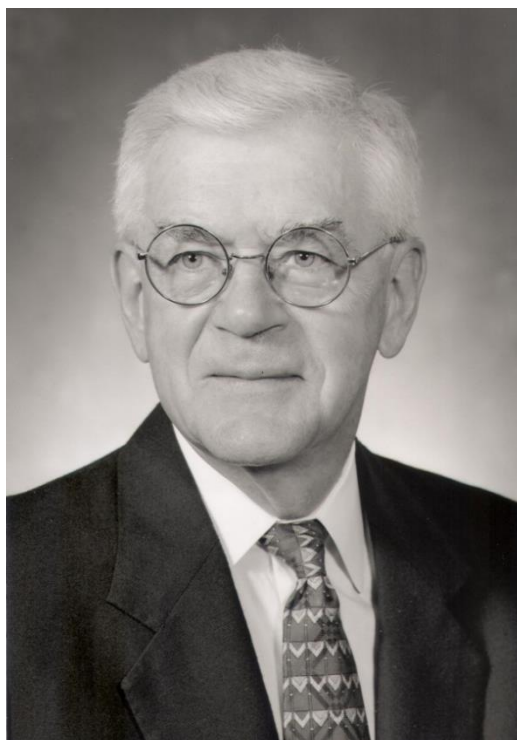




# THE LEMBERGER REPORT

A publication of the Sonderegger Research Center  
UW-Madison School of Pharmacy

2015



### **August P. Lemberger, PhD**

*With this second Lemberger Report, the Faculty and Staff of the Sonderegger Research Center pay tribute to the memory of former UW School of Pharmacy Dean August “Gus” Lemberger. Dean Lemberger believed that the social sciences in pharmacy were critical to identify and address evolving pharmacy related issues and health needs in the state of Wisconsin. To that end he worked with the Rennebohm Foundation to establish the Sonderegger Research Center (SRC) in 1985. Dr. Lemberger was a mentor, role model, and leader for pharmacy students, practitioners, and colleagues. SRC faculty and staff remember and honor his warmth, integrity and vision for the future. We are pleased to celebrate the SRC's 30<sup>th</sup> anniversary this year as a result of his support.*





## ***Pharmacy and the Health of Wisconsin's Population***

The *Lemberger Report* was initiated to provide information and insights related to pharmacy and public health in Wisconsin. With this second report in 2015, we build on findings



from the first Lemberger Report in 2011 to contribute to the well-being of the State in keeping with the *Wisconsin Idea*. A key aspect of our approach has been to undertake systematic

collection and analysis of existing health services data with an eye toward ambulatory care pharmacy. By highlighting data and research results on an ongoing basis, we hope the report will contribute to perspective on the state of the State with regard to pharmacy and provide trends and insights for policy and practice.

The first *Lemberger Report* noted that the Wisconsin population is aging and identified needs which pharmacists can influence. Analysis of hospital discharge data identified common Ambulatory Care Sensitive Conditions (ACSCs) for adults aged 65 years and older relevant to potential roles and contributions of pharmacists. This second Lemberger Report builds on those findings and includes additional analyses of data available about pharmacist immunizations via the Wisconsin Immunization Registry (WIR).

As part of our 30th anniversary of the Sonderegger Research Center, this report focuses on providing insights about both health needs and capacity related to ambulatory care

pharmacy for Wisconsin's population. To accomplish the goal of providing perspective on need and capacity, the report is organized into three main sections.

Section I focuses on health needs and county disparities. Given the aging of Wisconsin's population, particular emphasis is on residents 65 years of age and older. Pharmacist contributions are highlighted in relation to a state and national goal to improve immunizations.

Section II focuses on the access and availability of ambulatory care pharmacies by county, including capacity and proximity to ambulatory care pharmacies and availability of pharmacies within primary care shortage areas.

Section III focuses on the pharmacist workforce. The availability and characteristics of pharmacists in counties highlights variability in the human pharmacist resources available to meet the health needs of Wisconsin's population.

County differences in needs and capacity pose challenges for how best to respond to unmet health needs and more specifically how pharmacists can contribute to help address the State's health needs effectively.

By offering ongoing analyses and insights relevant to pharmacy and pharmacists, we hope to promote discussion of future health and workforce agendas to tailor resources, policies and provider capacity for different regions in the State.

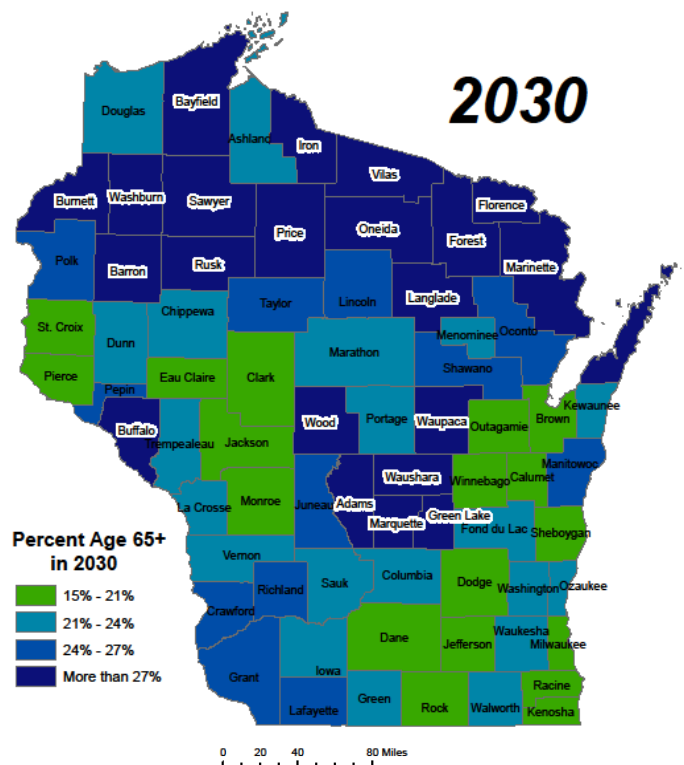
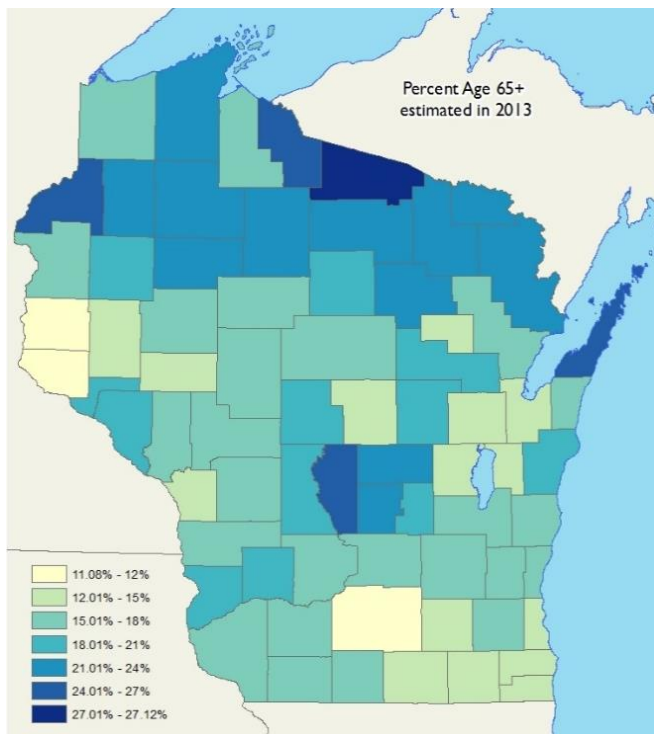


## I. Health Needs

The aging of Wisconsin remains an important backdrop and context for this report. It is important to consider how the older adult (65+ years) population is distributed in Wisconsin and how that distribution may change in the future. This has strong implications for anticipating health needs and the capacity needed to respond effectively. Accessibility to services and workforce capacity and distribution are central to these discussions.

**Figure 1** displays the distribution of Wisconsin's population 65+ years of age in 2013 and the projected distribution in 2030. The striking increase in older adults and particular changes in some regions pose serious questions about county based needs and how best to respond to them. The upper third of the state and center of the state stand out in this regard.

**Figure 1. Wisconsin Population Age 65+ Years, 2013 and 2030**



Source: WI DOA Demographic Services, Population Projections, Vintage 2008  
Prepared by Cindy Ofstead, DHS Bureau of Aging and Disability Resources

Variability in the current and county population age dispersions suggest consequent pharmacy-related health needs associated with

medications and their use. Older adults have increasing chronic comorbidities and complicated medication regimens. Pharmacy

services such as Medication Therapy Management (MTM)\*<sup>1</sup> to help older adults use their medications effectively are as important as the distribution of medications themselves. Given the increasing needs for services for this population, this report again examined the Ambulatory Care Sensitive Conditions (ACSCs) of older adults to understand needs.

### **ACSC Related Needs**

Hospitalizations for Ambulatory Care Sensitive Conditions (ACSCs) are a health care utilization measure that has been used by many federal, state, and local research sectors to examine access to primary health care and community area resource needs.<sup>2,3</sup> ACSCs are defined as “diagnoses for which timely and effective outpatient care can help to reduce the risks of hospitalization by either preventing the onset of an illness or condition, controlling an acute episodic illness or condition, or managing a chronic disease or condition.”<sup>4,5</sup> Appropriate drug therapy and medication use often are central to treating acute and chronic conditions, thus placing pharmacists potentially in a key position to influence these hospitalizations. In this second *Lemberger Report*, as in the first, we examine ACSC hospital discharge patterns by county to identify diagnoses that continue to be especially relevant to pharmacists’ roles in Medication Therapy Management in ambulatory care settings. Understanding the occurrence of hospitalizations helps identify conditions to target future initiatives and potential pharmacy services for contributions in ambulatory care.

### **Data and Methods**

Hospitalization records were drawn from the 2009 and 2012 Wisconsin State Inpatient Databases (SID) developed as part of the Healthcare Cost and Utilization Project (HCUP).<sup>6</sup> HCUP is sponsored by the Agency for Healthcare Research and Quality (AHRQ) and is

a collection of health care databases and related software tools developed through Federal-State-Industry partnerships. The Wisconsin SID contains all hospital admission record abstracts for the state. The unit of analysis is the hospital discharge, not the individual patient; if a patient is discharged multiple times throughout a year, each discharge is counted in the summary.

Although some hospital admissions are for 'out of area' patients, most are for individuals residing in the communities where the hospital is located. Consequently, local ambulatory care pharmacies and pharmacists would influence ACSCs via the medications and medication-related services they provide.

In the initial 2011 *Lemberger Report*, pharmacy-related ACSCs were identified using AHRQ’s Prevention Quality Indicators (PQIs).<sup>7</sup> The PQIs are a set of measures using ICD-9-CM codes in hospital administration records to identify hospital admissions that suggest the hospitalization could have been prevented through high-quality outpatient care. Using the PQI measures, seven chronic condition ACSCs that can be and often are managed to a large extent in an outpatient setting and for which medications are a prominent part of patients’ primary care were identified: asthma, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), diabetes long-term complications, diabetes short-term complications, uncontrolled diabetes, and hypertension (HTN). An eighth ACSC, bacterial pneumonia, is considered more of an acute condition and influenced by prevention services and is pharmacy-related via pharmacist involvement in immunizations for bacterial pneumonia.

For each ACSC, the number of hospitalization discharges was divided by the county population figure and then multiplied by

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\*<sup>1</sup> Medication Therapy Management (MTM) services encompass a range of patient centered pharmacist

activities to improve medication use and medication-related patient outcomes.<sup>1</sup>

100,000 to calculate hospitalization rates per 100,000 population by county. Hospitalization rate variability reflects differences in absolute need in counties. The rates provide identifying geographic areas that can benefit from pharmacy's presence and potentially increased involvement as part of patients' health care teams.

**Overall Significant Findings**

In 2009, there were over 47,000 hospitalizations in Wisconsin due to the eight Ambulatory Care Sensitive Conditions (ACSCs) targeted for the analyses in this report. **Table 1** presents the

number of 2009 Wisconsin adult hospital discharge events by the targeted subset of ACSCs. All hospitalization events due to these ACSCs varied by age group. Not surprisingly, hospitalizations were highest for older adults (65+ years); nearly two-thirds of all hospitalizations were for older adults. Also, nearly two-thirds of all the ACSC hospitalizations analyzed were due to bacterial pneumonia and congestive heart failure. For older adults, there was approximately three times the number of hospitalizations in these two condition categories compared to the other age groups combined.

**Table 1. Wisconsin 2009 Adult Hospitalization Events for Pharmacy-Related Ambulatory Care Sensitive Conditions by Age Groups**

Pharmacy-related ACSC	All Adults, 18+ years	Age Groups		
		18-44 years	45-64 years	65+ years
Asthma	3,802	1,059	1,545	1,198
Bacterial Pneumonia	14,582	1,368	3,363	9,851
COPD	6,881	182	1,869	4,830
CHF	14,818	396	2,563	11,859
DM Long-term Complications	3,688	560	1,538	1,590
DM Short-term Complications	2,220	1,349	676	195
Diabetes Uncontrolled	430	102	181	147
HTN	1,539	223	545	771
<b>Totals</b>	<b>47,960</b>	<b>5,239</b>	<b>12,280</b>	<b>30,441</b>

ACSC, Ambulatory Care Sensitive Condition; COPD, Chronic Obstructive Pulmonary Disease; CHF, Congestive Heart Failure; DM, Diabetes Mellitus; HTN, Hypertension.

The **2012** HCUP data were compared to the 2009 data. As seen in Table 2, the same pattern emerged with bacteria pneumonia the second most prevalent category of ACSC hospitalizations for older adults (65+).

To explore variation in counties, the 2012 bacterial pneumonia hospitalization rates per county for the older population, age 65+ years, are detailed in **Appendix A** and highlighted in **Figure 2**. As can be seen, counties differ considerably in their rates of older adults' hospitalizations for bacterial pneumonia.

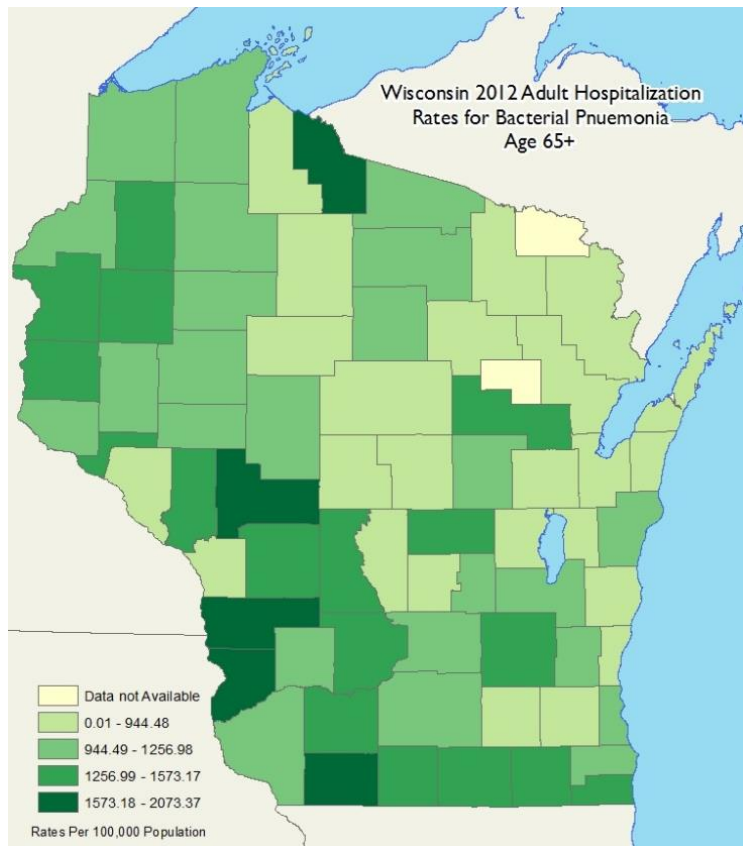
**Table 2. Wisconsin Top Three Hospitalization Events for Pharmacy-Related Ambulatory Care Sensitive Conditions for Older Adults 65+ Years of Age, 2012**

Year	Specific Pharmacy-Related ACSCs		
	Bacterial Pneumonia	Congestive Heart Failure (CHF)	Chronic Obstructive Pulmonary Disease (COPD)
2009	9,851	11,859	4,830
2012**	8,674	10,825	6,110

Source: Healthcare Cost and Utilization Project Website (<http://hcupnet.ahrq.gov/>)

\*\* The number of older adult (65+ years) hospitalization events in 2012 for Bacterial Pneumonia, CHF and COPD were not available for Florence, Iron, Kewaunee, and Menominee Counties. Therefore, they were not included in the calculation of hospitalization events for these three conditions in 2012.

**Figure 2. Wisconsin Hospitalization Rates for Bacterial Pneumonia Among Older Adults 65+ Years of Age, 2012**





## Prevention Needs - Immunizations

Immunizations continue to be one of the top public health achievements to prevent significant morbidity and mortality, and Wisconsin has a goal of increasing its immunization rates statewide. While *Healthy People 2020* established a target of 90% of older adults (65+ years) for influenza immunizations, only 56.7% of this age group in Wisconsin received immunizations during the 2013-14 influenza season as estimated by the Behavioral Risk Factor Surveillance Survey (BRFSS). This compares to 65% nationally.<sup>8,9</sup>

Given current community pharmacy interest and involvement in immunizations, there is an opportunity for community pharmacy to help address the gap in needed immunizations and perhaps specifically for bacterial pneumonia for the 65+ age group. Further, the Wisconsin Immunization Registry (WIR) offers a starting point to analyze timely data regarding pharmacy contributions to this health issue.

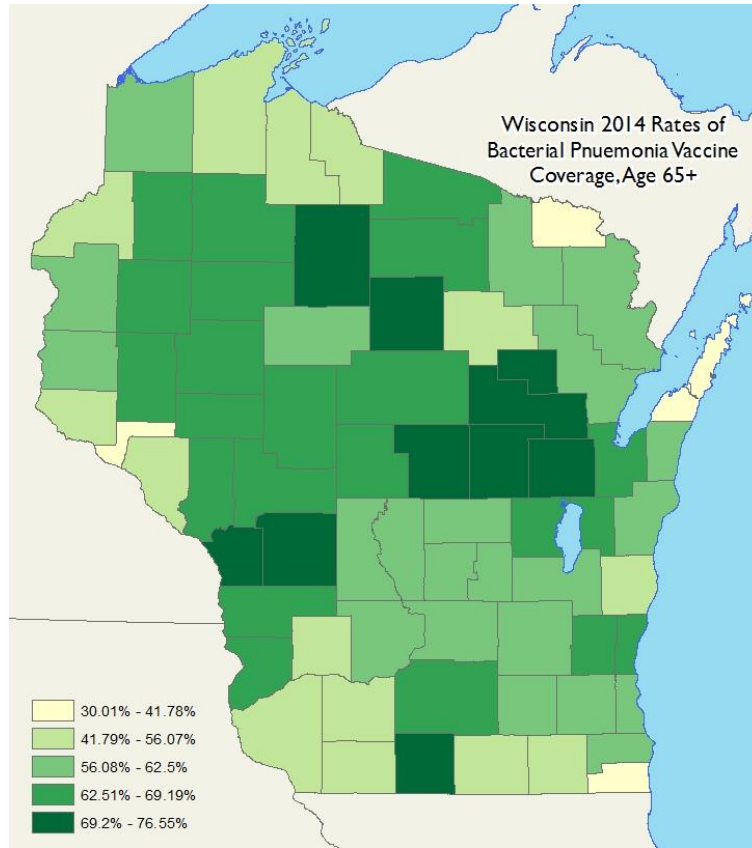
The Wisconsin Immunization Registry (WIR) is a critical partner for pharmacists and all health providers giving immunizations. The WIR is a statewide, population-based immunization information system (IIS) that assists pharmacists and other health care providers by

recommending needed vaccines, providing guidance on the proper ages and intervals at which vaccines should be administered and presenting the vaccination history of an individual person. When care providers administer a vaccine they are to report the immunization to the WIR. The WIR integrates information from birth and death records, public and private health care providers, community (retail) pharmacies, health maintenance organizations and Medicaid and allows reporting and assessment of clients' complete vaccination histories to ensure appropriate vaccination.<sup>3</sup>

### **Coverage for Bacterial Pneumonia Immunization**

Data from the WIR were analyzed by county to determine the 2014 estimated PPSV23 vaccine coverage rates among older adults aged 65 years and older (**Figure 3**). All Wisconsin counties fall considerably below the *Healthy People 2020* goal of the 90% bacterial pneumonia immunization coverage rate for older adults. See **Appendix B** for the estimated PPSV23 coverage rates by county for WIR clients 65 years of age and older. While some counties have immunized 70% of their older adults for bacterial pneumonia, others have immunized only 30-40%. This disparity compares poorly with national and State goals.

**Figure 3. Wisconsin Pneumococcal Vaccine Coverage for Older Adults 65+ Years of Age, 2014**



***Immunizations by Pharmacists***

Wisconsin pharmacists can immunize any client aged at least 6-years old with recommended vaccines.<sup>10</sup> Thus, pharmacists have the potential to help Wisconsin reach statewide goals with respect to immunization rates. See **Appendix C** for pharmacy-administered immunization rates for influenza and pneumococcal vaccines by county in Wisconsin.

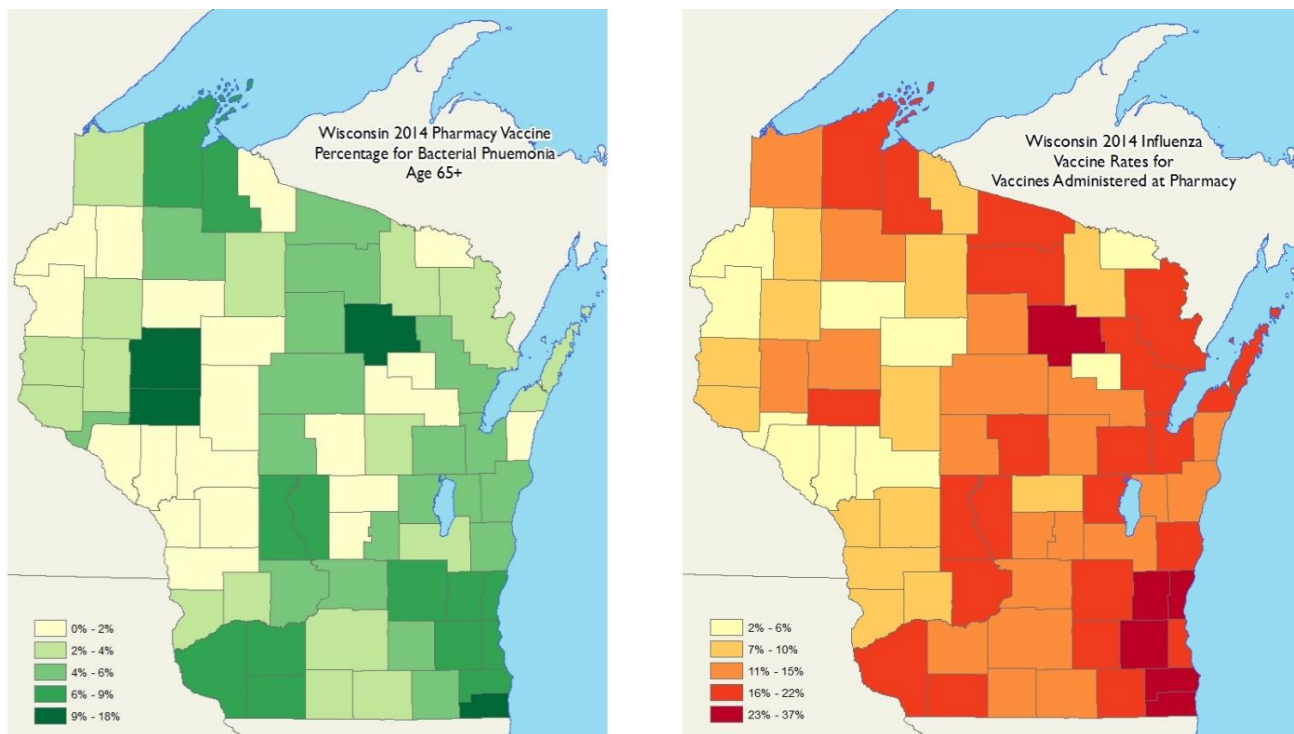
**Figure 4** documents that community pharmacists have begun in some counties to offer older adults immunizations for bacterial pneumonia. However this is not necessarily true of the counties showing the highest need (see **Figure 3**). There is considerable

opportunity for community pharmacies to increase their delivery of these immunizations. Second, more counties have community pharmacists who offer influenza vaccinations than is true for bacterial pneumonia. If similar levels of immunizations for influenza by pharmacists could be achieved for bacterial pneumonia, the burden on other providers for these immunizations could be reduced. In addition, if more immunizations overall occur for bacterial pneumonia, there may be fewer older adult hospitalizations for bacterial pneumonia, a favorable impact on that need related ambulatory care sensitive condition highlighted in **Figure 2**.

Although pharmacists have the potential to be one of the most accessible health care professionals to provide Medication Therapy Management and immunizations relevant to conditions prevalent in older adults, their

availability will need to be matched with areas of population need. This is particularly salient if availability to other primary care is limited. The following section addresses this important issue.

**Figure 4. Wisconsin Community Pharmacy-Administered Immunization Percentages for Pneumococcal Vaccines (2014) Among Older Adults 65+ Years of Age and for Influenza Vaccines total population (2014-15 Season)**





## II. Pharmacies and Accessibility

The aging of Wisconsin poses a particular challenge for meeting health needs across the State. Aligning primary care capacity to meet needs will require planning. Pharmacy sites provide an important access point for care using immunizations for older adults as an example.

An important question however is how well allocated is the pharmacy capacity to respond to health needs at the community and county level.

In this second section of the 2015 *Lemberger Report* we examine the distribution of ambulatory care pharmacies across the State. The shifting availability of ambulatory care pharmacies also is analyzed. Lastly, the location of pharmacies in relation to primary care health shortage areas are analyzed along with implications.

Traditionally, pharmacies are categorized by their settings. Broadly, pharmacies can be considered (a) community-based, ambulatory care pharmacies serving patients on an outpatient basis within the primary care component of the health care system, and (b) institutional pharmacies serving inpatients within the secondary or tertiary care component of the health care system.

According to the Board of Pharmacy Specialties (BPS), ambulatory care pharmacy practice is the provision of integrated, accessible health care services by pharmacists who are accountable for addressing medication needs, developing sustained partnerships with patients, and practicing in the context of family and community.<sup>11</sup> Ambulatory care pharmacies not only offer medication access points, but they also can serve as hubs for

Medication Therapy Management (MTM) services, self-care advice about non-prescription medications, and immunization programs.<sup>12-14</sup> A variety of pharmacy settings and diverse patient populations can fall under the umbrella of ambulatory or community practices such as independent and chain retail pharmacies, clinic-based pharmacies, and hospital/health system outpatient clinics.

Four perspectives of potential access to ambulatory pharmacy care were examined in this report. They include: (a) measuring the number of patients that potentially could be served per pharmacy, (b) assessing changes in the availability of pharmacies, (c) estimating travel times to pharmacies, and (d) determining whether pharmacies are located in areas with primary care shortages. These perspectives can help identify possible geographic areas of pharmacy capacity and access deficiency as well as identify areas of saturation.

### **Identifying Pharmacies**

To examine ambulatory care pharmacy capacity and access, first, an inventory of pharmacies representing unique pharmacy sites operating in the state was derived from a 2015 listing of all licensed pharmacies in Wisconsin obtained from the Department of Safety and Professional Services (DSPS). In some instances the DSPS listing included multiple licenses with the same or similar name for a single street address. Duplicate address entries were removed to result in an inventory of unique pharmacy sites and each unique site was considered a pharmacy. Next, pharmacies were categorized based on name recognition to represent pharmacy setting types, such as independent, chain, supermarket, mass merchandiser, clinic-based, hospital inpatient, hospital outpatient, long-term care, etc. Then, each pharmacy setting was categorized as whether it served an ambulatory or non-ambulatory clientele based



on whether it would or could serve ambulatory patients. The focus of analysis was on capacity for ambulatory care pharmacy practice. In cases where multiple licenses were associated with a site, the pharmacy was categorized as a 'combination' pharmacy (e.g., an independent pharmacy with long-term care pharmacy at the same site, or a hospital with inpatient and outpatient departments), and if it included ambulatory clients, it was considered an ambulatory care pharmacy. Finally, each pharmacy was assigned to a county based on a zip code to county matching file.

### **Population to Ambulatory Care Pharmacy Ratios**

Ambulatory care pharmacy capacity and access in Wisconsin were assessed by examining how counties differ in the number of Wisconsin residents per licensed ambulatory care pharmacy. The total population to ambulatory care pharmacy ratio was calculated for each county. The population of older adults (65+ years) to ambulatory care pharmacy ratio also was calculated for each county. Total and 65+ years population estimates for 2013 were obtained from the Office of Health Informatics,

Division of Public Health, Wisconsin Department of Health Services.

**Table 3** presents the number of Wisconsinites per licensed ambulatory care pharmacy by county. The total number of pharmacies with ambulatory care capacity in Wisconsin for 2015 was 994. This represents 83.6% of all pharmacy sites (N = 1,188) operating in the state.

Older adults (65+ years) are highlighted as a separate category because this population generally has a higher chronic disease burden relative to their younger counterparts<sup>15,16</sup> and subsequently consume a large majority of all prescribed medications.<sup>17</sup> For the total population, the number of Wisconsinites per ambulatory care pharmacy by county ranged from 2,199 to 16,855. The number of older adults per ambulatory care pharmacy by county ranged from 427 to 2,668.

The population to pharmacy ratios provide one perspective of access, and they are affected by both county population and pharmacy prevalence in the county. A less populated county with one or a few pharmacies might have an apparent low ratio, but access challenges still may occur for residents.

**Table 3. Number of Wisconsinites per Licensed Ambulatory Care Pharmacy by County, Total and Older Adults (65+ Years) Populations**

County	Total Population	Number of Ambulatory Care Pharmacies	Total Population per Each Ambulatory Care Pharmacy*	County	Total Population 65+ Years	65+ Years Population per Each Ambulatory Care Pharmacy*
Shawano	41,793	19	2,199.6	Shawano	8,131	427.9
Sawyer	16,619	6	2,769.8	Menominee	531	531.0
Forest	9,194	3	3,064.7	Dane	58,009	610.6
Oneida	35,940	11	3,267.3	Sawyer	3,716	619.3
Crawford	16,562	5	3,312.4	Polk	7,563	630.3
Price	14,024	4	3,506.0	Forest	1,941	647.0
Vilas	21,453	6	3,575.5	La Crosse	17,209	661.9
Polk	43,979	12	3,664.9	Crawford	3,365	673.0
Pepin	7,416	2	3,708.0	Pierce	4,777	682.4
Marinette	41,648	11	3,786.2	Ashland	2,789	697.3
Green Lake	19,057	5	3,811.4	Waukesha	62,852	722.4
Barron	45,883	12	3,823.6	Pepin	1,452	726.0
Ashland	16,063	4	4,015.8	Saint Croix	9,492	730.2
Waupaca	52,361	13	4,027.8	Milwaukee	115,136	742.8
Lincoln	28,875	7	4,125.0	Columbia	8,955	746.3
Menominee	4,256	1	4,256.0	Oneida	8,275	752.3
La Crosse	116,466	26	4,479.5	Barron	9,154	762.8
Waukesha	392,694	87	4,513.7	Grant	8,623	783.9
Door	27,946	6	4,657.7	Green Lake	3,956	791.2
Grant	51,801	11	4,709.2	Marinette	8,811	801.0
Columbia	56,753	12	4,729.4	Brown	32,081	802.0
Ozaukee	86,959	18	4,831.1	Price	3,219	804.8
Trempealeau	29,280	6	4,880.0	Lincoln	5,654	807.7
Rusk	14,657	3	4,885.7	Trempealeau	4,849	808.2
Vernon	30,079	6	5,013.2	Ozaukee	14,703	816.8
Burnett	15,426	3	5,142.0	Waupaca	10,714	824.2
Green	36,900	7	5,271.4	Walworth	15,168	842.7
Washburn	15,853	3	5,284.3	Green	5,923	846.1
Dane	503,072	95	5,295.5	Monroe	6,886	860.8
Douglas	44,121	8	5,515.1	Douglas	6,907	863.4
Monroe	45,279	8	5,659.9	Rock	23,406	866.9
Fond du Lac	102,070	18	5,670.6	Kenosha	20,083	873.2
Walworth	102,782	18	5,710.1	Eau Claire	14,010	875.6
Chippewa	63,030	11	5,730.0	Vernon	5,273	878.8
Pierce	41,009	7	5,858.4	Chippewa	9,683	880.3
Iron	5,879	1	5,879.0	Racine	27,815	897.3
Rock	160,331	27	5,938.2	Portage	9,934	903.1
Iowa	23,764	4	5,941.0	Iowa	3,652	913.0
Richland	17,911	3	5,970.3	Outagamie	23,084	923.4

County	Total Population	Number of Ambulatory Care Pharmacies	Total Population per Each Ambulatory Care Pharmacy*	County	Total Population 65+ Years	65+ Years Population per Each Ambulatory Care Pharmacy*
Milwaukee	952,054	155	6,142.3	Jefferson	12,009	923.8
Wood	74,499	12	6,208.3	Fond du Lac	16,661	925.6
Eau Claire	100,548	16	6,284.3	Vilas	5,818	969.7
Racine	195,224	31	6,297.5	Washington	20,049	1,002.5
Brown	253,078	40	6,327.0	Dunn	6,044	1,007.3
Portage	70,721	11	6,429.2	Winnebago	24,294	1,012.3
Jefferson	84,141	13	6,472.4	Rusk	3,164	1,054.7
Langlade	19,751	3	6,583.7	Richland	3,379	1,126.3
Saint Croix	85,645	13	6,588.1	Wood	13,711	1,142.6
Washington	132,804	20	6,640.2	Door	6,930	1,155.0
Juneau	26,800	4	6,700.0	Taylor	3,527	1,175.7
Manitowoc	81,102	12	6,758.5	Washburn	3,626	1,208.7
Kewaunee	20,584	3	6,861.3	Kewaunee	3,642	1,214.0
Jackson	20,608	3	6,869.3	Jackson	3,646	1,215.3
Taylor	20,695	3	6,898.3	Manitowoc	14,636	1,219.7
Winnebago	168,539	24	7,022.5	Burnett	3,756	1,252.0
Outagamie	179,830	25	7,193.2	Juneau	5,088	1,272.0
Kenosha	167,314	23	7,274.5	Marathon	20,411	1,275.7
Dunn	43,974	6	7,329.0	Oconto	6,441	1,288.2
Oconto	37,744	5	7,548.8	Dodge	14,357	1,305.2
Bayfield	15,100	2	7,550.0	Clark	5,548	1,387.0
Marquette	15,317	2	7,658.5	Langlade	4,178	1,392.7
Dodge	88,807	11	8,073.4	Sheboygan	18,160	1,396.9
Waushara	24,441	3	8,147.0	Iron	1,573	1,573.0
Marathon	134,961	16	8,435.1	Marquette	3,393	1,696.5
Clark	34,677	4	8,669.3	Waushara	5,160	1,720.0
Sheboygan	115,226	13	8,863.5	Bayfield	3,536	1,768.0
Adams	20,725	2	10,362.5	Sauk	10,048	2,009.6
Sauk	62,434	5	12,486.8	Calumet	6,130	2,043.3
Buffalo	13,528	1	13,528.0	Adams	5,213	2,606.5
Calumet	49,580	3	16,526.7	Buffalo	2,645	2,645.0
Lafayette	16,855	1	16,855.0	Lafayette	2,668	2,668.0
Florence	4,446	0	**	Florence	1,010	**
Overall WI	5,730,937	994	5,765.5	Overall WI	848,232	853.4

\* The total population per each ambulatory care pharmacy was calculated using the county's total population divided by the number of ambulatory care pharmacies in the county. The 65+ years population per each ambulatory care pharmacy was calculated using the county's 65+ years population divided by the number of ambulatory care pharmacies in the county.

\*\* Florence County does not have an ambulatory care pharmacy.

## Changes in Ambulatory Care Pharmacy Availability

To further examine ambulatory care pharmacy capacity and access by county in Wisconsin, the numbers of ambulatory care pharmacies, opened and closed between 2011 and 2015, were tallied. The 2015 listing of licensed pharmacies in Wisconsin from DSPS was compared to the 2011 listing to identify new or closed pharmacies based on whether they were included in the 2015 list but not the 2011 list, and vice versa. Pharmacies under the same ownership moving to a different location within a 10 minute drive time in the same city were not considered as new pharmacies. Additionally, pharmacies changing their names through acquisition by a different organization were not considered as new pharmacies; there remained access to a pharmacy at that location.

New and closed ambulatory care pharmacies were categorized into 3 types: independent retail, chain retail, and non-retail. Independent retail pharmacies included those with 4 or fewer stores under the same ownership. Chain retail pharmacies included those with 5 or more stores under the same ownership; supermarket and mass merchandiser stores were included in the chain retail category. Non-retail ambulatory care pharmacies included clinic-based and hospital/health system outpatient pharmacies. Of the 994 ambulatory care pharmacies, 61.7% are chain retail, 20.0% are independent retail, and 18.3% are non-retail such as clinic-based pharmacies and hospital/health system outpatient pharmacies.

**Table 4** presents a summary of the numbers of new and closed ambulatory care pharmacies between 2011 and 2015 by county and pharmacy category. There were both new and closed pharmacies across all the types of pharmacies in individual counties and state-wide. In Wisconsin overall, there was a total net

loss of 51 pharmacies with the greatest decrease in independent pharmacies (22 independent, 14 chain, 15 non-retail).

In 24 counties (not included in **Table 4**), there were no new or closed pharmacies between 2011 and 2015. Additionally, in most counties with changes, the net change in number of pharmacies was 1 or less. Only three counties had net growth of two or more pharmacies, increasing the total counts to 12 or 13 pharmacies in those counties. The net increase of four pharmacies in Saint Croix County represented a 44 percent increase in the number of ambulatory care pharmacies in the county.

Waukesha, Dodge, Outagamie, and Milwaukee Counties had the most sizeable decreases in numbers of pharmacies between 2011 and 2015. Although the net change was 14 fewer pharmacies, a total of 155 pharmacies remained located in Milwaukee County and the total population to pharmacy ratios for the county are mid-level and just slightly higher than the state-level overall ratio (**Table 3**). In contrast, the impact of five fewer pharmacies in Dodge County may be more impactful, with 11 pharmacies remaining in the county.

In other counties where there were decreases in the numbers of pharmacies, the impact from fewer pharmacies similarly would vary because the numbers of pharmacies remaining are diverse, as are the resulting total population to pharmacy ratios. If the loss of pharmacies is concentrated in certain cities or neighborhoods, disparity in access could increase.

In counties where there were small or no net change in total pharmacies, changes still occurred in pharmacy availability with examples of re-distribution of the types of pharmacy settings (e.g., independent to chain, chain or independent to non-retail, etc.) available for ambulatory care.



**Table 4. Number of New and Closed Ambulatory Care Pharmacies Between 2011 and 2015**

County (*)	New Pharmacies (n = 107)			Closed Pharmacies (n = 158)			Net Change
	Independent	Chain	Non-Retail	Independent	Chain	Non-Retail	
Milwaukee (155)	4	12	2	7	20	5	-14
Outagamie (25)	1	2	0	0	8	1	-6
Dodge (11)	0	1	0	3	0	3	-5
Waukesha (87)	0	6	2	1	5	7	-5
Brown (40)	0	5	0	1	3	4	-3
Winnebago (24)	1	5	0	1	8	0	-3
Columbia (12)	0	1	0	2	1	0	-2
Dane (95)	1	8	3	4	6	4	-2
Dunn (6)	1	1	0	1	3	0	-2
Eau Claire (16)	0	2	0	2	2	0	-2
Kenosha (23)	1	3	0	0	3	3	-2
Kewaunee (3)	0	0	0	0	1	1	-2
Washington (20)	1	0	1	0	2	2	-2
Ashland (4)	0	0	0	0	1	0	-1
Barron (12)	0	0	0	0	1	0	-1
Buffalo (1)	0	0	0	1	0	0	-1
Calumet (3)	0	1	0	0	2	0	-1
Chippewa (11)	0	1	0	0	1	1	-1
Clark (4)	0	0	0	0	1	0	-1
Green (7)	0	0	0	1	0	0	-1
Jackson (3)	0	0	0	1	0	0	-1
Jefferson (13)	0	0	0	0	1	0	-1
Juneau (4)	0	0	0	1	0	0	-1
La Crosse (26)	0	0	0	1	0	0	-1
Marathon (16)	0	1	1	0	1	2	-1
Marinette (11)	0	1	0	2	0	0	-1
Portage (11)	0	1	0	0	2	0	-1
Racine (31)	0	3	0	0	3	1	-1
Rock (27)	0	0	2	0	2	1	-1
Rusk (3)	0	0	0	1	0	0	-1
Walworth (18)	1	0	0	1	0	1	-1
Grant (11)	0	1	0	0	1	0	0
Manitowoc (12)	0	2	0	1	1	0	0
Ozaukee (18)	1	1	0	1	1	0	0
Shawano (19)	0	0	1	0	1	0	0
Sheboygan (13)	0	3	0	0	1	2	0
Bayfield (2)	0	0	1	0	0	0	1
Door (6)	0	2	0	0	1	0	1
Douglas (8)	0	1	1	1	0	0	1
Fond du Lac (18)	0	1	0	0	0	0	1
Green Lake (5)	0	0	2	1	0	0	1
Lincoln (7)	1	1	0	1	0	0	1
Monroe (8)	0	0	1	0	0	0	1
Sawyer (6)	0	0	1	0	0	0	1
Vernon (6)	0	0	1	0	0	0	1

County (*)	New Pharmacies (n = 107)			Closed Pharmacies (n = 158)			Net Change
	Independent	Chain	Non-Retail	Independent	Chain	Non-Retail	
Polk (12)	1	0	2	1	0	0	2
Waupaca (13)	0	2	0	0	0	0	2
Saint Croix (13)	1	1	2	0	0	0	4
Total	15	69	23	37	83	38	-51

\* Number of ambulatory care pharmacies per county in 2015

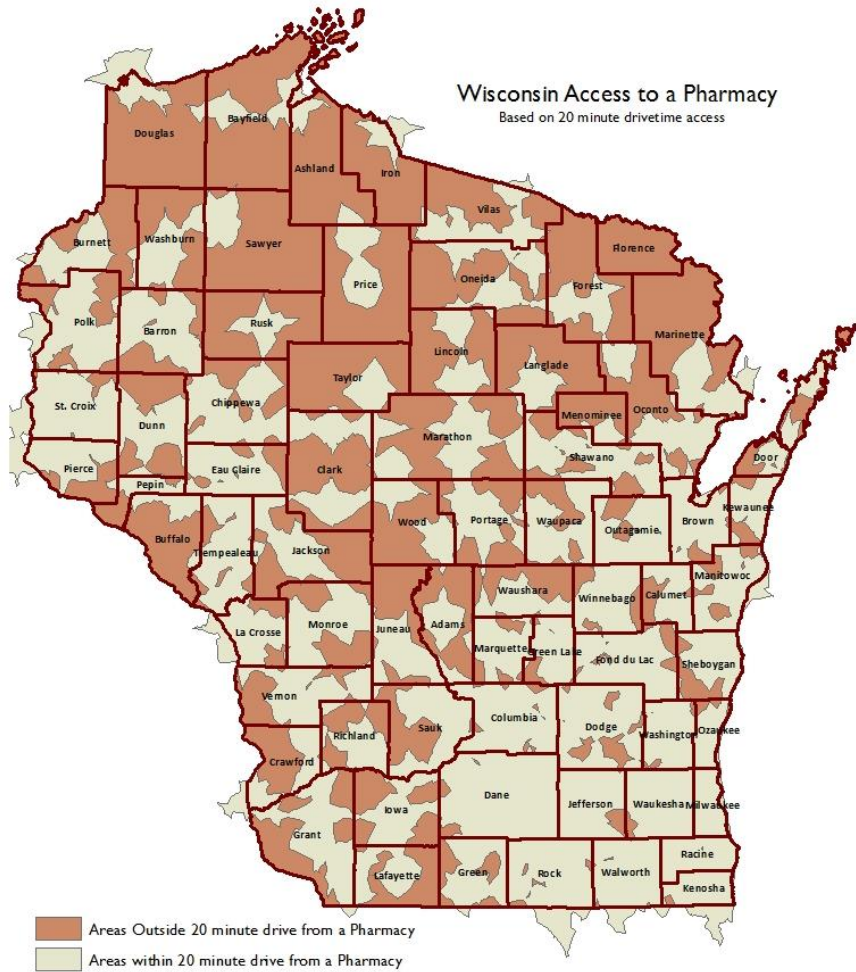
### Drive time to Ambulatory Care Pharmacies

To assess drive time to ambulatory care pharmacies, the inventory of pharmacy sites with street addresses from the 2015 DSPS list was linked with 2013 census data by staff at the University of Wisconsin Applied Population Laboratory, using Geographic Information System (GIS) mapping. The time duration of 20 minutes was specified as the drive time criterion for mapping state residents to the nearest ambulatory care pharmacy.

A visual depiction of drive time to an ambulatory care pharmacy is shown in **Figure 5**.

A drive time of 30 minutes or more has been used as one factor in designating shortage areas for primary care physicians.<sup>18,19</sup> In this report, a more stringent criterion was applied: 20 minutes. This represents a 40 minute round trip travel time to visit a pharmacy. The darker areas in **Figure 5** indicate that patrons must drive 20 minutes or more to reach an ambulatory care pharmacy. As can be seen from the map, longer drive times to an ambulatory care pharmacy tend to occur in rural areas. Some of these areas also have higher percentages of older adults in their total population which will increase by 2030.

**Figure 5. 20-Minute Driving Time to Ambulatory Pharmacies, 2015**



**Ambulatory Care Pharmacies and Primary Care Need Areas**

Primary Care Health Professional Shortage Areas (HPSAs) are designated by the Health Resources and Services Administration (HRSA) as geographic areas having unmet needs or shortages of primary care physicians practicing in the areas.<sup>19,20</sup> In **Figure 6**, Primary Care HPSAs in Wisconsin are shown. The HPSAs reflect the availability of primary care physicians, and areas with particular need for this health care resource; most of them are in rural areas of the state.

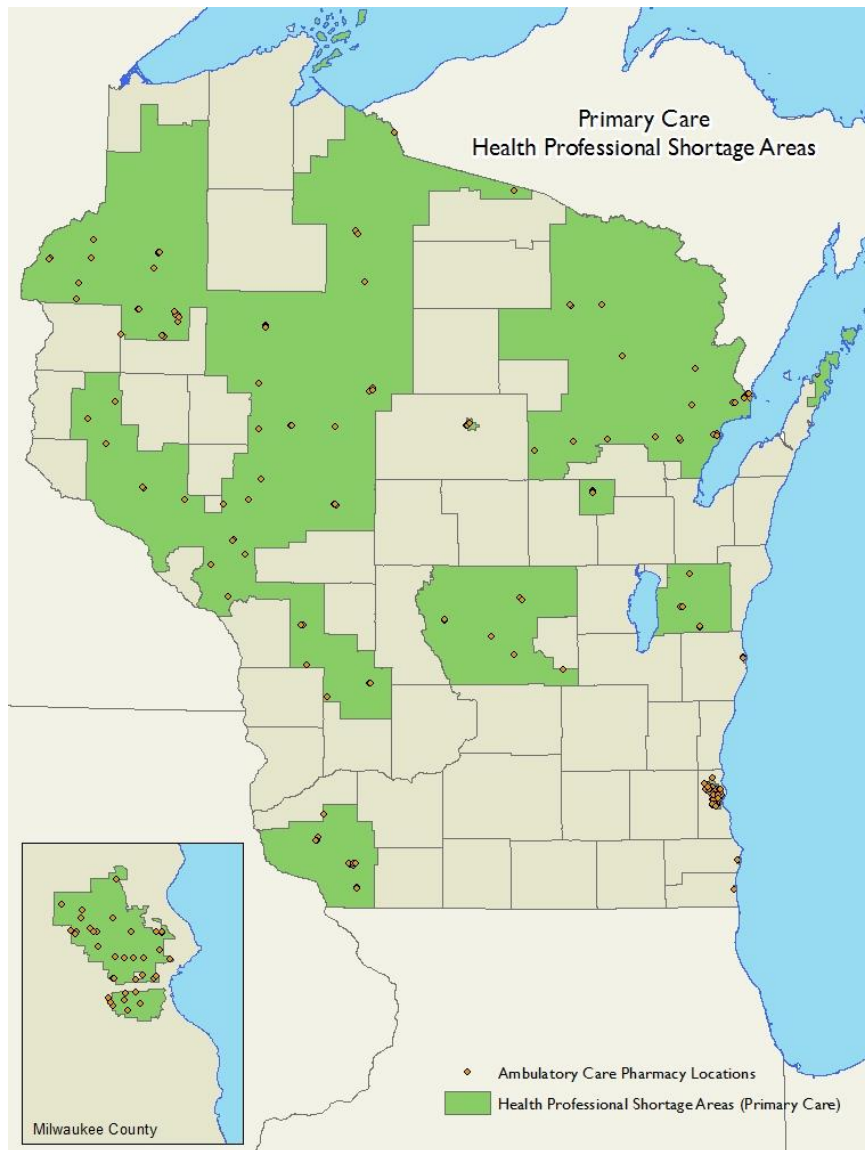
Also in **Figure 6**, locations of individual ambulatory care pharmacy sites within the HPSAs are identified. Pharmacies are represented in several sub-regions of the HPSAs, suggesting that there may be capacity for pharmacists to contribute. The pharmacists in those pharmacies are a potential resource for collaborating and assistance with primary care needs. However, there also are considerable areas where both primary care and pharmacy resources are deficient or lacking.

Not all areas with health professional shortage are in rural Wisconsin. The inset shows an

expanded view of the HPSAs in Milwaukee County. In contrast to some of the rural HPSAs, pharmacies are much more available in

Milwaukee County, suggesting considerable capacity for pharmacist contributions to primary care may be possible.

**Figure 6. Wisconsin Primary Care Health Professional Shortage Areas, January 2015**



Source: Health Resources and Services Administration (HRSA)





### III. Pharmacists and Accessibility

Although the distribution of ambulatory care pharmacies is key, another perspective on the capacity and potential contributions to needs of Wisconsin's population is the pharmacist workforce and their characteristics. The availability of *pharmacists* in counties can highlight variability in the human pharmacist resources available to meet the health needs of citizens. Section III addresses this issue by analyzing county based demographic data on licensed pharmacists.

A 2015 listing of licensed pharmacists was obtained from the Wisconsin Department of Safety and Professional Services (DSPS). The listing was restricted to pharmacists with a Wisconsin mailing address on file and county was assigned based on zip code to county matching file. Gender was provided for many pharmacists in the listing and where not available it was imputed based on name recognition (with 6 undetermined). Age was estimated for each pharmacist based on the date of first licensure reported in the pharmacist listing from the State. Assuming an age of 24 when first licensed and initial licensure in Wisconsin, the years accumulated since the year of first licensure were added to 24 as an estimate of current pharmacist age.

The State listing does not include practice address, or practice type or setting for licensed pharmacists, so focus on specific potential contribution areas, such as ambulatory care is not possible. Therefore, although the number of pharmacists in a county is a raw measure of pharmacist availability, it does provide a main basis for identifying varying pharmacist capacity throughout the State.

**Table 5** gives a breakdown of the number of pharmacists that reside in each county, along

with other characteristic data. Although there can be some slippage in the rates of pharmacists per county due to work commutes that cross county lines, the pharmacist counts per county give a baseline measure of pharmacist availability.

In 2015, there are 6,056 licensed pharmacists with residence in Wisconsin. Two counties with the lowest numbers of Wisconsin residents, Florence and Menominee, have no pharmacists living there. In 2011, those two counties were already at risk of having no pharmacist availability because each county had only one pharmacist who was at or near retirement age. The problem of no pharmacist availability in Florence is consistent with the lack of any licensed ambulatory care pharmacy in the county.

As might be expected, more pharmacists lived in more populated counties. Overall, approximately 17 percent of all the pharmacists in the state live in Dane County (where the average age and percent of pharmacists who are male are among the lowest) or a contiguous county. Nearly the same number of pharmacists live in Waukesha County (n = 883; 14.6% of total) and Milwaukee County (n = 876; 14.5% of total). The average estimated age of licensed pharmacists in Wisconsin is approximately 56 years. Additionally, there seems to be a correlation between average estimated age and percent of pharmacists who are male. Forest County has the highest average pharmacist age near retirement at 60 years, and one of the lowest number of pharmacists (n = 3) living there among all counties. This county may be at risk of having no pharmacist capacity if it is unable to attract new pharmacists in the near future.

The average total population to pharmacist ratio for the ten counties with the highest rates was nearly six times the average ratio for the ten counties with the lowest rates. For the 65+ years population to pharmacist ratios, the

discrepancy was even greater; there was more than eight-fold difference between the average ratio for the ten highest and ten lowest ranking counties. These measures reflect substantial capacity differences across the state. Assuming

similar needs among populations across counties, the ranges of population to pharmacist ratios suggest potential disparities are present in areas of the State.

**Table 5. Pharmacist Characteristics by County**

County	Number of Pharmacists (N = 6,056)	Percent of Pharmacists Who Are Male**	Average Estimated Pharmacist Age	Total Population per Pharmacist*	65+ Years Population per Pharmacist*
Adams	2	50.0	56.0	10,362.5	2,606.5
Ashland	13	46.2	38.2	1,235.6	214.5
Barron	40	65.0	48.2	1,147.1	228.9
Bayfield	15	57.1	54.0	1,006.7	235.7
Brown	249	52.6	42.9	1,016.4	128.8
Buffalo	6	83.3	58.7	2,254.7	440.8
Burnett	3	100.0	55.3	5,142.0	1,252.0
Calumet	13	38.5	47.8	3,813.8	471.5
Chippewa	58	55.2	47.4	1,086.7	166.9
Clark	15	53.3	51.9	2,311.8	369.9
Columbia	46	41.3	46.5	1,233.8	194.7
Crawford	10	40.0	40.9	1,656.2	336.5
Dane	1,035	42.1	40.9	486.1	56.0
Dodge	42	50.0	46.2	2,114.5	341.8
Door	27	59.3	48.1	1,035.0	256.7
Douglas	21	71.4	43.5	2,101.0	328.9
Dunn	24	62.5	45.9	1,832.3	251.8
Eau Claire	122	50.8	43.6	824.2	114.8
Florence	0	***	***	***	***
Fond du Lac	62	51.6	44.0	1,646.3	268.7
Forest	3	66.7	60.0	3,064.7	647.0
Grant	34	47.1	48.1	1,523.6	253.6
Green	45	51.1	42.0	820.0	131.6
Green Lake	15	57.1	47.1	1,270.5	263.7
Iowa	19	63.2	46.3	1,250.7	192.2
Iron	4	50.0	48.3	1,469.8	393.3
Jackson	10	50.0	48.0	2,060.8	364.6
Jefferson	53	46.2	47.3	1,587.6	226.6
Juneau	15	60.0	51.7	1,786.7	339.2
Kenosha	107	46.7	40.7	1,563.7	187.7
Kewaunee	12	50.0	50.7	1,715.3	303.5
La Crosse	167	53.9	39.1	697.4	103.0
Lafayette	9	33.3	31.9	1,872.8	296.4
Langlade	10	40.0	46.3	1,975.1	417.8
Lincoln	28	60.7	48.0	1,031.3	201.9
Manitowoc	57	70.2	45.7	1,422.8	256.8

County	Number of Pharmacists (N = 6,056)	Percent of Pharmacists Who Are Male**	Average Estimated Pharmacist Age	Total Population per Pharmacist*	65+ Years Population per Pharmacist*
Marathon	141	38.3	42.1	957.2	144.8
Marinette	36	77.8	43.3	1,156.9	244.8
Marquette	6	83.3	58.8	2,552.8	565.5
Menominee	0	***	***	***	***
Milwaukee	876	48.9	39.7	1,086.8	131.4
Monroe	25	68.0	52.0	1,811.2	275.4
Oconto	18	66.7	50.4	2,096.9	357.8
Oneida	62	66.1	49.6	579.7	133.5
Outagamie	230	50.9	40.9	781.9	100.4
Ozaukee	167	59.3	43.9	520.7	88.0
Pepin	5	60.0	42.2	1,483.2	290.4
Pierce	28	39.3	41.6	1,464.6	170.6
Polk	36	63.9	47.8	1,221.6	210.1
Portage	61	62.3	42.1	1,159.4	162.9
Price	11	72.7	56.2	1,274.9	292.6
Racine	164	47.9	45.0	1,190.4	169.6
Richland	9	88.9	48.2	1,990.1	375.4
Rock	94	44.7	42.9	1,705.6	249.0
Rusk	9	77.8	55.0	1,628.6	351.6
Saint Croix	57	36.8	41.7	1,502.5	166.5
Sauk	57	47.4	43.4	1,095.3	176.3
Sawyer	18	55.6	44.4	923.3	206.4
Shawano	25	60.0	43.5	1,671.7	325.2
Sheboygan	79	53.2	45.9	1,458.6	229.9
Taylor	9	88.9	49.4	2,299.4	391.9
Trempealeau	19	36.8	42.5	1,541.1	255.2
Vernon	24	45.8	41.1	1,253.3	219.7
Vilas	21	47.6	50.2	1,021.6	277.0
Walworth	61	72.1	45.8	1,685.0	248.7
Washburn	9	55.6	49.0	1,761.4	402.9
Washington	138	54.0	46.9	962.3	145.3
Waukesha	883	48.0	44.5	444.7	71.2
Waupaca	35	54.3	47.1	1,496.0	306.1
Waushara	4	75.0	46.0	6,110.3	1,290.0
Winnebago	137	44.5	40.8	1,230.2	177.3
Wood	111	44.1	38.9	671.2	123.5
State Average	84.1	56.5	46.3	1,703.0	316.7

\* The total population per pharmacist was calculated using the county's total population divided by the number of pharmacists in the county. Refer to Table 3 for each county's total population. The 65+ years population per pharmacist was calculated using the county's 65+ years population divided by the number of pharmacists in the county. Please refer to Table 3 for each county's 65+ years population.

\*\* The gender of one pharmacist was undetermined for each of the following six counties (Bayfield, Green Lake, Jefferson, Racine, Washington and Waukesha). Therefore, the percent of pharmacists who are male was adjusted for each of those counties to account for missing data.

\*\*\* Not applicable because there are no pharmacists in Florence and Menominee Counties.



## Summary and Implications

This 2015 *Lemberger Report* built on the baseline indicators of population health needs relevant to pharmacy identified in 2011 by the initial *Lemberger Report*. Questions continue about how best to meet the increasing health needs of our aging population. How can preventable hospitalizations be averted? What configuration and access to ambulatory pharmacy and primary care will be needed 15 years from now?

The analyses in Section I confirmed the salience of Wisconsin's aging population on health needs. Hospitalizations for bacterial pneumonia continue as a common Ambulatory Care Sensitive Condition (ACSC) among those 65 years and older. The prospect for pharmacists to contribute to reducing those preventable hospitalizations in older adults via pneumococcal immunizations was explored. Analyses revealed that community pharmacies already contribute to meeting State and national immunization goals. Increasing levels of these immunizations overall could contribute to reducing the occurrence of these hospitalizations. Their partnership with the Wisconsin Immunization Registry (WIR) offers a clear-cut approach to appropriate, coordinated immunizations as a team member in the health care system.

At the same time, pneumococcal immunization coverage is still short of State and national goals. Although pharmacists currently are not a major contributor to the immunizations that are being given, if they did increase their numbers, and if that increase adds to what others are doing (instead of substituting), that could be an important contribution to increased coverage of those immunizations. Pneumococcal immunizations are less often done by pharmacists compared to influenza

immunizations. Several factors may contribute to this difference. It may be that pharmacists are less aware of how efficiently WIR can be used to identify and plan a range of reimbursable immunizations for an interested individual.<sup>21</sup> Also, it is likely that consumers are unaware when a community pharmacy offers a full range of immunizations. This calls for clearer pharmacy messaging to move toward a consumer driven expansion of immunizations by community pharmacists.

Additionally, it is clear that there are striking county and general regional differences in immunizations and aging projections. A subset of counties with the fewest immunizations also have a greater proportion of older adults projected in the next 15 years. These counties in particular may deserve special attention to primary care including pharmacist immunization roles.

Section II and III analyses identified a continuing trend from 2011 that some counties have higher total population to ambulatory care pharmacy ratios, and 20 minute or more drive times to ambulatory care pharmacies. Additionally, there is a considerable degree of pharmacy transition occurring with closing and moving pharmacies to different locations, potentially contributing to increasing drive time durations and decreasing accessibility to ambulatory care pharmacies in some areas more than others.

Similarly, some counties have much higher total population to pharmacist ratios. Some of the counties with few pharmacists also have the oldest pharmacists and are at risk of losing pharmacists altogether as these pharmacists approach retirement age. Other counties do not have these issues. Counties with older

pharmacists may have lessened capacity as pharmacists retire and leave the workforce; attracting pharmacists to replenish that supply will be necessary but without additional incentives may be harder.

The aging and varying distribution of older adults by county also reveals potential need for pharmacists, and likely intensification of those needs in particular counties and geographic regions by 2030. Some counties have higher older adult population to ambulatory care pharmacy ratios as well as higher older adult population to pharmacist ratios. Pharmacies and the pharmacists practicing there can be a resource to contribute to meeting older adults' needs.

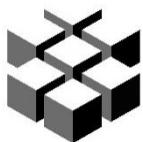
The disparity in pharmacy and pharmacist distribution in Wisconsin suggests that more consideration of barriers and incentives affecting the education, recruitment, location, and retention of pharmacists in underserved areas is needed. How to stimulate supply and coverage of pharmacy/pharmacist resources to those areas is an important health professional workforce consideration. It is not enough to train sufficient numbers of practicing pharmacists. The larger challenge may be attracting them to practice in some counties with the highest needs for their services. This is particularly true for the parts of Wisconsin already designated as Health Professional Shortage Areas (HPSAs) for primary care physicians. Analysis of the county differences in these areas suggests some counties are particularly in need of greater attention to how inter-professional care can be offered to address health needs. System and policy level interventions may be needed to improve communication and coordination of care across health care sites and professions to reduce preventable hospitalizations. The introduction of Accountable Care Organizations (ACOs) has begun in Wisconsin. It will be interesting to

track what this means with respect to community pharmacy service delivery in underserved areas especially.

It is important to note that all of the counties in the State of Wisconsin except one has at least one pharmacy as a resource for ambulatory primary care. The question is how to promote optimum use of these resources in order to best meet the needs of the Wisconsin population. This becomes a key policy question particularly given the disparity of pharmacies and pharmacists among the counties and their aging populations.

Looking ahead to future *Lemberger Reports*, we anticipate continuing to track health and pharmacist trends to examine county disparities and explore their implications for potential interventions. Examining other hospitalizations related to ACSCs, such as congestive heart failure and chronic obstructive pulmonary disease and other Agency for Healthcare Research and Quality's (AHRQ) Prevention Quality Indicators (PQIs)<sup>7</sup> of hospital admissions that might have been prevented through high-quality outpatient care can provide additional perspectives on gaps and opportunities for pharmacy to help address health needs of the Wisconsin population. Contributions by pharmacists through Medication Therapy Management (MTM) services can be an important area for further exploration.

As more data become available about demographic trends as well as needs, this will allow additional analyses and inform revised perspectives. The Sonderegger Research Center will continue working collaboratively with our Wisconsin Pharmacy Practice Enhancement and Action Research Link (Pearl Rx) Network and other providers and researchers around the state as we seek to improve the health of Wisconsin.

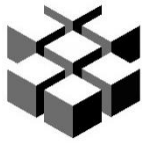


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## Appendix A

### Wisconsin Adult Hospitalization Rates for Bacterial Pneumonia by County and Age, 2012

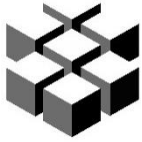
County	Rates per 100,000 population*		
	Age Groups		
	18-44 years	45-64 years	65+ years
Adams	**	**	759.6
Ashland	**	213.9	856.7
Barron	**	197.6	1,495.4
Bayfield	**	**	1,085.8
Brown	20.6	96.5	666.5
Buffalo	**	**	836.8
Burnett	**	349.8	1,228.9
Calumet	**	**	790.2
Chippewa	**	216.1	1,060.8
Clark	**	172.6	1,175.0
Columbia	**	131.3	1,151.1
Crawford	**	319.9	1,726.4
Dane	26.5	113.3	1,022.1
Dodge	29.1	173.8	1,390.9
Door	**	**	944.3
Douglas	**	170.4	1,043.8
Dunn	**	186.8	1,199.6
Eau Claire	50.2	229.3	1,061.0
Florence	**	**	**
Fond du Lac	50.9	205.4	996.6
Forest	**	**	768.7
Grant	**	118.5	1,099.7
Green	**	120.9	1,465.5
Green Lake	**	**	1,079.7
Iowa	**	**	1,353.7
Iron	**	**	2,073.4
Jackson	**	**	1,958.9
Jefferson	**	168.9	944.5
Juneau	**	202.4	1,532.6
Kenosha	75.4	279.6	1,289.1
Kewaunee	**	**	661.2
La Crosse	**	118.5	754.4
Lafayette	**	260.5	1,866.9
Langlade	**	**	784.1
Lincoln	**	241.1	1,257.0
Manitowoc	66.1	219.1	962.6
Marathon	49.1	110.3	711.7
Marinette	**	146.4	827.6
Marquette	**	**	634.5
Menominee	**	**	**
Milwaukee	58.6	241.5	1,150.3
Monroe	**	159.6	1,479.5

County	Rates per 100,000 population*		
	Age Groups		
	18-44 years	45-64 years	65+ years
Oconto	**	**	928.6
Oneida	**	143.1	1,011.6
Outagamie	30.3	106.3	753.8
Ozaukee	**	88.2	838.7
Pepin	**	**	1,379.7
Pierce	**	**	1,187.8
Polk	**	134.9	1,573.2
Portage	**	82.9	638.2
Price	**	**	488.5
Racine	48.9	205.8	1,186.9
Richland	**	209.0	1,180.3
Rock	65.3	173.9	1,269.0
Rusk	**	**	1,079.4
St. Croix	**	138.9	1,437.3
Sauk	74.3	217.8	1,431.5
Sawyer	**	301.4	972.5
Shawano	**	142.7	1,466.2
Sheboygan	**	87.5	887.4
Taylor	**	**	917.2
Trempealeau	**	175.7	1,363.0
Vernon	**	147.3	1,746.8
Vilas	**	208.7	1,223.1
Walworth	50.6	200.0	1,403.6
Washburn	**	226.3	1,499.8
Washington	26.8	112.9	1,106.8
Waukesha	38.0	96.0	855.6
Waupaca	**	168.1	1,127.7
Waushara	**	232.8	1,292.0
Winnebago	32.2	103.2	857.5
Wood	**	106.5	810.4

Source: Healthcare Cost and Utilization Project Website (<http://hcupnet.ahrq.gov/>)

\* The number of bacterial pneumonia discharges was divided by the county population figure and then multiplied by 100,000. Rates were not risk-adjusted.

\*\* Data not available

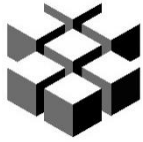


## Appendix B

### Wisconsin Pneumococcal Vaccination (1+ PPSV23) Coverage Rate for Older Adults 65+ Years of Age, 2014\*

County	Coverage Rate	County	Coverage Rate
Adams	57.38%	Marathon	68.12%
Ashland	50.80%	Marinette	57.93%
Barron	65.91%	Marquette	61.82%
Bayfield	55.94%	Menominee	70.33%
Brown	65.49%	Milwaukee	57.20%
Buffalo	56.07%	Monroe	71.03%
Burnett	52.88%	Oconto	59.27%
Calumet	65.90%	Oneida	67.73%
Chippewa	69.19%	Outagamie	74.64%
Clark	64.92%	Ozaukee	63.19%
Columbia	59.06%	Pepin	40.33%
Crawford	67.25%	Pierce	54.79%
Dane	68.61%	Polk	59.12%
Dodge	60.63%	Portage	71.21%
Door	41.78%	Price	69.92%
Douglas	61.64%	Racine	57.70%
Dunn	66.05%	Richland	54.82%
Eau Claire	65.96%	Rock	49.70%
Florence	30.01%	Rusk	68.79%
Fond du Lac	59.66%	Sauk	62.07%
Forest	60.42%	Sawyer	66.28%
Grant	49.70%	Shawano	71.55%
Green	71.70%	Sheboygan	53.25%
Green Lake	58.43%	St Croix	57.50%
Iowa	54.10%	Taylor	62.14%
Iron	53.25%	Trempealeau	68.61%
Jackson	64.11%	Vernon	67.04%
Jefferson	57.58%	Vilas	65.13%
Juneau	59.62%	Walworth	53.36%
Kenosha	35.64%	Washburn	63.45%
Kewaunee	62.50%	Washington	66.61%
La Crosse	74.25%	Waukesha	61.00%
Lafayette	52.15%	Waupaca	76.55%
Langlade	50.32%	Waushara	60.95%
Lincoln	72.33%	Winnebago	69.09%
Manitowoc	57.55%	Wood	65.94%
WISCONSIN: 61.55%			

\*As of 1/1/2015. This data does not include PCV13 doses, but does include PPSV23 doses administered prior to age 65 years for high risk. Although WIR gets doses reported by most providers in Wisconsin, there may be underreporting. The adult denominator in WIR is greater than the population denominator since some people haven't been appropriately moved out of state or marked as inactive.



## Appendix C

### Wisconsin Community Pharmacy-Administered Immunization Percentages for Pneumococcal Vaccines (2014) and Influenza Vaccines (2014-15 Season) among Older Adults 65+ Years of Age

County	Pneumococcal Vaccines 2014		Influenza Vaccines 2014-15 Season	
	Not Pharmacy	Pharmacy	Not Pharmacy	Pharmacy
Adams	93.13%	6.87%	75.66%	24.34%
Ashland	91.91%	8.09%	78.88%	21.12%
Barron	97.31%	2.69%	88.86%	11.14%
Bayfield	90.83%	9.17%	76.38%	23.62%
Brown	95.28%	4.72%	71.44%	28.56%
Buffalo	99.59%	0.41%	94.55%	5.45%
Burnett	97.89%	2.11%	97.17%	2.83%
Calumet	94.29%	5.71%	81.77%	18.23%
Chippewa	89.09%	10.91%	79.13%	20.87%
Clark	98.06%	1.94%	88.94%	11.06%
Columbia	93.77%	6.23%	77.47%	22.53%
Crawford	96.67%	3.33%	89.76%	10.24%
Dane	96.33%	3.67%	81.95%	18.05%
Dodge	91.10%	8.90%	73.72%	26.28%
Door	97.39%	2.61%	77.41%	22.59%
Douglas	97.13%	2.87%	84.10%	15.90%
Dunn	96.45%	3.55%	81.58%	18.42%
Eau Claire	88.93%	11.07%	74.34%	25.66%
Florence	100.00%	0.00%	97.35%	2.65%
Fond du Lac	96.84%	3.16%	86.64%	13.36%
Forest	97.28%	2.72%	89.38%	10.62%
Grant	90.73%	9.27%	81.48%	18.52%
Green	96.65%	3.35%	80.85%	19.15%
Green Lake	95.41%	4.59%	87.01%	12.99%
Iowa	93.13%	6.87%	82.38%	17.62%
Iron	98.97%	1.03%	91.13%	8.87%
Jackson	98.69%	1.31%	96.42%	3.58%
Jefferson	94.71%	5.29%	77.49%	22.51%
Juneau	91.57%	8.43%	78.38%	21.62%
Kenosha	82.48%	17.52%	47.43%	52.57%
Kewaunee	98.38%	1.62%	82.81%	17.19%
La Crosse	97.86%	2.14%	87.25%	12.75%
Lafayette	93.26%	6.74%	77.85%	22.15%
Langlade	88.17%	11.83%	65.12%	34.88%
Lincoln	95.22%	4.78%	84.48%	15.52%

County	Pneumococcal Vaccines 2014		Influenza Vaccines 2014-15 Season	
	Not Pharmacy	Pharmacy	Not Pharmacy	Pharmacy
Manitowoc	94.32%	5.68%	81.04%	18.96%
Marathon	95.36%	4.64%	85.41%	14.59%
Marinette	97.09%	2.91%	72.95%	27.05%
Marquette	97.77%	2.23%	88.12%	11.88%
Menominee	100.00%	0.00%	93.48%	6.52%
Milwaukee	92.69%	7.31%	69.62%	30.38%
Monroe	98.80%	1.20%	91.26%	8.74%
Oconto	93.97%	6.03%	72.48%	27.52%
Oneida	94.52%	5.48%	80.22%	19.78%
Outagamie	95.26%	4.74%	77.01%	22.99%
Ozaukee	93.45%	6.55%	65.54%	34.46%
Pepin	94.69%	5.31%	90.42%	9.58%
Pierce	97.21%	2.79%	86.64%	13.36%
Polk	98.62%	1.38%	93.89%	6.11%
Portage	98.05%	1.95%	78.46%	21.54%
Price	96.77%	3.23%	91.01%	8.99%
Racine	93.13%	6.87%	52.93%	47.07%
Richland	96.44%	3.56%	90.40%	9.60%
Rock	95.95%	4.05%	81.63%	18.37%
Rusk	98.83%	1.17%	95.01%	4.99%
Sauk	94.90%	5.10%	75.67%	24.33%
Sawyer	95.28%	4.72%	82.60%	17.40%
Shawano	98.98%	1.02%	86.59%	13.41%
Sheboygan	94.07%	5.93%	76.69%	23.31%
St Croix	96.14%	3.86%	89.04%	10.96%
Taylor	100.00%	0.00%	98.68%	1.32%
Trempealeau	97.95%	2.05%	92.25%	7.75%
Vernon	98.73%	1.27%	87.86%	12.14%
Vilas	93.67%	6.33%	75.78%	24.22%
Walworth	93.77%	6.23%	74.69%	25.31%
Washburn	98.20%	1.80%	89.56%	10.44%
Washington	92.18%	7.82%	65.46%	34.54%
Waukesha	90.54%	9.46%	65.43%	34.57%
Waupaca	96.02%	3.98%	86.13%	13.87%
Waushara	98.98%	1.02%	90.64%	9.36%
Winnebago	94.57%	5.43%	75.92%	24.08%
Wood	94.86%	5.14%	80.29%	19.71%



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Map of the Wisconsin population age 65+ for 2030 was provided by Cindy Ofstead, Wisconsin Department of Health Services, Division of Long Term Care, using population projections from the Wisconsin Department of Administration, Demographic Services Center.



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