

# Long-Term Care Healthcare-Associated Infections in 2021: An Analysis of 17,971 Reports

By **Shawn Kepner, MS\***, **JoAnn Adkins, BSN, RN\*** & **Rebecca Jones, MBA, RN\***

DOI: 10.33940/data/2022.6.1

**Background:** The Pennsylvania Patient Safety Reporting System (PA-PSRS) is the largest repository of patient safety data in the United States. In addition to over 4.2 million acute care reports, the PA-PSRS database contains more than 375,000 long-term care (LTC) healthcare-associated infection (HAI) reports.

**Methods:** LTC HAI data from PA-PSRS were extracted on February 10, 2022. Reports submitted by LTC facilities and specific care areas were included for infection rates each month if resident and device days were also entered in PA-PSRS for the facility and care area.

**Results:** A total of 17,971 infections were reported in 2021, representing a 31.7% decrease from the prior year. Overall, the reporting rate from LTC facilities decreased notably, from 1.06 in 2020 to 0.78 in 2021, due in large part to a drop in respiratory tract infections, which had an infection rate of 0.431 in 2020 and 0.191 in 2021. The North Central region of the state had the highest overall infection rate, with 0.94 reports per 1,000 resident days, and the Southeast region had the lowest rate at 0.62. The number of reports decreased for all five infection types from 2020 to 2021, with respiratory tract infections decreasing the most, by 58.4%. The number of reports for all infection subtypes decreased as well, with the exception of scabies, which increased by 7.1%. Among all infection subtypes, the number of reports for lower respiratory tract infections decreased the most, with 2,553 fewer reports in 2021 than in 2020. In terms of percentage, influenza-like illness decreased the most, dropping 93.9% from 2020 to 2021. In terms of infection rate, catheter-associated urinary tract infections showed the greatest decrease, and infections involving cellulitis, soft tissue, and wounds showed the greatest increase.

**Conclusions:** In 2021, there were notable decreases in both the infection rate and the number of infection reports submitted by Pennsylvania LTC facilities. Currently, it is unknown whether these decreases are reflective of fewer infections in LTC facilities or a lack of identifying and reporting infections, or a combination of both. Patient Safety Authority infection preventionists (IPs) continue to work with LTC IPs to provide support, education, and tools to assist them in their role.

**Keywords:** *long-term care, nursing homes, annual report, healthcare-associated infections, HAI, infection rates, resident days*

\*Corresponding author

♦Patient Safety Authority

Disclosure: The authors declare that they have no relevant or material financial interests.

## Introduction

The Pennsylvania Patient Safety Reporting System (PA-PSRS)<sup>a</sup> is the largest repository of patient safety data in the United States. In addition to over 4.2 million acute care records, PA-PSRS has collected more than 375,000 long-term care (LTC) healthcare-associated infection (HAI) reports since 2009. In 2021, 17,971 HAIs were reported by 647 of Pennsylvania's LTC facilities.

## Methods

The LTC data from PA-PSRS were extracted on February 10, 2022, to allow additional time for rate calculations based on resident days and device utilization days. Reports submitted by LTC facilities and specific care areas were included for infection rates each month if resident and device days were also entered in PA-PSRS for the facility and care area.

Infection counts reflect the year when infection reports were submitted in PA-PSRS. Overall rates are based on infection confirmation dates and resident days. Specific infection rates related to catheters or central lines are based on catheter or central line days, respectively. In addition, rates are expressed as infections per 1,000 resident, catheter, or central line days. Infection rates from prior years may differ from information in previous publications, as facilities may have since submitted or made changes to reports and/or entered utilization data in PA-PSRS.

## Results

The number of reports for 2021 decreased by 31.7% from 2020, with 17,971 reported infections in 2021 (see **Figure 1**). This is the third annual decrease since 2018.

In 2021, the overall infection rate was 0.78 infections per 1,000 resident days, which is a decrease from the 2020 rate of 1.06. As shown in **Figure 2**, the rate for the North Central region showed the least amount of change between 2020 and 2021, and this region had the highest rate of reported infections in 2021, with 0.94 reports per 1,000 resident days. The Southeast region had the lowest rate, at 0.62.

The distribution of LTC infection reports submitted in 2021 by region is shown in **Table 1**. The Southeast region reported more infections in 2021 than any other region, although this represents a 39% decrease from the prior year.

### LTC Healthcare-Associated Infections

Reports submitted by LTC facilities to PA-PSRS are classified into five main infection types (see **Figure 3**). In 2019 and 2020, respiratory tract infections were the most frequently reported infection type. However, reports of respiratory tract infections dropped by 58.4% in 2021, making them the third most frequently reported infection type.

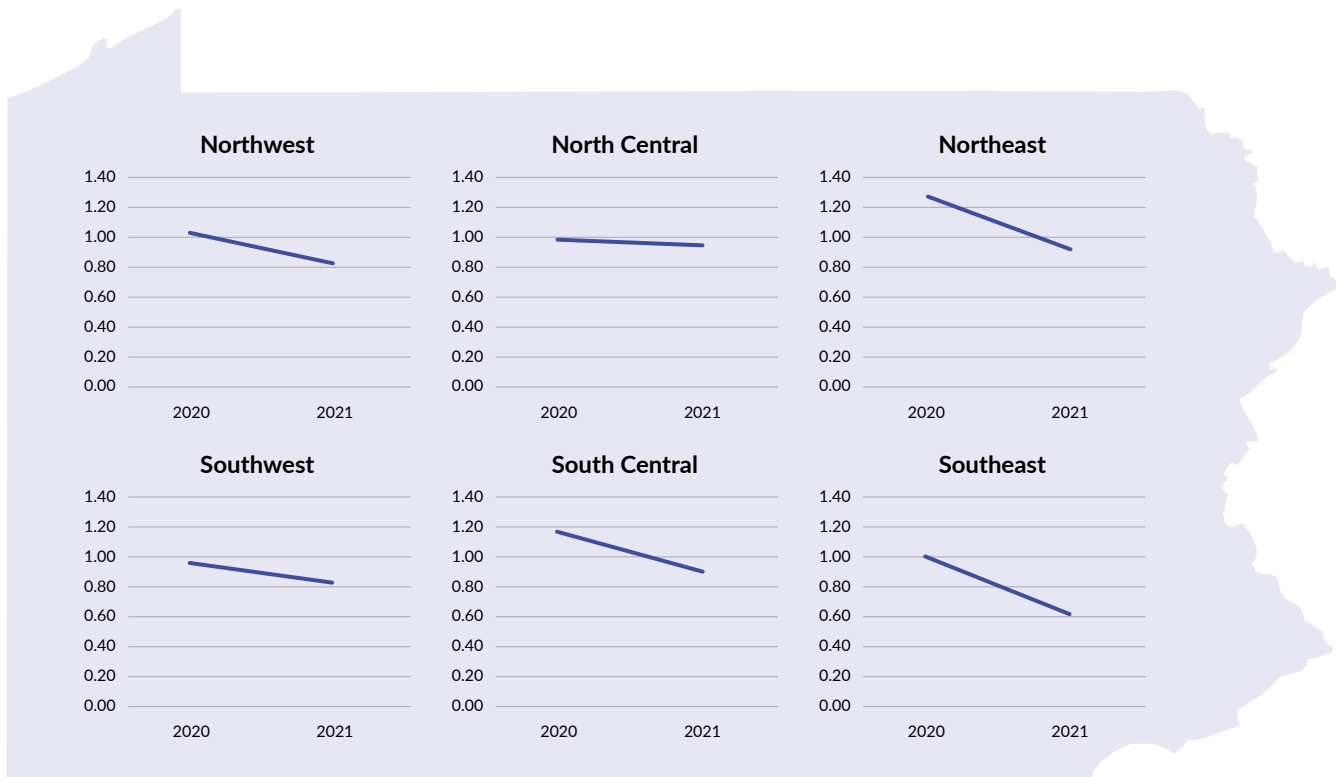
**Figure 1.** LTC Infection Reports Submitted to PA-PSRS by Year With Resident Days and Overall Infection Rates (per 1,000 Resident Days)



**Note:** Numbers shown for prior years may differ from previously published numbers due to receipt of data or changes to reports made by reporting facilities after the data cutoff date for prior publications.

<sup>a</sup>PA-PSRS is a secure, web-based system through which Pennsylvania long-term care facilities submit reports of healthcare-associated infections in accordance with mandatory reporting laws outlined in the Medical Care Availability and Reduction of Error (MCARE) Act (Act 52 of 2007).<sup>1</sup> All reports submitted through PA-PSRS are confidential and no information about individual facilities or providers is made public.

**Figure 2.** PA-PSRS LTC Infection Rates per 1,000 Resident Days by Region—2020 Versus 2021



**Table 1.** LTC Infection Reports Submitted to PA-PSRS and Infection Rates per 1,000 Resident Days by Region

Region	2020 Infection Reports	2020 Rate per 1,000 Resident Days	2021 Infection Reports	2021 Rate per 1,000 Resident Days
North Central	1,547	0.98	1,289	0.94
Northeast	4,164	1.28	2,689	0.91
Northwest	2,564	1.04	1,722	0.84
South Central	4,034	1.18	2,841	0.90
Southeast	9,287	1.00	5,643	0.62
Southwest	4,735	0.95	3,787	0.83
<b>Total</b>	<b>26,331</b>	<b>1.06</b>	<b>17,971</b>	<b>0.78</b>

**Note:** Numbers shown for prior years may differ from previously published numbers due to receipt of data or changes to reports made by reporting facilities after the data cutoff date for prior publications.

## LTC Healthcare-Associated Infection Subtypes

**Table 2** shows the number of reports for all infection subtypes. The most frequently reported subtype in 2021 was cellulitis, soft tissue, or wound infection, followed by symptomatic urinary tract infection (SUTI) and pneumonia. The number of reports for all infection subtypes decreased from 2020 to 2021, except for scabies, which increased by 9 reports (7.1%). Lower respiratory tract infection (LRTI) showed the greatest decrease in number of reports from 2020 to 2021, with 2,553 fewer reports. In terms of percentage, influenza-like illness had the greatest decrease, dropping 93.9% from 2020 to 2021.

### Care Area

**Table 3** shows the distribution of 2021 reports by infection type and care area. Skilled nursing/short-term rehabilitation units accounted for the largest proportion of infections (6,412 of 17,971; 35.7%). In 2021, skin and soft tissue infections were reported more than any other infection type in all care areas except ventilator-dependent units, in which respiratory tract infections were most frequently reported. **Table 4** shows the 2021 distribution of infection reports by infection subtype and care area. Cellulitis, soft tissue, or wound infection accounted for the largest number of reports in all units except for ventilator-dependent units, in which pneumonia was the most frequently reported infection subtype.

### LTC Healthcare-Associated Infection Rates

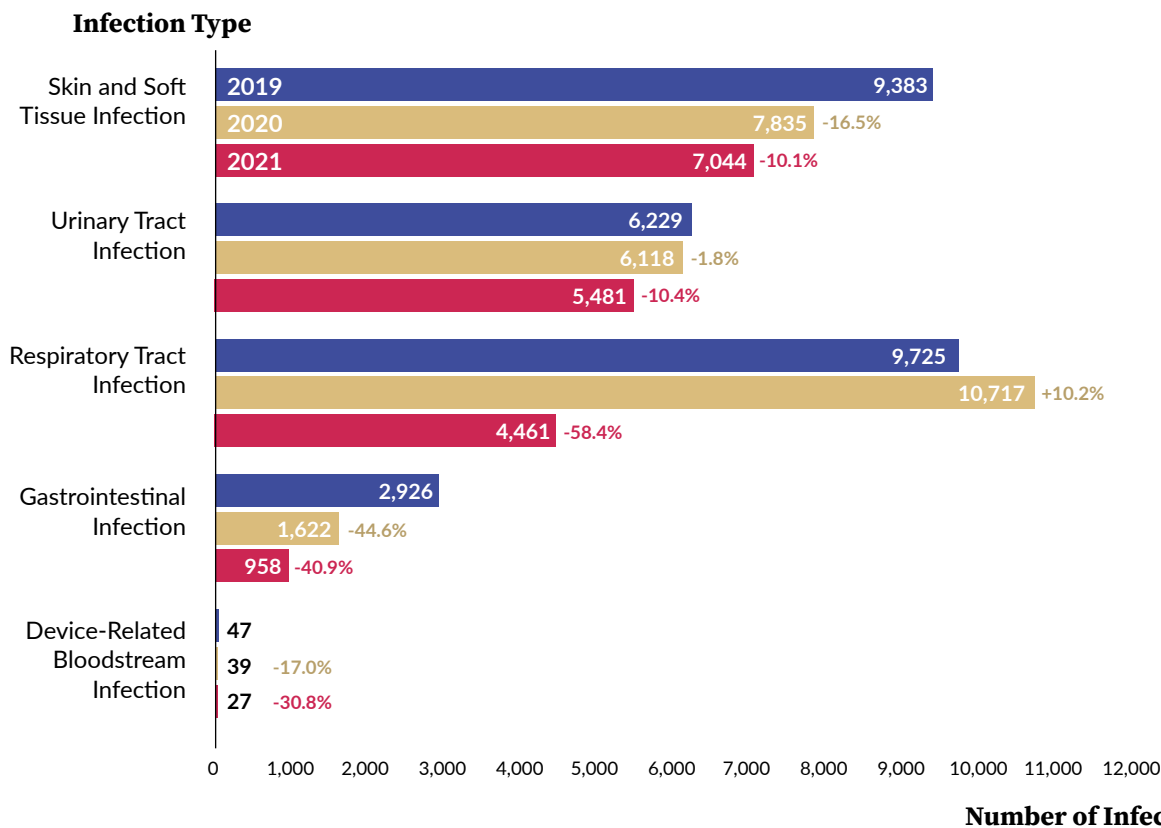
**Figure 4** shows infection rates per 1,000 resident days for the five infection types for 2019 through 2021. All rates decreased from 2020 to 2021, with respiratory tract infection showing the largest decrease.

In **Figure 5** and **Table 5**, the rates are shown for each infection subtype for 2019 through 2021. The infection rate for cellulitis, soft tissue, or wound infection increased the most from 2020 to 2021, and the rate for catheter-associated urinary tract infection (CAUTI) had the greatest decrease. The rates for three infection subtypes decreased in both 2020 and 2021: conjunctivitis, central line-associated blood stream infection (CLABSI), and norovirus.

In **Table 6**, the infection rates are displayed by year based on care area and infection subtype. Five of the seven care area and infection subtype rates that increased in both 2020 and 2021 occurred in the ventilator-dependent units, with the largest two-year increase from 2019 to 2021 and the largest one-year increase from 2020 to 2021 occurring with LRTI in ventilator-dependent units. We recommend some caution when interpreting rate changes for ventilator-dependent units, as the total number of reported infections is relatively small. Many rates decreased from 2020 to 2021, with the largest decrease being the CAUTI rate in dementia units.

**Figure 6** and **Table 7** display the infection rates for influenza, influenza-like illness, pneumonia, LRTI, and norovirus by quarter for 2019 through 2021. These rates are calculated as the number of infections confirmed, using the infection confirmation date, by quarter, per 1,000 resident days. The increase in influenza and influenza-like illness rates from Q4 2019 to Q2 2020 is consistent with the usual influenza season in Pennsylvania. The large increase in pneumonia and LRTI rates in Q2 2020 reflects the impact of the COVID-19 outbreaks in Pennsylvania LTC facilities. The extremely low numbers of reported influenza and influenza-like illness from Q3 2020 through Q2 2021 is inconsistent with what is usually seen during seasonal influenza in Pennsylvania.

**Figure 3. LTC Infection Reports Submitted to PA-PSRS by Infection Type and Year**



**Note:** Numbers shown for prior years may differ from previously published numbers due to receipt of data or changes to reports made by reporting facilities after the data cutoff date for prior publications.

**Table 2.** LTC Infection Reports Submitted to PA-PSRS and Percentage Distribution by Infection Subtype and Year

Infection Type	Infection Subtype	Number of Reports			% of Total			Change in Reports 2020 to 2021	
		2019	2020	2021	2019	2020	2021	Number	Percent
Skin and Soft Tissue Infection	Cellulitis, soft tissue, or wound infection	6,039	5,180	4,951	21.3%	19.7%	27.5%	-229	-4.4%
	Conjunctivitis	3,157	2,528	1,957	11.2%	9.6%	10.9%	-571	-22.6%
	Scabies	187	127	136	0.7%	0.5%	0.8%	9	7.1%
Urinary Tract Infection	SUTI	4,939	4,715	4,288	17.4%	17.9%	23.9%	-427	-9.1%
	CAUTI	1,136	1,251	1,052	4.0%	4.8%	5.9%	-199	-15.9%
	ABUTI	154	152	141	0.5%	0.6%	0.8%	-11	-7.2%
Respiratory Tract Infection	Pneumonia	5,282	4,862	3,004	18.7%	18.5%	16.7%	-1,858	-38.2%
	LRTI	2,874	3,769	1,216	10.2%	14.3%	6.8%	-2,553	-67.7%
	Influenza	1,409	1,432	201	5.0%	5.4%	1.1%	-1,231	-86.0%
	Influenza-Like Illness	160	654	40	0.6%	2.5%	0.2%	-614	-93.9%
Gastrointestinal Infection	<i>C. diff</i>	1,358	961	883	4.8%	3.6%	4.9%	-78	-8.1%
	Norovirus	1,550	647	70	5.5%	2.5%	0.4%	-577	-89.2%
	Bacteriologic gastroenteritis	18	14	5	0.1%	0.1%	0.0%	-9	-64.3%
Device-Related Bloodstream Infection	CLABSI	47	39	27	0.2%	0.1%	0.2%	-12	-30.8%
<b>Totals</b>		<b>28,310</b>	<b>26,331</b>	<b>17,971</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>-8,360</b>	<b>-31.7%</b>

**Note:** Numbers shown for prior years may differ from previously published numbers due to receipt of data or changes to reports made by reporting facilities after the data cutoff date for prior publications.

LRTI = Lower Respiratory Tract Infection  
 SUTI = Symptomatic Urinary Tract Infection  
 CAUTI = Catheter-Associated Urinary Tract Infection  
 ABUTI = Asymptomatic Bacteremic Urinary Tract Infection  
 CLABSI = Central Line-Associated Blood Stream Infection

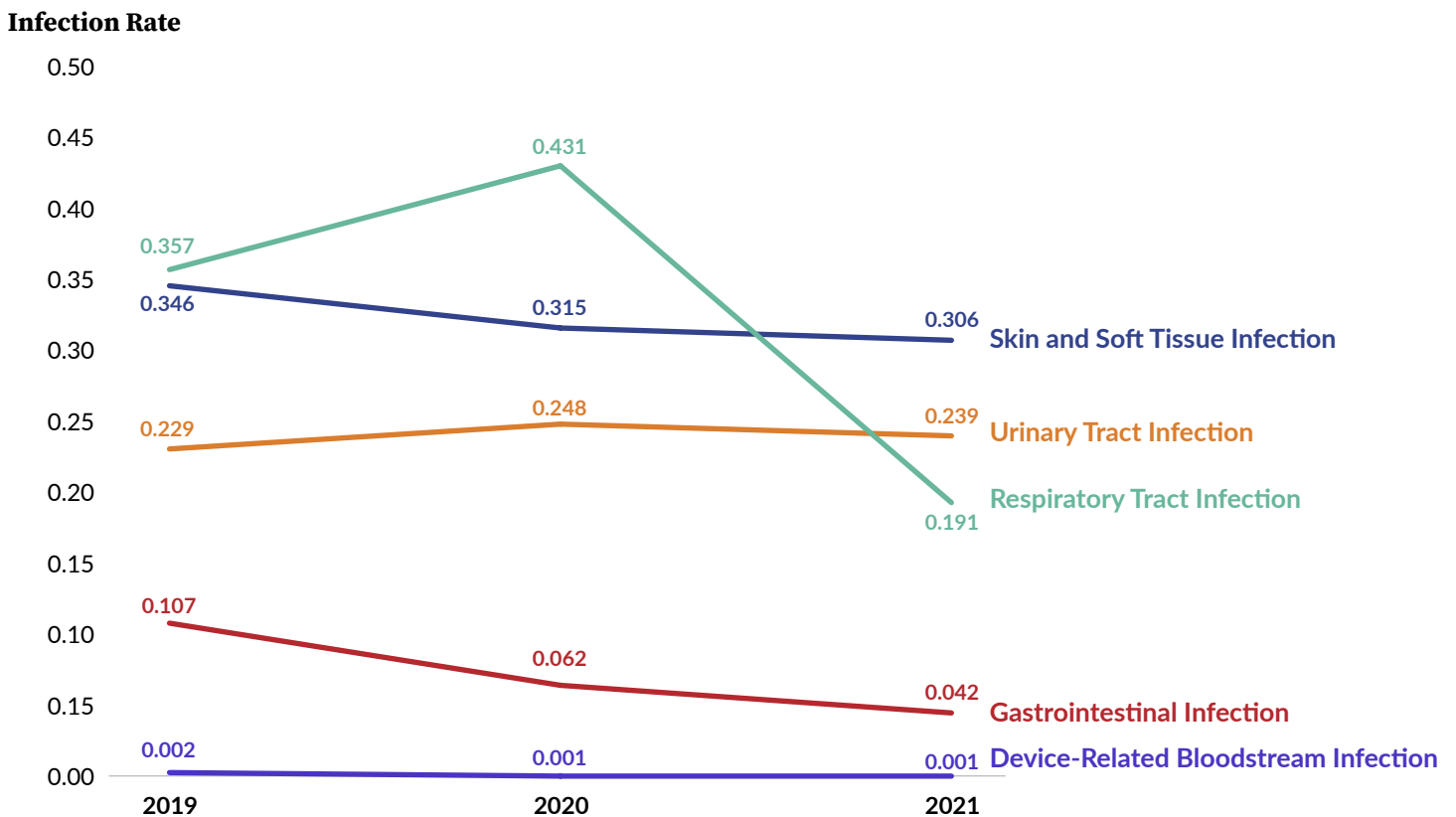
**Table 3.** LTC Infection Reports Submitted to PA-PSRS in 2021 by Infection Type and Care Area

Infection Type	Skilled Nursing/ Short-Term Rehabilitation Unit	Mixed Unit	Nursing Unit	Dementia Unit	Ventilator- Dependent Unit	Total
Skin and Soft Tissue Infection	2,363	2,049	2,021	488	123	7,044
Urinary Tract Infection	2,005	1,628	1,547	233	68	5,481
Respiratory Tract Infection	1,633	1,118	1,225	217	268	4,461
Gastrointestinal Infection	393	265	247	24	29	958
Device-Related Bloodstream Infection	18	7	1	1	-	27
<b>Total</b>	<b>6,412</b>	<b>5,067</b>	<b>5,041</b>	<b>963</b>	<b>488</b>	<b>17,971</b>

**Table 4.** LTC Infection Reports Submitted to PA-PSRS in 2021 by Infection Subtype and Care Area

Infection Subtype	Skilled Nursing/ Short-Term Rehabilitation Unit	Mixed Unit	Nursing Unit	Dementia Unit	Ventilator- Dependent Unit	Total
Cellulitis, Soft Tissue, or Wound Infection	1,720	1,436	1,457	285	53	4,951
SUTI	1,559	1,306	1,202	205	16	4,288
Pneumonia	1,060	790	839	162	153	3,004
Conjunctivitis	608	573	529	177	70	1,957
LRTI	459	263	330	49	115	1,216
CAUTI	405	286	293	20	48	1,052
<i>C. diff</i>	376	247	207	24	29	883
Influenza	100	63	34	4	-	201
ABUTI	41	36	52	8	4	141
Scabies	35	40	35	26	-	136
Norovirus	13	17	40	-	-	70
Influenza-Like Illness	14	2	22	2	-	40
CLABSI	18	7	1	1	-	27
Bacteriologic Gastroenteritis	4	1	-	-	-	5
<b>All</b>	<b>6,412</b>	<b>5,067</b>	<b>5,041</b>	<b>963</b>	<b>488</b>	<b>17,971</b>

**Figure 4.** LTC Infection Rates per 1,000 Resident Days by Infection Type

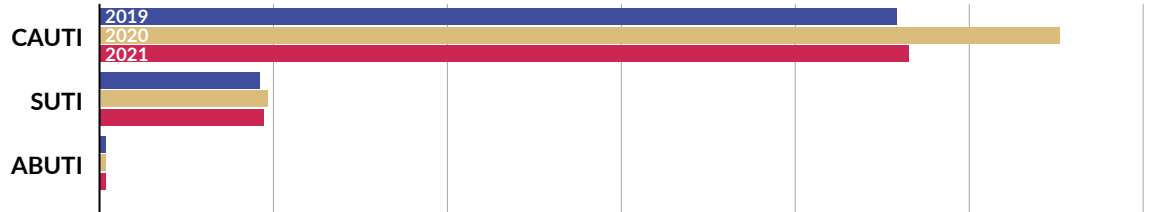


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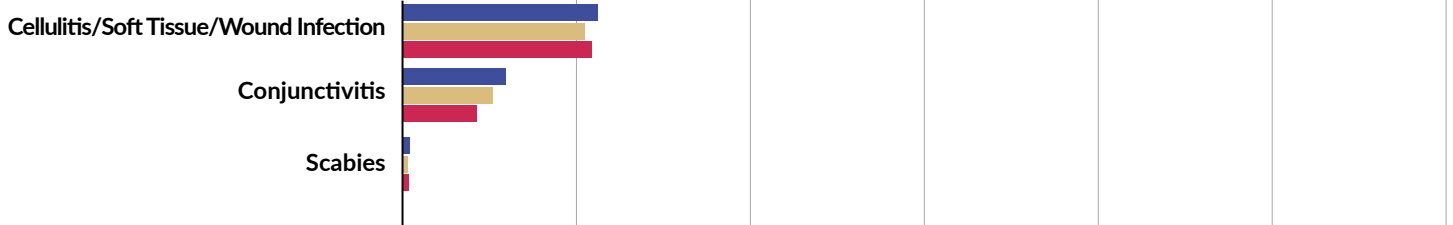
Figure 5. LTC Infection Rates per 1,000 Resident or Device Days by Infection Subtype and Year

**Infection Subtype**

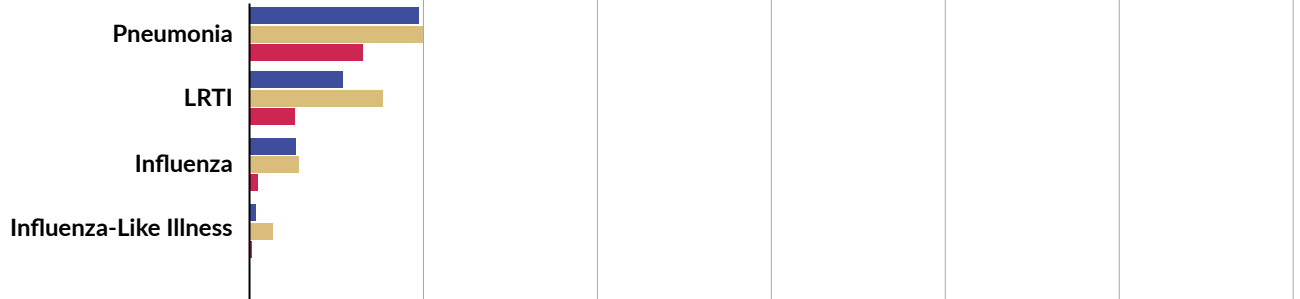
Urinary Tract Infection



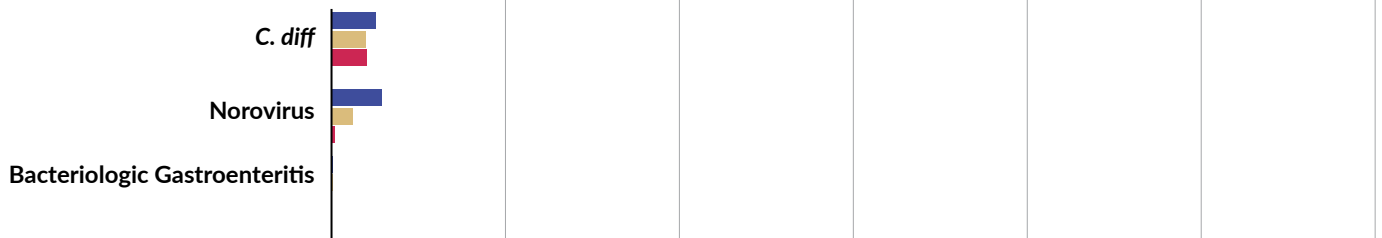
Skin and Soft Tissue Infection



Respiratory Tract Infection



Gastrointestinal Infection



Device-Related Bloodstream Infection



**Infection Rate**

Note: Numbers shown for prior years may differ from previously published numbers due to receipt of data or changes to reports made by reporting facilities after the data cutoff date for prior publications.

**Table 5.** LTC Infection Rates per 1,000 Resident or Device Days by Infection Subtype and Year in Descending Order by 2021 Rates

Infection Subtype	2019	2020	2021
CAUTI	0.911	1.098	0.925
Cellulitis, Soft Tissue, or Wound Infection	0.222	0.208	0.216
SUTI	0.182	0.191	0.187
Pneumonia	0.193	0.197	0.129
Conjunctivitis	0.117	0.102	0.084
CLABSI	0.097	0.095	0.060
LRTI	0.106	0.152	0.051
<i>C. diff</i>	0.050	0.038	0.039
Influenza	0.052	0.055	0.009
ABUTI	0.006	0.006	0.006
Scabies	0.007	0.005	0.006
Norovirus	0.057	0.023	0.003
Influenza-Like Illness	0.006	0.026	0.002
Bacteriologic Gastroenteritis	0.001	0.001	<0.001

**Note:** Numbers shown for prior years may differ from previously published numbers due to receipt of data or changes to reports made by reporting facilities after the data cutoff date for prior publications.



**Table 6.** LTC Infection Rates per 1,000 Resident or Device Days by Care Area, Infection Subtype, and Year

Care Area	Infection Subtype	2019	2020	2021
<b>Dementia Unit</b>	ABUTI	0.004	0.005	0.004
	Bacteriologic Gastroenteritis	-	<0.001	-
	<i>C. diff</i>	0.016	0.015	0.012
	CAUTI	1.133	1.105	0.453
	CLABSI	-	-	-
	Cellulitis, Soft Tissue, or Wound Infection	0.165	0.149	0.152
	Conjunctivitis	0.127	0.107	0.091
	Influenza-Like Illness	0.006	0.032	0.001
	Influenza	0.040	0.044	0.002
	LRTI	0.102	0.136	0.027
	Norovirus	0.098	0.045	-
	Pneumonia	0.146	0.147	0.085
	SUTI	0.127	0.122	0.108
	Scabies	0.012	0.005	0.014
<b>Mixed Unit</b>	ABUTI	0.006	0.007	0.006
	Bacteriologic Gastroenteritis	0.001	0.001	<0.001
	<i>C. diff</i>	0.042	0.043	0.040
	CAUTI	0.841	1.256	0.956
	CLABSI	0.039	0.062	0.052
	Cellulitis, Soft Tissue, or Wound Infection	0.226	0.215	0.228
	Conjunctivitis	0.126	0.108	0.089
	Influenza-Like Illness	0.007	0.022	<0.001
	Influenza	0.055	0.041	0.011
	LRTI	0.110	0.143	0.040
	Norovirus	0.065	0.016	0.003
	Pneumonia	0.201	0.200	0.123
	SUTI*	0.183	0.204	0.207
	Scabies	0.006	0.002	0.006
<b>Nursing Unit</b>	ABUTI*	0.005	0.005	0.007
	Bacteriologic Gastroenteritis	0.001	0.001	-
	<i>C. diff</i>	0.042	0.025	0.028
	CAUTI	0.751	0.943	0.864
	CLABSI	0.130	0.151	0.014
	Cellulitis, Soft Tissue, or Wound Infection	0.200	0.183	0.201
	Conjunctivitis	0.103	0.093	0.072
	Influenza-Like Illness	0.005	0.023	0.002
	Influenza	0.047	0.057	0.005
	LRTI	0.098	0.139	0.042
	Norovirus	0.049	0.033	0.006
	Pneumonia	0.157	0.164	0.110
	SUTI	0.150	0.164	0.164
	Scabies	0.006	0.005	0.005

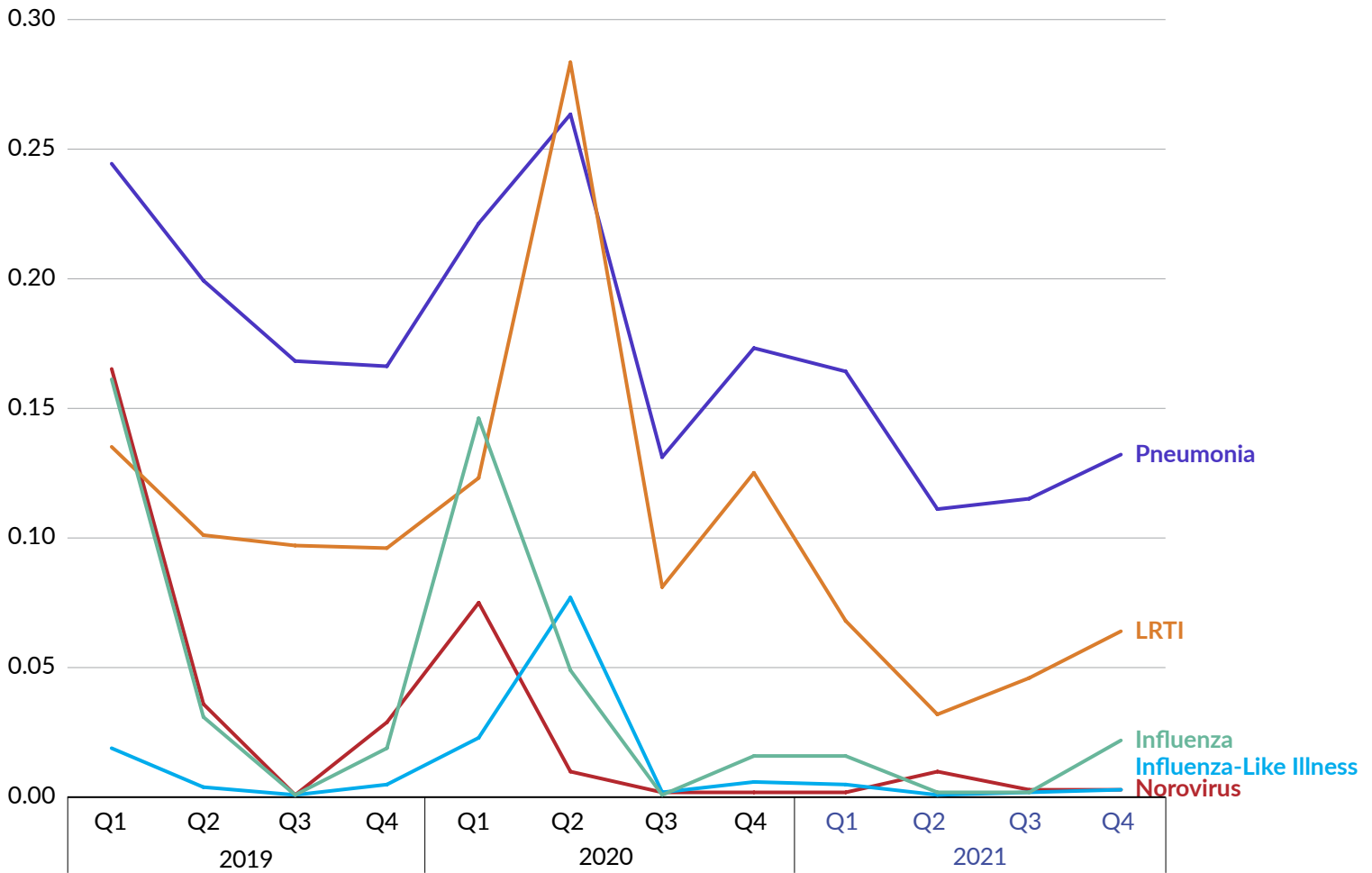
Table 6 (continued).

Care Area	Infection Subtype	2019	2020	2021
Skilled Nursing/ Short-Term Rehabilitation Unit	ABUTI	0.007	0.007	0.006
	Bacteriologic Gastroenteritis	0.001	<0.001	0.001
	<i>C. diff</i>	0.071	0.050	0.052
	CAUTI	1.009	1.054	0.950
	CLABSI	0.101	0.095	0.092
	Cellulitis, Soft Tissue, or Wound Infection	0.252	0.239	0.233
	Conjunctivitis	0.119	0.100	0.083
	Influenza-Like Illness	0.007	0.030	0.002
	Influenza	0.056	0.070	0.014
	LRTI	0.109	0.169	0.061
	Norovirus	0.047	0.014	0.002
	Pneumonia	0.223	0.226	0.145
	SUTI	0.225	0.225	0.214
	Scabies	0.007	0.008	0.005
Ventilator-Dependent Unit	ABUTI	0.007	0.006	0.027
	Bacteriologic Gastroenteritis	-	-	-
	<i>C. diff</i> *	0.122	0.141	0.193
	CAUTI	1.730	1.785	1.446
	CLABSI	0.724	-	-
	Cellulitis, Soft Tissue, or Wound Infection*	0.259	0.340	0.367
	Conjunctivitis*	0.231	0.289	0.414
	Influenza-Like Illness	-	0.006	-
	Influenza	0.058	0.019	-
	LRTI*	0.339	0.449	0.787
	Norovirus	-	-	-
	Pneumonia*	0.720	0.892	1.054
	SUTI	0.043	0.109	0.107
	Scabies	-	-	-

**Note:** When a dash “-” appears in a cell within the table, it means that the rate is exactly zero. If “< 0.001” appears in a cell, it means that the rate is greater than zero but less than 0.001. Shading is used to indicate the higher rates and can be used to see year-over-year changes for particular rows. Numbers shown for prior years may differ from previously published numbers due to receipt of data or changes to reports made by reporting facilities after the data cutoff date for prior publications. Care area and infection subtype rates that increased in both 2020 and 2021 are marked with an asterisk.

**Figure 6.** LTC Infection Rates per 1,000 Resident Days Trending for Seasonal Infection Subtypes by Infection Confirmation Quarter

**Infection Rate**



**Note:** Numbers shown for prior years may differ from previously published numbers due to receipt of data or changes to reports made by reporting facilities after the data cutoff date for prior publications.

**Table 7.** Overall LTC Seasonal Infection Rates per 1,000 Resident Days by Year

	Influenza	Influenza-Like Illness	LRTI	Norovirus	Pneumonia
<b>2019 Q1</b>	0.160	0.018	0.134	0.164	0.243
Q2	0.030	0.003	0.100	0.035	0.198
Q3	0.000	0.000	0.096	0.000	0.167
Q4	0.018	0.004	0.095	0.028	0.165
<b>2020 Q1</b>	0.145	0.022	0.122	0.074	0.220
Q2	0.048	0.076	0.282	0.009	0.262
Q3	0.000	0.001	0.080	0.001	0.130
Q4	0.015	0.005	0.124	0.001	0.172
<b>2021 Q1</b>	<b>0.015</b>	<b>0.004</b>	<b>0.067</b>	<b>0.001</b>	<b>0.163</b>
Q2	<b>0.001</b>	<b>0.000</b>	<b>0.031</b>	<b>0.009</b>	<b>0.110</b>
Q3	<b>0.001</b>	<b>0.001</b>	<b>0.045</b>	<b>0.002</b>	<b>0.114</b>
Q4	<b>0.021</b>	<b>0.002</b>	<b>0.063</b>	<b>0.002</b>	<b>0.131</b>

**Note:** Numbers shown for prior years may differ from previously published numbers due to receipt of data or changes to reports made by reporting facilities after the data cutoff date for prior publications.

## Discussion

At this time, we do not know whether decreases in the number of infection reports and infection rates are reflective of fewer infections in LTC facilities or a lack of identifying and reporting infections, or a combination of both. The COVID-19 pandemic brought about a focus on infection prevention, an awareness of the need to follow best practices, and guidance that mandated isolation and the wearing of personal protective equipment (PPE). It is possible the wearing of PPE, especially masks, contributed to a decrease in the transmission of respiratory infections during this time. Another possibility is the frequent turnover of infection preventionists (IPs) in LTC, as noted by the Patient Safety Authority (PSA) IPs during their work with LTC IPs throughout the pandemic. This increase in new, inexperienced IPs, along with staffing shortages in LTC facilities, results in less time dedicated to infection prevention activities and lack of knowledge in basic IP activities, such as surveillance for infections. PSA IPs will continue to work with LTC IPs to provide support, education, and tools to assist them in their role.

## Conclusion

Pennsylvania's LTC facilities reported 17,971 healthcare-associated infections in PA-PSRS in 2021. This represents a 31.7% decrease in reports from 2020. All five main infection types decreased from 2020 to 2021. The infection subtype with the greatest decrease in number of reports was LRTI, which had 2,553 fewer reports in 2021. In terms of percentage, the largest decrease was seen with influenza-like illness, dropping by 93.9% from 2020 to 2021. Scabies was the only infection subtype that had an increase—albeit relatively minor—in number of reports. Overall, the reporting rate from LTC facilities decreased notably from 1.06 in 2020 to 0.78 in 2021, due in large part to a drop in respiratory tract infections, which had an infection rate of 0.431 in 2020 and 0.191 in 2021. The cellulitis, soft tissue, or wound infection subtype increased the most

from 2020 to 2021, and the CAUTI rate had the greatest decrease. Ventilator-dependent units had increases in five infection subtypes in both 2020 and 2021. It is unclear whether the notable decreases in reporting numbers and rates in 2021 are truly representative of a decrease in the number of infections occurring in Pennsylvania LTC facilities or if there may have been a lack of identifying and reporting infections. PSA infection preventionists (IPs) continue to work with LTC IPs to provide support, education, and tools to assist them in their role.

## Note

This analysis was exempted from review by the Advarra Institutional Review Board.

## References

1. Pennsylvania Department of Health. Medical Care Availability and Reduction of Error (MCARE) Act, Pub. L. No. 154 Stat. 13 (2002). DOH website. <https://www.health.pa.gov/topics/Documents/Laws%20and%20Regulations/Act%2013%20of%202002.pdf>. Published 2002. Accessed April 28, 2022.

## About the Authors

**Shawn Kepner** (shawkepner@pa.gov) is a statistician at the Patient Safety Authority.

**JoAnn Adkins** is a registered nurse and a senior infection preventionist for the Patient Safety Authority.

**Rebecca Jones** is director of Data Science and Research at the Patient Safety Authority (PSA) and founder and director of the PSA's Center of Excellence for Improving Diagnosis.