Table S1. Age, period, and cohort effects (relative risks) on suicide mortality in the United States during 1999-2019, by sex

|  |  |  |  |
| --- | --- | --- | --- |
| Group | Effect and 95% CI | | |
| All | Female | Male |
| Age |  |  |  |
| 16-18 | 5.01 (4.73, 5.31) | 1.51 (1.43, 1.60) | 8.44 (7.92, 8.99) |
| 19-21 | 8.28 (7.87, 8.71) | 2.06 (1.96, 2.18) | 14.54 (13.76, 15.37) |
| 22-24 | 9.89 (9.43, 10.37) | 2.57 (2.45, 2.70) | 17.27 (16.39, 18.21) |
| 25-27 | 10.44 (9.97, 10.93) | 3.08 (2.94, 3.23) | 17.88 (16.99, 18.81) |
| 28-30 | 11.07 (10.59, 11.57) | 3.72 (3.57, 3.89) | 18.46 (17.58, 19.39) |
| 31-33 | 11.79 (11.30, 12.30) | 4.33 (4.16, 4.51) | 19.31 (18.43, 20.24) |
| 34-36 | 12.73 (12.23, 13.25) | 4.98 (4.80, 5.17) | 20.57 (19.68, 21.51) |
| 37-39 | 14.00 (13.49, 14.54) | 5.84 (5.64, 6.05) | 22.29 (21.37, 23.24) |
| 40-42 | 15.17 (14.67, 15.69) | 6.80 (6.59, 7.01) | 23.60 (22.81, 24.60) |
| 43-45 | 16.44 (15.93, 16.98) | 7.85 (7.63, 8.08) | 25.19 (24.30, 26.12) |
| 46-48 | 17.88 (17.34, 18.44) | 8.62 (8.38, 8.86) | 27.37 (26.44, 28.34) |
| 49-51 | 19.01 (18.44, 19.59) | 9.386 (9.14, 9.64) | 28.93 (29.95, 29.93) |
| 52-54 | 20.18 (19.58, 20.80) | 10.089 (9.82, 10.36) | 30.68 (29.64, 31.75) |
| 55-57 | 20.69 (20.05, 21.35) | 10.05 (9.77, 10.34) | 31.89 (30.78, 33.04) |
| 58-60 | 21.05 (20.35, 21.77) | 10.01 (9.71, 10.32) | 32.82 (31.60, 34.09) |
| 61-63 | 19.84 (19.06, 20.66) | 9.20 (8.87, 9.55) | 31.36 (29.98, 32.81) |
| 64-66 | 19.93 (19.06, 20.83) | 8.98 (8.62, 9.36) | 31.96 (30.42, 33.58) |
| 67-69 | 21.03 (20.03, 22.07) | 8.80 (8.41, )9.22 | 34.66 (32.84, 36.58) |
| 70-72 | 22.61 (21.44, 23.83) | 8.78 (8.34, 9.25) | 38.29 (36.12, 40.58) |
| 73-75 | 25.55 (24.14, 27.06) | 8.46 (7.97, 8.97) | 45.20 (42.47, 48.12) |
| 76-78 | 27.94 (26.26, 29.72) | 8.76 (8.21, 9.36) | 50.71 (47.42, 54.23) |
| 79-81 | 30.39 (28.43, 32.48) | 8.79 (8.18, 9.46) | 57.34 (53.36, 61.62) |
| 82-84 | 32.21 (29.94, 34.66) | 8.46 (7.78, 9.19) | 63.99 (59.16, 69.22) |
| Period |  |  |  |
| 1999-2001 | 0.87 (0.85, 0.89) | 0.81 (0.79, 0.83) | 0.89 (0.87, 0.92) |
| 2002-2004 | 0.91 (0.89, 0.93) | 0.87 (0.86, 0.89) | 0.92 (0.90, 0.94) |
| 2005-2007 | 0.93 (0.91, 0.95) | 0.92 (0.90, 0.94) | 0.93 (0.91, 0.95) |
| 2008-2010 | 1.00 (1.00, 1.00) | 1.00 (1.00, 1.00) | 1.00 (1.00, 1.00) |
| 2011-2013 | 1.05 (1.03, 1.08) | 1.09 (1.07, 1.12) | 1.04 (1.02, 1.06) |
| 2014-2016 | 1.11 (1.09, 1.13) | 1.20 (1.18, 1.23) | 1.08 (1.05, 1.10) |
| 2017-2019 | 1.17 (1.14, 1.19) | 1.21 (1.19, 1.24) | 1.14 (1.12, 1.17) |
| Cohort |  |  |  |
| 1917 | 0.62 (0.53, 0.71) | 0.51 (0.43, 0.60) | 0.74 (0.64, 0.86) |
| 1920 | 0.58 (0.52, 0.64) | 0.46 (0.41, 0.52) | 0.68 (0.61, 0.76) |
| 1923 | 0.58 (0.53, 0.63) | 0.49 (0.44, 0.54) | 0.66 (0.60, 0.72) |
| 1926 | 0.55 (0.51, 0.60) | 0.45 (0.41, 0.48) | 0.62 (0.57, 0.68) |
| 1929 | 0.59 (0.55, 0.63) | 0.46 (0.43, 0.50) | 0.65 (0.60, 0.70) |
| 1932 | 0.58 (0.54, 0.61) | 0.45 (0.42, 0.48) | 0.63 (0.59, 0.67) |
| 1935 | 0.57 (0.54, 0.61) | 0.46 (0.43, 0.49) | 0.62 (0.58, 0.66) |
| 1938 | 0.60 (0.56, 0.63) | 0.49 (0.47, 0.52) | 0.63 (0.59, 0.67) |
| 1941 | 0.64 (0.60, 0.67) | 0.54 (0.51, 0.57) | 0.67 (0.63, 0.71) |
| 1944 | 0.68 (0.65, 0.71) | 0.63 (0.61, 0.66) | 0.70 (0.66, 0.73) |
| 1947 | 0.71 (0.68, 0.74) | 0.68 (0.66, 0.71) | 0.72 (0.69, 0.75) |
| 1950 | 0.77 (0.74, 0.80) | 0.74 (0.71, 0.76) | 0.78 (0.75, 0.82) |
| 1953 | 0.87 (0.84, 0.90) | 0.84 (0.82, 0.87) | 0.88 (0.85, 0.92) |
| 1956 | 0.93 (0.90, 0.96) | 0.93 (0.91, 0.96) | 0.93 (0.90, 0.96) |
| 1959 | 1.00 (1.00,1.00) | 1.00 (1.00,1.00) | 1.00 (1.00,1.00) |
| 1962 | 1.05 (1.02, 1.09) | 1.07 (1.04, 1.10) | 1.05 (1.01, 1.08) |
| 1965 | 1.06 (1.03, 1.10) | 1.11 (1.08, 1.14) | 1.05 (1.01, 1.09) |
| 1968 | 1.07 (1.03, 1.11) | 1.13 (1.09, 1.17) | 1.05 (1.01, 1.09) |
| 1971 | 1.11 (1.07, 1.16) | 1.17 (1.13, 1.21) | 1.10 (1.05, 1.14) |
| 1974 | 1.15 (1.10, 1.19) | 1.25 (1.21, 1.30) | 1.11 (1.06, 1.16) |
| 1977 | 1.19 (1.14, 1.24) | 1.30 (1.25, 1.35) | 1.15 (1.10, 1.21) |
| 1980 | 1.28 (1.23, 1.34) | 1.45 (1.39, 1.51) | 1.24 (1.18, 1.30) |
| 1983 | 1.38 (1.31, 1.44) | 1.59 (1.52, 1.66) | 1.32 (1.25, 1.39) |
| 1986 | 1.45 (1.38, 1.52) | 1.78 (1.69, 1.86) | 1.36 (1.29, 1.44) |
| 1989 | 1.48 (1.41, 1.56) | 1.92 (1.82, 2.02) | 1.38 (1.31, 1.46) |
| 1992 | 1.58 (1.49, 1.66) | 2.09 (1.98, 2.21) | 1.46 (1.38, 1.55) |
| 1995 | 1.72 (1.62, 1.83) | 2.51 (2.36, 2.67) | 1.57 (1.47, 1.67) |
| 1998 | 1.90 (1.77, 2.04) | 2.92 (2.72, 3.14) | 1.71 (1.58, 1.85) |
| 2001 | 2.19 (1.99, 2.42) | 3.44 (3.13, 3.78) | 1.96 (1.76, 2.18) |
|  |  | *P* value# |  |
|  | All | Female | Male |
| Net drift | <0.001 | <0.001 | <0.001 |
| All period rate ratios | <0.001 | <0.001 | <0.001 |
| All cohort rate ratios | <0.001 | <0.001 | <0.001 |
| All local drifts | <0.001 | <0.001 | <0.001 |

# Wald Chi square tests were used for estimable functions

Table S2. Age, period, and cohort effects (relative risks) on drug overdose mortality in the United States during 2000-2020, by race.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Group | Effect and 95% CI | | |  |
| White | Black or African American | Asian or Pacific Islander | American Indian or Alaska Native |
| Age |  |  |  |  |
| 16-18 | 5.15 (4.87, 5.46) | 3.08 (2.81, 3.38) | 2.91 (2.51, 3.38) | 9.64 (7.85,11.83) |
| 19-21 | 8.26 (7.86, 8.68) | 6.42 (5.93, 6.96) | 5.36 (4.70, 6.10) | 14.50 (11.93, 17.62) |
| 22-24 | 9.94 (9.49, 10.42) | 7.87 (7.29, 8.50) | 6.07 (5.36, 6.88) | 13.99 (11.55, 16.95) |
| 25-27 | 10.68 (10.20, 11.17) | 7.86 (7.29, 8.48) | 5.82 (5.17, 6.56) | 14.18 (11.77, 17.09) |
| 28-30 | 11.48 (11.00, 11.99) | 7.93 (7.37, 8.54) | 5.95 (5.30, 6.69) | 13.55 (11.26, 16.31) |
| 31-33 | 12.55 (12.05, 13.07) | 7.35 (6.84, 7.91) | 5.49 (4.90, 6.15) | 13.59 (11.33, 16.30) |
| 34-36 | 13.76 (13.24, 14.30) | 7.30 (6.80, 7.84) | 5.65 (5.06, 6.31) | 13.23 (11.08, 15.81) |
| 37-39 | 15.37 (14.82, 15.93) | 7.24 (6.75, 7.75) | 5.70 (5.13, 6.35) | 14.15 (11.93, 16.77) |
| 40-42 | 16.92 (16.38, 17.47) | 7.13 (6.70, 7.60) | 5.59 (5.06, 6.18) | 12.89 (10.97, 15.15) |
| 43-45 | 18.56 (18.00, 19.13) | 6.73 (6.32, 7.16) | 6.27 (5.69, 6.90) | 11.59 (9.86, 13.62) |
| 46-48 | 20.33 (19.74, 20.93) | 6.55 (6.16, 6.98) | 6.96 (6.34, 7.63) | 13.14 (11.22, 15.38) |
| 49-51 | 21.76 (21.14, 22.39) | 6.48 (6.09, 6.91) | 7.59 (6.94, 8.31) | 10.80 (9.18, 12.70) |
| 52-54 | 23.25 (22.59, 23.93) | 6.24 (5.84, 6.67) | 7.74 (7.06, 8.48) | 11.76 (9.97, 13.89) |
| 55-57 | 23.93 (23.23, 24.66) | 5.95 (5.54, 6.38) | 8.13 (7.40, 8.93) | 11.24 (9.41, 13.41) |
| 58-60 | 24.43 (23.67, 25.22) | 5.87 (5.44, 6.33) | 8.03 (7.26, 8.88) | 8.90 (7.20, 11.01) |
| 61-63 | 23.04 (22.18, 23.94) | 5.15 (4.70, 5.64) | 8.52 (7.58, 9.57) | 8.33 (6.46, 10.75) |
| 64-66 | 23.16 (22.21, 24.15) | 5.34 (4.83, 5.90) | 7.78 (6.83, 8.86) | 8.99 (6.78, 11.93) |
| 67-69 | 24.63 (23.53, 25.78) | 4.63 (4.12, 5.21) | 8.39 (7.28, 9.67) | 7.60 (5.40, 10.69) |
| 70-72 | 26.53 (25.24, 27.89) | 4.96 (4.36, 5.63) | 8.37 (7.17, 9.77) | 8.49 (5.87, 12.29) |
| 73-75 | 30.14 (28.56, 31.81) | 5.18 (4.50, 5.96) | 8.70 (7.34, 10.32) | 7.76 (4.94, 12.21) |
| 76-78 | 33.00 (31.14, 34.98) | 5.13 (4.39, 5.98) | 9.84 (8.20, 11.80) | 7.84 (4.76, 12.89) |
| 79-81 | 36.04 (33.85, 38.37) | 4.74 (3.97, 5.66) | 10.03 (8.23, 12.22) | 11.74 ( 6.91, 19.93) |
| 82-84 | 38.35 (35.81, 41.08) | 4.59 (3.74, 5.62) | 9.55 (7.64, 11.94) | 10.01 (4.90, 20.45) |
| Period |  |  |  |  |
| 1999-2001 | 0.85 (0.83, 0.86) | 1.07 (1.03, 1.12) | 0.94 (0.88, 1.00) | 1.04 (0.94, 1.16) |
| 2002-2004 | 0.89 (0.87, 0.91) | 1.03 (0.99, 1.08) | 0.92 (0.87, 0.98) | 1.05 (0.95, 1.16) |
| 2005-2007 | 0.92 (0.90, 0.94) | 0.98 (0.94, 1.02) | 0.93 (0.88, 0.99) | 1.03 (0.93, 1.13) |
| 2008-2010 | 1.00 (1.00, 1.00) | 1.00 (1.00, 1.00) | 1.00 (1.00, 1.00) | 1.00 (1.00, 1.00) |
| 2011-2013 | 1.06 (1.04, 1.08) | 1.03 (0.99, 1.07) | 1.02 (0.96, 1.07) | 1.06 (0.97, 1.16) |
| 2014-2016 | 1.13 (1.10, 1.15) | 1.07 (1.03, 1.11) | 1.03 (0.98, 1.09) | 1.19 (1.08, 1.30) |
| 2017-2019 | 1.18 (1.16, 1.20) | 1.23 (1.19, 1.28) | 1.06 (1.00, 1.11) | 1.34 (1.21, 1.48) |
| Cohort |  |  |  |  |
| 1917 | 0.55 (0.48, 0.63) | 1.32 (0.86, 2.01) | 1.99 (1.27, 3.13) | 0.38 (0.04, 3.94) |
| 1920 | 0.52 (0.47, 0.57) | 1.18 (0.88, 1.58) | 1.22 (0.86, 1.73) | 0.69 (0.22, 2.09) |
| 1923 | 0.52 (0.48, 0.56) | 1.13 (0.90, 1.43) | 1.30 (1.00, 1.70) | 0.56 (0.16, 1.96) |
| 1926 | 0.50 (0.47, 0.54) | 1.05 (0.86, 1.28) | 1.11 (0.88, 1.40) | 0.90 (0.45, 1.81) |
| 1929 | 0.53 (0.50, 0.57) | 1.10 (0.93, 1.31) | 0.98 (0.79, 1.22) | 1.07 (0.61, 1.88) |
| 1932 | 0.53 (1.50, 0.56) | 1.09 (0.94, 1.28) | 0.94 (0.78, 1.14) | 0.73 (0.42, 1.28) |
| 1935 | 0.53 (0.50, 0.56) | 0.91 (0.79, 1.06) | 0.97 (0.81, 1.15) | 0.87 (0.56, 1.35) |
| 1938 | 0.56 (0.53, 0.59) | 0.85 (0.75, 0.98) | 0.87 (0.74, 1.02) | 0.91 (0.62, 1.33) |
| 1941 | 0.60 (0.57, 0.63) | 0.98 (0.88, 1.10) | 0.80 (0.68, 0.93) | 0.79 (0.56, 1.11) |
| 1944 | 0.64 (0.62, 0.67) | 0.88 (0.79, 0.98) | 0.95 (0.84, 1.09) | 0.82 (0.61, 1.10) |
| 1947 | 0.68 (0.65, 0.70) | 0.94 (0.86, 1.03) | 0.84 (0.74, 0.95) | 0.78 (0.60, 1.02) |
| 1950 | 0.75 (0.72, 0.78) | 0.88 (0.81, 0.95) | 0.89 (0.79, 0.99) | 0.77 (0.61, 0.97) |
| 1953 | 0.85 (0.82, 0.88) | 1.03 (0.95, 1.10) | 0.94 (0.85, 1.04) | 0.91 (0.75, 1.11) |
| 1956 | 0.92 (0.89, 0.95) | 1.03 (0.96, 1.10) | 1.00 (0.91, 1.10) | 0.98 (0.82, 1.17) |
| 1959 | 1.00 (1.00, 1.00) | 1.00 (1.00, 1.00) | 1.00 (1.00, 1.00) | 1.00 (1.00, 1.00) |
| 1962 | 1.06 (1.03, 1.09) | 1.08 (1.02, 1.15) | 1.08 (0.98, 1.19) | 1.12 (0.95, 1.31) |
| 1965 | 1.08 (1.04, 1.11) | 1.11 (1.04, 1.18) | 1.03 (0.93, 1.14) | 1.32 (1.12, 1.55) |
| 1968 | 1.09 (1.05, 1.13) | 1.15 (1.08, 1.23) | 1.11 (1.00, 1.23) | 1.12 (0.95, 1.33) |
| 1971 | 1.14 (1.10, 1.19) | 1.19 (1.11, 1.28) | 1.18 (1.07, 1.31) | 1.16 (0.98, 1.38) |
| 1974 | 1.19 (1.14, 1.23) | 1.21 (1.12, 1.29) | 1.21 (1.09, 1.35) | 1.33 (1.11, 1.58) |
| 1977 | 1.24 (1.19, 1.29) | 1.25 (1.16, 1.34) | 1.18 (1.06, 1.32) | 1.21 (1.01, 1.45) |
| 1980 | 1.35 (1.30, 1.41) | 1.30 (1.21, 1.40) | 1.18 (1.05, 1.33) | 1.24 (1.03, 1.49) |
| 1983 | 1.45 (1.39, 1.52) | 1.35 (1.25, 1.45) | 1.38 (1.23, 1.56) | 1.50 (1.24, 1.81) |
| 1986 | 1.53 (1.46, 1.61) | 1.40 (1.29, 1.51) | 1.43 (1.27, 1.62) | 1.63 (1.35, 1.97) |
| 1989 | 1.59 (1.51, 1.67) | 1.36 (1.25, 1.47) | 1.45 (1.27, 1.64) | 1.81 (1.49, 2.20) |
| 1992 | 1.68 (1.59, 1.77) | 1.49 (1.37, 1.62) | 1.75 (1.53, 2.00) | 1.68 (1.37, 2.05) |
| 1995 | 1.83 (1.72, 1.94) | 1.62 (1.48, 1.77) | 2.15 (1.87, 2.48) | 1.61 (1.30, 1.99) |
| 1998 | 2.02 (1.88, 2.17) | 1.80 (1.62, 1.99) | 2.38 (2.03, 2.80) | 1.38 (1.09, 1.76) |
| 2001 | 2.32 (2.11, 2.56) | 2.02 (1.75, 2.33) | 3.06 (2.48, 3.77) | 1.70 (1.27, 2.29) |
|  |  | *P* value# |  |  |
|  | White | Black | Asian or Pacific Islander | American Indian or Alaska Native |
| Net drift | <0.001 | <0.001 | <0.001 | <0.001 |
| All period rate ratios | <0.001 | <0.001 | <0.001 | <0.001 |
| All cohort rate ratios | <0.001 | <0.001 | <0.001 | <0.001 |
| All local drifts | <0.001 | <0.001 | <0.001 | <0.001 |

# Wald Chi square tests were used for estimable functions