independent pharmacists, thus limiting the impact of chain pharmacies.¹⁶ Some of Iowa's research programs include the development of innovative practice models founded on evidence-based research and assessment of quality improvements in patient care resulting from medication therapy management services.^{17,18}

The sparse population in both states creates significant challenges in access and delivery of health services, including pharmacy services to remote locations. In rural areas, many communities have lost healthcare providers, including physicians, nurses, and pharmacists, because of their small populations. A 2004 Institute of Medicine study reported medical access problems in rural areas due to hospital and pharmacy closures, greater

distance to travel for physician services, and limited if any choice of providers.¹⁹ Many rural counties have no primary care providers and typically there are fewer specialist physicians in these areas. Although rural areas offer opportunities for health providers, most physicians, nurse practitioners, and physician assistants generally practice in urban rather than rural areas.¹⁹ Recent reports indicate that a shortage of pharmacists exists in some practice areas, primarily in rural areas throughout the United States, and it is particularly acute in North Dakota.²⁰⁻²³ Pharmacy owners in rural areas often cannot find pharmacists to fill available positions because recent graduates either have not been interested or have pursued other opportunities.²³ One of the strategies to resolve the shortage of pharmacy services in rural North Dakota is the Telepharmacy Project, that has increased pharmacy services in limited access communities.²⁴⁻²⁷ In an attempt to improve public services, both Iowa and North Dakota have developed relatively new MPH public health training programs.^{28,29}

While the workforce and patient care situation is probably similar to other states, there are factors unique to North Dakota. State law requires each community pharmacy to have a North Dakota-licensed pharmacist owning 51% of the pharmacy, which has restricted the number of chain stores and is an advantage to independent community pharmacy owners.^{23,26} Given the unique situation, there is a need to collect pharmacist workforce efforts in public health and patient care information both in Iowa and North Dakota and compare that to regional and national information.

Survey design

This survey collected data from practicing pharmacists in three areas: 1) public health services currently being provided, 2) level of involvement in the 10 essential services of public health, and 3) barriers to delivering public health services.

The first area surveyed was the critical services that pharmacy is providing which contribute to improved population health. In recent decades, pharmacy practice has significantly changed with the implementation of Omnibus Reconciliation Act of 1990 (OBRA '90) and Medicare Part D. OBRA '90 required that pharmacists provide prospective drug reviews, provide an offer to counsel Medicaid patients, and maintain patient records. Medicare Part D required that MTM be conducted by a pharmacist or another healthcare professional for patients taking multiple chronic disease medications. Both programs have opened the door for numerous pharmacist-mediated opportunities. Some are being utilized, many are not. In more recent times, the Patient Protection and Affordable Care Act of 2010 has set up the opportunity for more healthcare professionals to contribute to improved population-based health outcomes. Frequency of delivery of 18 common service areas was surveyed including: immunizations, disease state management, tobacco cessation, medication therapy management, transitions of care, pain management counseling, prescription medication take-back programs, weight control, preventive

screenings, chronic care management, and pain management. Respondents were requested to respond to the question, "How many times in the past 30 days have you delivered the following services in your practice setting?" Response options were: 0, 1, 2, 3, 4, and 5 or more days. Therefore the values in this domain represent the mean number of times delivering the stated service in the last 30 days, with five representing everything from 5 to 30 days.

The second area surveyed was the extent to which pharmacists are contributing to the 10 essential services of public health.¹¹ These services are: evaluate effectiveness, accessibility, and quality of personal and population-based health services; link people to needed personal health services and assure the provision of health care when otherwise unavailable; inform, educate, and empower people about health issues; research for new insights and innovative solutions to health problems; diagnose and investigate health problems and health hazards in the community; monitor health status to identify and solve community health problems; develop policies and plans that support individual and community health efforts; mobilize community partnerships and action to identify and solve health problems; enforce laws and regulations that protect health and ensure safety; and assure competent public and personal healthcare workforce. Response options used a Likert scale with 0 to 5, representing "never" to "always".

The third area addressed the barriers that exist that may keep some pharmacists from delivering public health services. These barriers need to be understood before the services can be expanded. Therefore, this survey also explored perceived barriers pharmacists may have about delivering public health services. A recent publication reported that pharmacists' confidence in providing public health services was average to low.¹² Ten barriers were listed by the investigators including: lack of an adequate counseling space, lack of demand, lack of time, and others. Response options used a Likert scale from 0 to 5, representing "not at all problematic" to "extremely problematic".

This survey was adapted from a pharmaceutical care study conducted in North Dakota and was modified to include items regarding respondents' socio-demographics, public health services, and essential services.¹⁵ A 48-item survey was created for this research project, comprised of 18 public health service areas, 10 essential services, 11 barriers, and 12 demographic items.^{15,30} The survey instrument was created by modifying items in two previously used instruments, thus preserving the validity and reliability of the instrument created. The Assessment, Development, Assurance Pharmacist's Tool (ADAPT) was used as a model for how to operationalize the public health ten essential services within pharmacy terminology.³⁰ The pharmaceutical care survey was used to guide the design of pharmacists' self-evaluation of the frequency of and perceived barriers to service delivery.¹⁵ Barriers to care and demographic characteristics were adapted from previous surveys

that were based on validated measures.^{15,30,31} The survey instrument was further validated by operationalizing the items precisely by cross-checking the items against other pharmacy surveys and pilot-testing on a small group of pharmacists (n=7). These pharmacists were chosen based on their practice location and willingness to pilot the survey. Five pharmacists from within the survey states and with varying years of experience were chosen to navigate the entire survey. Two pharmacists outside of the survey states/provinces were chosen to ensure disqualification processes were correctly enabled.

Survey administration

The study protocol and procedures were reviewed and approved by the North Dakota State University Institutional Review Board. The respondents were not identified, but respondents wishing to participate in the lottery (incentive to participate was a raffle held for an iPad mini) could opt-in by providing their email address. For data analysis purposes, the respondents were undisclosed by the researchers in the analysis or reports.

This study was performed among pharmacists in District V of NABP/AACP who met eligibility criteria (i.e., registered pharmacist who lived and practiced pharmacy in the state). Our goal was to obtain at least 150 respondents from each state for a total of 450 respondents; this number exceeded the number of 351 which was calculated by power analysis as the number needed to detect significance at the 0.05 level among a population of 4000 eligible respondents. Rural pharmacists (nonmetropolitan) were defined as those working in areas with populations under 49,999. Urban pharmacists (metropolitan) were defined as those working in areas with populations of 50,000 or more, which included North Dakota's largest metropolitan area of Fargo/West Fargo (population about 120,000), followed by Bismarck, Minot, and Grand Forks. The largest metropolitan area in Iowa is Des Moines (about 210,000), followed by Cedar Rapids, Davenport, Sioux City, Iowa City, Waterloo, Council Bluffs, Ames, West Des Moines, Dubuque, and Ankeny (all over 50,000 in population).

The investigators used a modified Total Design Method that has been used successfully in mail surveys to obtain a sound response rate.³² The Total Design Method is based on sound research principles and confirms that when attention is paid to administrative detail, high response rates can be achieved from non-responsive subjects, and a modification of this approach was used to ensure the best possible response rate.³³ The 2015 mailing list was obtained from the North Dakota Board of Pharmacy. The Iowa Board of Pharmacy agreed to send out the survey themselves and follow the same procedures as that done in North Dakota. In September 2015, the survey was emailed to all pharmacists registered and living in Iowa and North Dakota. The survey was distributed by e-mail invitation two more times at 2 and 4 weeks.

Table 1. Demographic characteristics of the participants				
Item*	Rural (n=297)	Urban (n=305)	Total (n=602)	p-value (chi-square)
Gender (missing = 0)	297 (50.66%)	305 (49.34%)	602 (100%)	0.1235
Female	196 (65.99%)	219 (71.80%)	415 (68.94%)	
Male	101 (34.01%)	86 (28.20%)	187 (31.06%)	
Age (missing = 3)	294 (49.08%)	305 (50.92%)	599 (100%)	0.8736
≤ 33	69 (23.47%)	79 (25.90%)	814 (24.72%)	
33 -41	74 (25.17%)	78 (25.57%)	152 (25.38%)	
42-53	78 (26.53%)	79 (25.90%)	157 (26.21%)	
> 53	73 (24.83%)	69 (22.62%)	142(23.71%)	
Degree (missing = 4)	294 (49.16%)	304 (50.84%)	598 (100%)	0.2334
BS/MS	124 (42.18%)	105 (34.54%)	229 (38.29%)	
PharmD/Residency	166 (56.46%)	198 (65.13%)	336 (61.20%)	
PhD	2 (0.68%)	3 (0.99%)	5 (0.84%)	
Other	2 (0.68%)	1 (0.33%)	3 (0.50%)	
Practice (missing = 2)	296 (49.33)	304 (50.67%)	600 (100%)	<.0001
Independent	103 (34.80%)	59 (19.41%)	162 (27.00%)	
Chain	97 (32.77%)	72 (23.68%)	169 (28.176%)	
Hospital	57 (19.26%)	99 (32.57%)	156 (26.00%)	
Education	0 (0.00%)	8 (2.63%)	8 (1.33%)	
Industry/other	26 (8.78%)	74 (24.34%)	82 (18.83%)	
Nursing home	13 (4.39%)	10 (3.29%)	23 (3.83%)	
Region (missing = 0)	297 (49.34%)	305 (50.66%)	602 (100%)	0.0483
Iowa	215 (72.39%)	198 (64.92%)	413 (68.60%)	
North Dakota	82 (27.61%)	107 (35.08%)	189 (31.40%)	
*characteristics sorted by rural (<49,000 population) and urban (>50,000 population)				

Data analysis

Qualtrics (Qualtrics LLC, Provo, Utah) was used to compile the data collection from the on-line survey. Open-ended questions were tabulated by the common themes. The themes were reviewed and tabulated by the lead investigator (MS) along with the pharmacy students (GA, AC).

Mean values were compared using the chi-square test for the demographic variables and the ANOVA F-test for public health services and essential public health services. Data were sorted by rural versus urban, based on respondents' self-reported place of employment. The equality of variance test was used for the two factors variance. A p-value of <0.05 means the variances are equal, so the pooled T test p-value and confidence interval values were used. A p-value of >0.05 means the variances are not equal, so the Student t-tests were conducted on rural versus urban areas using the Satterthwaite's correction.³⁴ An alpha level of 0.05 was used for all tests of significance.

RESULTS

There were 821 out of 939 practicing pharmacists who were eligible for the survey. Within this group of pharmacists, there were 670 pharmacists who finished 60% or more of the survey whose data were treated as valid data. Among these valid data, 415 were from Iowa and 193 were from North Dakota. Among these 608 pharmacists from Iowa and North Dakota, 297 were from rural areas, 305 from urban areas, and 6 did not determine their living area.

Of the surveys emailed, 4 respondents were retired, 60 were non-practicing, and 48 did not complete the survey, and these were removed from the final sample of 602 pharmacists. The overall response rate was 14.8% (13.9% for Iowa and 17.3% for North Dakota). Of these, 68.9% were female, 61.2%

had a Doctor of Pharmacy (PharmD) degree, and 38.3% had a Bachelor of Science (B.S.) in pharmacy degree. More respondents had a PharmD degree in urban areas (65.1%) compared to those in rural areas (56.5%). Three practice settings [independent community pharmacies (27.0%), chain stores (28.2%), and hospital pharmacies (26.0%)] comprised 81.2% of the sample. More independent pharmacists and chain store pharmacists were located in rural areas than urban areas (p<0.0001). More hospital pharmacists were located in urban areas than in rural areas (p<0.0001). Iowa had more pharmacists practicing in rural areas, while North Dakota had slightly more in urban areas (Table 1).

The frequency of delivery of pharmacy services are reported in Table 2. The value should be interpreted as a relative comparison between the rural and urban categories, and not an absolute representation of the number of days of the month that it is performed. In total, the most commonly reported service was disease state management, followed in order by MTM, transition of care from inpatient to outpatient, safe medication disposal, pain management counseling, immunizations, and tobacco cessation counseling. More commonly reported in rural areas than urban areas (P < .05) were disease state management, MTM, immunizations, tobacco cessation counseling, and prescription medication take-back programs.

Table 3 summarizes the public health essential service delivery. The most commonly reported service was to comply with pharmacy laws and regulations, followed by: inform and educate people about health issues, participate in training programs, refer people to other healthcare professionals, and review the services offered in my practice to improve future initiatives. Pharmacists in rural areas more commonly reported certain public health essential services than in urban areas (P < .05) and included: refer people to other healthcare

	Rural n=297	Urban n=305	Total n=602	CI of the mean difference	
Disease state management	1.87	1.56	1.71	-0.5639	-0.0601
Medication Therapy Management (MTM)	1.82	1.44	1.63	-0.654	-0.1197
Transition of care from inpatient to outpatient	1.8	1.43	1.61	-0.6502	-0.1054
Prescription Medication Take Back Program (safe medication disposal)	1.71	1.21	1.46	-0.7776	-0.2342
Pain management counseling	1.69	1.49	1.59	-0.4892	0.075
Immunizations	1.36	0.94	1.15	-0.6073	-0.2336
Tobacco cessation counseling	1.23	0.9	1.06	-0.6066	-0.0432
Hypertension screening	1.06	0.81	0.94	-0.5023	0.00092
Mental health counseling	0.98	0.89	0.93	-0.3443	0.1607
Weight control counseling	0.69	0.54	0.62	-0.376	0.0781
Lab test/diagnostic ordering	0.65	0.94	0.8	0.0957	0.4941
Diabetes screening	0.55	0.55	0.55	-0.2034	0.1909
Substance abuse counseling	0.54	0.34	0.44	-0.3916	-0.008
Prescribing	0.46	0.56	0.51	-0.0806	0.2807
Dyslipidemia screening	0.38	0.42	0.4	-0.1312	0.2214
Poison prevention education	0.36	0.3	0.33	-0.227	0.0999
HIV screening	0.04	0	0.02	-0.0848	0.0102
Hepatitis C screening	0.04	0.02	0.03	-0.0815	0.0396

professionals, evaluate the services the pharmacy provides, partner with the community to identify and help solve health problems, and conduct needs assessments to identify health risks in my community.

As reported in Table 4, lack of time was the most commonly reported barrier to expanding public health service delivery in the pharmacy. This was followed by lack of reimbursement, lack of personnel, and lack of space that were considered the most problematic barriers in implementing public health into practices. Five items, lack of time, lack of personnel, lack of mentors or role models, lack of confidence in my ability, and lack of patient demand for services, were more commonly perceived as serious problems in rural areas than in urban areas ($p < 0.05$).

As reported in Tables 2 and 3, pharmacists in rural areas were more likely to report some pharmacy services and public health essential services than those in urban areas. To assess whether these differences were due to the type of pharmacy practice, the investigators classified the urban and rural area data by practice setting. For this analysis, responses from education ($n=8$), nursing homes ($n=23$), and industry/other responses ($n=82$) were removed, since this study focused primarily on assessing the impact by independent retail pharmacy, chain retail pharmacy, and hospital

pharmacy.

Overall, chain and independent pharmacists more frequently delivered public health services ($p < 0.05$) than hospital pharmacists in eight areas (Table 5): counseling of weight control, mental health, tobacco control, and pain management; along with hypertension screening, MTM, immunizations, and prescription medication take-back programs. Hospital pharmacists reported more frequent delivery than independent and chain pharmacies ($p < 0.05$) in the areas of lab test/diagnostic monitoring and prescribing. Independent pharmacists reported more frequent delivery than chain pharmacists ($p < 0.05$) for substance abuse counseling and prescription medication take-back programs. Chain pharmacists reported more frequently delivering immunizations than independent pharmacists ($p < 0.05$).

Table 6 shows the public health essential service delivery by pharmacy practice site. Overall, chain and independent pharmacists were more likely than hospital pharmacists ($p < 0.05$) to refer people to other health professionals and to inform and educate people about health issues. Independent pharmacists had a significantly higher level of service delivery than chain pharmacists ($p < 0.05$) in 7 areas (listed in descending order): review the services offered in my practice in order to improve future services; evaluate the services the pharmacy

	Rural n=297	Urban n=305	Total n=602	95% CI of the mean difference	
Comply with pharmacy-specific laws and regulations	3.86	3.75	3.8	-0.236	0.0148
Inform and educate people about health issues	3.17	3.17	3.17	-0.232	0.2328
Participate in ongoing training beyond CE requirements	2.93	3.01	2.97	-0.1595	0.321
Refer people to other healthcare professionals	2.9	2.47	2.68	-0.6944	-0.1722
Review the services offered in my practice in order to improve future initiatives	2.79	2.63	2.71	-0.4519	0.114
Evaluate the services the pharmacy provides	2.61	2.29	2.45	-0.6011	-0.0259
Work with other healthcare providers to identify and help solve health issues in my community	2.46	2.28	2.37	-0.4667	0.1023
Explore alternative approaches and innovative solutions to health issues	2.38	2.4	2.39	-0.2454	0.2911
Advocate for policy change	1.76	1.84	1.8	-0.2157	0.3807
Partner with the community to identify and help solve health problems	1.63	1.29	1.46	-0.6215	-0.0522
Conduct needs assessments to identify health risks in my community	1.47	1.14	1.31	-0.6135	-0.0496

Table 4. Perceived barriers to expanding public health service delivery in the pharmacy (Likert scale: 0= not at all problematic to 5= extremely problematic)

	Rural n=297	Urban n=305	Total n=602	95% CI	
Lack of time	3.16	2.92	3.04	-0.4312	-0.0514
Lack of reimbursement	3.06	2.86	2.96	-0.4128	0.0186
Lack of personnel	2.87	2.54	2.7	-0.5482	-0.1008
Lack of space	2.69	2.4	2.55	-0.5349	-0.0409
Lack of access to additional training programs	2.43	2.17	2.3	-0.5545	0.0274
Unclear regulatory environment	2.39	2.14	2.26	-0.5243	0.0233
Lack of management support	2.35	2.3	2.32	-0.334	0.2203
Lack of mentors or role models	2.32	1.93	2.12	-0.6882	-0.0931
Lack of confidence in my ability	2.29	1.8	2.05	-0.8091	-0.1694
Lack of patient demand for services	2.24	1.85	2.04	-0.6497	-0.114

provides; work with other healthcare providers to identify and help solve health issues in my community; explore alternative approaches and innovative solutions to health issues; advocate for policy change; partner with the community to identify and help solve health problems; and conduct needs assessments to identify health risks in my community. Chain pharmacists did not report any significantly higher levels than did the independents pharmacists for any of the public health essential services. Similarly, hospital pharmacists did not report any significant differences than the other two practice settings for any of the essential services.

DISCUSSION

The study objective was to assess the self-reported level of delivery of public health services and essential service in rural and urban areas in Iowa and North Dakota. Until now, the level of pharmacy alignment with providing public health services and the 10 essential services of public health has not been assessed and has only been reviewed in the literature.¹¹ This lack of alignment results in lack of awareness in the broader healthcare community of the critical contributions made by pharmacists. It also compromises the potential for pharmacists to

learn from and model successful public health contributions made by pharmacists in other settings.

Respondent characteristics

Chain store (28.2%) and independent pharmacists (27.0%) were similar in distribution, and this is unlike the national distribution of 15.1% independent and 41.3% chain stores in 2004.³⁵ A total of 34 chain pharmacies were reported in North Dakota, including six CVS stores and 28 Thrifty White stores (which includes five telepharmacies). Hence, the number of chain pharmacists working in North Dakota is fewer than in the state of Iowa.^{15,23}

These findings were expected since the 51% ownership law in North Dakota has restricted the number of chain pharmacies and hospital pharmacies with an outpatient business. North Dakota also has a higher proportion of rural pharmacies than Iowa. Rural pharmacists in this study report lack of access to additional training as a barrier to delivering public health services more frequently than urban pharmacists.

Increased training offered in urban areas, along with greater access to ancillary services, may also explain the higher rate of lab test and diagnostic ordering in urban areas. While the findings show this trend, there are some rural pharmacists who

Table 5. Frequency (mean number of times) of pharmacy services delivery

	number			overall p-value*	Paired (p-value)**		
	Chain n=169	Hospital n=156	Independent n=162		Chain- Hospital	Chain- Independent	Hospital- Independent
HIV screening	0	0.03	0.01	0.4141	0.2074	0.808	0.3127
Hepatitis C screening	0.01	0.07	0	0.1269	0.108	0.7495	0.0577
Lab test/diagnostic ordering	0.11	1.75	0.28	<0.0001	<0.0001	0.1183	<0.0001
Prescribing	0.21	0.93	0.31	<0.0001	<0.0001	0.4092	<0.0001
Poison prevention education	0.41	0.32	0.35	0.7161	0.4244	0.5916	0.791
Dyslipidemia screening	0.44	0.24	0.47	0.1146	0.089	0.8134	0.0562
Substance abuse counseling	0.45	0.21	0.80	0.0001	0.0802	0.0117	<0.0001
Diabetes screening	0.61	0.29	0.66	0.016	0.0207	0.7005	0.0078
Weight control counseling	0.99	0.15	0.76	<0.0001	<0.0001	0.1381	0.0001
Mental health counseling	1.16	0.39	1.30	<0.0001	<0.0001	0.4128	<0.0001
Tobacco cessation counseling	1.37	0.46	1.56	<0.0001	<0.0001	0.3174	<0.0001
Hypertension screening	1.38	0.26	1.22	<0.0001	<0.0001	0.353	<0.0001
Disease state management	1.60	1.72	1.86	0.3394	0.5238	0.1424	0.4191
Transition of care from inpatient to outpatient	1.66	1.85	1.48	0.1709	0.3309	0.3486	0.0603
Medication Therapy Management (MTM)	1.88	1.13	2.01	<.0001	<0.0001	0.473	<0.0001
Immunizations	1.92	0.36	1.44	<.0001	<0.0001	<.0001	<0.0001
Prescription Medication Take Back Program (safe medication disposal)	1.93	0.50	2.40	<.0001	<0.0001	0.0048	<0.0001
Pain management counseling	1.96	1.03	1.96	<.0001	<0.0001	0.9935	<0.0001

* F-test; ** t-test

	mean			Overall p-value*	Paired (p-value)**		
	Chain n=169	Hospital n=156	Independent n=162		Chain-Hospital	Chain-Independent	Hospital-Independent
Conduct needs assessments to identify health risks in my community	1.11	1.28	1.68	0.0139	0.4004	0.0043	0.0478
Partner with the community to identify and help solve health problems	1.11	1.42	1.86	0.0006	0.1179	0.0001	0.0251
Advocate for policy change	1.18	1.97	2.01	<.0001	<.0001	<.0001	0.8507
Work with other healthcare providers to identify and help solve health issues in my community	1.81	2.38	2.73	<.0001	0.003	<.0001	0.0766
Evaluate the services the pharmacy provides	2.04	2.46	2.74	0.0017	0.0352	0.0004	0.152
Review the services offered in my practice in order to improve future initiatives	2.13	2.77	3.15	<.0001	0.0011	<.0001	0.0555
Explore alternative approaches and innovative solutions to health issues	2.25	1.92	2.72	<.0001	0.0714	0.009	<.0001
Participate in ongoing training beyond CE requirements	2.88	2.87	3.09	0.3407	0.9812	0.2033	0.2039
Refer people to other healthcare professionals	2.99	2.03	3.05	<.0001	<.0001	0.7465	<.0001
Inform and educate people about health issues	3.34	2.77	3.43	<.0001	0.0003	0.5492	<.0001
Comply with pharmacy-specific laws and regulations	3.86	3.81	3.82	0.7451	0.4691	0.5675	0.8767

have developed outstanding patient care and public health programs. For instance, the Indian Health Service (IHS) provides innovation in the provision of chronic disease programs.³⁶ While the IHS is a federal agency, it is an exemplar for innovations for pharmacy in community health centers and other ambulatory care settings.^{37,38} Pharmacies in many settings in both North Dakota and Iowa have benefitted from a significant number of IHS settings in both states. Pharmacy leaders in both states encourage their students to apply IHS innovations in other ambulatory care settings such as community health centers and managed health care settings.

Additionally, pharmacists in rural areas in Iowa and North Dakota have conducted medication therapy management (MTM) and diabetic programs. These findings should be interpreted as primarily due to differences in practice setting. Since rural areas tend to have more independent pharmacists and urban areas more chain pharmacists, this may be due to a lower volume of prescriptions, therefore providing the pharmacist with more time to pursue public health opportunities.

Public health services

In total, the most frequently reported public health service was disease state management followed by MTM, transition of care from inpatient to outpatient, safe medication disposal, pain management counseling, immunizations, and tobacco cessation counseling. In North Dakota, the "About the Patient", program has expanded pharmacist involvement in chronic disease management in the areas of diabetes and pain management services.³⁹ Some regions in North Dakota contract with workmen's compensation programs for pharmacists to provide pain management counseling.^{40,41} Formal public health programs, such as the dual degree

PharmD/MPH program at North Dakota State University, create the opportunity for increased training in the delivery of public health services.⁴² Gortney and colleagues reported on the prevalence of PharmD/MPH dual degree programs nationwide, and this report suggested that more pharmacy students are pursuing and have additional exposure to public health than in traditional pharmacy programs.⁴² Public health education has been enhanced in colleges/schools of pharmacy, in accordance with CAPE Outcomes, and should result in greater exposure in both didactic and experiential pharmacy student training.⁴³ However, this training needs to be combined with recognition of provider status for pharmacists and reimbursement models from insurers.

Services reported more frequently in rural areas than urban areas were disease state management, MTM, immunizations, tobacco cessation counseling, and prescription medication take-back programs. Nationwide, pharmacists provide a significant role in providing immunizations. However, our findings suggest that this role is performed by a relatively small proportion of pharmacists. Similarly, while a number of pharmacists are involved in disease state management programs and MTM programs, this is an area that has considerable room for expansion, particularly in rural areas. Pharmacists are well positioned to provide public health services in all pharmacy settings with particular emphasis in ambulatory settings including the community pharmacy settings.⁴⁴ Pharmacists in rural settings, particularly independent community and chain store pharmacists, were more likely to provide these services than did the hospital pharmacists. Rural pharmacists do lab testing and diagnostic ordering less frequently than their urban counterparts, largely

due to low volume that does not justify the investment in testing equipment.

The relatively low rate of the pharmacist delivery of diabetes, dyslipidemia, HIV, and hepatitis C screenings may be a function of lack of need in the community, inadequate training, or a lack of significant reimbursement by insurers for these services. There is great need in Iowa and North Dakota for pharmacy programs to provide certification in these specialty areas, such as those being offered by pharmacy organizations, including the APhA training in diabetes disease state management and immunizations.⁴⁵ North Dakota has developed similar training programs for pharmacists, such as the "About the Patient" program for Diabetes Management and for Pain Management.^{39,40} However, the relatively infrequent involvement in counseling for tobacco cessation, mental health, and weight control may be a function of inadequate training, coupled with a reluctance to engage with patients on these sensitive issues unless the patient actively seeks out this type of counseling support. It is also the case that in some independent and chain pharmacies, screenings are "events" to be held occasionally, and therefore are not perceived as a part of daily operations.

This study has also shown that pharmacists are most inclined to contribute to the public's health in areas focusing on medications. This is the pharmacist's specialty, so it is reasonable to focus the pharmacist contributions on disease state management, MTM, immunizations, and prescription medication take-back programs, which all focus on medications. Conversely, screening for conditions such as diabetes, hypertension, hyperlipidemia, HIV, and hepatitis C, are still prior to the start of medication use, and thus do not capitalize on the primary expertise of the pharmacist, which is medication use.

Essential public health services

Pharmacists in rural areas of Iowa and North Dakota more frequently reported providing public health essential services, than in urban areas, and these included: refer people to other healthcare professionals, evaluate the services the pharmacy provides, partner with the community to identify and help solve health problems, and conduct needs assessments to identify health risks in my community. For example, a rural pharmacy in North Dakota reported collaborating with the local hospital to create a discharge plan, complete with prescribing privileges, in order to formally transfer medication management for the newly discharged patient over to the community pharmacist. Overall, the most commonly reported service was to comply with pharmacy laws and regulations, followed by educate people about health issues, participate in training programs, refer people to other healthcare professionals, and review the services offered in my practice to improve future initiatives. Pharmacists practicing in independent community pharmacies in this sample were more likely than chain pharmacists to provide these services.

Opportunities for pharmacists to contribute to rural workforce shortages

Rural areas generally have fewer, and often shortages of, healthcare professionals. This can have far-reaching impacts on the health of rural communities.⁴⁶ Iowa currently has a 31.6% unmet need for primary care in Health Professional Shortage Areas (HPSAs), and North Dakota has a 60.8% unmet need.⁴⁷ Due to their accessibility and expanding public health roles, pharmacists could be of great benefit in helping to improve community health outcomes amidst shortages.⁴⁸ It has been identified in the literature and in this study that pharmacists are in need of forming partnerships with communities as well as other healthcare providers and organizations in order to maximize their contributions.^{48,49} For example, in this study working with other healthcare providers was ranked as the seventh most frequently delivered essential public health service out of the 10 services, while partnering with the community was ranked last. With the formation of partnerships, pharmacists could broaden the reach of public health and help close the healthcare workforce shortage gaps.⁵⁰

Barriers and recommendations for rural areas

Lack of time and lack of reimbursement were the most commonly reported barriers to implementing public health into pharmacy practice. Five items, lack of time, lack of patient demand for services, lack of personnel, lack of confidence in my ability, and lack of mentors or role models, were more commonly perceived as barriers in rural areas than in urban areas ($p < 0.05$). This is an opportunity for state pharmacy associations and the boards of pharmacy to collaborate with colleges of pharmacy to identify training needs of rural pharmacists and to establish training programs with the goal of increasing their skill and confidence in delivering public health services, and thus improve the health of populations in rural communities. Furthermore, specific training could be developed to showcase the unique opportunities available in the rural setting. Preceptors could then highlight these opportunities with students on rural rotations, with the hope of retaining these students to practice in rural settings. There is also a movement in pharmacy toward conferring provider status on pharmacists beyond what is currently experienced through collaborative practice agreements.⁵¹ This would allow pharmacists to practice at the top of their scope of practice, which can only help to improve population health outcomes.⁴⁹

Future research.

Our data from Iowa and North Dakota suggest that independent pharmacies have higher involvement than chain pharmacies in the areas of disease state management, MTM services, and tobacco cessation counseling. However, these findings raised questions that have not yet been fully addressed in the literature. These public health services are being delivered more often in independent pharmacies than in chain pharmacies, but the reasons for this difference have not been explored. In general, it is well accepted that time restraints

influence service delivery.⁵² Other literature has suggested that rural pharmacies, which are often independent, tend to have a lighter work load and therefore more time to provide ongoing patient care, including increased service delivery.⁵³ Further research into the differences between independent and chain pharmacies could be conducted to help outline the areas where pharmacists could best focus their efforts when trying to increase their patient care service delivery. There may be other motivational factors, such as a desire to make a difference, professional aspirations, and other intrinsic motivators influencing pharmacists' decisions to implement such services into their pharmacies.

Study limitations

The self-reported nature of this study introduces the possibility of respondent or recall bias. Therefore the results of this study serve as a general comparison of frequency of delivery of public health services in different sites and not actual observation and recording of these activities, which was beyond the scope of this study. With an overall response rate of 14.8%, these results may have selection bias, with respondents being overly enthusiastic about the topic, and thus more likely to respond. Another limitation is that the cross-sectional findings of two states have limited generalizability. North Dakota's 51% ownership law further limits extrapolation to other states.

CONCLUSIONS

Increasing focus on population health outcomes is an opportunity for pharmacy to more deeply engage with public health and make contributions that are unique to the discipline of pharmacy and the expertise of pharmacists. This study has shown that rural pharmacists more frequently deliver public health services than urban, perhaps due to more time, or greater community need. It was also demonstrated that pharmacist public health contributions are more frequently in individual patient care areas, such as disease state management, medication therapy management and transitions of care, and less frequently in screenings and health education. The impact of pharmacy in the healthcare system at large can be increased by expanding the delivery of public health services.

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CONFLICT OF INTEREST

The authors report no conflict of interest in the conduction of this study or the preparation of this manuscript.

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