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| **Online Supplemental Table 1: Risk Factors Associated with Opioid Related Hospitalization and Mortality – Oregon 2013** |
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| **Risk Factor** | **Total****N = 838689** | **No. controls (%)****N = 837280** | **No. cases (%)****N = 1409** | **Unadjusted OR** | **95% CI** | ***Χ2*** |
| Urbanicity/Rurality  |
|  Urban | 511592 | 510743(99.83) | 849(.17) | 1 | - | - |
|  Rural | 324918 | 324360(99.83) | 558(.17) | 1.03 | (.93, 1.15) | .40 |
|  Unknown | 2179 | 2177(99.91) | 2(.09) | .55 | (.14, 2.21) | .72 |
| Age category |
|  12-24 years |  100501 | 100460(99.96) | 41 (.04) | 1 | - | - |
|  25-34 years | 127674 | 127590 (99.93) | 84 (.07) | 1.61 | (1.11, 2.34) | 6.42\* |
|  35-44 years | 126100 | 125966 (99.89) | 134 (.11) | 2.61 | (1.84, 3.70) | 31.06\*\*\* |
|  45-54 years | 143455 | 143226 (99.84) | 229 (.16) | 3.92 | (2.81, 5.46) | 75.49\*\*\* |
|  55-64 years | 154776 | 154421 (99.77) | 355 (.23) | 5.63 | (4.08, 7.78) | 139.89\*\*\* |
|  65-74 years | 106717 | 106434 (99.73) | 283 (.27) | 6.52 | (4.69, 9.04) | 166.94\*\*\* |
|  75+ years | 79466 | 79183 (99.64) | 283 (.36) | 8.76 | (6.31, 12.15) | 245.54\*\*\* |
| Number of prescribers  |
|  1 | 533754 | 533372 (99.93) | 382 (.07) | 1 | - | - |
|  2 | 172557 | 172234 (99.81) | 323 (.19) | 2.62 | (2.26, 3.04) | 174.81\*\*\* |
|  3 | 70254 | 69984 (99.62) | 270 (.38) | 5.39 | (4.61, 6.30) | 563.16\*\*\* |
|  >4 | 62124 | 61690 (99.30) | 434 (.70) | 9.82 | (8.56, 11.27) | 1599.88\*\*\* |
| Number of pharmacies |
|  1 | 654034 | 653402(99.90) | 632(.10) | 1 | - | - |
|  2 | 130079 | 129659(99.68) | 420(.32) | 3.35 | (2.96, 3.79) | 414.52\*\*\* |
|  3 | 34865 | 34696(99.52) | 169(.48) | 5.04 | (4.25, 5.97) | 429.28\*\*\* |
|  >4 | 19711 | 19523(99.05) | 188(.95) | 9.96 | (8.45, 11.72) | 1156.48\*\*\* |
| Number of prescriptions  |
|  1 | 400631 | 400449(99.95) | 182(.05) | 1 | - | - |
|  2 | 134643 | 134499(99.89) | 144(.11) | 2.36 | (1.89, 2.93) | 62.66\*\*\* |
|  3 | 62598 | 62506(99.85) | 92(.15) | 3.24 | (2.52, 4.16) | 94.43\*\*\* |
|  >4 | 240817 | 239826(99.59) | 991(.41) | 9.09 | (7.76, 10.65) | 1104.33\*\*\* |
| Other Prescription Measures |
| 4 x 4 Metric | 12514 | 12371(98.86) | 143(1.14) | 18.59 | (15.24, 22.68) | 1613.68\*\*\* |
| Opioid-Opioid Overlap | 262065 | 261054(99.61) | 1011(.39) | 5.61 | (4.99, 6.30) | 1077.91\*\*\* |
| ER/LA Opioid Rx | 65458 | 64863(99.09) | 595(.91) | 8.70 | (7.83, 9.68) | 2324.27\*\*\* |
| LA/SA Opioid Overlap | 52319 | 51800(99.01) | 519(.99) | 8.84 | (7.93, 9.86) | 2258.91\*\*\* |
| Benzodiazepine Rx | 183558 | 182787(99.58) | 771(.42) | 4.33 | (3.90, 4.81) | 889.96\*\*\* |
| Opioid-Benzo/Sedative Overlap | 109463 | 108877(99.46) | 586(.54) | 4.76 | (4.28, 5.30) | 1012.89\*\*\* |
| Carisoprodol Rx | 10508 | 10449(99.44) | 59(.56) | 3.46 | (2.66, 4.49) | 98.23\*\*\* |
| Opioid-Benzo-Carisoprodol Overlap | 2825 | 2796(98.97) | 29(1.03) | 6.27 | (4.33, 9.08) | 124.58\*\*\* |
| MMEDD ≥ 90 mg | 29915 | 29648(99.11) | 267(.89) | 6.37 | (5.57, 7.28) | 970.94\*\*\* |

*Note.* \**p*<.05, \*\**p*<.01, \*\*\**p*<.001; LA/SA = Long Acting/Short Acting; ER/LA = Extended Release/ Long Acting; MMEDD = Morphine Milligrams Equivalent Daily Dose OR = odds ratio; CI = confidence interval.

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| **Online Supplemental Table 2: Model 1 Regression Coefficients** |
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| **Parameter** | **β** | **SE** | **χ2** | **p** | **aOR** | **95%CI** |
| Intercept | -8.24 | 0.16 | 2604.64 | <.0001 | - | - |
| Rural | -0.06 | 0.06 | 1.38 | 0.24 | 0.94 | (0.84, 1.04) |
| 25-34 years | 0.11 | 0.19 | .35 | 0.55 | 1.12 | (0.77, 1.63) |
| 35-44 years | 0.46 | 0.18 | 6.66 | 0.01 | 1.59 | (1.12, 2.27) |
| 45-54 years | 0.76 | 0.17 | 19.33 | <.0001 | 2.13 | (1.52, 2.98) |
| 55-64 years | 1.14 | 0.17 | 46.45 | <.0001 | 3.13 | (2.25, 4.35) |
| 65-74 years | 1.42 | 0.17 | 70.95 | <.0001 | 4.15 | (2.98, 5.78) |
| 75+ years | 1.76 | 0.17 | 107.83 | <.0001 | 5.79 | (4.16, 8.06) |
| Number of prescribers | 0.13 | 0.02 | 67.43 | <.0001 | 1.13 | (1.10, 1.17) |
| Number of pharmacies | 0.11 | 0.02 | 21.10 | <.0001 | 1.11 | (1.06, 1.16) |
| Number of prescriptions | -0.01 | <0.01 | 10.74 | <.01 | 0.99 | (0.98, 0.99) |
| LA/SA Opioid Overlap | 0.99 | 0.08 | 171.67 | <.0001 | 2.70 | (2.32, 3.13) |
| Opioid-Benzodiazepine/sedative overlap | 0.75 | 0.06 | 158.79 | <.0001 | 2.13 | (1.89, 2.39) |
| Opioid-Opioid Overlap | 0.91 | 0.07 | 160.98 | <.0001 | 2.48 | (2.16, 2.86) |
| Opioid-Benzo-Carisoprodol Overlap | 0.46 | 0.19 | 5.65 | .02 | 1.59 | (1.08, 2.32) |
| MMEDD >= 90 mg | .42 | .10 | 18.52 | <.0001 | 1.52 | (1.25, 1.83) |

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| **Online Supplemental Table 3: Model 2 Regression Coefficients** |
|  |
| **Parameter** | **β** | **SE** | **χ2** | **p** | **aOR** | **95%CI** |
| Intercept | -7.99 | .09 | 7275.29 | <.0001 | - | - |
| 35-44 years | 0.38 | 0.13 | 9.38 | <.01 | 1.47 | (1.15, 1.88) |
| 45-54 years | 0.67 | 0.11 | 34.91 | <.0001 | 1.95 | (1.57, 2.44) |
| 55-64 years | 1.04 | 0.11 | 94.65 | <.0001 | 2.82 | (2.29, 3.48) |
| 65-74 years | 1.30 | 0.11 | 140.57 | <.0001 | 3.68 | (2.97, 4.57) |
| 75+ | 1.61 | 0.11 | 212.04 | <.0001 | 4.99 | (4.02, 6.19) |
| No. of prescribers | 0.14 | 0.01 | 101.69 | <.0001 | 1.15 | (1.12, 1.18) |
| No. of pharmacies | 0.10 | 0.02 | 19.70 | <.0001 | 1.11 | (1.06, 1.16) |
| Any Rx of ER/LA opioid | 1.48 | 0.06 | 640.53 | <.0001 | 4.41 | (3.93, 4.94) |
| Any Rx of benzodiazepine/sedative | 0.91 | 0.06 | 262.20 | <.0001 | 2.50 | (2.23, 2.79) |
| Any Rx of Carisoprodol | 0.49 | 0.14 | 12.94 | 0.0002 | 1.63 | (1.25, 2.13) |