

Analysis of US Opioid Mortality and ER Visit Data

[CDC Wonder + AHRQ HCUP-US Databases]

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+ Richard A Lawhern, Ph.D – Data interpretation and conclusions

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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 2018

Take-Away Conclusions

- There is no consistent causal relationship between rates of opioid prescription and rates of opioid-overdose-related deaths by US State.
- Production restrictions on scheduled opioid drugs – 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

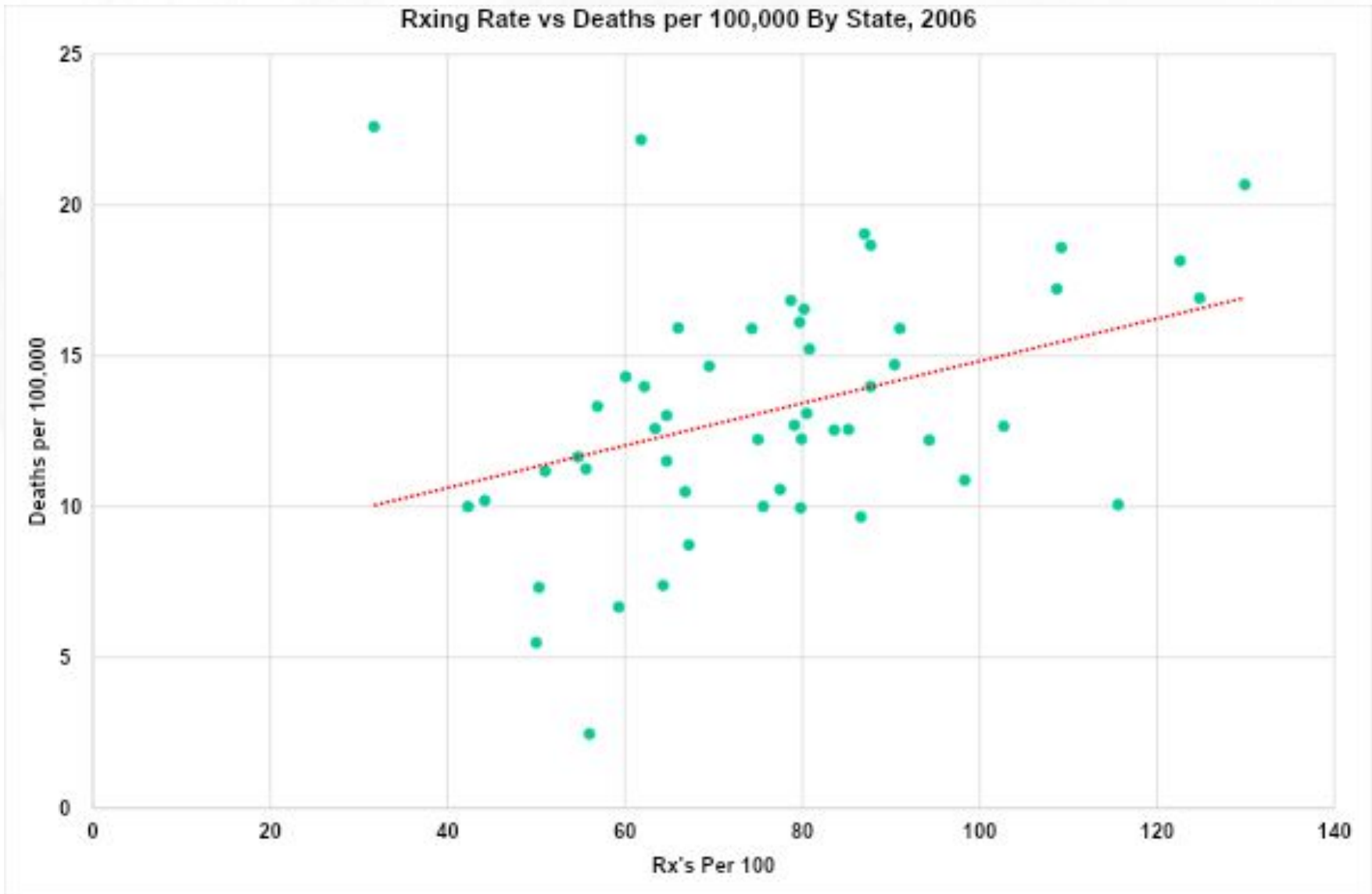
About Data Analysis

Excel TM 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.

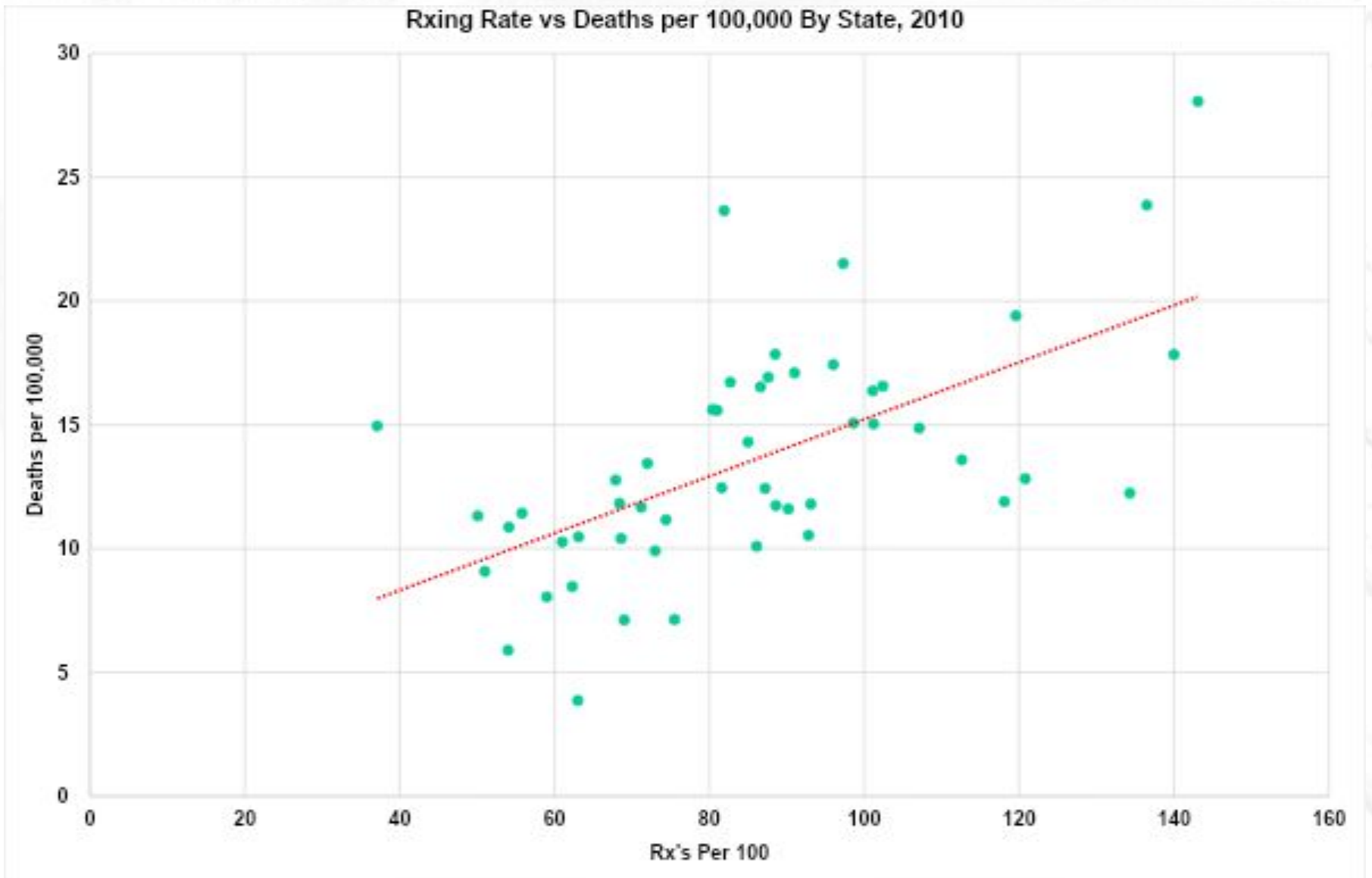
In a strong relationship, R-Squared should be above 0.9. This means that the data “fit” closely around a “moving average” line. The smaller the value of R-Squared, the weaker is the “fit” and the weaker is the relationship.

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.

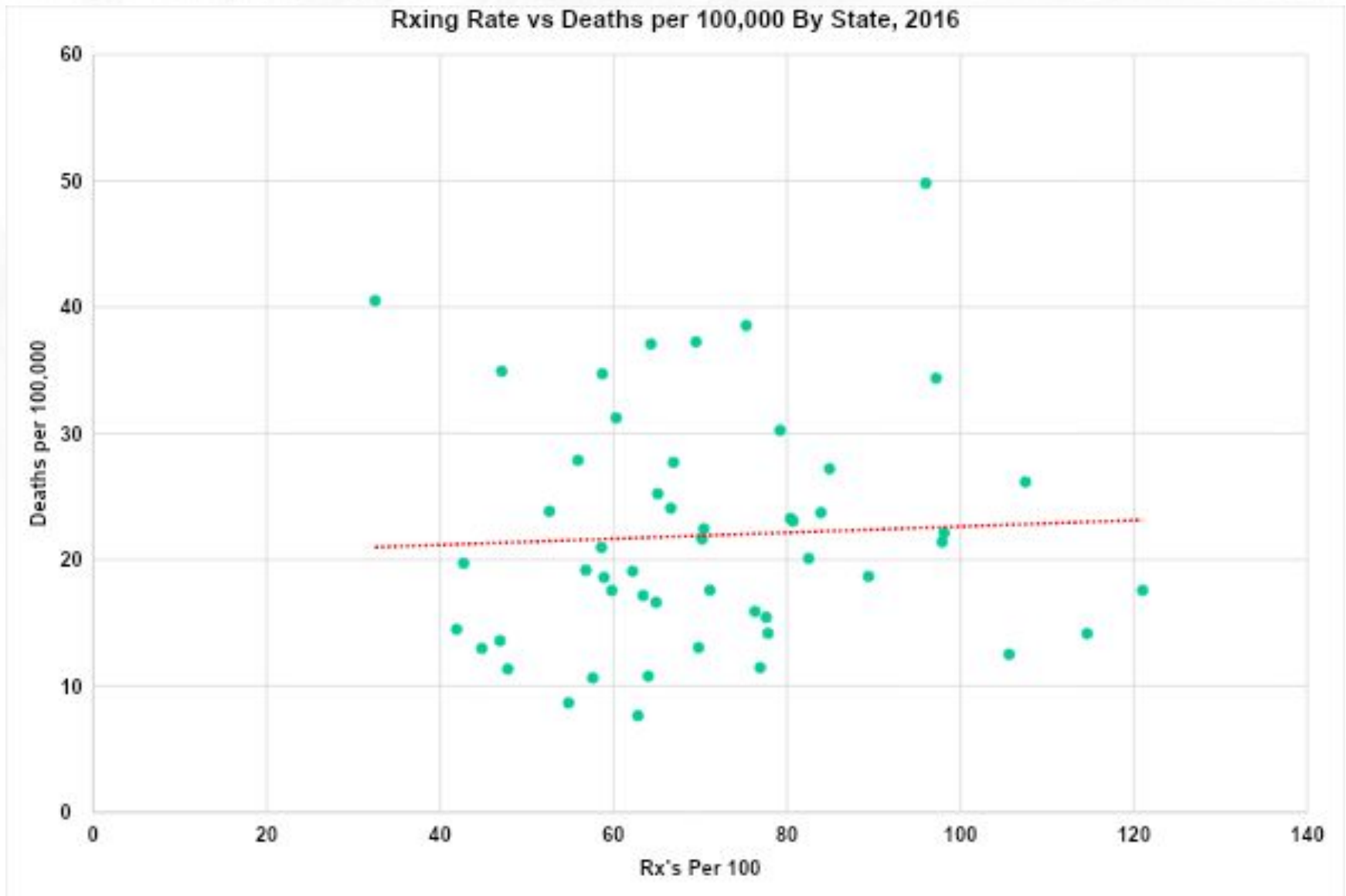
Computed R-squared for all of the data is so low that no consistent relationship can be detected. **Higher rates of prescription are *NOT* “causing” increased drug overdose deaths.** Other factors must be at work.



Opioid prescriptions per 100 people by US State vs. opioid-related deaths per 100K. Weak upward trend with prescription rates, wide variation between States

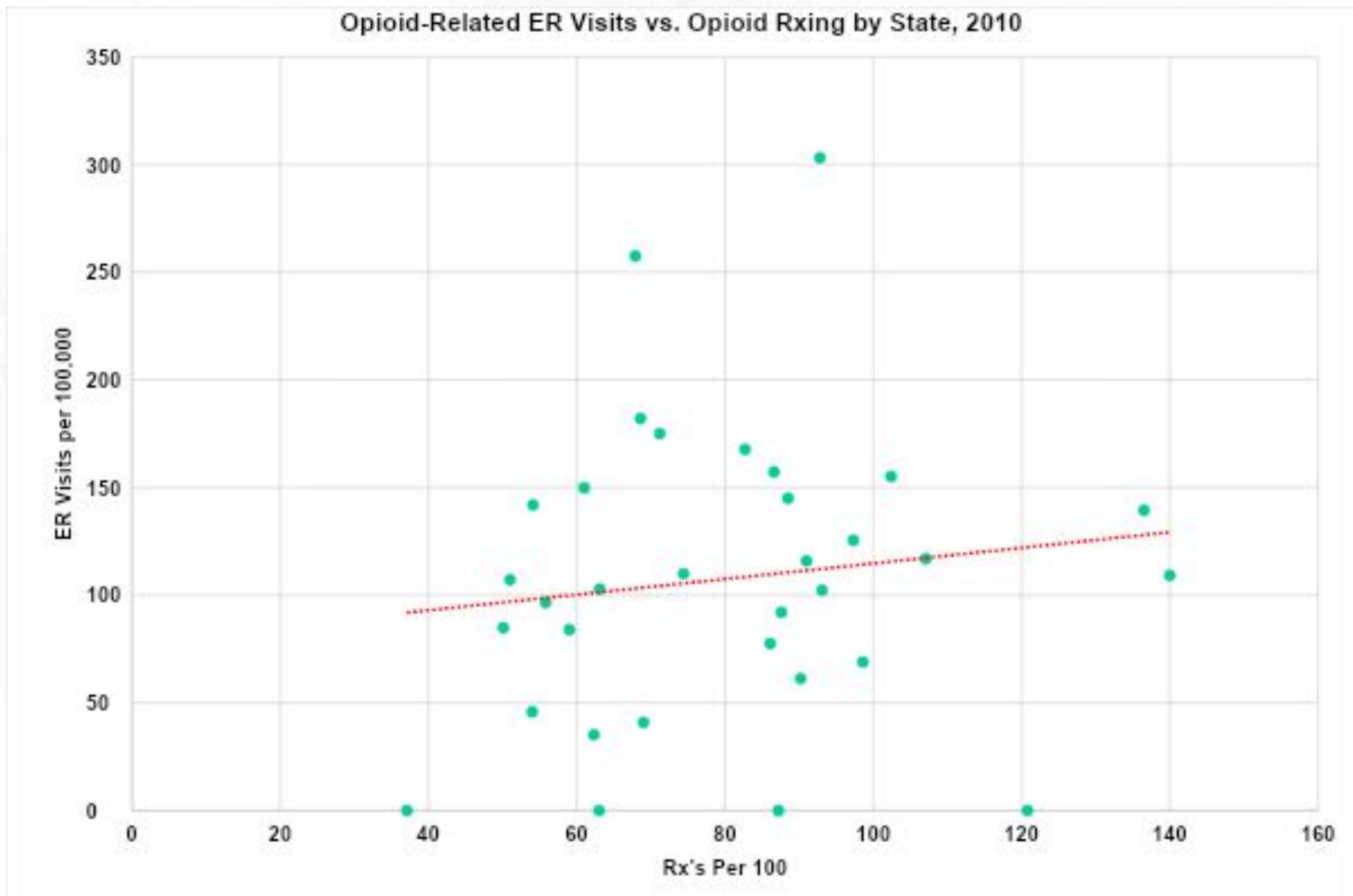


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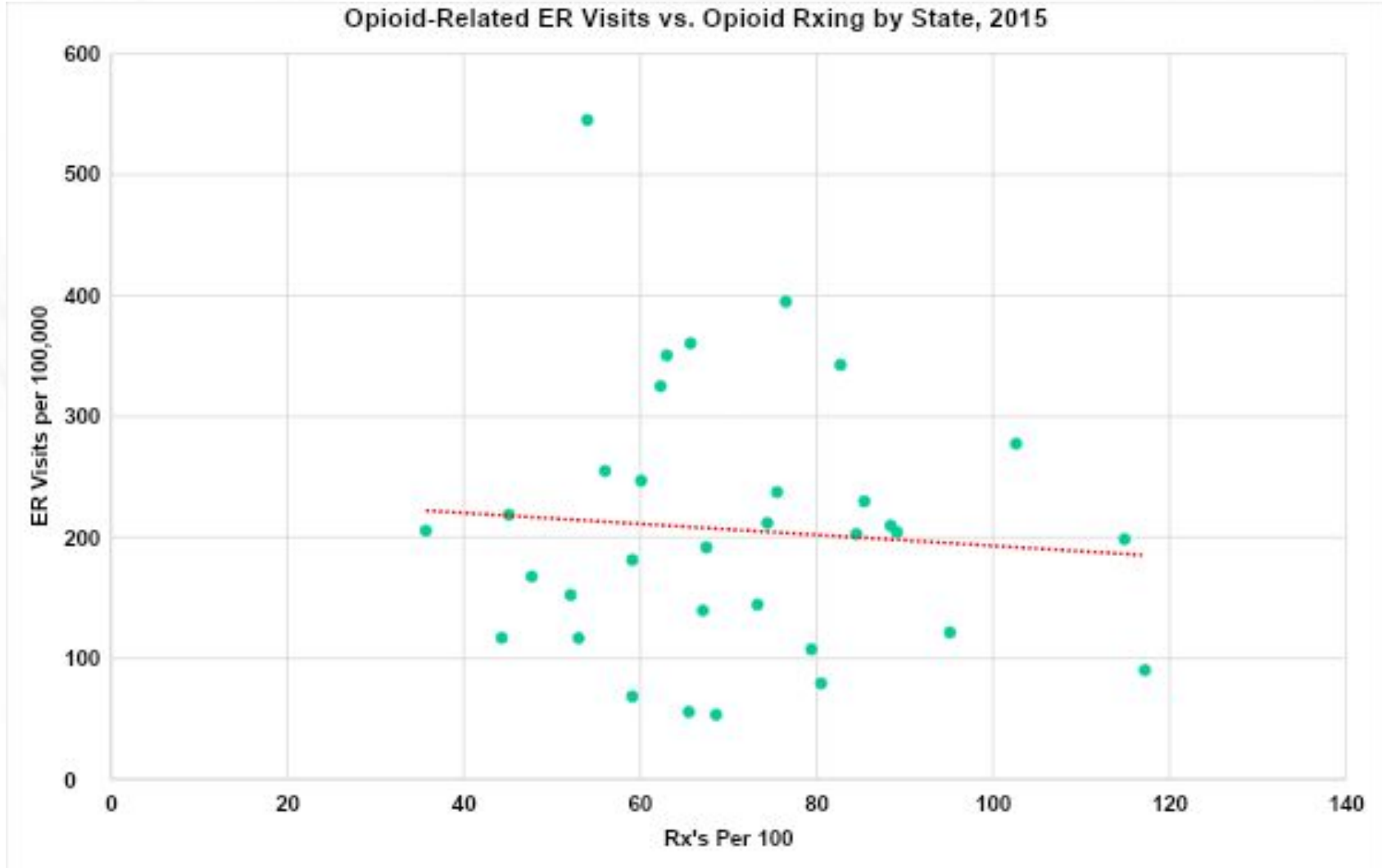


Opioid prescription rates per 100 people by US State versus opioid-related deaths per 100,000. **No consistent trends, wide variations, very poor data fit.**

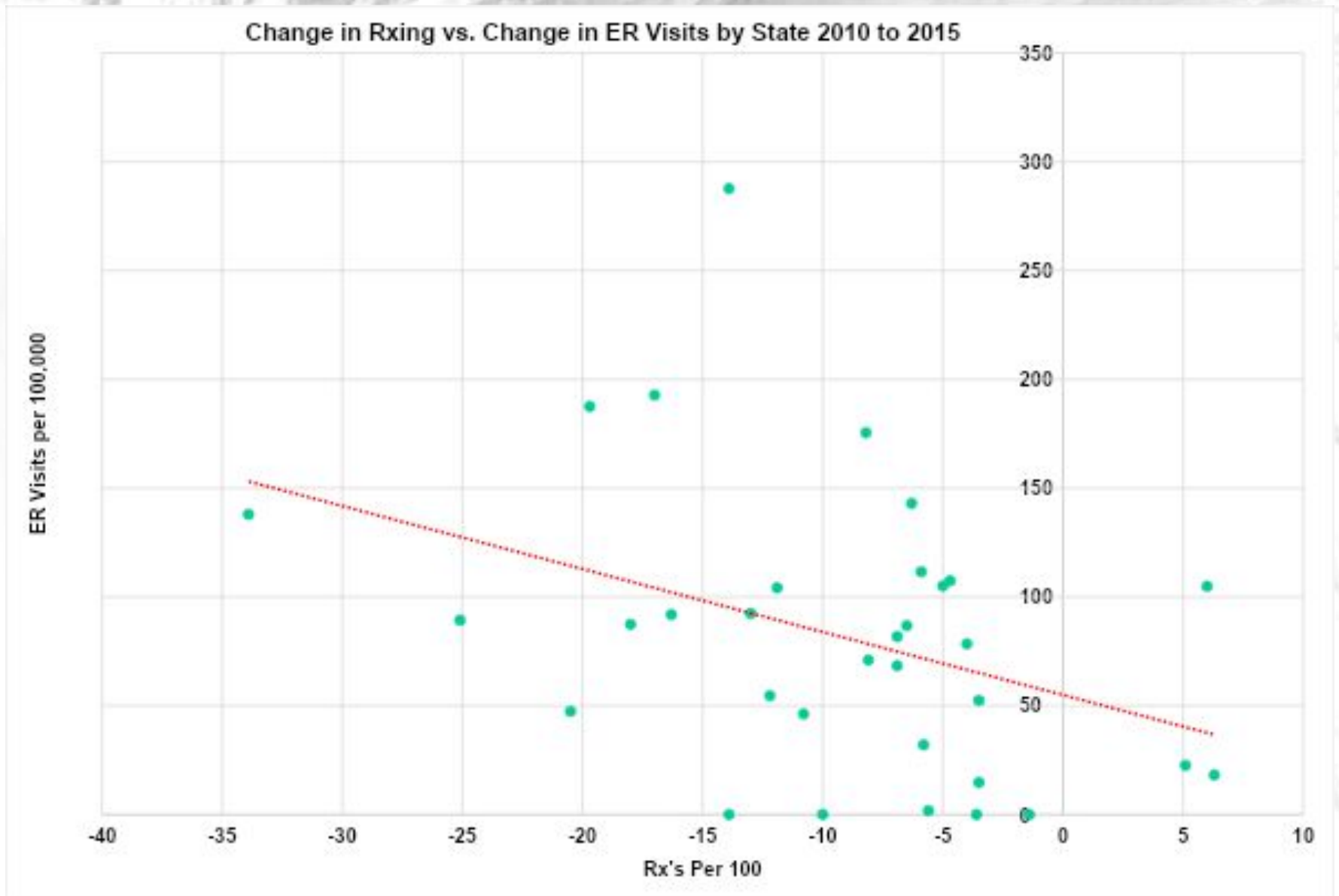
Graphical Analysis of Hospital Visits vs Opioid Prescribing



Opioid prescription rates per 100 people by US State vs. ER Visits per 100,000.
Wide variations between states, no consistent trends.

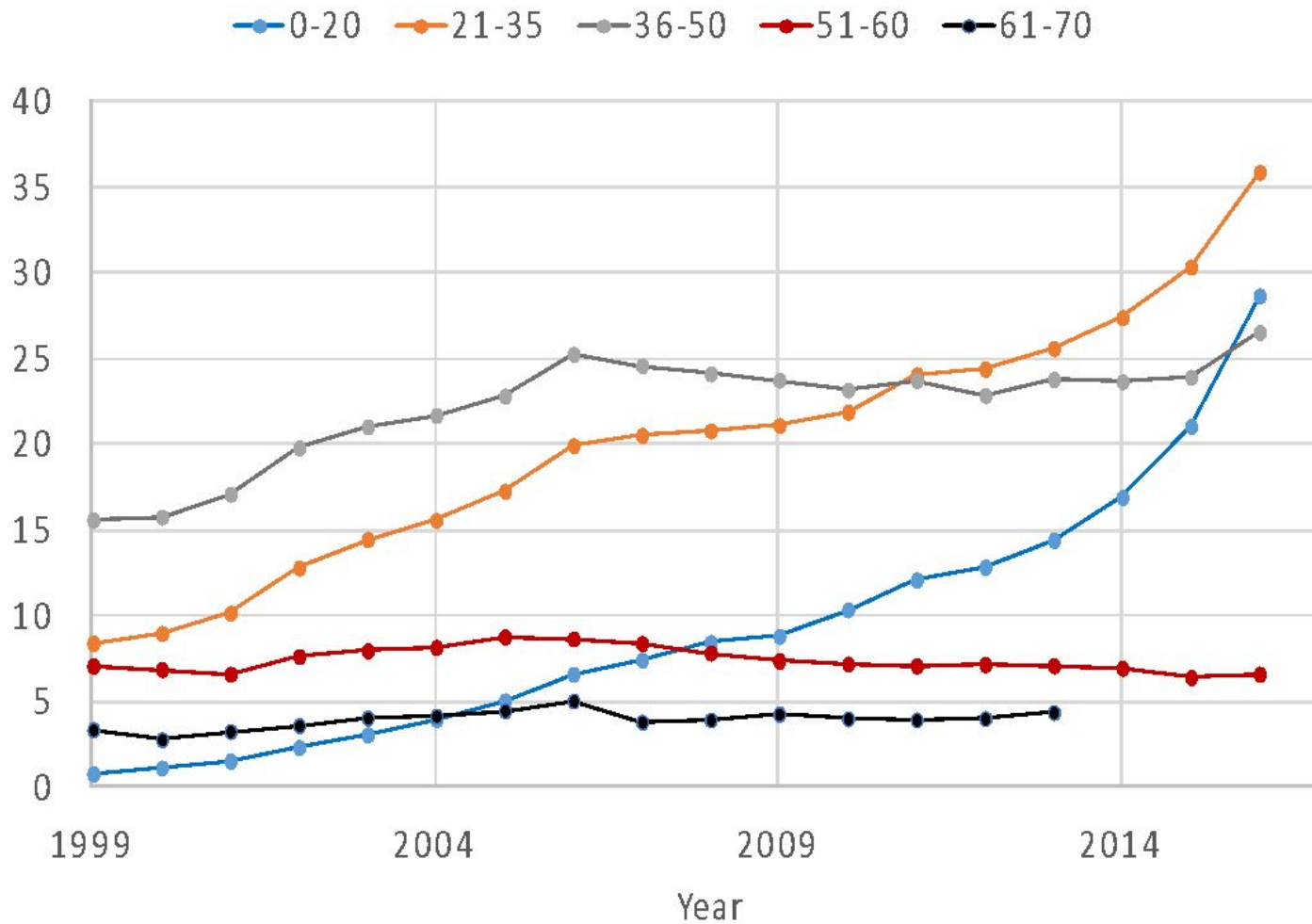


Opioid prescriptions per 100 people by US State versus opioid-related ER visits. **Wide variations between States. No consistent trends.**

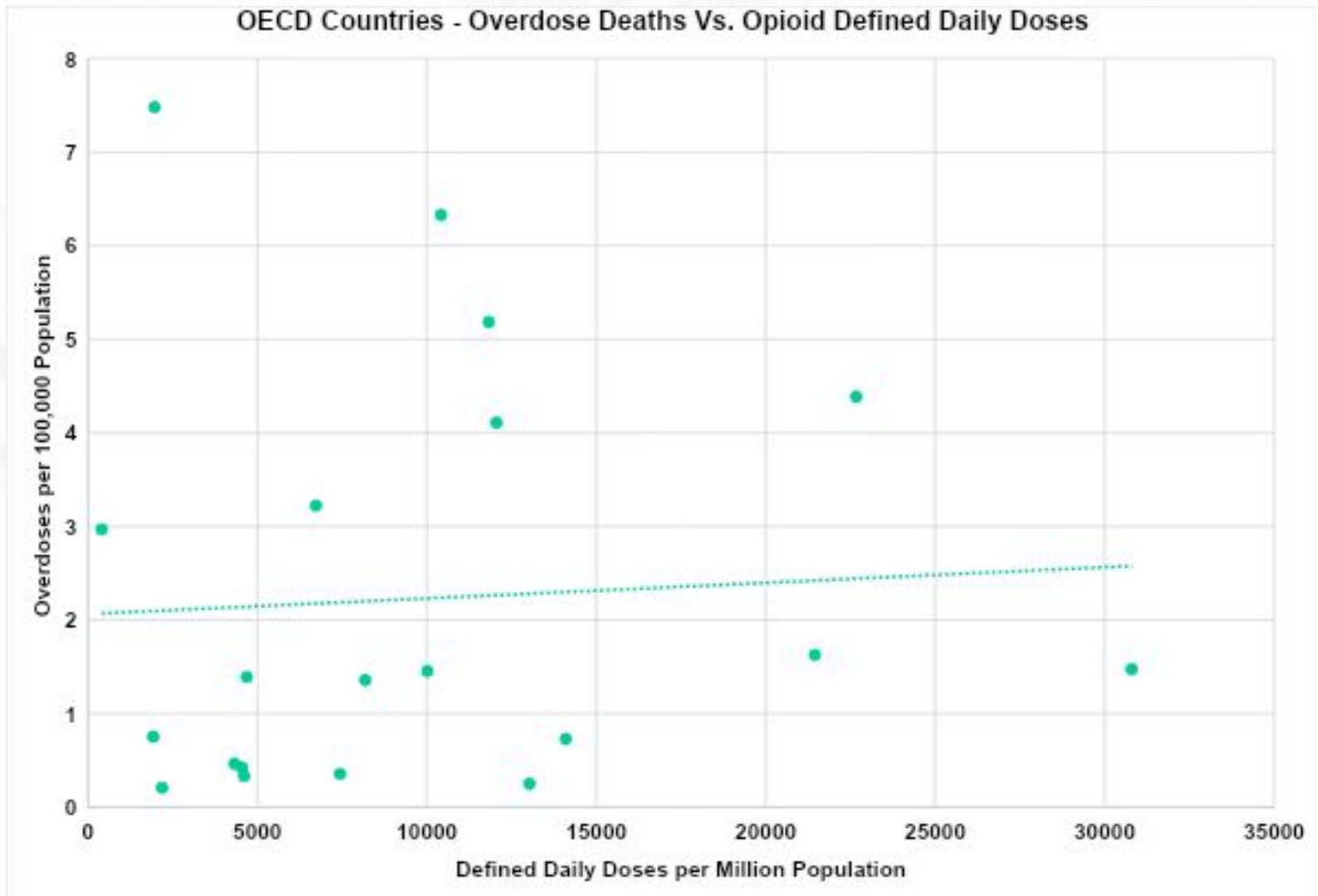


Change in prescribing vs. change in ER Visits by US State. Major variations between States. **Reduced prescribing but increasing admissions.**

Longitudinal Analysis of Opioid ODs by Age - 1999 to 2016



Who died of opioid-related overdose by age group and year?



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

- US Opioid-related deaths/100K population doubled from 2006 to 2016
- Deaths/100K increase weakly with prescription rates for 2006-2015 -- but not for 2016.
- Decreasing prescriptions in 2010-2016 were accompanied by *increasing* deaths.
- Major statistical variation between US States, suggests multiple factors and causes are operating.
- Decreasing prescriptions per 100K population from 2010 to 2015 **BUT** opioid-related ER visits doubled. Something besides prescribing is going on – illegal street drugs.

Observations (2)

- Maximum US mortality rate (2016) attributed to opioid overdose is .06% - Compared to .007% in other developed countries.
- US mortality rate increase 1999-2016 is dominated by adolescents and adults under 35. However, highest rates of opioid prescription are generally among adults over 50.
- US Opioid mortality over age 50 is stable throughout; 35-50 rate initially rises, then stabilizes from 2006 onward.
- In 34 industrialized countries, opioid overdose rates show no trend line versus daily opioid dose per million population.

Observations (3)

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

Source Notes (1)

- Prescribing Data – CDC Prescribing Data Page
- Mortality and Population – CDC Wonder Database
 - Data (deaths / 100,000) obtained by searching deaths by year and State using the limitation "Drug-induced causes" within the UCD - Drug/Alcohol Induced Causes" module of "Underlying Cause of Death". All other search parameters were left at their defaults. Mortality rates are not age-adjusted. Where the death rate was described as "not reliable" due to a low death count, a nominal value was estimated by dividing number of deaths by population.
- Emergency Room Visits – Agency for Healthcare Research Quality
 - Data downloaded 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
- Longitudinal Analysis of Overdose Deaths by Age Cohort
 - Searched CDC wonder by age (1 year intervals) and State, using the Drug/Alcohol Induced Causes selection in underlying cause of death and choosing "drug related." Compiled into a table using Excel™ lookup functions and then grouped each year by 10-15 year age categories. Population data unavailable for the oldest age category beyond 2013.
- 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 Hospital Use 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 21 years experience in peer to peer social media support groups and medical literature analysis.
- John Allan 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.