

Changes in Occupation-Specific Non-COVID-19 Death Rates during the COVID-19 Pandemic in King County, WA

March 1 – December 31, 2020

Background

The first known COVID-19 related death in King County, Washington (WA) occurred in late February 2020. State and local mitigation measures designed to protect the health and safety of residents were implemented in March 2020, with a phased re-opening process beginning in June that was subsequently scaled back in November as case counts increased. COVID-19 mitigation measures included closing schools, businesses, and recreation facilities; cancellation of elective medical procedures and guidance to avoid non-urgent medical care; stay-home orders and guidance to practice social distancing with non-household members. These mitigation efforts have prevented deaths and hospitalizations, and also resulted in isolation, grief,¹ and economic hardship² for some individuals. Research after previous recessions³ and pandemics showed changing patterns of death following the events. For example, the Centers for Disease Control (CDC) found that, in the United States, job loss or financial problems (in a non-pandemic year) contributed to 16% of all suicide deaths.⁴

Earlier investigations by Public Health – Seattle & King County (PHSKC) and other researchers revealed that 2020 excess deaths could not be fully attributed to COVID-19 diagnoses.^{5,6} In response, PHSKC conducted an analysis of deaths that may have arisen through non-biological means, such as delayed care seeking for chronic or acute illnesses or increases in

KEY POINTS

- 1) There were 2,695 deaths among King County residents ages 16 to 64 between March 1 and December 31, 2020 that were not due to COVID-19. Age-adjusted death rates among this population were 6% higher in 2020 compared to the last three years (2017-2019).
- 2) King County occupation-specific death rates increased in 2020 compared to 2017-2019 by:
 - 31% among food preparation and serving related workers;
 - 14% among production, transportation, and material moving workers
- 3) King County occupation-specific death rates decreased by 15% in 2020 compared to 2017-2019 among Management, Business, and Financial workers
- 4) Overall King County deaths rates did not significantly change among arts, design, entertainment, sports, and media; building and grounds cleaning and maintenance; computer, engineering, and science; education, legal, and community service; healthcare practitioners and technical; healthcare support; natural resources, construction, and maintenance; personal care and service; protective service; sales and office; people with disabilities that prevent employment; homemakers; and students.

¹ Mortazavi SS, Assari S, Alimohamadi A, Rafiee M, Shati M. Fear, Loss, Social Isolation, and Incomplete Grief Due to COVID-19: A Recipe for a Psychiatric Pandemic. *Basic Clin Neurosci*. 2020;11(2):225-232. doi:10.32598/bcn.11.covid19.2549.1

² Witteveen D, Velthorst E. Economic hardship and mental health complaints during COVID-19. *PNAS* 2020;117(44):27277-27284. <https://doi.org/10.1073/pnas.2009609117>

³ Davalos ME, French MT. This recession is wearing me out! Health-related quality of life and economic downturns. *J Ment Health Policy Econ*. 2011 Jun;14(2):61-72. PMID: 21881162.

⁴ https://www.cdc.gov/mmwr/volumes/67/wr/mm6722a1.htm?s_cid=mm6722a1_w

⁵ See <https://www.kingcounty.gov/depts/health/covid-19/data/~media/depts/health/communicable-diseases/documents/C19/deaths-associated-with-covid-19-current.ashx>.

⁶ <https://jamanetwork.com/journals/jama/fullarticle/2771761#>

stress and anxiety resulting in negative health outcomes. This [previous analysis](#) examined changes in death rates by gender, race and ethnicity, geographic region, and time regardless of COVID-19 status for the entirety of 2020 compared to 2017-2019. The report found increased all-cause death rates across the board, with notable increases among American Indian/Alaska Native and Hispanic/Latinx residents.

This new analysis examines changes in non-COVID-19 death rates among working age adults (ages 16 to 64) by occupation during March through December 2020. Governor Jay Inslee issued the [“Stay Home – Stay Healthy” proclamation](#) on March 23, 2020, which required closure of non-essential businesses, bars, and restaurants but specifically excluded grocery store workers, medical staff, and other essential workers. Occupations that were affected by the closure of non-essential businesses that could not easily transition to telecommuting, such as food service/restaurant and arts/entertainment workers, faced widespread [unemployment](#) and corresponding [financial distress](#). Given the differential impacts of COVID-19 mitigation measures on different occupations, this analysis seeks to examine whether select occupation groups experienced disproportionate changes in death rates.

Please refer to the [online tool](#) for additional exploration.

Death Rates

Below we present a high-level summary of death rate changes among working-age King County residents during the pandemic. Specific causes of death were selected to focus on leading causes of death as well as those potentially impacted by COVID-19 mitigation measures such as business closures. These causes of death include: cancer, cardiovascular disease, dementia (including Alzheimer’s), diabetes, drowning, firearms, homicide, overdose, stroke, suicide, traffic, and unintentional injuries. Deaths that were biologically related to COVID-19 were excluded from this analysis. For COVID-19-related deaths and an excess deaths analysis, see the 2020 year-end [Summary Report on Deaths Associated with COVID-19](#).

We analyzed deaths among King County residents from 2017-2020 using death certificate data, comparing 2020 provisional death data to 2017-2019 death certificates. Causes of death were defined using death certificate text fields (see [Technical Appendix](#) for definitions and additional details). This analysis framework considered multiple causes of death rather than the underlying cause of death due to use of timely provisional data. For example, a traffic fatality due to diabetic shock would be identified in this report as a diabetes-related death, an unintentional injury death, and a traffic death. The cause of death definitions and analytic framework used in this analysis prohibit comparison with existing lists of the leading causes of death.

This report uses rate ratios to compare March 1 through December 31, 2020 death rates to those during the same months of 2017-2019. A ratio of less than 1 represents a decreased death rate in 2020 compared to 2017-2019; a ratio greater than 1 represents an increased death rate in 2020, and a ratio equal to 1 represents a stable death rate. Unless otherwise noted, all death rates and ratios are age-adjusted. The text below identifies ratios that were statistically significant (p-value < 0.05).

Occupations

The standard certificate of death records the decedent's "usual occupation" and "kind of business/industry".⁷ Occupation categories used in this report were nationally standardized by processing occupation and industry open text fields for working age adults (ages 16 to 64) using the National Institute for Occupational Safety and Health Industry and Occupation Computerized Coding System (NIOCCS)⁸ version 4 application programming interface (API). The NIOCCS API output was then aggregated into 13 standardized occupation categories. Additional data processing identified decedents who were classified as people with disabilities that prevent employment, homemakers, and students as other analytic categories. See the [Technical Appendix](#) for additional details.

Countywide Death Rates among Working-Age Residents

Between March 1 and December 31, 2020, there were 12,029 deaths among King County residents compared to an annual average of 10,693 deaths during the same period in 2017-2019. We excluded 1,064 COVID-19 deaths leaving 10,965 deaths in 2020. Further limiting the data to the working age population (ages 16 to 64), there were 2,695 deaths in 2020 compared to an average of 2,495 during 2017-2019.

Among the working-age population, the King County all-cause death rate increased by 6% in 2020 compared to 2017-2019. The drowning death rate increased 75% (36 deaths in 2020 compared to an average of 20 deaths in 2017-2019) and the homicide rate increased 44% (92 deaths in 2020 vs an average of 62 in 2017-2019). Significant death rate increases were observed for overall unintentional injuries (26%, 516 deaths in 2020 vs average of 397 deaths in 2017-2019) and overdose (24%, 345 deaths in 2020 vs average of 270 in 2017-2019). There were decreases in the death rates for suicide (17%, 166 in 2020 vs average of 195 in 2017-2019) and cancer (10%, 621 in 2020 vs average of 681 in 2017-2019).

Occupation Specific Death Rates

Occupations are divided into those with and without significant changes in countywide death rate ratios. Within each section, occupations are presented in order from highest to lowest 2020 all-cause death rates (Figure 1).

Occupations with Significant Changes in All-Cause Death Rates

Food Preparation and Serving Related

In 2020 there were 168 deaths among workers in food preparation and serving occupations, compared to an average of 124 during 2017-2019. The countywide all-cause death rate increased 31% for this population. The overdose death rate increased 73% (33 deaths in 2020 compared to an average of 19 deaths in 2017-2019). The unintentional injury death rate increased 67% (45 deaths in 2020 compared to an average of 26 deaths in 2017-2019). There were no other significant death rate changes among the specific causes of death examined in this analysis.

Production, Transportation, and Material Moving

In 2020 there were 331 deaths among workers in production, transportation, and material moving occupations, compared to an average of 281 deaths during 2017-2019. The countywide all-cause death

⁷ https://www.cdc.gov/nchs/data/misc/hb_occup.pdf

⁸ <https://csams.cdc.gov/nioccs/>

rate increased 14% for this population. Unintentional injury death rates increased 42% (63 deaths in 2020 compared to an average of 43 deaths in 2017-2019). There were no other statistically significant changes among the specific causes of death examined in this analysis.

Management, Business, and Financial

In 2020 there were 272 deaths among those working in management, business, and financial occupations compared to an average of 304 during 2017-2019. The countywide all-cause death rate decreased 15% for this population. This population did not experience rate changes for any specific cause of death examined in this analysis.

Occupations without Significant Changes in All-Cause Death Rates

Natural Resources, Construction, and Maintenance

In 2020 there were 342 deaths among workers in natural resources, construction, and maintenance occupations, compared to an average of 312 deaths during 2017-2019.

Arts, Design, Entertainment, Sports, and Media

In 2020 there were 94 deaths among those working in arts, design, entertainment, sports, and media occupations compared to an average of 78 during 2017-2019.

Personal Care and Service

In 2020 there were 71 deaths among those working in personal care and service occupations compared to an average of 79 during 2017-2019. The homicide death rate in this population increased (215%) but due to the small number of deaths (6 in 2020 vs. an average of 2 in 2017-2019) this change should be interpreted with caution. There were no other significant changes among the specific cause of death rates examined in this analysis.

Building and Grounds Cleaning and Maintenance

In 2020 there were 88 deaths among workers in building and grounds cleaning and maintenance occupations compared to an average of 80 during 2017-2019.

Protective Service

In 2020 there were 24 deaths among those working in protective service occupations compared to an average of 36 during 2017-2019.

Sales and Office

In 2020 there were 370 deaths among those working in sales and office occupations compared to an average of 356 during 2017-2019.

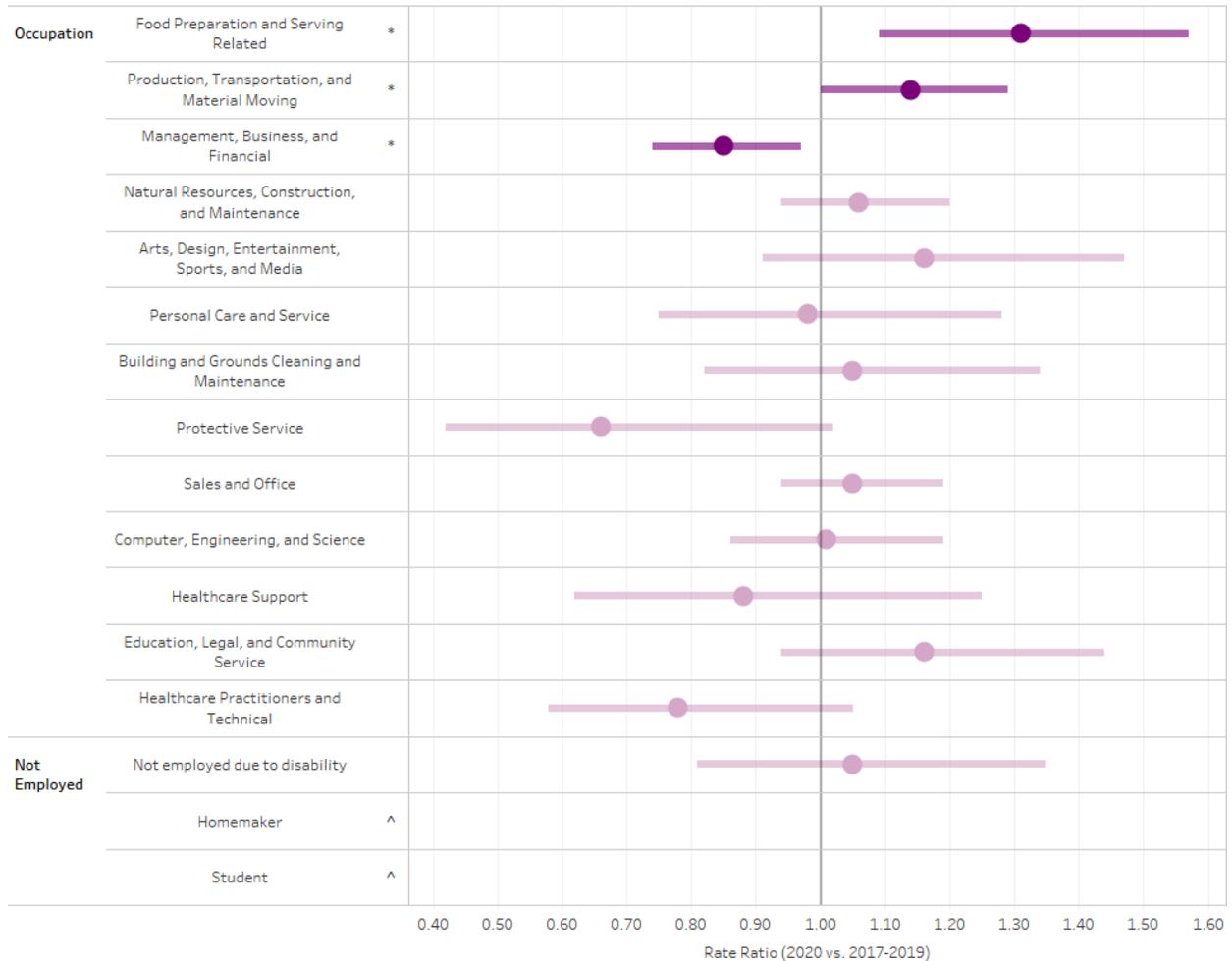
Computer, Engineering, and Science

In 2020 there were 193 deaths among those working in computer, engineering, and science occupations compared to an average of 177 during 2017-2019.

Healthcare Support

In 2020 there were 41 deaths among those working in healthcare support occupations compared to an average of 38 during 2017-2019.

Figure 1. King County occupation specific all-cause (excluding COVID-19) death rate ratios, 2020 vs. 2017-2019



* = statistically significant difference between 2020 and 2017-2019 death rates
 ^ = rate not available; unable to determine population denominator

Education, Legal, and Community Service

In 2020 there were 116 deaths among those working in education, legal, and community service occupations compared to an average of 99 during 2017-2019.

Healthcare Practitioners and Technical

In 2020 there were 54 deaths among those working in healthcare practitioner and technical occupations compared to an average of 68 during 2017-2019. The cancer death rate decreased 50% (14 deaths in 2020 compared to an average of 28 deaths in 2017-2019). There were no other significant death rate changes among the specific causes of death examined in this analysis.

People with disabilities that prevent employment, Homemakers, and Students

People with disabilities that prevent employment

Among King County residents whose death certificate indicated a disability that prevented employment, there were 79 deaths in 2020 compared to an average of 74 during 2017-2019. The countywide all-

cause death rate did not significantly change between 2017-2019 and 2020 for this population. This population did not experience rate changes for any specific cause of death examined in this analysis.

Homemakers

In 2020 there were 128 deaths among people who were reported as homemakers, compared to an average of 122 during 2017-2019. Due to the inability to identify a relevant population denominator, rates and ratios were not calculated for homemakers.

Students

In 2020 there were 60 deaths among individuals listed as a students ages 16 or older compared to an average of 60 during 2017-2019. Due to the inability to identify a relevant population denominator, rates and ratios were not calculated for students.

Limitations

This analysis has many limitations. Death counts are preliminary and may change as death certificate and/or case investigations data are updated. Death certificates are typically issued within 10 days, but in rare circumstances may take up to one year or longer. Furthermore, our method for assigning cause of death based on text searches rather than ICD-10 codes has not been externally validated, which prohibits direct comparison with cause of death estimates published elsewhere. (See the [Technical Appendix](#) for details about the coding methods). Use of multiple causes of death rather than a single underlying cause of death will also make comparison with external analyses difficult. In addition, these data are calculated for King County residents and do not account for deaths of non-residents that occurred within King County or residents that died outside of Washington state; therefore, numbers in this report may differ slightly from other tallies.

The U.S. Standard Certificate of Death requests the decedent's "usual occupation" and industry.⁹ This is problematic since this analysis is interested in the decedent's most recent occupation, rather than the occupation(s) engaged in for most of the decedent's working life. In addition, we cannot identify decedents who were recently unemployed either before or during the pandemic. This measurement error may bias our results in an unknown direction for any given occupation. In addition, categorizing the open text occupation of decedents is imperfect and the NIOCCS API was unable to categorize the occupation of 8.2% (n=837) of all working age decedents. Moreover while 4.8% of decedents had their occupation listed as homemakers (493 decedents in the 4 years) and 2.3% as students (239 decedents in the 4 years), we were unable to identify relevant population denominators for homemakers or students and therefore could not calculate these death rates and ratios. Finally, our subsequent string searches that categorized an additional small proportion of occupations were not externally validated.

Estimates for people with disabilities that prevent employment were based on NIOCCS occupation coding of 'Did Not Work (unpaid)' and the occupation text field containing the string "disab". While we inferred that these individuals were prevented from working due to the disability, we recognize that many people living with disabilities are gainfully employed. The population denominator was estimated in a similar fashion, counting those with a disability and without an occupation in the 2015-2019 American Communities Survey. Since we inferred the relationship between occupation and disability for

⁹ https://www.cdc.gov/nchs/data/misc/hb_occup.pdf

both the numerator and denominator, the resulting rates may be biased. However, since any bias would be consistent across years, the ratios remain informative.

Baseline death rates among working age individuals are low; therefore, even proportionally large increases may be due to chance fluctuations in death rates over time. Our attempt to address this limitation through the aggregation of occupation categories may have obscured meaningful changes for some specific occupation groups. Refer to the [Technical Appendix](#) for links detailing which occupations are included in each aggregate occupation group.

This analysis was not hypothesis driven and statistical adjustments have not been made for multiple comparisons. Multiple comparisons increase the likelihood that reported statistically ‘significant’ findings are due to chance alone. Therefore, attention should be directed to the magnitude of the change and whether it makes sense in context, in addition to its statistical significance.

Discussion

Locally and across the country, changes in death rates have been observed that are not fully explained by COVID-19 deaths. Closure of workplaces, businesses, entertainment venues, schools, and other establishments have had wide-ranging impacts on economic, social, and health conditions in King County. We observed a 31% increase in death rates among food preparation and serving related workers, a 14% increase among production, transportation, and material moving workers, and a 15% decrease in death rates among Management, Business, and Financial workers from March-December 2020 compared to the previous three years. While we are unable to draw conclusions from this analysis regarding causal links between COVID-19 mitigation strategies and these death rate changes, other sources of evidence may suggest possible mechanisms for the observed changes. We did not examine essential workers as a group in this brief due to lack of clear definitions of occupational groups to include as well as the evolving definition during the pandemic.

Food preparation and serving related workers could have been impacted by the pandemic and ensuing non-pharmaceutical interventions in multiple ways. Due to lockdowns and capacity limits in restaurants and bars, many food service workers became unemployed, which is a risk factor for increased all-cause deaths.^{10,11} In addition, a recent study suggests that restaurant employees who retained their positions during the pandemic had greater psychological distress and used more drugs and alcohol as compared to furloughed employees.¹² Regardless of the reason, this increase in death rates exacerbated pre-existing health disparities faced by these workers. The ratio of this occupation’s death rate to that of the occupation with the lowest death rate increased from 3.2 to 4.9 times in 2017-2019 and 2020, respectively. In other words, the largest proportionate increase in death rates was observed among workers in an occupation that was already experiencing high rates of death. In 2020, the five most common causes (and number) of death for this population were unintentional injuries (45), cardiovascular disease (40), overdose (33), cancer (26), and suicide (9).

Reasons why workers in production, transportation, and material moving experienced increased death rates are unclear. Although the occupations in this category are typically not conducive to working

¹⁰ <https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2020.306095>

¹¹ <https://www.sciencedirect.com/science/article/abs/pii/S027795361100044X>

¹² <https://www.sciencedirect.com/science/article/abs/pii/S0278431920303169>

remotely, many if not most were considered essential and are unlikely to have been furloughed or laid-off. Without corresponding unemployment status and the inability to explore more specific occupations due to small numbers, our ability to test explanatory hypotheses is limited. In 2020, the five most common causes (and number) of death for this population were cardiovascular disease (105), cancer (72), unintentional injuries (63), overdose (37), and firearms (16, nine homicides and seven suicides).

Workers in management, business and financial occupations were the only occupational group to have lower death rates in 2020 compared to 2017-2019. These workers are the most likely to be able to work from home¹³ and have among the highest average wages of the occupational groups included in this analysis¹⁴, which may have insulated them from risks associated with unemployment and from workplace hazards. In 2020, the top five most common causes (and number) of death for this population were cancer (90), cardiovascular disease (86), unintentional injuries (31), suicide (23), and overdose (18).

The 6% increase in non-COVID-19 death rates among working age adults was not distributed equally among all occupations. The differences we observed are likely due to long standing underlying socioeconomic disparities which allowed some workers to endure pandemic related stresses more easily than others. PHSKC conducted this study with the intent of identifying impacts by occupation, in order to inform community-level interventions to mitigate negative impacts. Sharing these disparities with policy makers, the community, and others as they emerge is critical for efficient and equitable allocation of limited resources.

Technical Notes

We analyzed deaths among King County residents from 2017-2020 using death certificate data from the Washington State Department of Health Center for Health Statistics. We compared provisional deaths occurring in 2020 to deaths that occurred during the same time period of 2017-2019. Deaths that were biologically related to COVID-19 were excluded from this analysis. To provide the most current possible analysis, we defined causes of death using free text searches and the recorded manner of death rather than the International Classification of Disease (ICD)-10 codes because ICD-10 codes were not available for the 2020 death data.

Please refer to our technical appendix for complete details: <https://www.kingcounty.gov/~media/depts/health/communicable-diseases/documents/C19/changes-in-occupation-specific-death-rates-tech-app.ashx>

Resources

- Guidance related to COVID-19: <https://www.kingcounty.gov/depts/health/covid-19.aspx>
- Summary Report on Deaths Associated with COVID-19 in 2020: <https://www.kingcounty.gov/depts/health/covid-19/data/~media/depts/health/communicable-diseases/documents/C19/deaths-associated-with-covid-19-2020-year-end.ashx>

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For more information, see: <https://www.kingcounty.gov/covid/impacts>

¹³ <https://www.bls.gov/news.release/flex2.t01.htm>

¹⁴ <https://esd.wa.gov/labormarketinfo/occupations>