Analysis of US Opioid Mortality and ER Visit Data

Version 1.2

[CDC Wonder + AHRQ HCUP-US Databases]

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John Alan Tucker, Ph.D.*

Updated April 7, 2019

+ Richard A Lawhern, Ph.D – Updated to Version 1.2 with revised opioid mortality data and graphics
* John Alan Tucker, Ph.D. - Original data extraction, organization and Excel spreadsheet graphics for Version 1.0

Objectives and Sources

- Assess trends, patterns in opioid prescriptions versus opioid-related mortality by US State
- Assess trends, patterns in Emergency Department admissions for opioid-related causes
- Sources
    * CDC Wonder Database
    * CDC Prescribing Data
    * Agency for Healthcare Research Quality HCUP-US Database
- Trends Checked in Organization for Economic Cooperation and Development (OECD = 34 industrialized countries)
- Data Current April 7, 2019

Take-Away Conclusions

- There is no consistent cause and effect relationship between rates of opioid prescription versus rates of opioid-overdose-related deaths by US State.
- Deeper production restrictions on scheduled prescription opioids – either prescribed for patients or diverted – will not reduce opioid-overdose related deaths or opioid-related hospital admissions.

Graphical Analysis of Overdose Rates by US State

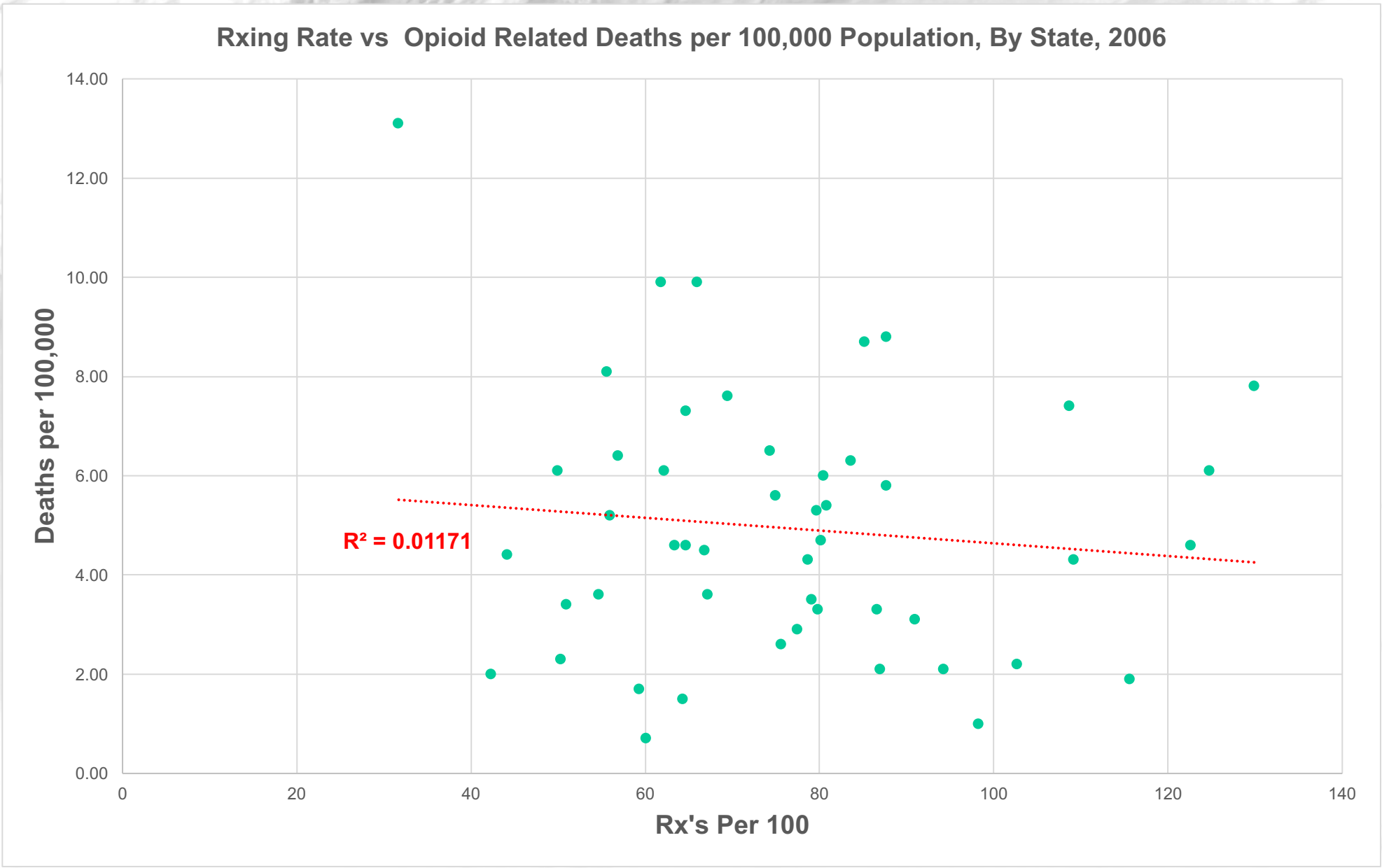
About Data Analysis

Excel ™ spreadsheets offer “regression analysis” capabilities, to examine how strongly one set of data may be related to another. “R-Squared” is a mathematical measure of how well two groups of data “fit” with a model of the relationship between them.

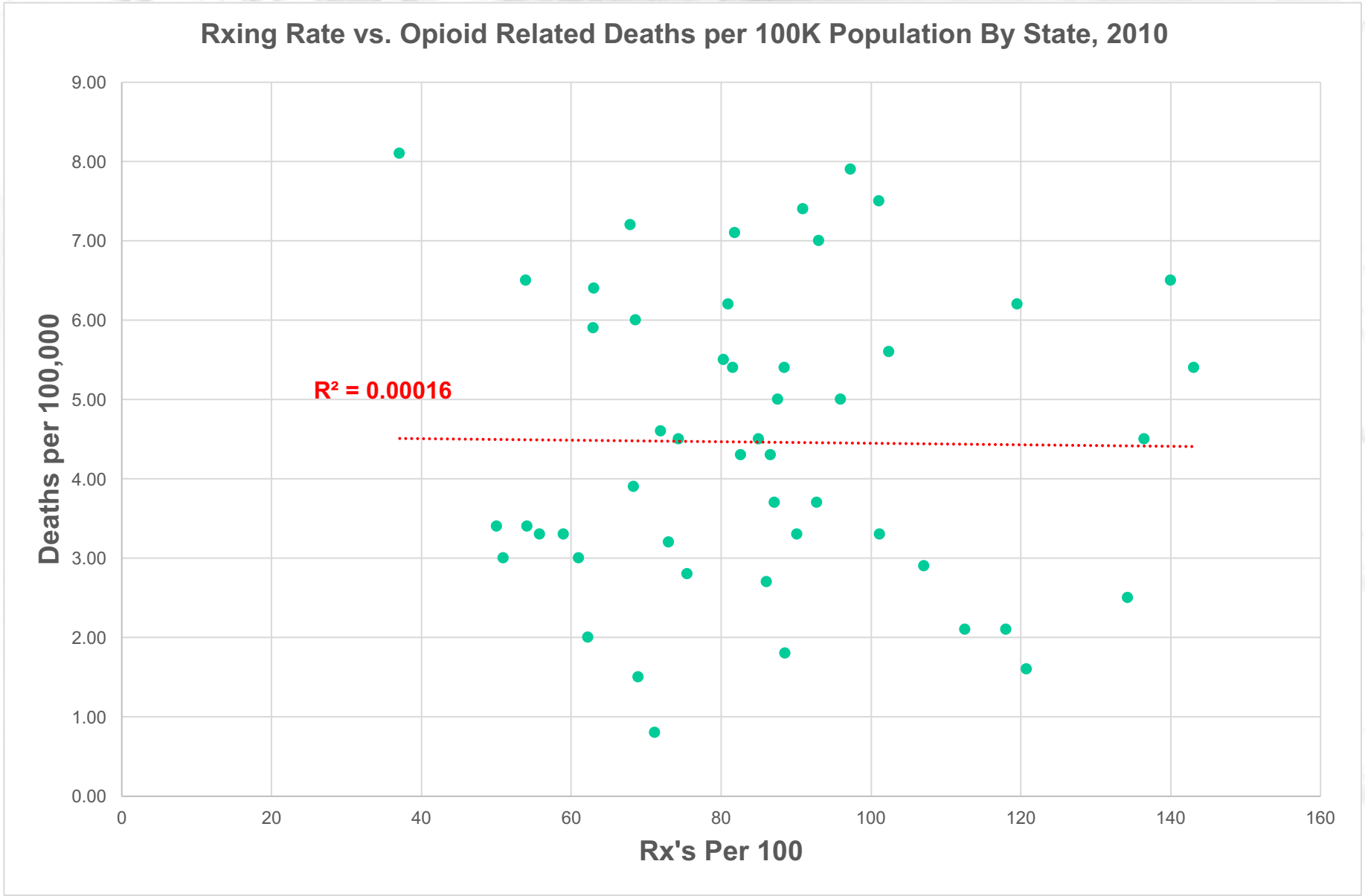
In a strong relationship, R-Squared should be above 0.9. This means that the data “fit” closely around a “moving average” line. The smaller the value of R-Squared, the weaker is the “fit” and the weaker is the relationship.

In charts which follow, data on opioid-related overdoses from all sources (legal and illegal) and data on hospital and ER visits involving opioids of all kinds (legal and illegal) are compared with State-by-State rates of medical opioid prescriptions.

Computed R-squared for all of the data is so low and statistical splatter is so high that no consistent relationship can be detected. **Higher rates of prescription are *NOT* “causing” increased drug overdose deaths.** Other factors must be at work.



Opioid deaths per 100K population vs. prescriptions per 100 people by US State.
Updated April 7, 2019



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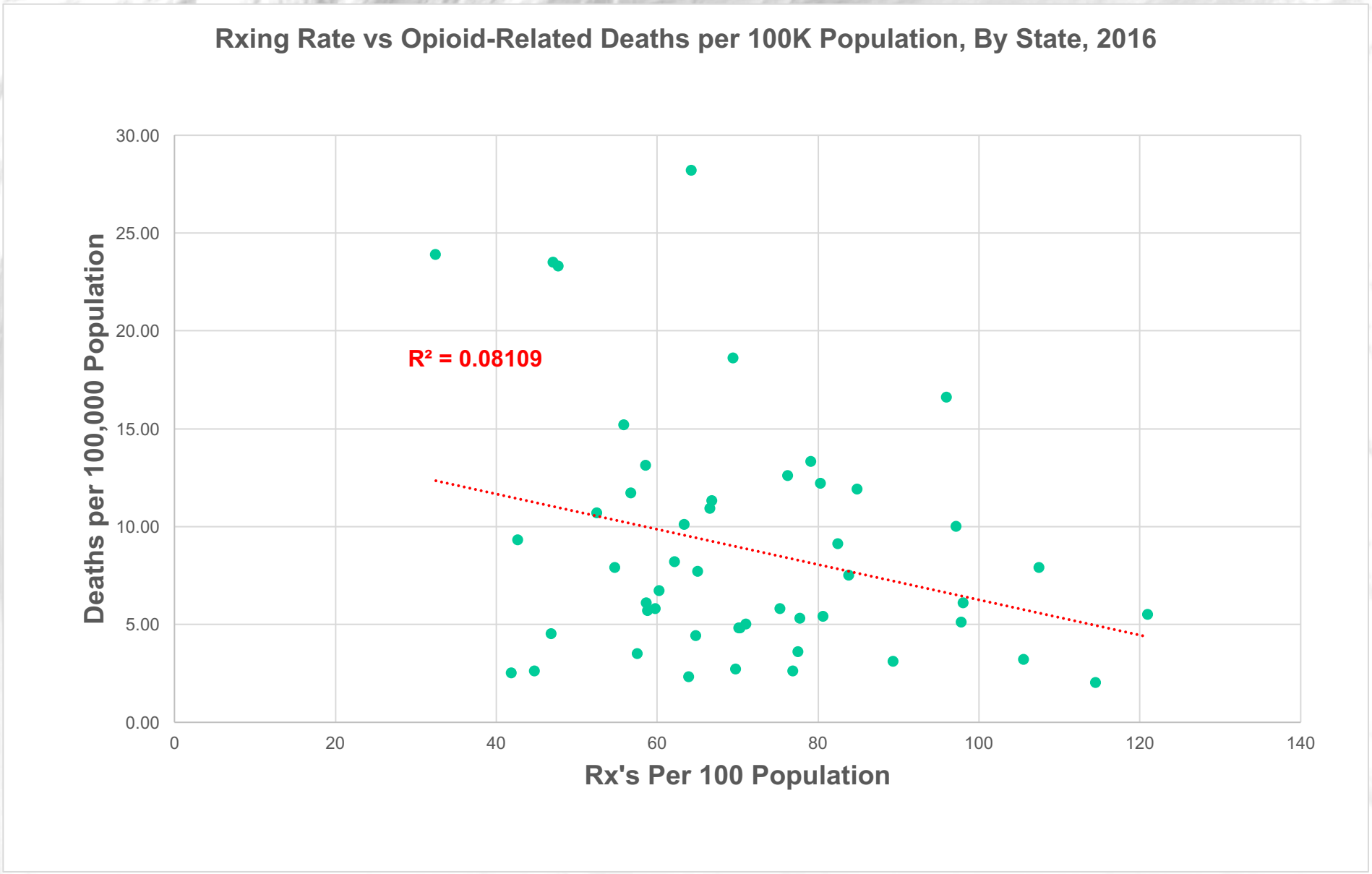
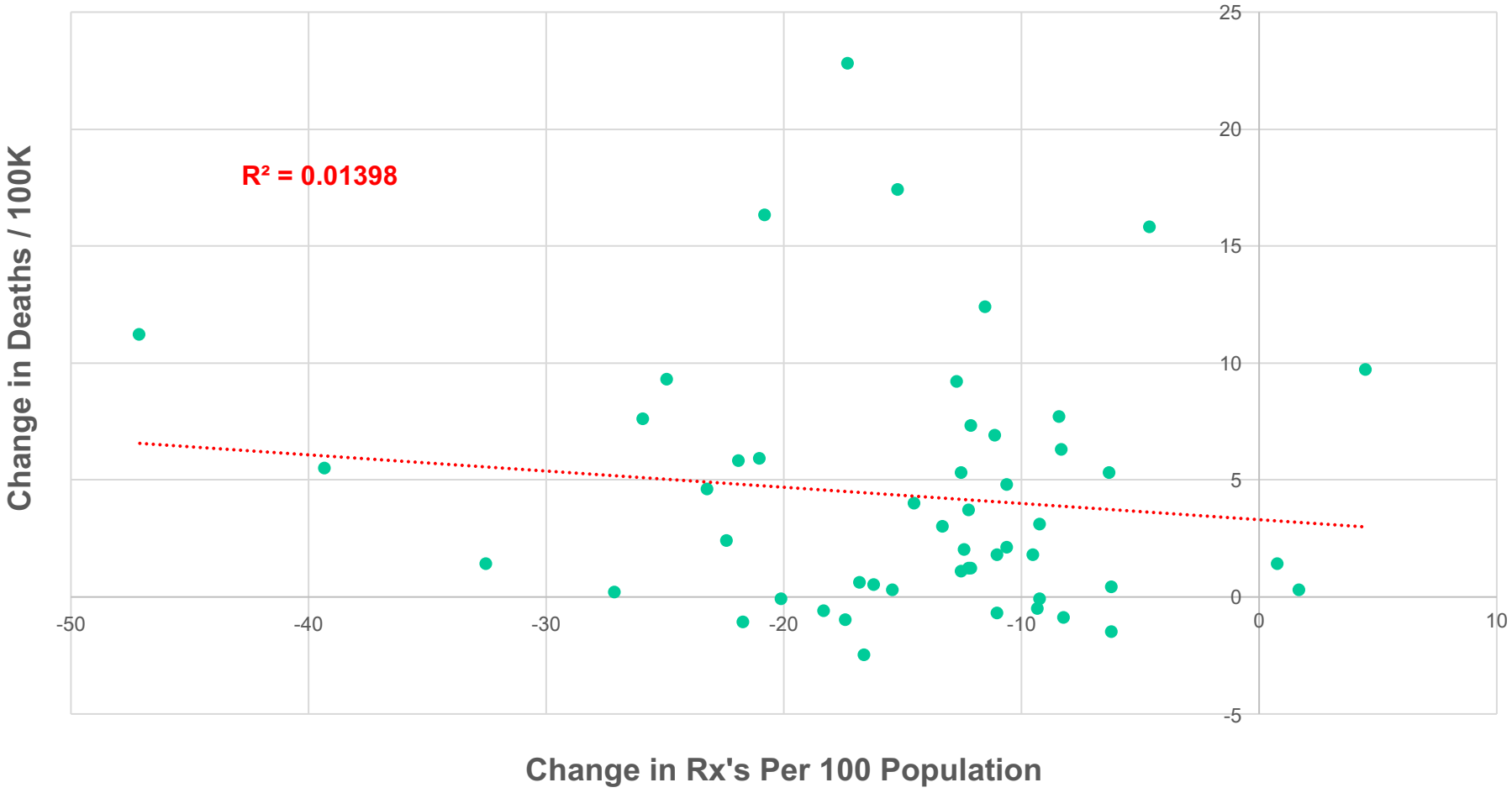
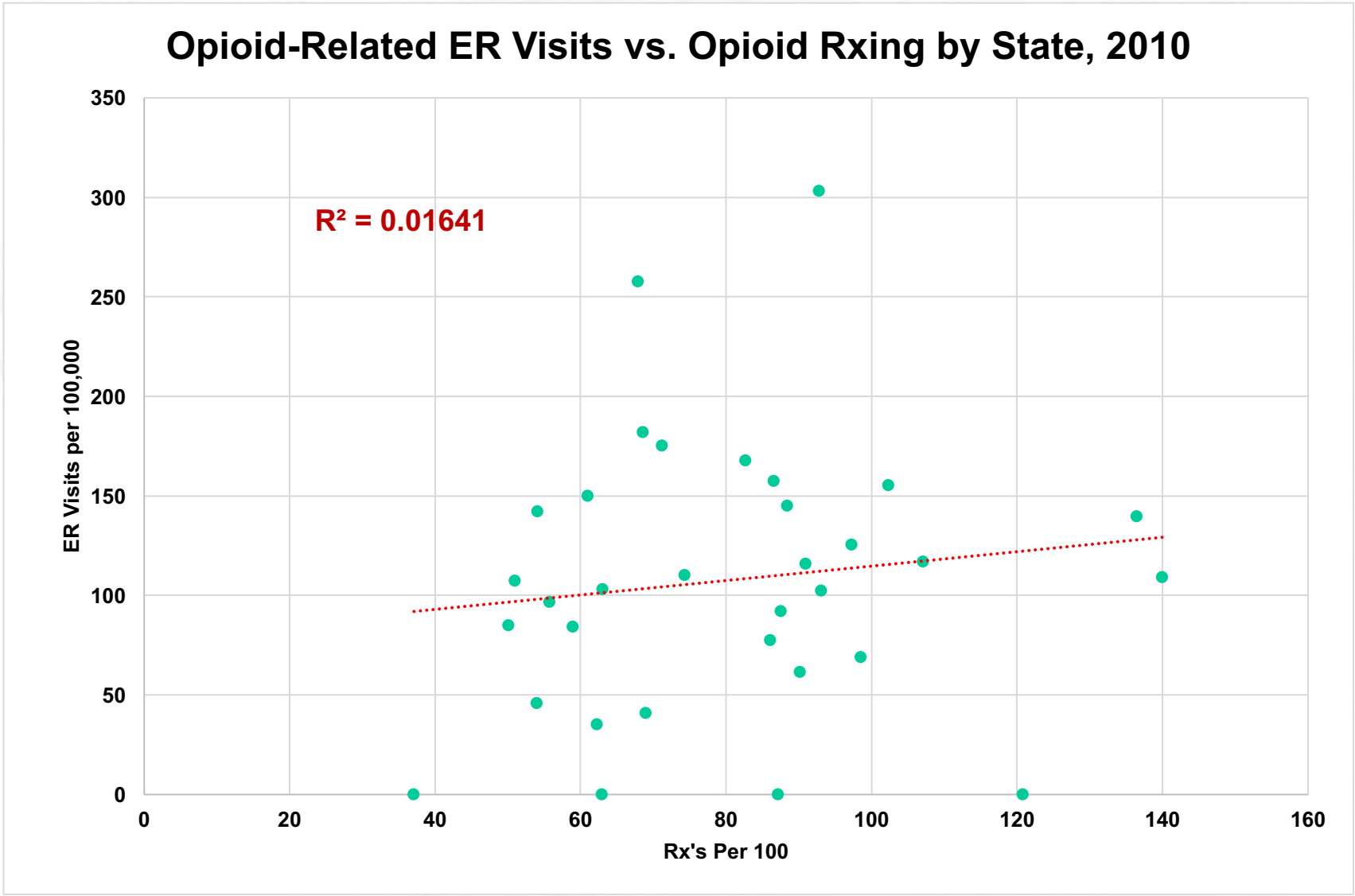


Opioid related deaths per 100K Population vs. prescriptions per 100 people by US State.
Updated April 7, 2019

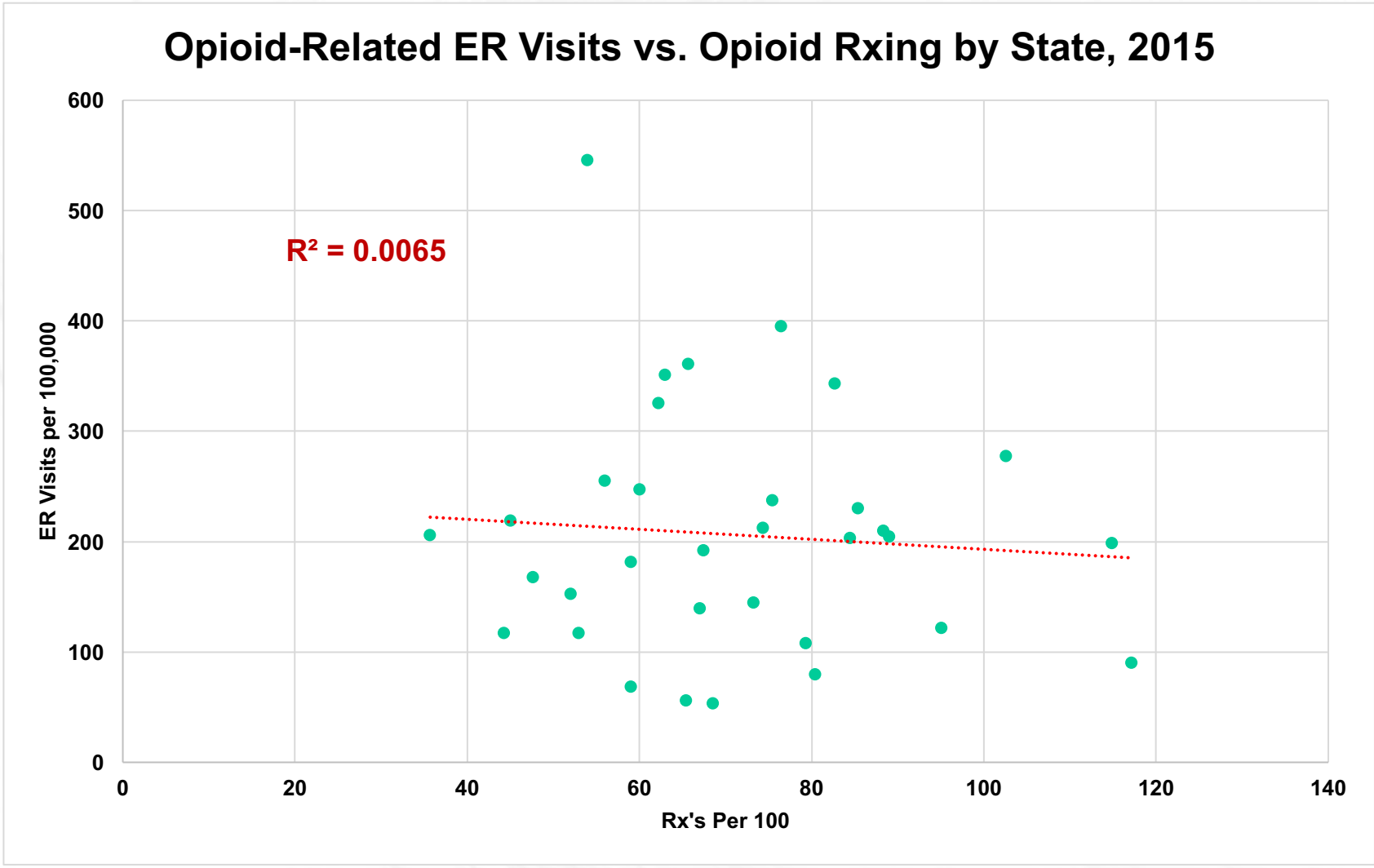
Change in Opioid Deaths per 100K vs Change in Rxing, by State, 2010-2016



Graphical Analysis of Hospital Visits vs Opioid Prescribing



Opioid Prescriptions per 100 people by US State vs. Opioid Related ER Visits per 100,000 population.



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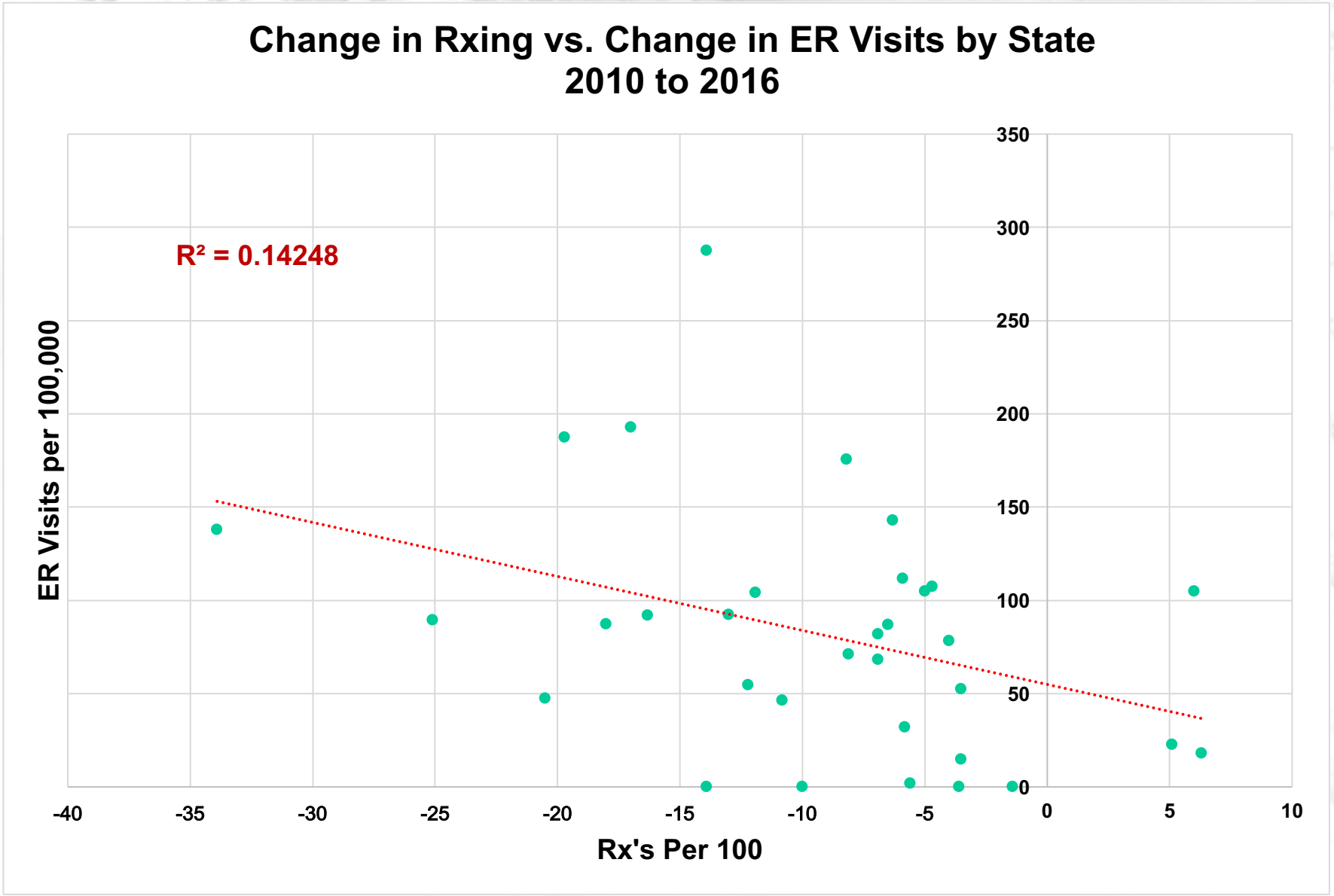
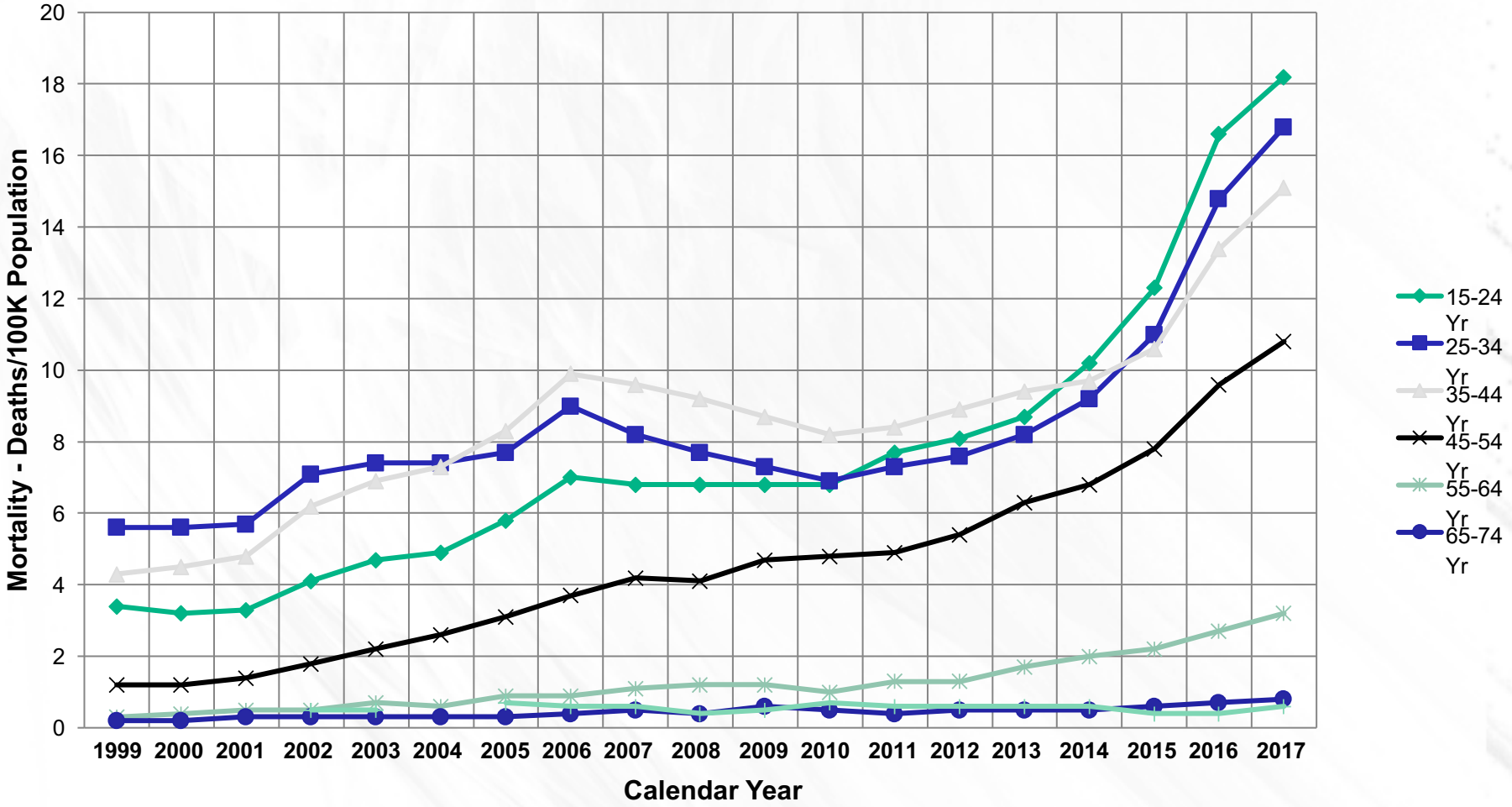


Change in prescribing vs. change in ER Visits by US State.
Trend line = rise in mortality with fall in prescription rates

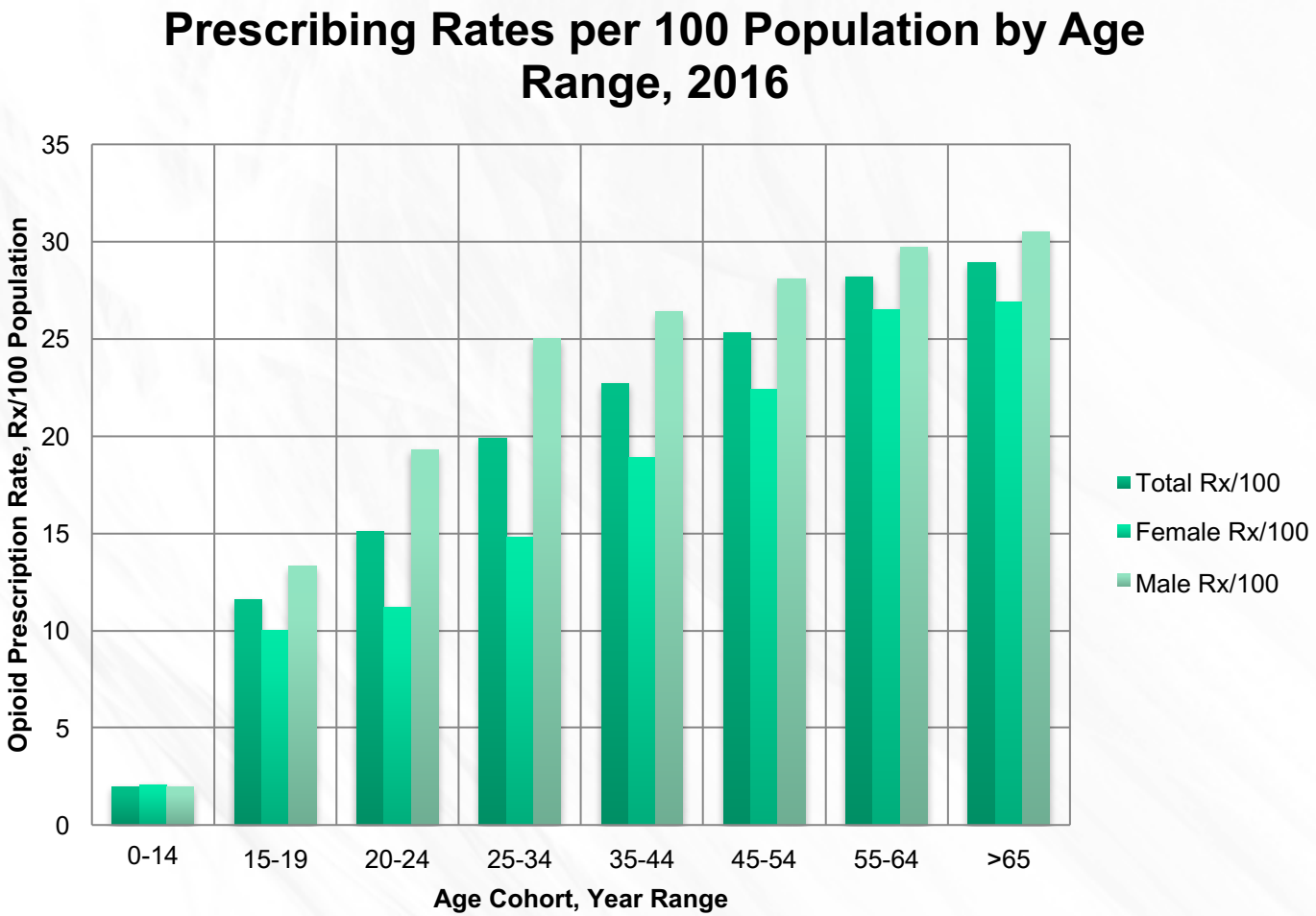
Age Adjusted Opioid-Overdose Related Mortality by Year and Age

(CDC Wonder Database Apr 2, 2019)



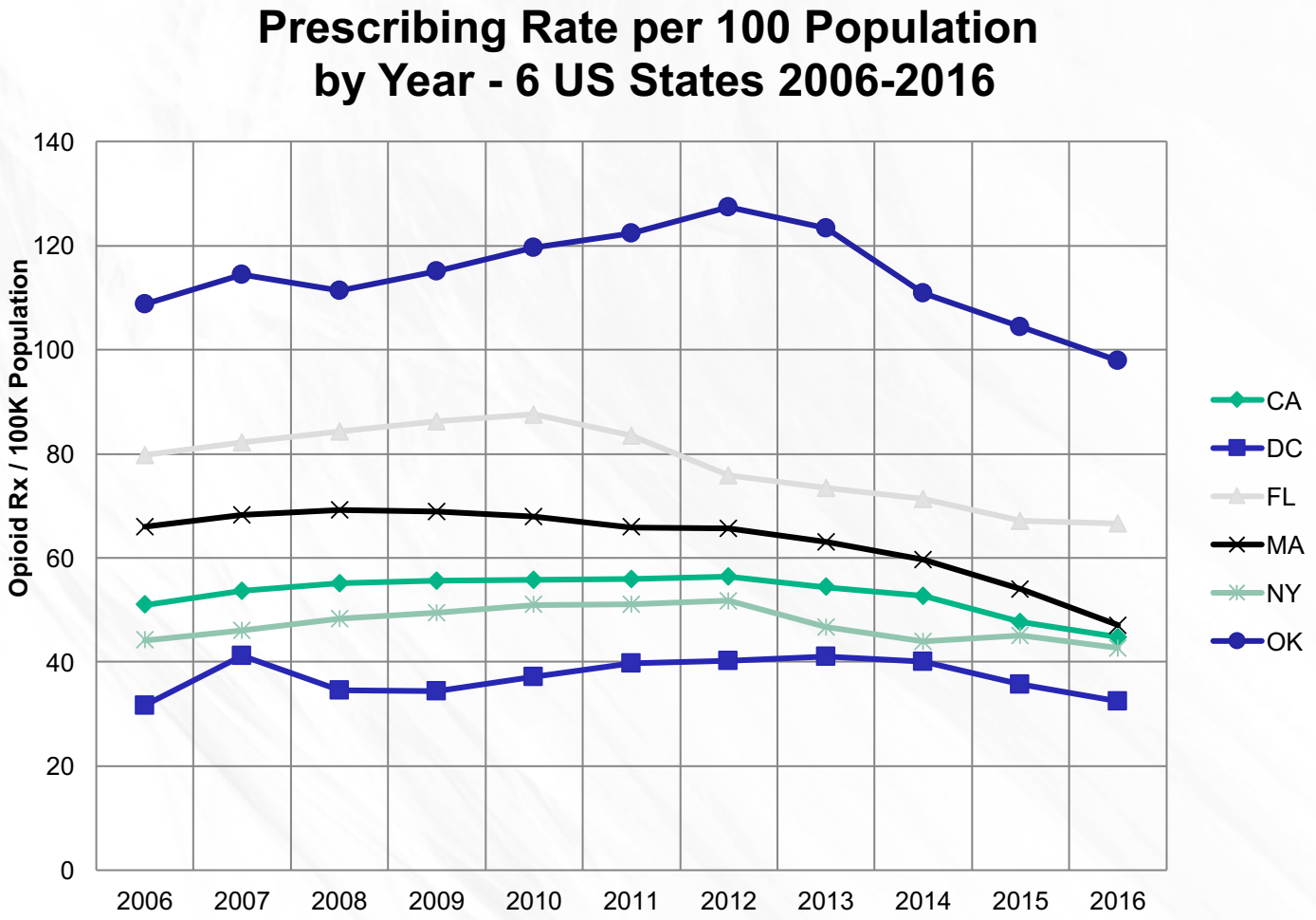
Dataset: Multiple Cause of Death, 1999-2017
Narcotics Related (T40.0-T40.6) Accidental and Intentional Drug Overdose Deaths (X42, X62)

Opioid Prescribing by Age Group *



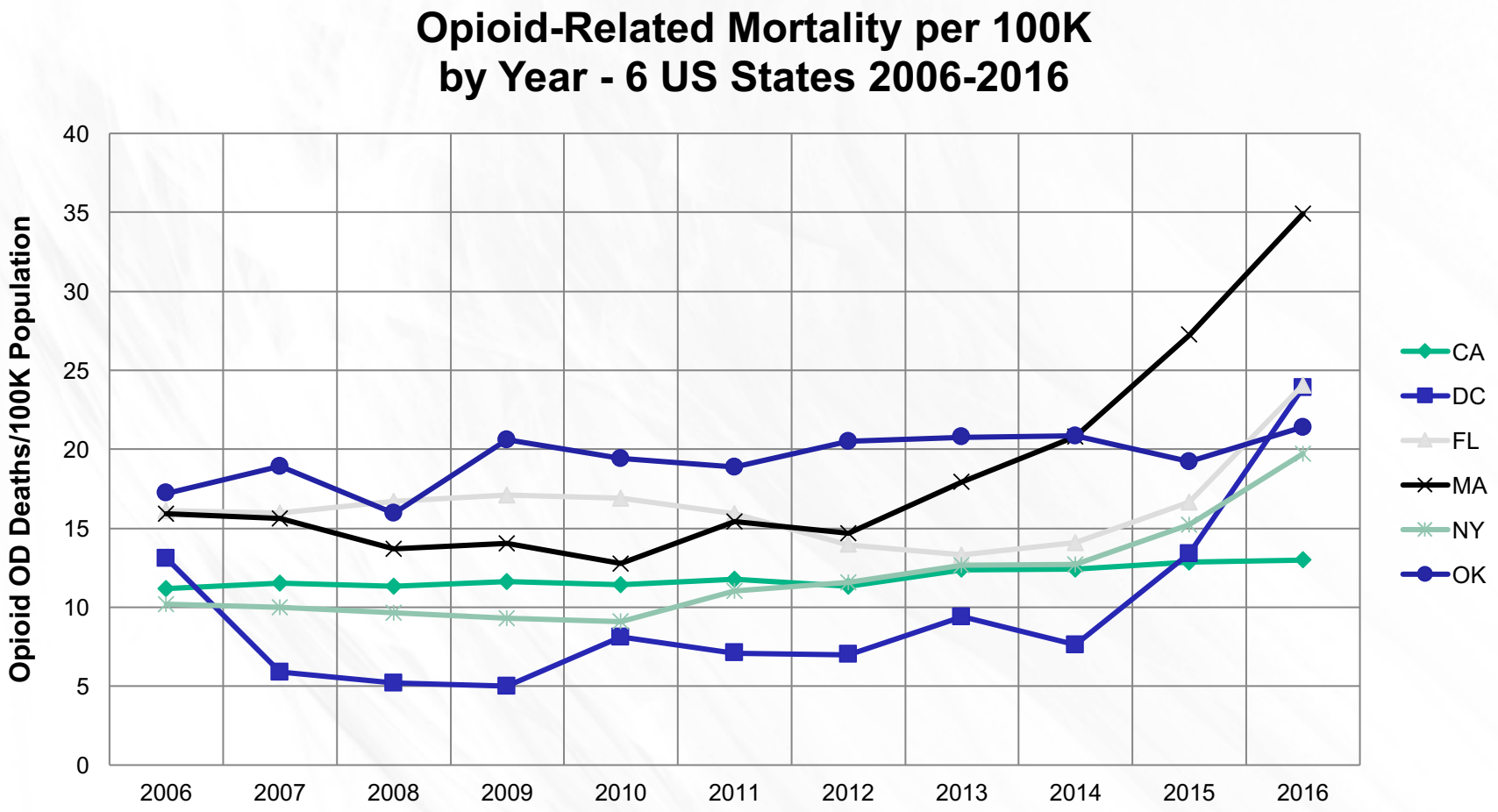
* Prescriptions/100 population over age 55 >300% higher than under age 20.

One Opioid Crisis or Many?

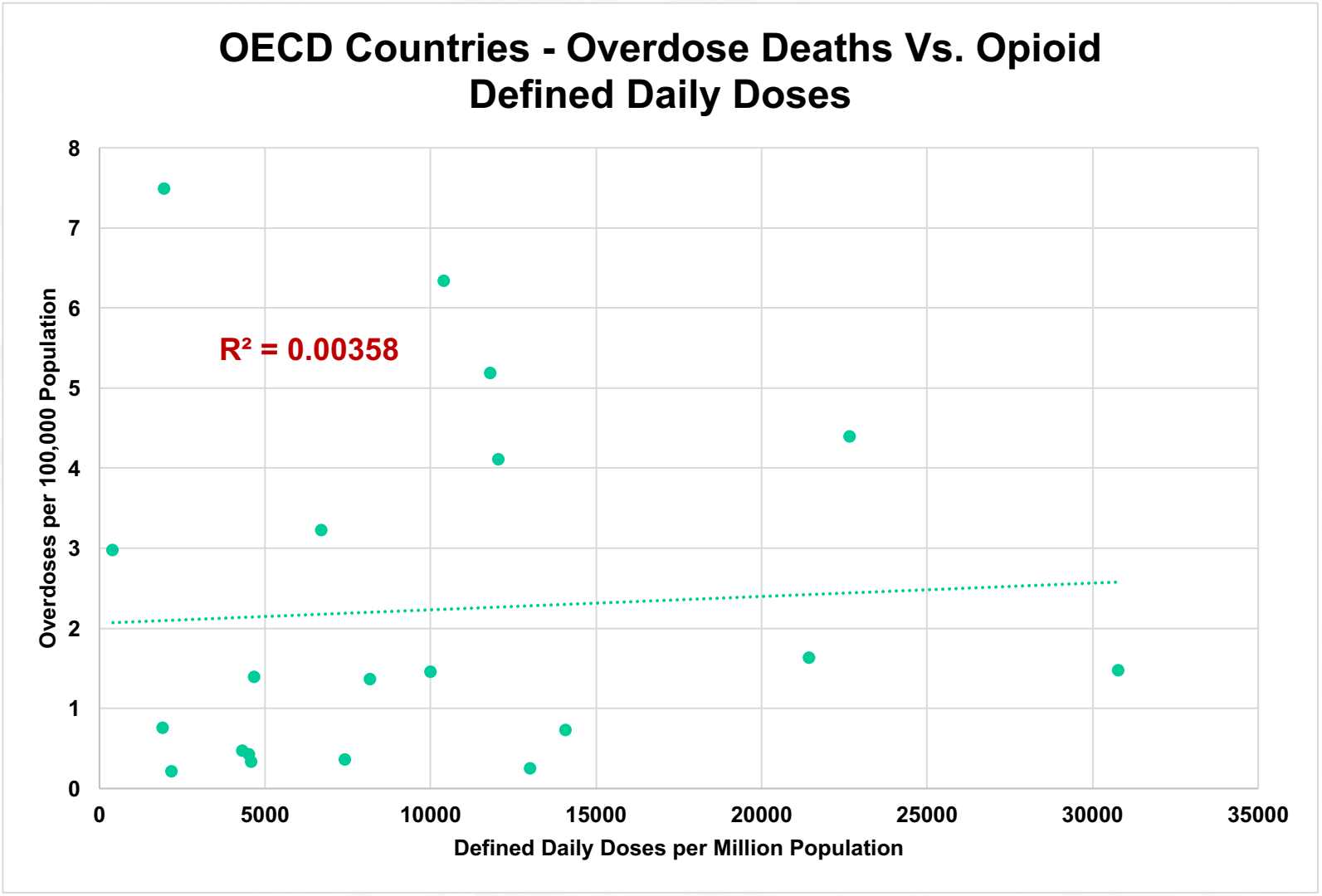


Prescribing rates vary by 3:1 across States, fall after 2010

One Opioid Crisis or Many? (2)



2006-2012 OD-related mortality relatively stable.
Rates vary .005% to .025% between six analyzed States.
2012-2016 mortality rises sharply in some States, not in others.



Organization of Economic Cooperation and Development – 34 industrialized countries. Wide “scatter”, **no consistent trends** for overdose deaths vs. average daily doses per million population.

Observations on Opioid-Related Mortality by Age Group 1999-2017

- Age-adjusted mortality below age 14 or above age 84 unreliable due to small numbers
- Mortality rises for all age groups, but most sharply for age 15-24, 25-34, 35-44
- Mortality trends are closely similar under age 44
- Age-adjusted mortality for age 15-24 increases by ~600%, 1999-2017
- Age adjusted mortality above age 64 is lowest of any group, and relatively stable

Observations (2)

- Opioid-Related Deaths/100K Population show no significant upward trend or correlation with prescribing rates
- For 2016, mortality trend *drops* in States with higher prescribing rates.
- Major mortality differences between US States suggest multiple factors and causes are operating.
- Something besides prescribing is going on – Possibly increased illegal street drugs, particularly Fentanyl, and patient suicides.

Observations (3)

- 2017 US mortality rate attributed to opioid overdose is .0025% in seniors, compared to 0.018% in youth - and .007% in other developed countries.
- US mortality increase 1999-2016 is dominated by adolescents and adults under 55. However, highest rates of opioid prescription are among adults over age 50.
- Among 34 industrialized countries, opioid overdose rates show no trends versus daily opioid doses per million population.

Observations (4)

* **Prescribing rates are not a significant driver in either US overdose deaths or ER admission rates.**

Source Notes (1)

- Prescribing Data – from CDC Prescribing Data Page
  - Prescribing data privatized after 2016. No longer publicly available without fee
- Mortality and Population – from CDC Wonder Database, Updated April 2, 2019
  - Data (deaths / 100,000) obtained by searching deaths by year and State using ICD codes for Narcotics Related (T40.0-T40.6) accidental and intentional Drug Overdose Deaths (X42, X62) within the UCD - Drug/Alcohol Induced Causes" module of "Underlying Cause of Death“ database.
- Emergency Room Visits – Agency for Healthcare Research Quality
  - Data downloaded December 2017 as Excel spreadsheet. ER visits per 100K population in 35 states for ER visits and in 46 states for inpatients.
- Correlation of Prescribing With Mortality and ER Visits – Performed with Excel™ Spreadsheet Graphics Tools
- Year by Year Analysis of Overdose Deaths by Age Cohort
  - Searched CDC Wonder (1999-2017) by age (10 year intervals) and State, using the Underlying Cause of Death codes for accidental death or suicide (X42, X62) attributed to opioids (T40.0-T40.6)
- Organization for Economic Cooperation and Development (34 Nations)
  - Opioid Consumption data from https://www.incb.org/incb/en/narcotic-drugs/Technical_Reports/2016/narcotic-drugs-technical-report-2016.htm.

Source Notes (2)

- Opioid-Related ER Visits and Hospital Admissions Estimated by Diagnostic Codes (CDC Wonder)
  - Hospital inpatient stays and ER visits including opioid-related hospital use are identified by any diagnosis from a range of codes in the International Classification of Diseases, relating to legal and illegal opioids.

    ICD-9 prior to October 2015
    ICD-10-CM after October 2015
  - Rx and Admissions data are aggregated by drug type and medical diagnosis code. Adverse outcomes are not reliably tracked to diverted versus therapeutic use.

Author Notes

- Richard A Lawhern, PhD is a technically trained non-physician healthcare writer and patient advocate, with 22 years experience in peer to peer social media support groups and medical literature analysis.
- John Alan Tucker, PhD is a research chemist and business analyst for Fortune 1000 financial services firms.
- Neither author has a personal financial interest in the findings or data of this presentation.