

Connecting Emerging COVID-19 Data to Insured Claims

April 15, 2020 (revised 4/16/2020)





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Updates since initial 4/15/2020 release

April 16, 2020

- Comparing past flu seasons – average deaths across flu seasons of 19,400 corrected to 190,400.
- Figure 5 and commentary – flu/pneumonia deaths updated to remove flu/pneumonia deaths that also included a COVID-19 cause of death.

Introduction

Over the past month, the evolution of the COVID-19 pandemic has raised questions on how this outbreak will impact life insurance industry claims. Data on deaths and hospitalization rates are reported throughout the media, but is often in an aggregated form and not at a level that is useful for actuaries. Data by factors such as by age, gender, and other factors are emerging, but lags the data reported on the nightly news. Until this more detailed data on COVID-19 becomes readily available, other publicly available data may prove useful to compare to and benchmark against emerging COVID-19 data for the purpose of estimating future insurance claims.

Data on past influenza seasons are available and can be compared to the emerging COVID-19 data. This comparison, along with information on the impact of past flu seasons on an insurer's block, can be used to get a sense of how this pandemic will likely impact their future insurance claims. In addition, the relationship between U.S. population mortality and insured mortality may be useful in providing a connection between U.S. population influenza data, emerging COVID-19 data, and life insurance claims. This report uses publicly available U.S. population data and insured data to give the reader a sense of the information that is readily available to help determine a connection between emerging COVID-19 data, past influenza data, and existing population and insured mortality.

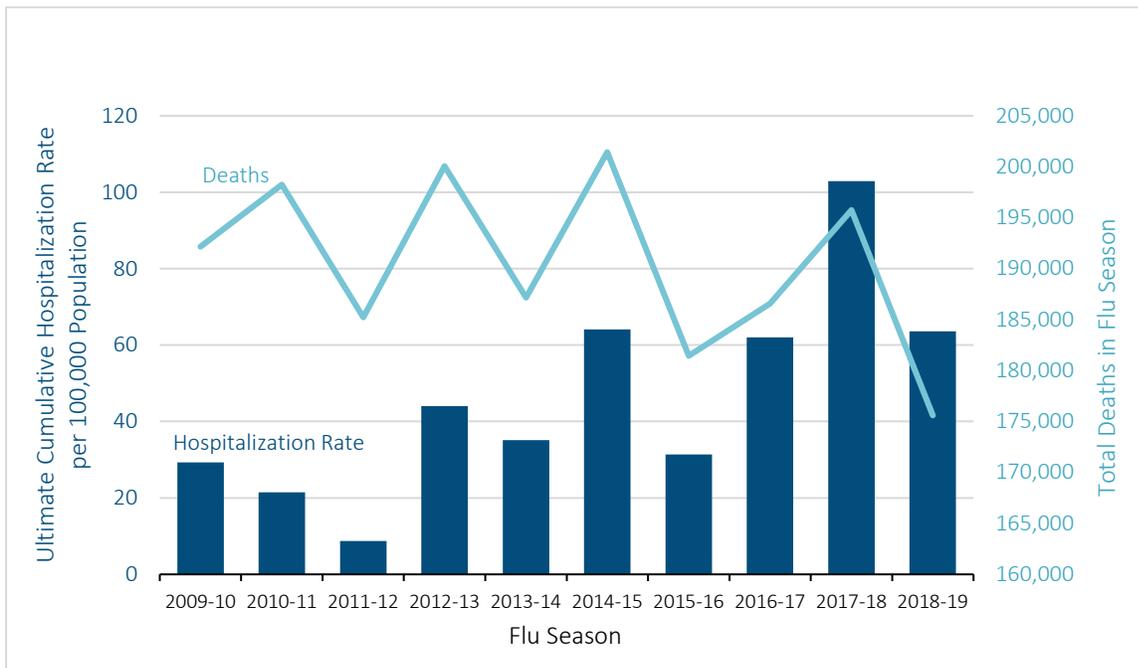
This report pulls emerging U.S. COVID-19 hospitalization data and deaths obtained from the Centers for Disease Control and Prevention's (CDC) COVIDView, a Weekly Surveillance Summary of U.S. COVID-19 activity¹, and compares it to data from past U.S. influenza seasons obtained from the CDC's Flu Activity and Surveillance webpage². Deaths from pneumonia are included with influenza deaths in the flu surveillance because some deaths due to pneumonia impact influenza death and mortality trends.³ The COVID-19 deaths shown in this report are provisional counts based on the current flow of mortality data in the National Vital Statistics System and may differ from other published sources, as data are currently lagging by an average of one to two weeks. Flu and pneumonia deaths are provided with the COVID-19 deaths for comparison purposes.

This report also provides U.S. population mortality data for county level income quintiles. The relationships between the quintile mortality rates and the total population mortality rates can be used to tie U.S. population influenza deaths to insured populations, assuming the income level of the insureds is known. In addition, data from the American Council of Life Insurers (ACLI) and SCOR Reinsurance Company are included to provide another set of information to benchmark population data against insured data.

Comparing Past Flu Seasons

Each flu season is unique. The total number of deaths and cumulative hospitalization rates provides an indication of the severity of each season. Figure 1 contains a comparison of the number of total deaths and cumulative hospitalization rate for the 10 flu seasons ending in 2010 through 2019. A flu season in the U.S. is measured by week and typically begins in week 40 of a calendar year and goes through week 39 of the following calendar year. Deaths over these 10 flu seasons have averaged 190,400 per season and have ranged between 175,600 and 201,400. The ultimate cumulative hospitalization rate has averaged 46.3 per 100,000 and ranged between 8.7 and 102.9 per 100,000 over these 10 seasons.

Figure 1
HOSPITALIZATIONS AND DEATHS BY FLU SEASON – TOTAL U.S. POPULATION



Data source: CDC

Subsequent sections of this report will focus on the 2009-2010, 2011-2012, 2014-2015, and 2017-2018 flu seasons. These four flu seasons were chosen because of their relative range in hospitalizations and deaths. The 2009-2010 pandemic had a relatively low number of hospitalizations and the number of deaths was ranked fifth in terms of number of deaths among these 10 flu seasons. The 2011-2012 season was relatively mild in terms of hospitalizations and deaths. The 2014-2015 and 2017-2018 seasons were relatively severe, both in terms of hospitalizations and deaths.

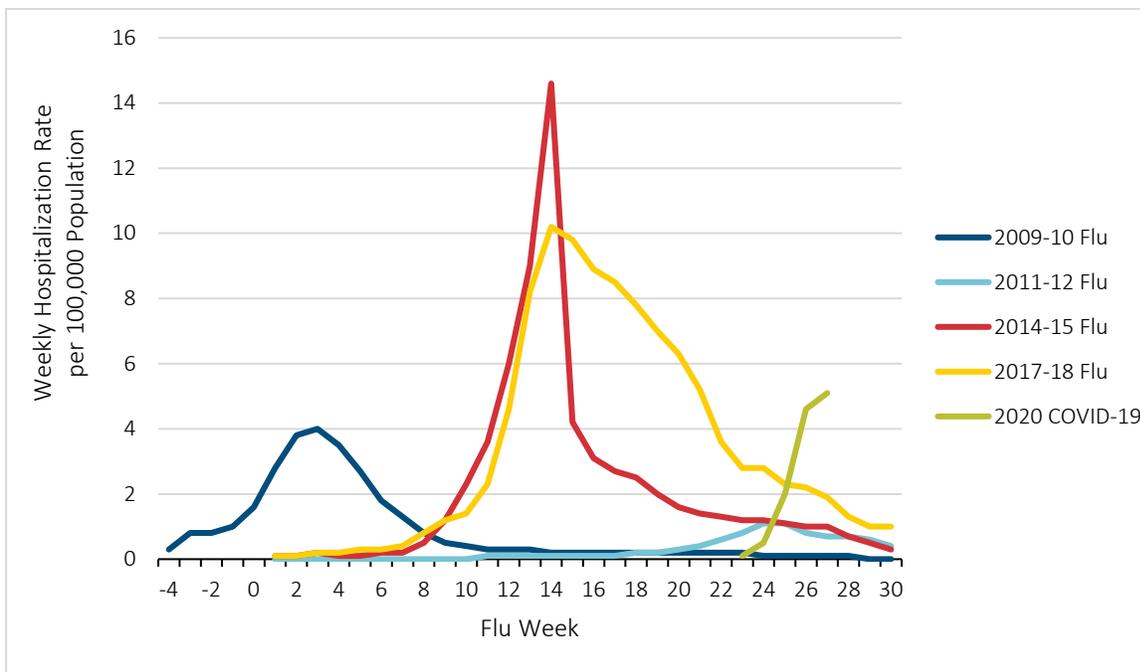
Hospitalizations of Past Flu Seasons vs. Emerging COVID-19 Data

Each influenza outbreak can differ by the time of year it will peak and the severity by age group. Figure 2 shows the weekly hospitalization rate for the total U.S. population for the four highlighted flu seasons. A flu season in the U.S. is measured by week and typically begins in week 40 of a calendar year through week 39 of the following calendar year. Week 40 in a calendar year will be the first flu week.

The 2009-2010 season was unusual in that it peaked early in flu week three, whereas the 2011–2012 flu-season peaked in flu week 24. The 2014-2015 season’s peak was quite severe at a rate of 14.6 per 100,000 hospitalizations in week 14, but dropped off quickly the following week. The 2017-2018 season also peaked in week 14 at a rate of 10.2 and dropped off slowly over the next eight weeks.

Results for the COVID-19 season have also been added to this graph and are available through April 4 or flu week 27. These results begin to appear in flu week 23, but because of the lag in reported data, this data may be updated in future weeks. The trend in COVID-19 hospitalizations is quite steep and has already surpassed the peak hospitalization rate of the 2009-2010 pandemic. As hospitalization data from other sources indicates, we can expect this increasing trend to continue in the coming weeks as the CDC surveillance data is updated.

Figure 2
WEEKLY HOSPITALIZATION RATE BY FLU SEASON – TOTAL U.S. POPULATION

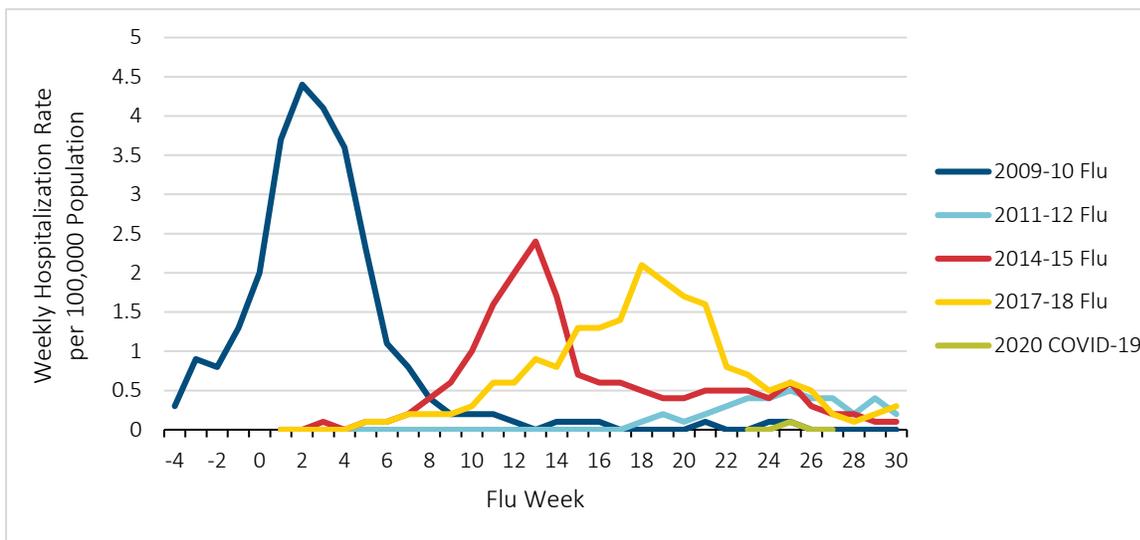


Data source: CDC

Weekly hospitalization rates also vary by age group as shown in Figure 3 for age group 5-17 and Figure 4 for age group 65-74. The 2009-2010 pandemic was unusual in that it impacted younger people more than other flu seasons. The 2009-2010 season also started earlier than the other highlighted seasons. Adjusting for the differences in the scales of the y-axis in the 2009-2010 season, the number of deaths for ages 65-74 was in the same magnitude as the 5-17 age group. The 2011-2012 flu season was mild for both younger and older age groups relative to other seasons.

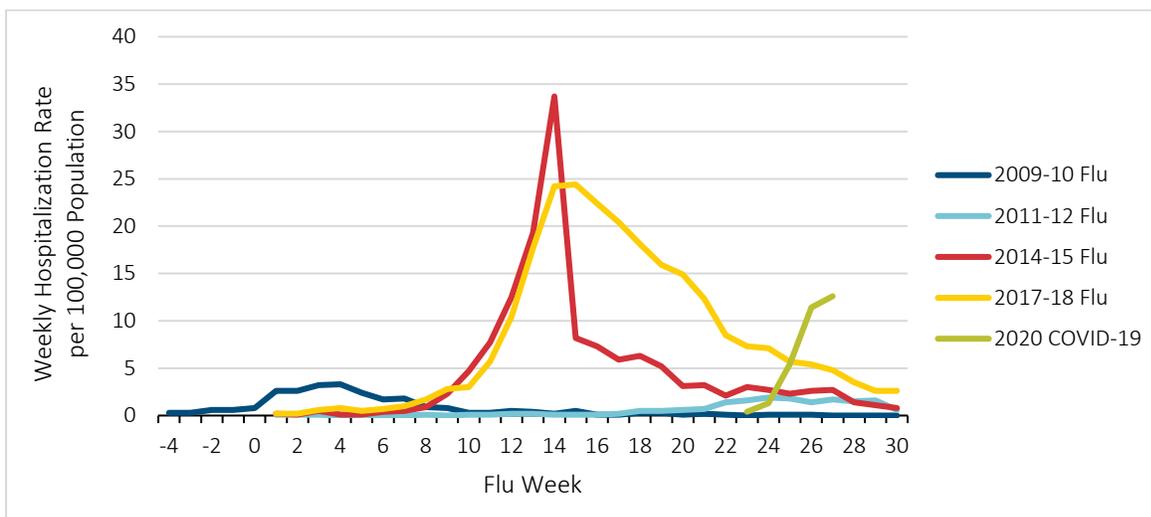
Emerging data on the COVID-19 pandemic has been included and indicates that older people are at greater risk of hospitalization than younger people. In week 27, the weekly hospitalization rate across all ages was at 12.6 hospitalizations per 100,000 and on an upward trajectory. To date, younger age groups appear to be impacted by COVID-19 less than other flu seasons but, again, data is just emerging.

Figure 3
WEEKLY HOSPITALIZATION RATE BY FLU SEASON – AGES 5-17



Data source: CDC

Figure 4
WEEKLY HOSPITALIZATION RATE BY FLU SEASON – AGES 65-74



Data source: CDC

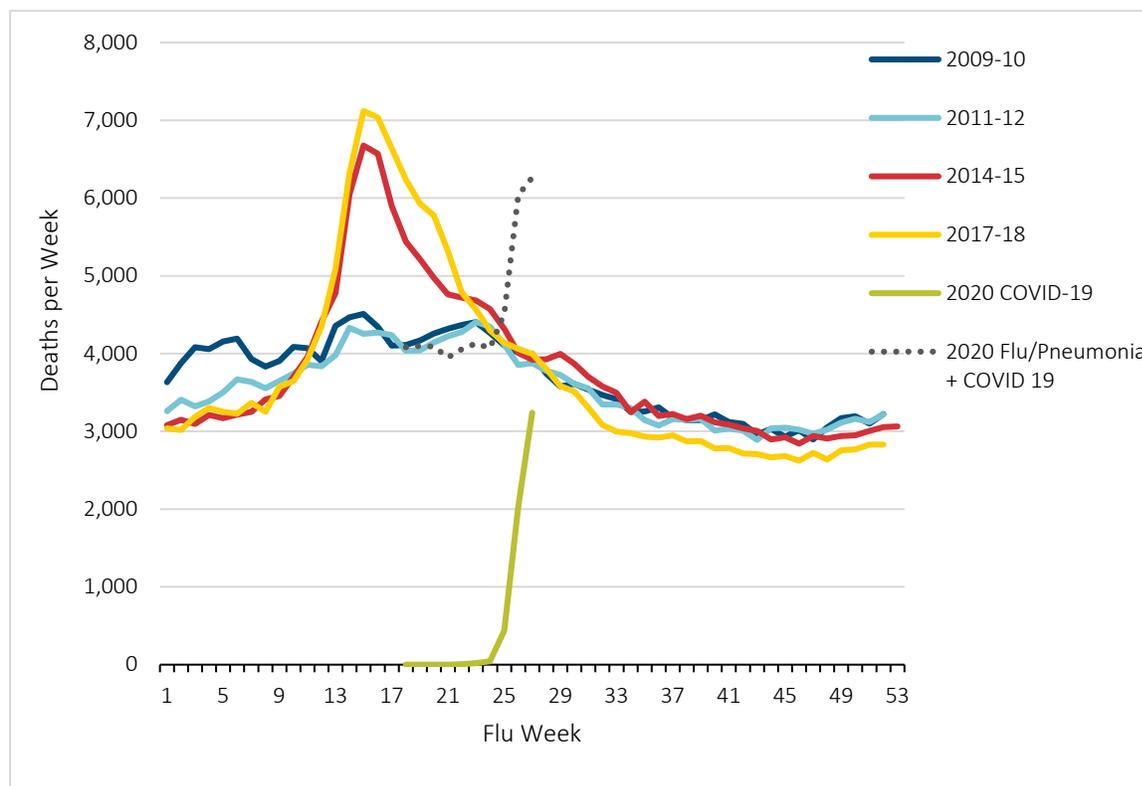
Deaths from Past Flu Seasons vs. Emerging COVID-19 Data

When looking at deaths, each flu season can vary by timing within the flu season and by severity. Figure 5 shows the weekly deaths for the total U.S. population for the four highlighted flu seasons. A flu season in the U.S. is measured by week and typically begins in week 40 of a calendar year through week 39 in the following calendar year. Week 40 in a calendar year will be the first flu week.

Deaths in the 2014-2015 and 2017-2018 flu seasons peaked in week 14, increasing by about 25% over the prior week. The week over week increases in the 2009-2010 and 2011-2012 seasons were much lower, with the largest increase of 8.8% occurring in week 14 of the 2011-2012 season.

Results for the COVID-19 deaths and 2020 flu/pneumonia deaths through flu week 27, or April 4, have been added to this graph. Flu/pneumonia deaths are included to provide context for understanding the completeness of COVID-19 mortality data and related trends. Deaths due to COVID-19 may be misclassified as flu or pneumonia deaths and the increase in flu/pneumonia deaths may be an indicator of excess COVID-19 related mortality. Weekly death data for COVID-19 increased greatly in weeks 26 and 27, as deaths from flu/pneumonia decreased, possibly indicating a shift from classifying some flu/pneumonia deaths to COVID-19 deaths. In week 27, the total flu/pneumonia plus COVID-19 deaths equaled 6,265 nearing the 2014-2015 flu season weekly high.

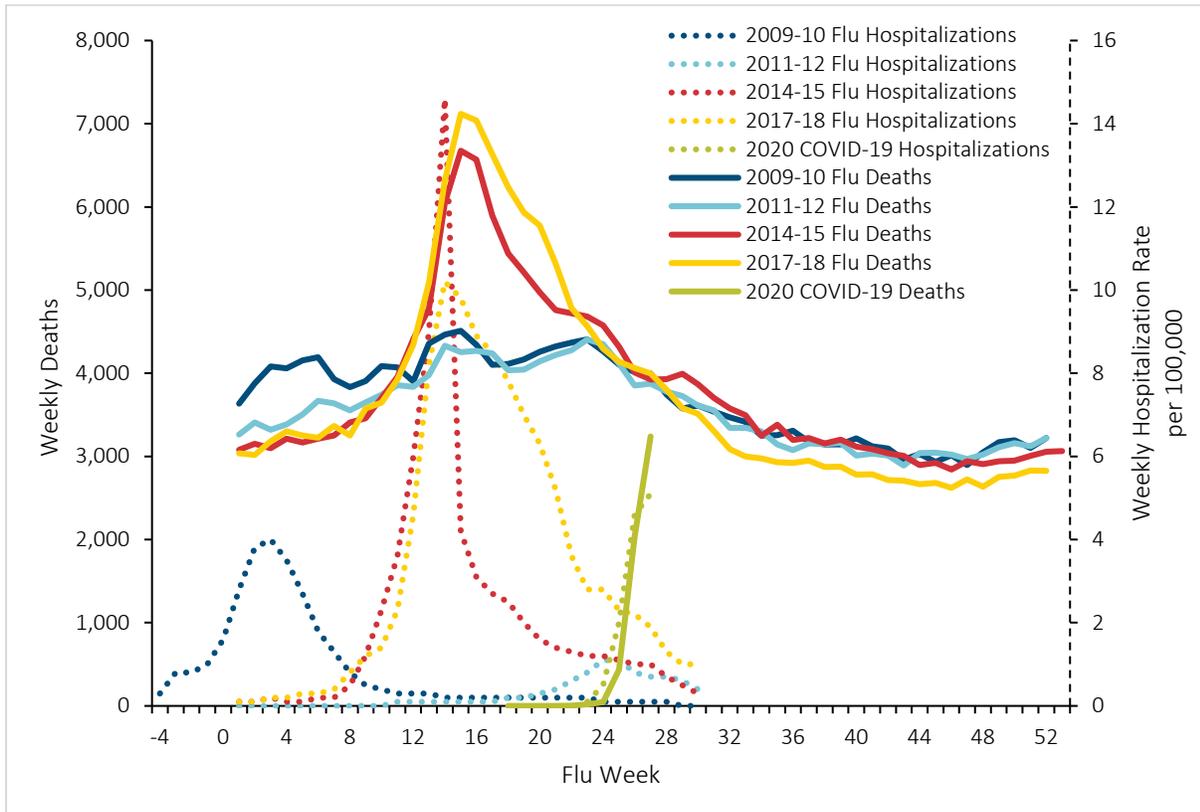
Figure 5
DEATHS PER FLU WEEK – TOTAL POPULATION



Data source: CDC

Figure 6 combines the weekly deaths and hospitalization rates for the four highlighted flu seasons. Hospitalizations were a leading indicator of deaths in flu seasons 2009-2010, 2014-2015, and 2017-2018. Even though there were relatively low levels of hospitalizations in the 2011-2012 season, there was a notable number of deaths. The COVID-19 deaths appear to be occurring simultaneously with hospitalizations. This is consistent with reports on how quickly people can succumb to this virus.

Figure 6
2017-2018 FLU SEASON DEATHS PER FLU WEEK BY AGE GROUP



Data source: CDC

U.S. Influenza and Pneumonia Population Data by County Level Quintiles

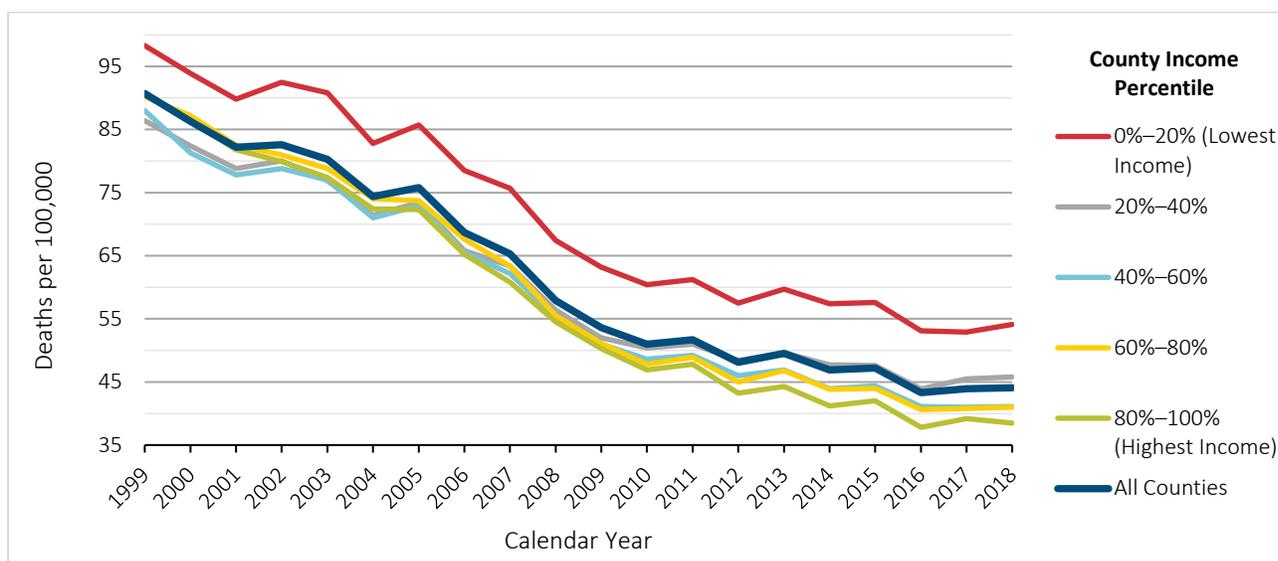
Research has shown that mortality experience varies by socioeconomic status. Using county level U.S. population mortality experience from the CDC⁴ and median household income data by county from the U.S. Census Bureau’s Small Area Income and Poverty Estimates Program⁵, historical mortality results by county level income group can be obtained. It should be noted that not all counties are homogeneous in terms of income level. Some large counties have large variations of income. Regardless, mortality shown by county income groupings may provide an indication of the variation of mortality by various income levels. Table 1 indicates the range of median household income levels of U.S. counties grouped into quintiles.

Table 1
MEDIAN HOUSEHOLD COUNTY LEVEL INCOME RANGES BY PERCENTILE GROUP⁶

Percentile Group	Low Income	High Income
0–20 th Percentile	19,021	42,289
20 th –40 th Percentile	42,289	47,621
40 th –60 th Percentile	47,621	54,728
60 th –80 th Percentile	54,728	63,854
80 th –100 th Percentile	63,854	112,891

Figure 8 demonstrates how flu and pneumonia death rates in the U.S. have varied historically by the five county level income percentile groups in Table 1. U.S. counties were ranked based on median household income. The 80%–100% group represents the quintile of counties with the highest income and the 0%–20% group is the quintile of counties with the lowest income. The bottom income quintile (0%–20%) has had significantly higher mortality, ranging from 8.4% to 22.7% higher, than the total population. The other quintile groups have clustered together, and their rank order has shifted over time. However, the top income quintile (80%–100%) has had the lowest mortality rates since 2005 and has ranged from 0.2% higher to 12.7% lower than the total population.

Figure 8
U.S. POPULATION DEATHS FROM FLU AND PNEUMONIA BY COUNTY INCOME PERCENTILE

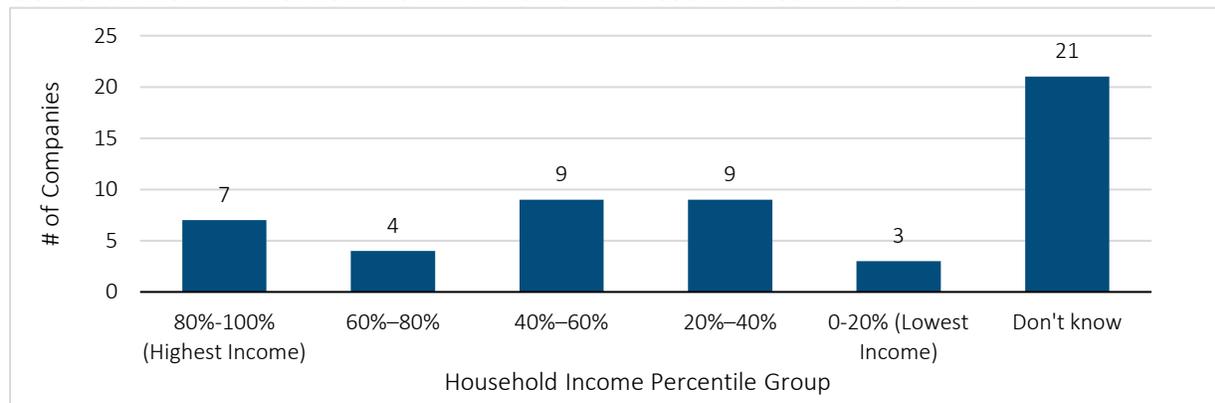


Data source: CDC

Insurers who can segment their policyholders into various income level groupings may be able to make use of U.S. population mortality data, shown in Figure 8, to benchmark their own flu/pneumonia experience. A survey completed by the SOA, LIMRA, Oliver Wyman, and the American Council of Life Insurers (ACLI)⁷ asked insurance companies for the estimated median household income range of their life insurance policyholders. Results varied across the board as shown in Figure 9 and indicates that each insurer needs to consider its own block of business if using population mortality for projecting COVID-19 impacts.

Figure 9

U.S. POPULATION DEATHS FROM FLU AND PNEUMONIA BY COUNTY INCOME PERCENTILE



Insured Mortality Compared to Population Mortality

In addition, it can be helpful to get an overall sense of full U.S. population mortality compared to how many of those deaths may drive an individual life insurance claim. In recent years, the number of deaths that have been annually recorded across the entire United States has eclipsed a count of 2.8 million. The strict number of recorded deaths has grown every year since 2009 as the U.S. population increases at a pace faster than overall crude mortality improvement. Age-adjusted mortality, computed by using techniques that standardize the counts of exposures of the population using a common census date, has seen some fluctuations in the degree of improvement over the last decade. Some recent years have seen examples of overall age-adjusted mortality disimprovement and small reductions in period life expectancy.

Clearly, however, not all people in the U.S. population are covered by individual life insurance policies. Many people may not purchase an individual policy due to the cost of the product relative to their income or wealth levels or covering the risk of premature death may not be a first priority. Others may desire to purchase the product but are not in a health condition needed to qualify through individual life insurance underwriting examinations.

By studying recent U.S. life insurance industry data and comparing the results to population mortality trends, the relative levels of mortality can be compared. Table 2 shows recent historical statistics on mortality that has evolved from death claims in U.S. life insurers' individual life lines of business, along with data from the full U.S. population. Note that, in both cases, the mortality rates are not age-adjusted, with crude rates more simply done as the division of observed death information into exposure amounts. Claim amounts and face amounts are used for the industry data instead of claim counts in order to mitigate the cases where one person would count multiple times if they owned more than one individual life policy.

Table 2
INDIVIDUAL LIFE INSURANCE AND POPULATION MORTALITY IN THE UNITED STATES⁸⁹

Year	Estimated Individual Life Death Claims (Millions)	Estimated Individual Life Face Amount Exposure (Millions)	Estimated Individual Life Crude Mortality Rate per 100,000 (A)	Population Deaths (Millions)	Population Exposure (Millions)	Population Crude Mortality Rate per 100,000 (B)	(A) / (B)
2009	\$38,306	\$10,289,417	372.3	2.44	306.77	794.50	46.9%
2010	\$39,045	\$10,403,986	375.3	2.47	308.75	799.50	46.9%
2011	\$41,869	\$10,738,509	389.9	2.52	311.59	807.30	48.3%
2012	\$43,109	\$11,104,319	388.2	2.54	313.91	810.20	47.9%
2013	\$43,405	\$11,290,289	384.4	2.60	316.13	821.50	46.8%
2014	\$46,419	\$11,595,684	400.3	2.63	318.86	823.70	48.6%
2015	\$52,436	\$12,084,040	433.9	2.71	321.42	844.00	51.4%
2016	\$54,214	\$12,166,850	445.6	2.74	323.13	849.30	52.5%
2017	\$54,960	\$11,959,400	459.6	2.81	325.72	863.80	53.2%
2018	\$56,749	\$12,023,849	472.0	2.84	327.17	867.80	54.4%

Table 2 shows that, in recent history, insured mortality may generally be observed somewhere in the 45%-55% range of overall population mortality. Of course, factors such as the age and gender composition of both groups

over time will certainly affect these annual results and overall trends. The information also helps to show the presence of selection in the insured lives as individual life underwriting will create an insured cohort that is identified as healthy at issue, with a general income level that would need protection against premature death and also be able to pay for the recurring expense of the individual life insurance policy.

The causes of death within the individual life insured cohort and the general U.S. population can vary quite a bit as well. Table 3 shows data from a recent Scor Reinsurance study¹⁰ of individual life claims compared to the full population. Insured lives have relatively higher proportions of claims for diseases that cause mortality across broad spectrums of socioeconomic classes more equally, such as cancer. Diseases such as respiratory disease, influenza, and pneumonia have a mortality profile that is higher for low socioeconomic classes and has relatively lower proportions of claims in the insured individual life population.

Table 3
PERCENTAGE OF DEATHS FOR AGES 55-89, 2010-2015

Selected Causes of Death	Population Proportion of Total Claims, Male	Population Proportion of Total Claims, Female	Individual Life Proportion of Total Claims, Male	Individual Life Proportion of Total Claims, Female
Circulatory System Disease	33.3%	33.0%	25.9%	22.1%
Cancer	26.4%	21.9%	38.7%	44.4%
Respiratory System Disease, Influenza and Pneumonia	10.8%	11.0%	6.8%	7.5%

These trends help associate general industry relationships of population mortality to insured mortality, as well as some of the socioeconomic levels and trends that can occur within respiratory diseases. Together, these trends may help actuaries gain an improved understanding of how respiratory death patterns may play out within a specific insurer's book of business.

End Notes

¹ Centers for Disease Control and Prevention. <https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview.html>.

² Centers for Disease Control and Prevention. <https://www.cdc.gov/flu/weekly/fluviewinteractive.htm>.

³ Centers for Disease Control and Prevention. <https://www.cdc.gov/nchs/nvss/vsrr/COVID19/index.htm>.

⁴ Centers for Disease Control and Prevention. <https://wonder.cdc.gov/mcd-icd10.html>.

⁵ U.S. Census Bureau, Small Area Estimates Branch. <https://www.census.gov/data/datasets/2008/demo/saipe/2008-state-and-county.html> and <https://www.census.gov/data/datasets/2009/demo/saipe/2009-state-and-county.html>.

⁶ Ibid.

⁷ Campion, Scott, et. al. (2020, April 13). "COVID-19 Mortality Modeling Survey Summary of Results." <https://www.soa.org/resources/research-reports/2020/covid-19-pulse-surveys/>.

⁸ ACLI 2019 Life Insurers Fact Book. <https://www.acli.com/posting/rp19-010>.

⁹ Centers for Disease Control and Prevention WONDER. <https://wonder.cdc.gov/>.

¹⁰ Bahna-Nolan, Mary and David Wylde. (2017, April). "Mortality Trends in the U.S.: Differences Between the Insured Population and the General Population." <http://www.scorgloballifeamericas.com/en-us/knowledgecenter/Pages/Recent-Mortality-Trends-Cause-Of-Death.aspx>.

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