Washington State Health Services Research Project
Research brief No. 109

Impact of COVID-19 pandemic on life expectancy in Washington

By Dennis McDermot *Jan. 25, 2023*

Background

The first diagnosed COVID-19 case in the United States occurred in Washington state in February 2020. By Jan. 1, 2022, 825,817 Americans — including 10,619 Washington residents — had died of the disease.[1] In addition to deaths from diagnosed COVID-19, deaths from all causes increased in 2020 and 2021 over the expected baseline[2]. Excess deaths early in the epidemic were largely from undiagnosed COVID-19 cases. Other excess deaths may be due to delayed treatment, 'deaths of despair' (addiction, suicide), or other events caused by social isolation and mental distress. As a result, 2020 saw life expectancy decline globally,[3] nationally,[4] and in Washington. But while life expectancy and excess deaths began to recover in other comparable countries, life expectancy in the U.S. fell again in 2021.[2,3,4] This report examines life expectancy changes in Washington associated with COVID-19.

Life expectancy in Washington

Between 2010 and 2019, life expectancy at birth in Washington remained steady at just over 82 years for women and around 78 years for men (Figure 1). Life expectancy for women decreased by 1.4 years from 82.6 years in 2019 to 81.2 years in 2021. Life expectancy for men decreased by 2.5 years, from 78.4 years in 2019 to 75.9 years in 2021 (Figure 2). Life expectancy from age 65 increased slightly from 21.0 years in 2010 to 21.5 years in 2019 for women, and from 18.5 years in 2010 to 19.3 years in 2019 for men (Figure 3).

[1] HealthData.org https://covid19.healthdata.org/united-states-of-america?view=cumulative-deaths&tab=trend accessed 12/13/2022

[2] Weinberger, D.M. et.al. COVID-19 and Excess All-Cause Mortality in the US and 20 Comparison Countries, June 2021-March 2022. JAMA Intern Med, doi:10.1001/jamainternmed.2020.3391. Accessed 12/13/2022.

[3] Peterson-KFF Health System Tracker. https://www.healthsystemtracker.org/chart-collection/u-s-life-expectancy-compare-countries/#Life%20expectancy%20at%20birth%20in%20years,%201980-2021 accessed 12/13/2022.

[4] CDC National Center for Health Statistics, Pressroom. Life Expectancy in the U.S. Dropped for the Second Year in a Row in 2021 https://www.cdc.gov/nchs/pressroom/nchs_press_releases/2022/20220831.htm accessed 12/13/2022

Figure 1. Life expectancy at birth in Washington, 2010-2021

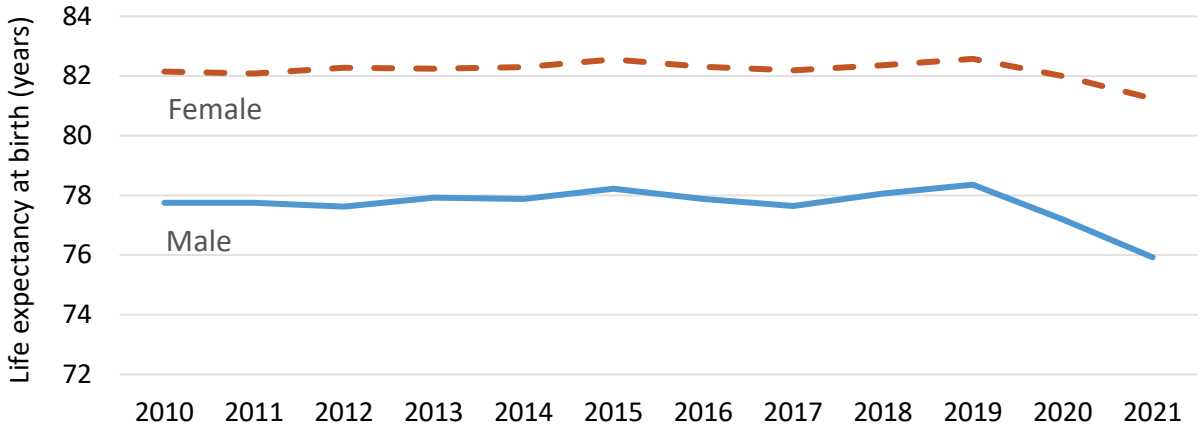


Figure 2a. Life expectancy at birth 2019-2021 (male)

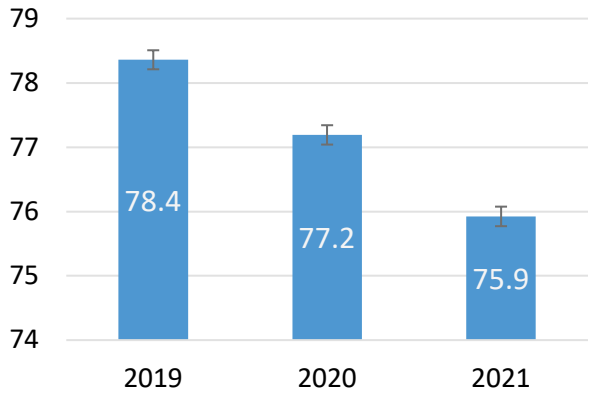
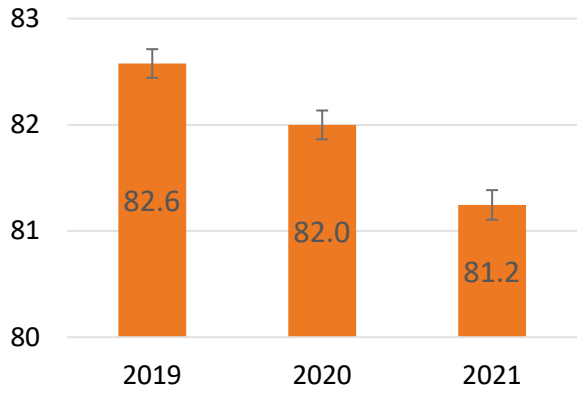


Figure 2b. Life expectancy at birth 2019-2021 (female)



Brackets at the top of each bar display the margin of error – a statistical measure of uncertainty. Non-overlapping margins of error illustrate statistically significant differences

Figure 3. Life expectancy from age 65 in Washington, 2010 -2021

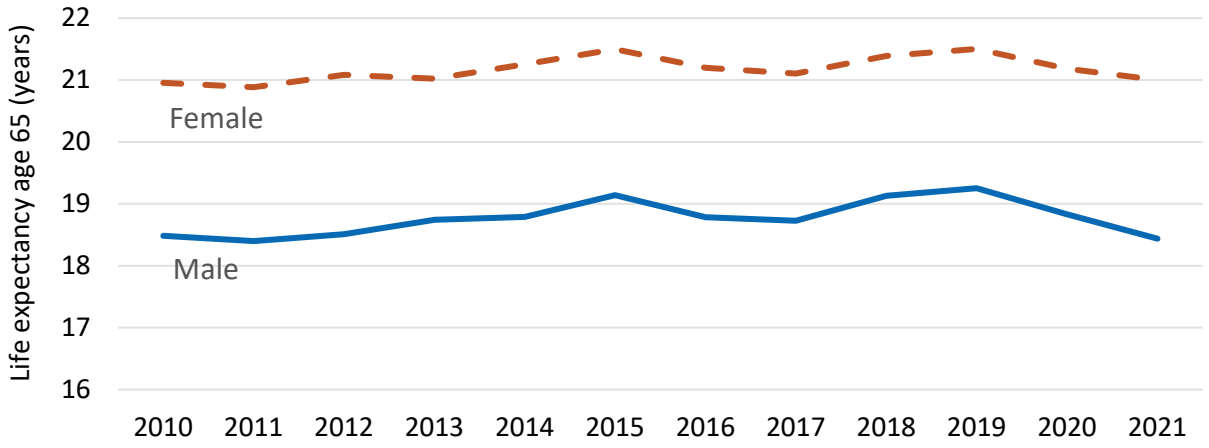


Figure 4a. Life expectancy from age 65, with 95% confidence intervals, 2019-2021 (male)

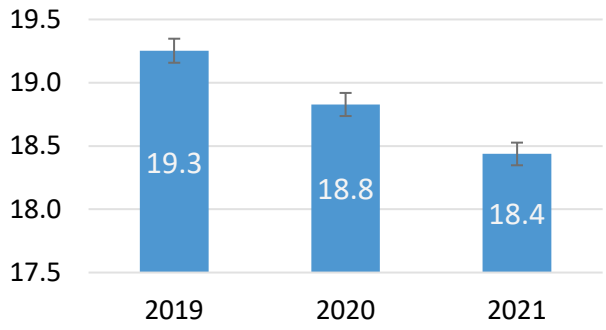
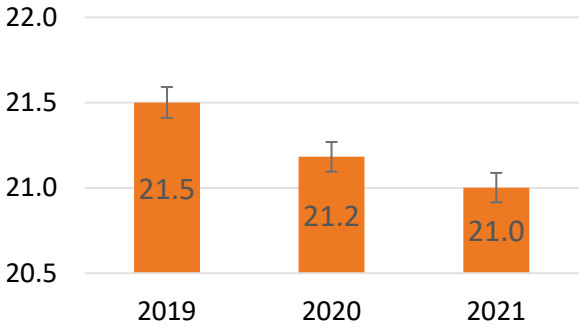


Figure 4b. Life expectancy from age 65 with 95% confidence intervals, 2019-2021 (female)



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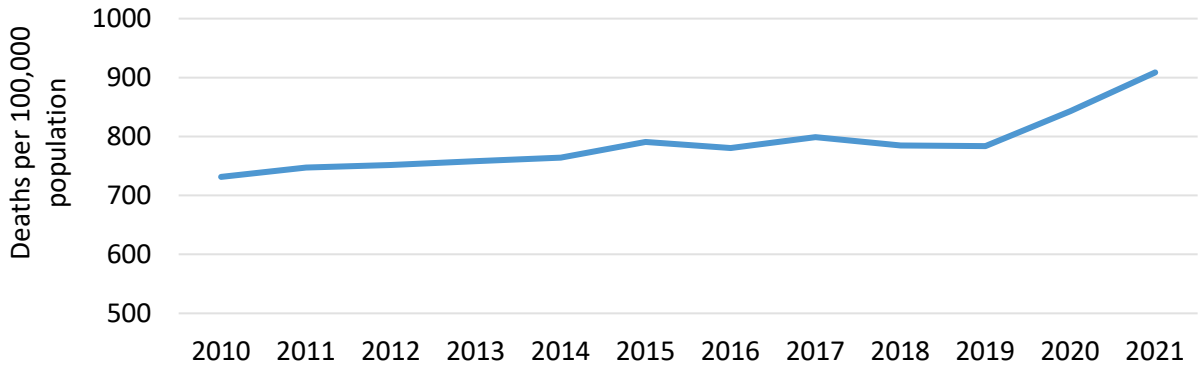
Life expectancy in Washington from age 65 also decreased significantly in 2020, and then again in 2021 for both men and women (Figure 4). It may seem unintuitive that life expectancy at birth decreased more than life expectancy at age 65, when deaths from COVID-19 were mostly among the elderly. This is because life expectancy is cumulative over a life span. Life expectancy at age 65 is included within life expectancy at birth. Also, small risk early in life will have a big impact, because it shortens life span by many years for those affected. For instance, a single infant death represents about 80 years of potential life lost, while a death at age 65 represents about 20 years lost on average. So, each infant death reduces the average life expectancy by four times as much as a death at 65.

Excess deaths

The death rate in Washington state increased sharply from 784 deaths per 100,000 population in 2019 to 843 in 2020 and 909 in 2021 (Figure 5). Before the pandemic, the death rate rose slowly from 2010 – 2015, then held steady at under 800 deaths per 100,000 population from 2015-2019. If the death rate had remained at the 2019 level through 2020 and 2021, there would have been 14,170 fewer deaths in those two years. **This amounts to a 12% increase in all-cause deaths** over what we would expect based on 2019 rates.

Figure 5. Death rate per 100,000 population in Washington, 2010-2021



Race and ethnicity

We examined changes in life expectancy at birth in six racial-ethnic categories:

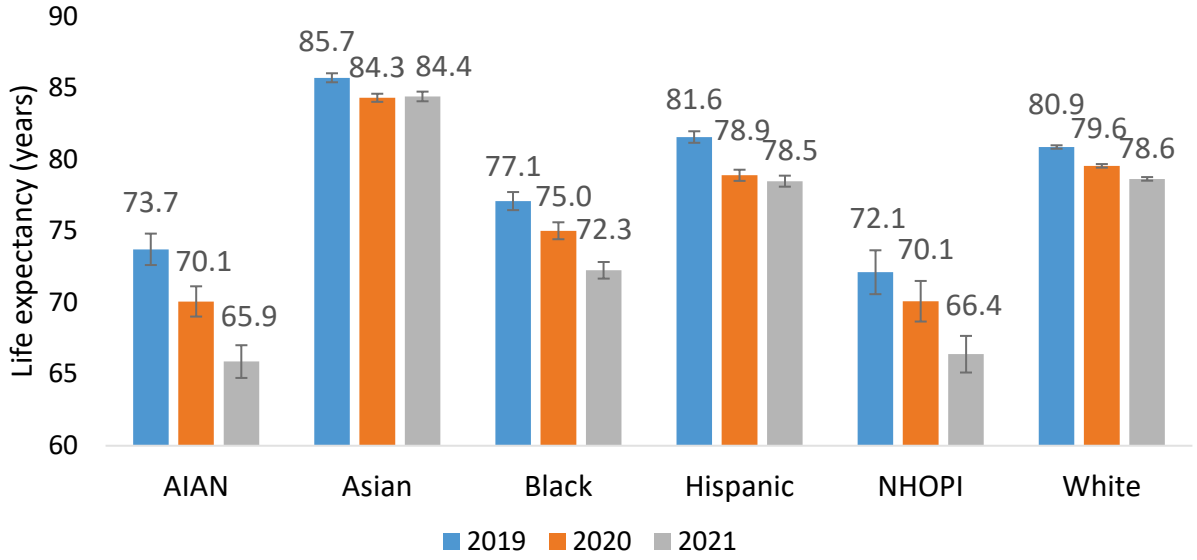
- Non-Hispanic Asian
- Non-Hispanic American Indian or Alaska Native (AIAN)
- Non-Hispanic Black
- Non-Hispanic Native Hawaiian or Other Pacific Islander (NHOPI)
- Non-Hispanic White
- Hispanic

(For brevity, we will omit the term “non-Hispanic” from here on). Life expectancy varies greatly by race and ethnicity (Figure 6). Life expectancy for Asians was consistently higher than for other groups, and was *least affected* by the pandemic. Life expectancy for AIAN was lower than other groups, and *most impacted* by the pandemic. Life expectancy for Hispanics and NHOPI trended downward from 2010-2019

even before the pandemic. Exploring why life expectancy declined in these two groups is beyond the scope of this present report, but we might examine it in a future study.

Life expectancy at birth decreased by 7.8 years for AIAN, from 73.7 years in 2019 to 65.9 years in 2021 – the greatest pandemic associated impact of any group (Figure 7). Life expectancy for NHOPI decreased 5.7 years from 72.1 years in 2019 to 66.4 years in 2021. Coming on top of the steady decline over the study period, this group has experienced an 8.8 year decline in life expectancy since 2010. Similarly, Hispanics experienced a 3.1 year decline in life expectancy during the pandemic, and a 5.9 year decline from 2010 through 2021. Life expectancy between 2019 and 2021 decreased 4.8 years for Blacks, and 2.2 years for whites. Asians experienced the smallest pandemic-related decrease of 1.3 years, and were the only group where life expectancy did not decrease further in 2021 .

Figure 7. Change in life expectancy at birth by race and ethnicity, 2019-2021



Brackets at the top of each bar display the margin of error – a statistical measure of uncertainty. Non-overlapping margins of error illustrate statistically significant differences

Geographic variation

We computed life expectancy at birth by Washington state legislative districts for 2019 and 2020. Population data by age and legislative district for 2021 were not yet available at the time of our analysis. We will post a supplement to this report when data become available in 2023. Geographic variation in pre-pandemic (2019) life expectancy is shown in Figure 8. Pandemic-related change in life expectancy is shown in Figure 9. Pre-pandemic life expectancy was highest in parts of the Seattle metropolitan area and lowest along the Pacific coast. The greatest decrease in life expectancy occurred in the southeast. Life expectancy declined between 2019 and 2020 in most districts, though a few experienced a slight increase (Figure 10). Small populations at the legislative district level (about 157,000 per district) leads to high natural variability. Though life expectancy decreased in most districts, the difference was only statistically significant in about a quarter of cases (Appendix – Table 3). An additional year of data may help clarify patterns of change.

Figure 8. Life expectancy at birth by state legislative districts, 2019.

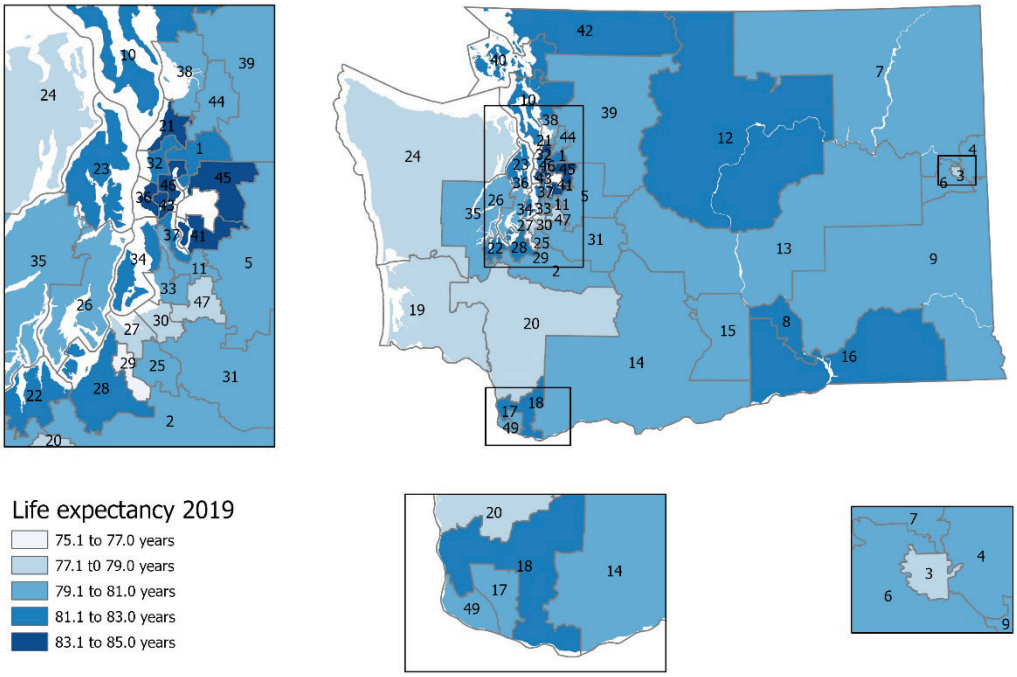


Figure 9. Change in life expectancy at birth, 2019-2020 by state legislative districts.

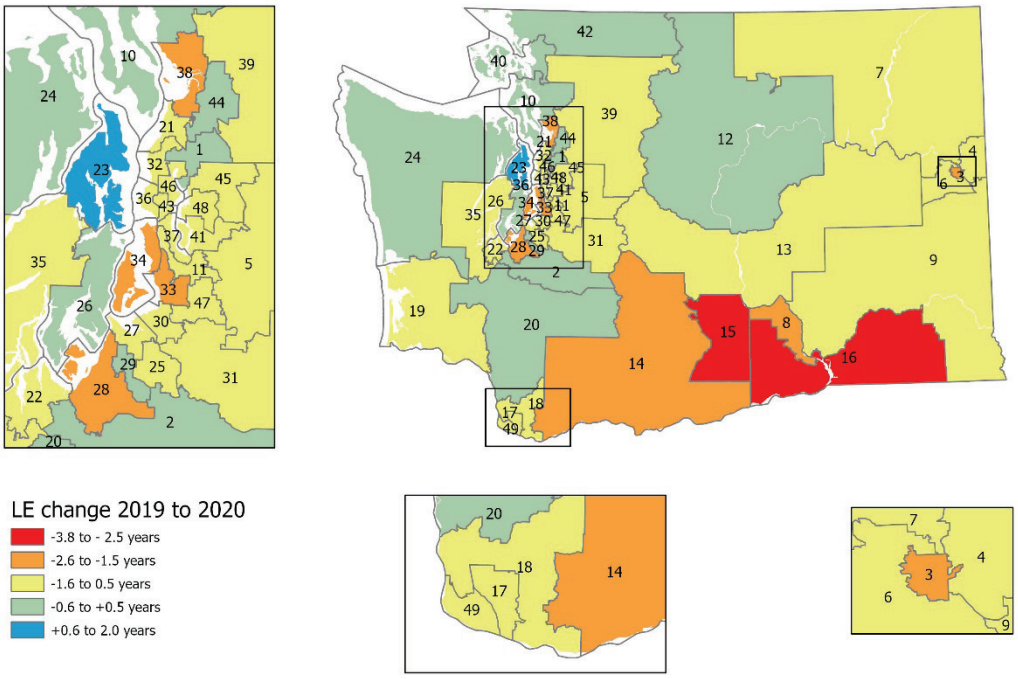
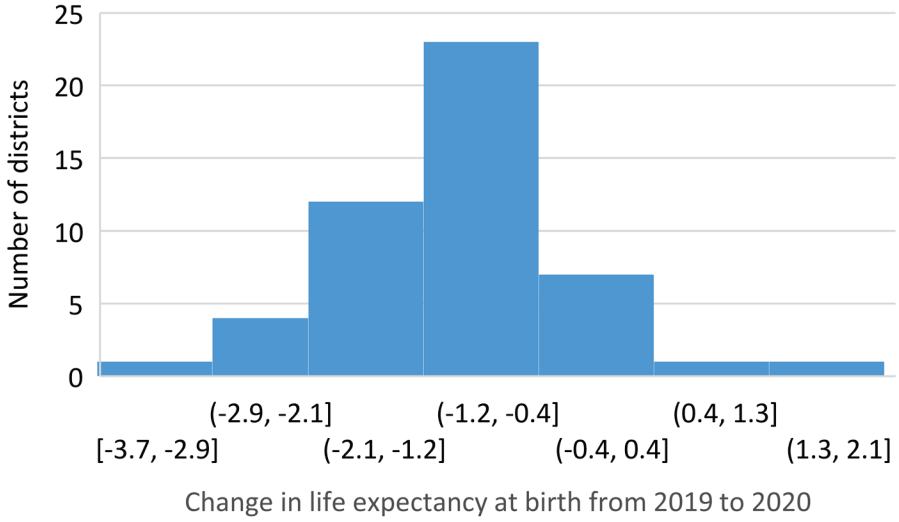


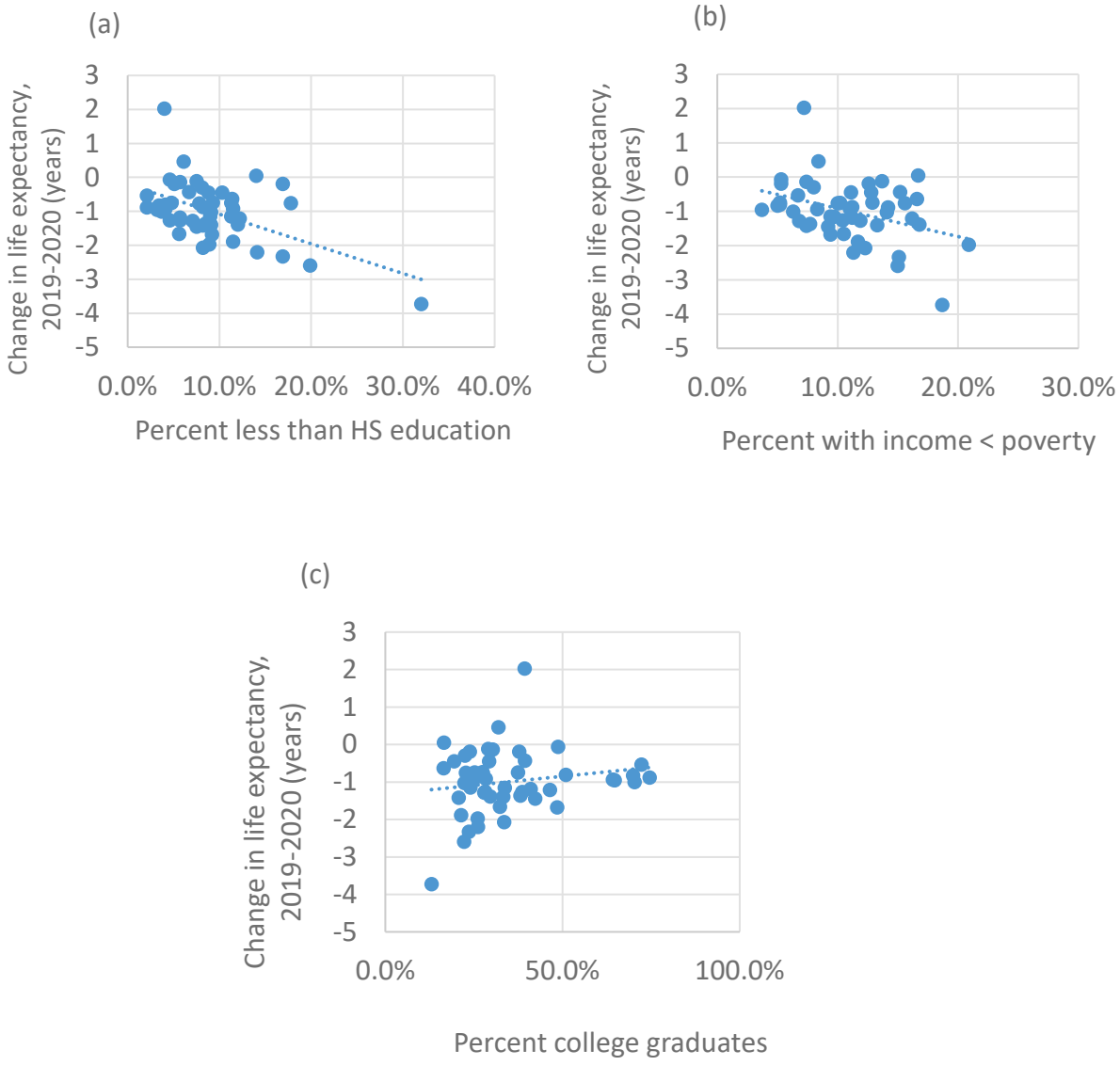
Figure 10. Frequency distribution of legislative district changes in life expectancy at birth between 2019 and 2020.



We compared change in life expectancy by legislative district with socioeconomic data using five-year average (2015-2019) estimates from the American Community Survey. There was a significant association (R^2 = .28, p< .001) between greater decrease in life expectancy and higher percent of adults with less than a high school education (Figure 11). We found a similar but weaker association with district poverty percentage (R^2 = .14, p=.008), but not with the percent of adults with a college degree (R^2=.03, p=.238) (Figure 10). R^2 is a measure of statistical association, ranging from 0 to 1. Higher R^2 indicates a stronger association. An R^2 = 1 would indicate a perfect correlation, while R^2 = 0 would mean there is no association at all.

Figure 11. State legislative district change in life expectancy 2019-2020 by:

a) Percent of population with less than high school education
b) Percent of population with income below poverty
c) Percent of population with a college degree.



Data sources and methods

We calculated life expectancy and death rates using death certificate data from the Washington State Department of Health, Center for Health Statistics,[5] and population estimates from the Washington Office of Financial Management.[6] Socioeconomic data by state legislative district come from the U.S. Census Bureau, American Community Survey.[7]

We computed life expectancy with an abridged life table using five-year age intervals with a final age interval of 85+, based on the methods described by Chiang.[8] In brief, from a starting population at age 0, the fraction surviving at each five-year age group is determined by the death rate in the age group and the fraction surviving from the previous age group. Life expectancy is obtained by adding up the number of years lived so far times the probability of living that long, summed over all age groups.

[5] Death data - Washington Center for Health Statistics https://doh.wa.gov/data-and-statistical-reports/health-statistics/death

[6] Population data - Washington Office of Financial Management https://ofm.wa.gov/washington-data-research/population-demographics/population-estimates

[7] US Census Bureau American Community Survey https://www.census.gov/programs-surveys/acs/data.html

[8] Chiang CL. The Life Table and its Construction. In: Introduction to Stochastic Processes in Biostatistics. New York, John Wiley & Sons, 1968: 189-214.

Appendix

Table 1. Life expectancy at birth and from age 65 in Washington, 2010-2021

	Life expectancy at birth			Life expectancy age 65		
	Total	Male	Female	Total	Male	Female
2010	80.0	77.8	82.2	19.8	18.5	21.0
2011	79.9	77.8	82.1	19.7	18.4	20.9
2012	79.9	77.6	82.3	19.9	18.5	21.1
2013	80.1	77.9	82.2	20.0	18.7	21.0
2014	80.1	77.9	82.3	20.1	18.8	21.3
2015	80.4	78.2	82.6	20.4	19.1	21.5
2016	80.1	77.9	82.3	20.0	18.8	21.2
2017	79.9	77.6	82.2	20.0	18.7	21.1
2018	80.2	78.1	82.4	20.3	19.1	21.4
2019	80.4	78.4	82.6	20.4	19.3	21.5
2020	79.5	77.2	82.0	20.0	18.8	21.2
2021	78.5	75.9	81.2	19.8	18.4	21.0

Table 2. Life expectancy at birth by race and ethnicity in Washington, 2010-2021.

	AIAN	Asian	Black	Hispanic	NHOPI	White
2010	71.1	86.1	76.9	84.4	75.2	79.7
2011	72.5	85.4	76.8	84.5	74.1	79.7
2012	73.0	85.9	76.9	84.3	75.9	79.6
2013	72.1	85.1	76.3	84.5	75.1	79.8
2014	72.0	85.4	76.7	83.7	72.5	79.8
2015	72.3	85.9	77.2	84.6	73.3	80.0
2016	71.8	85.0	76.5	82.1	72.4	80.0
2017	72.1	84.7	76.2	81.6	71.0	79.9
2018	71.1	84.6	76.6	81.6	71.6	80.1
2019	73.7	85.7	77.1	81.6	72.1	80.9
2020	70.1	84.3	75.0	78.9	70.1	79.6
2021	65.9	84.4	72.3	78.5	66.4	78.6

Table 3. Life expectancy at birth by lefislative district in Washington, 2019 and 2020

District	2019	2020	Change		District	2019	2020	Change	
1	82.4	82.3	-0.1		26	80.9	81.3	0.5	
2	79.2	78.9	-0.3		27	78.7	77.3	-1.4	
3	77.6	75.6	-2.0	*	28	81.6	79.9	-1.7	*
4	79.3	78.1	-1.3		29	75.7	75.7	0.0	
5	80.5	79.7	-0.8		30	77.5	76.8	-0.7	
6	80.7	79.4	-1.3		31	79.7	78.4	-1.3	
7	79.3	78.2	-1.0		32	82.1	80.7	-1.4	*
8	81.0	79.0	-2.1	*	33	79.7	77.5	-2.2	*
9	80.4	79.0	-1.4		34	82.2	80.5	-1.7	*
10	82.2	82.1	-0.1		35	80.9	80.1	-0.9	
11	79.6	78.5	-1.2		36	83.7	83.2	-0.5	
12	81.2	81.0	-0.2		37	82.3	81.0	-1.2	
13	80.8	80.1	-0.8		38	80.4	78.6	-1.9	*
14	79.4	77.1	-2.3	*	39	79.5	78.1	-1.4	
15	79.5	75.8	-3.7	*	40	81.7	81.3	-0.4	
16	81.9	79.3	-2.6	*	41	84.9	84.0	-0.8	
17	80.2	79.4	-0.8		42	81.6	81.1	-0.4	
18	82.0	81.2	-0.7		43	84.0	83.1	-0.9	
19	77.6	77.0	-0.6		44	81.0	80.8	-0.2	
20	78.4	77.9	-0.4		45	83.7	82.8	-1.0	
21	83.2	81.9	-1.4	*	46	83.1	82.1	-0.9	
22	81.7	80.5	-1.2		47	78.4	77.5	-0.9	
23	82.8	84.8	2.0	*	48	85.6	84.6	-1.0	
24	79.0	78.9	-0.1		49	80.4	79.7	-0.7	
25	80.3	79.2	-1.1						

* Statistically different based on non-overlapping margins of error