
Update on Prescription Drug Overdose Research

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Outline

- Overview of fatal drug poisoning in Utah
 - Review past studies of fatal drug poisoning in Utah
 - Medical Examiner Data
 - Describe other data sources available for the study of fatal drug poisoning
 - Describe ongoing study
 - an individual link between Vital Statistics and the Controlled Substances Database
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Utah Health Status Update: August 2007

**Poisonings surpass motor vehicle crashes
as Utah's leading cause of injury death.**

In 2003, rate of unintentional and undetermined intent poisoning deaths, 13.9 per 100,000, surpassed that for motor vehicle crash, 13.2 per 100,000.

The increase has continued and the gap is widening.



Drug Categories

- Illicit drugs only
 - Drugs that are not legal to use
 - Heroin, cocaine, methamphetamine

 - Non-illicit drugs only
 - Prescription drugs – although often acquired illegally
 - Methadone, oxycodone, hydrocodone, anti-anxiety, sleep drugs

 - Combination of illicit and non-illicit drugs
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Utah Medical Examiner

- Investigates
 - Sudden or unexpected deaths
 - including drug-related deaths
 - Examination includes
 - Toxicology – identity and amount of drugs or poisons
 - Physical examination
 - Information gathering from friends, family, witnesses when possible
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Drug Overdose in 2006

485 fatal overdoses
investigated by OME

Mean age = 40 years

96 illicit drugs only

Mean age = 35.4 yrs

Range 16-59

76% male

66% undetermined
intent

58% involve heroin

57% involve cocaine

12 counties

63 combination of
illicit and non-illicit

Mean age = 34 yrs

Range 18-61

71% male

98% undetermined intent

36% involve morphine
(heroin?)

66% involve cocaine

12 counties

307 non-illicit drugs only

Mean age = 41.9 yrs

Range 16-80

51% male

67% undetermined intent

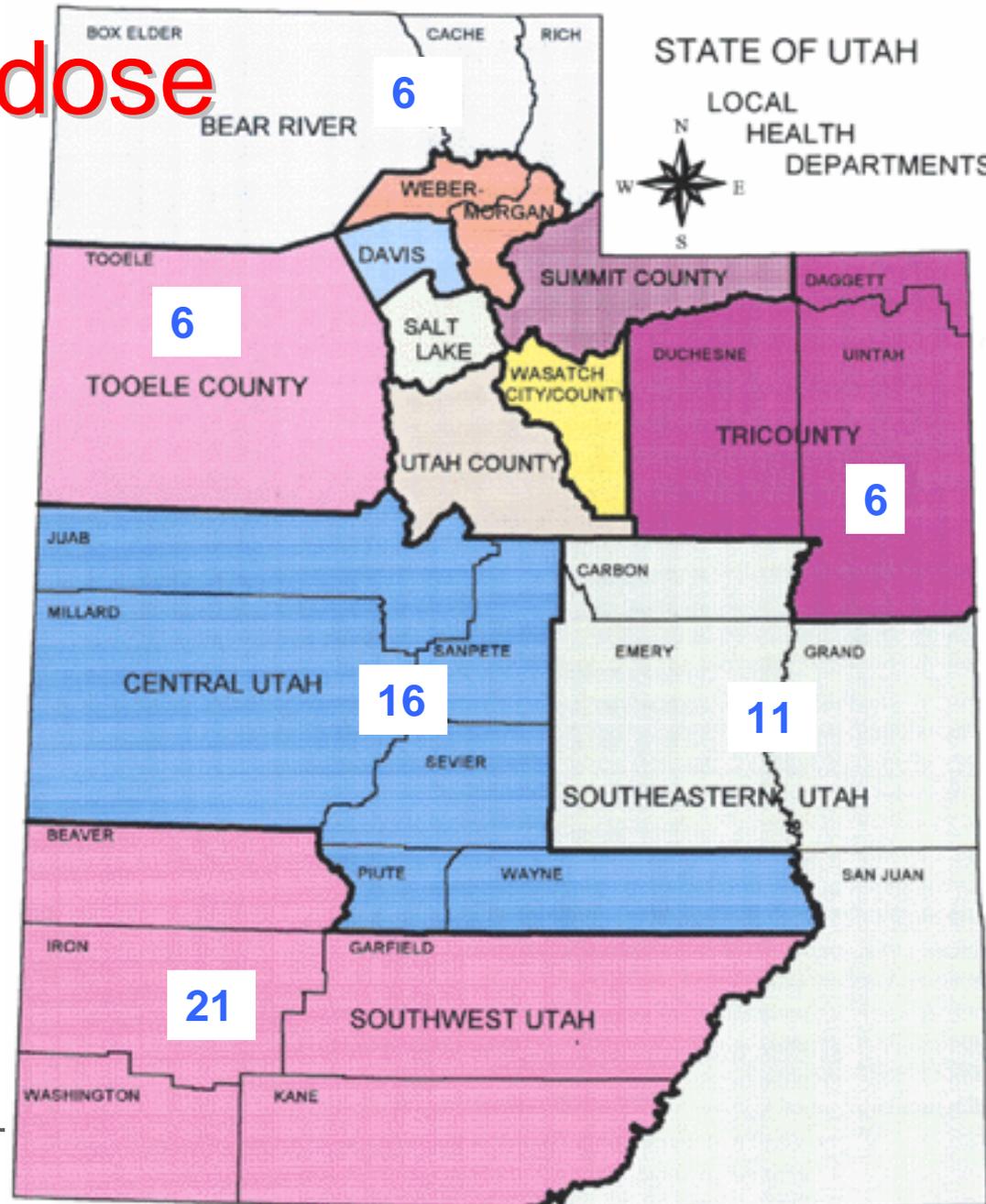
56% involve rx narcotics

30% involve methadone

24 counties

Non-Illicit Overdose Deaths by Health District, 2006

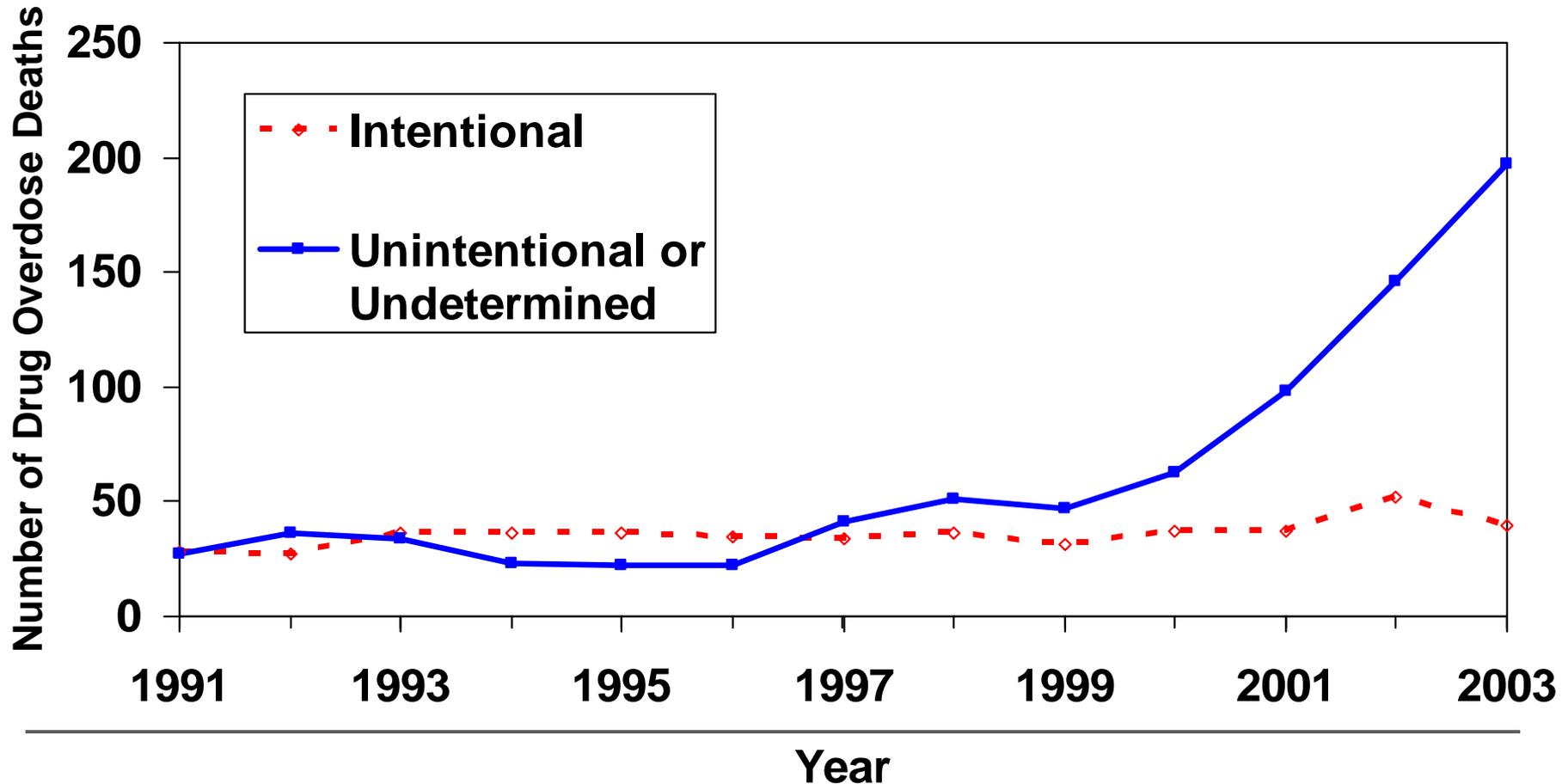
- Weber-Morgan = 22
- Davis = 29
- Salt Lake = 122
- Utah = 56
- Summit & Wasatch* = 9



What about suicides?

- Number of suicides involving non-illicit drugs relatively stable since 1991
 - In 2005 and 2006,
 - Suicide decedents older and more female than other drug poisoning decedents ($p < 0.05$)
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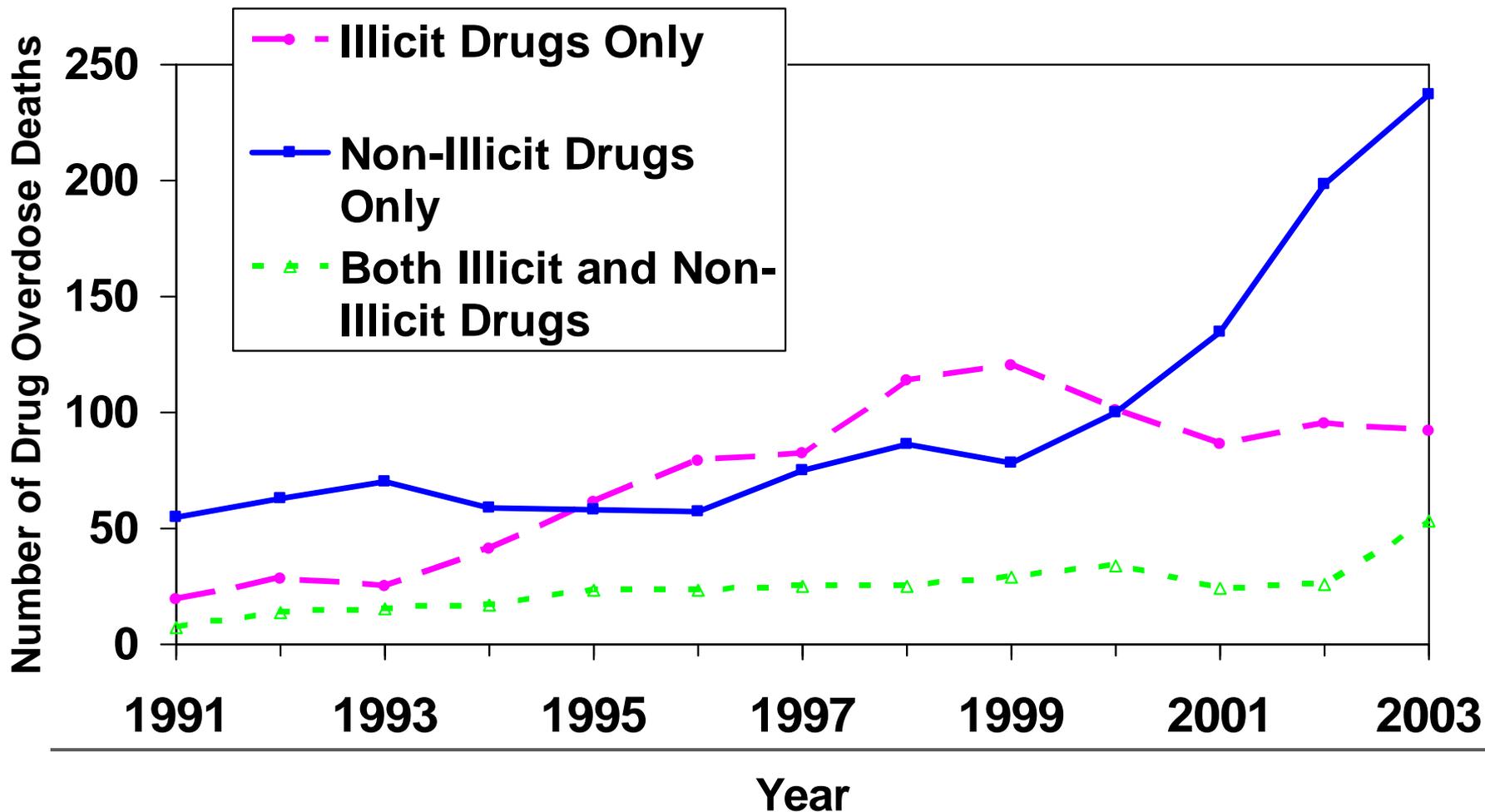
Non-Illicit Drug Poisoning Deaths by Manner and Year — Utah 1991-2003



The first study

- Using Medical Examiner data
 - Reviewed all drug poisoning deaths between 1991 and 2003
 - Categorized by type of drug involved
 - Compared decedent characteristics in two time periods, 1991-1998 and 1999-2003
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Number of Drug Poisoning Deaths by Drug Category and Year — Utah 1991-2003





Changes in Rate of Deaths / 100,000 Population

	1991–1998	1999–2003	% change
Total deaths	1.47	4.40	200
Female	1.08	3.90	261
Male	1.86	4.90	163



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Urban	1.53	4.15	171
Rural	1.25	5.21	317



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Body Mass Index: Risk Factor?

BMI	1991–1998 Death rate	1999–2003 Death rate	% change
<25.0	1.17	3.61	208
25.0–29.9	1.90	5.26	177
≥30.0	6.06	14.25	135



Geography

- Popular belief that drug use is an urban problem
 - Analyzed county of residence compared to county of death
 - Agreement analysis
 - Simple and modified kappa (κ) statistic
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Residence County Compared to Death County

- County of residence agreed with death county for **91.6%** (668 / 729)
 - An additional 36 decedents (4.9%) died in a county contiguous to their county of residence
 - **96.6%** of decedents with known residence died in their home county or in a contiguous county
-

Timing of Death

- Hypothesis that non-illicit drug poisoning deaths more likely to occur during sleep
 - Opioid drugs can induce a central apnea

 - Time of death was often estimated
 - Decedents found in the morning
 - Decedents most often found in bed or usual sleeping place
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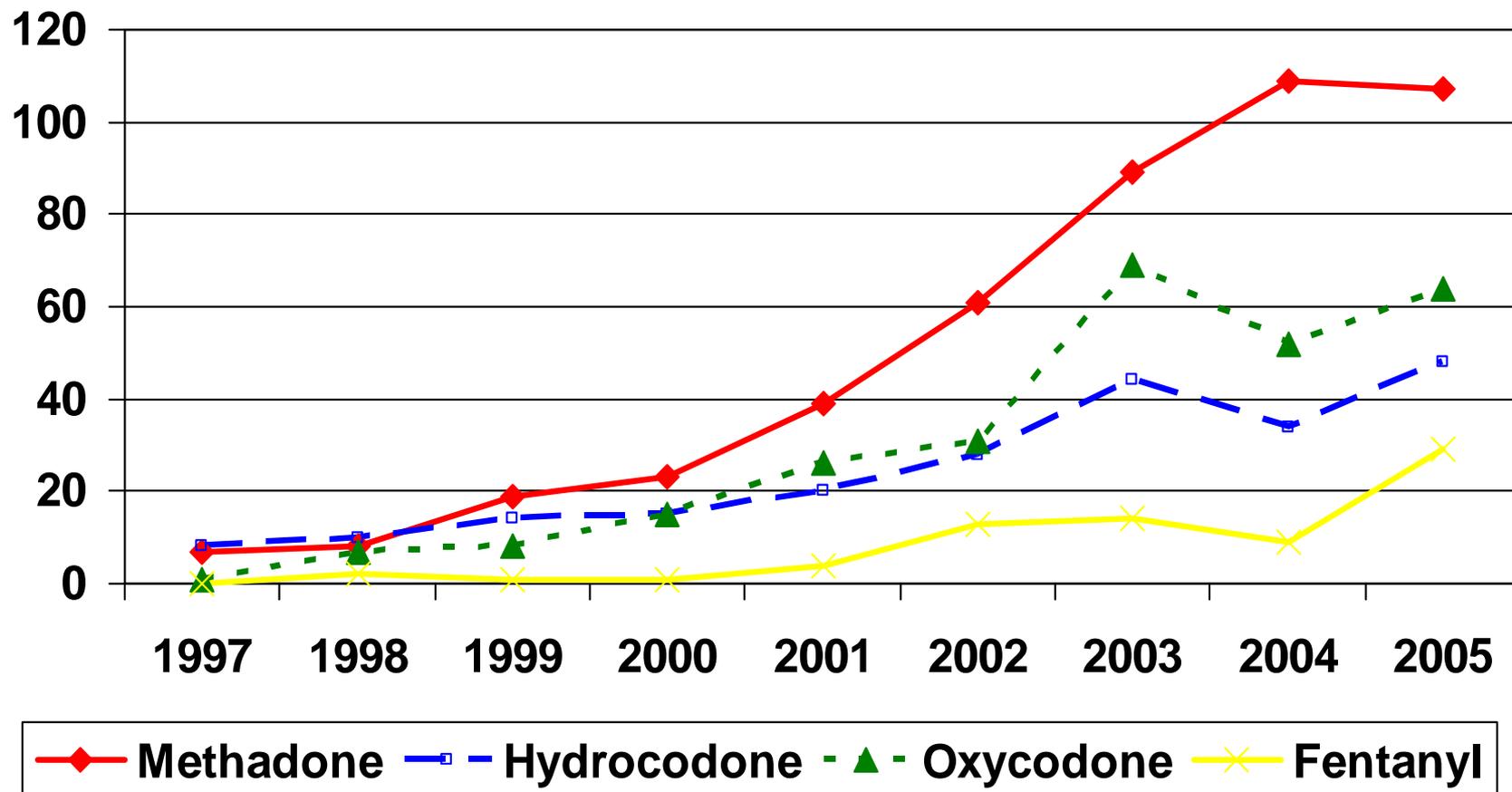
A Related Analysis

Increase in Number of Methadone-Related Deaths

- Office of the Medical Examiner case files for methadone-related deaths
- Year 2000 on the left, 2004 on the right



Number of Accidental and Intent Undetermined Deaths by Year & Drug



Other Data Sources

- US DEA collects information on retail supply of prescription drugs
 - Proxy for amount of drug legitimately circulating
 - Emergency Department Encounter Database
 - Data on non-fatal poisoning events
 - Controlled Substances Database
 - Registry of all filled prescriptions for controlled substances
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Utah Controlled Substances Database

- Maintained by DOPL
 - Registry of all prescriptions for Schedule II-V drugs dispensed in Utah and by Utah providers.
 - “The purpose of the database is to contain data as described in this section regarding every prescription for a controlled substance dispensed in the state to any person other than an inpatient in a licensed health care facility”
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Data Access

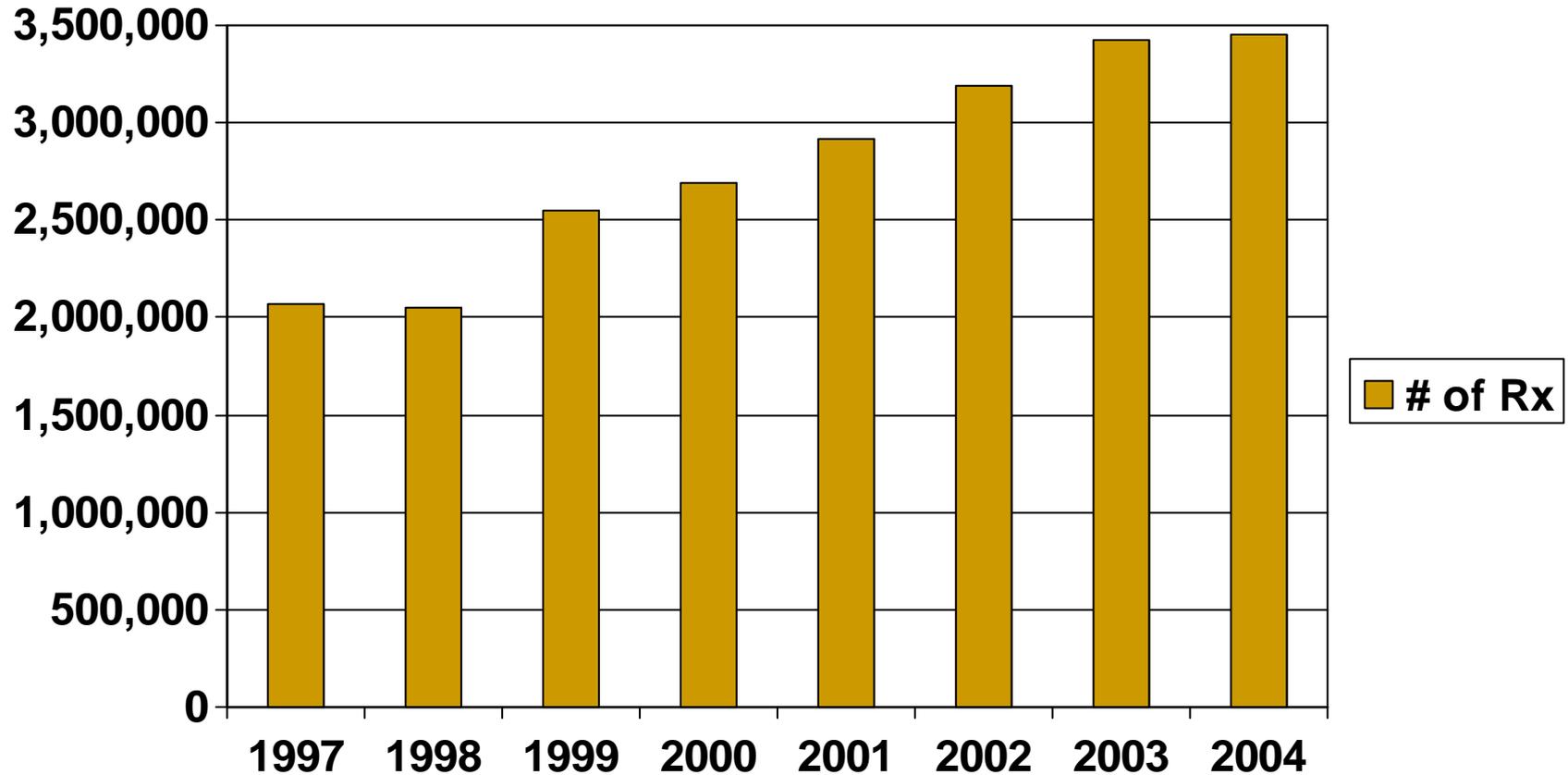
- Strong privacy protection on CSDB
 - Providers can access to query their patients
 - DOPL can access to monitor providers, pharmacies, and patients
-

Data Access

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 - Providers can access to query their patients
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 - Legislation changed to allow Utah Department of Health researchers to access
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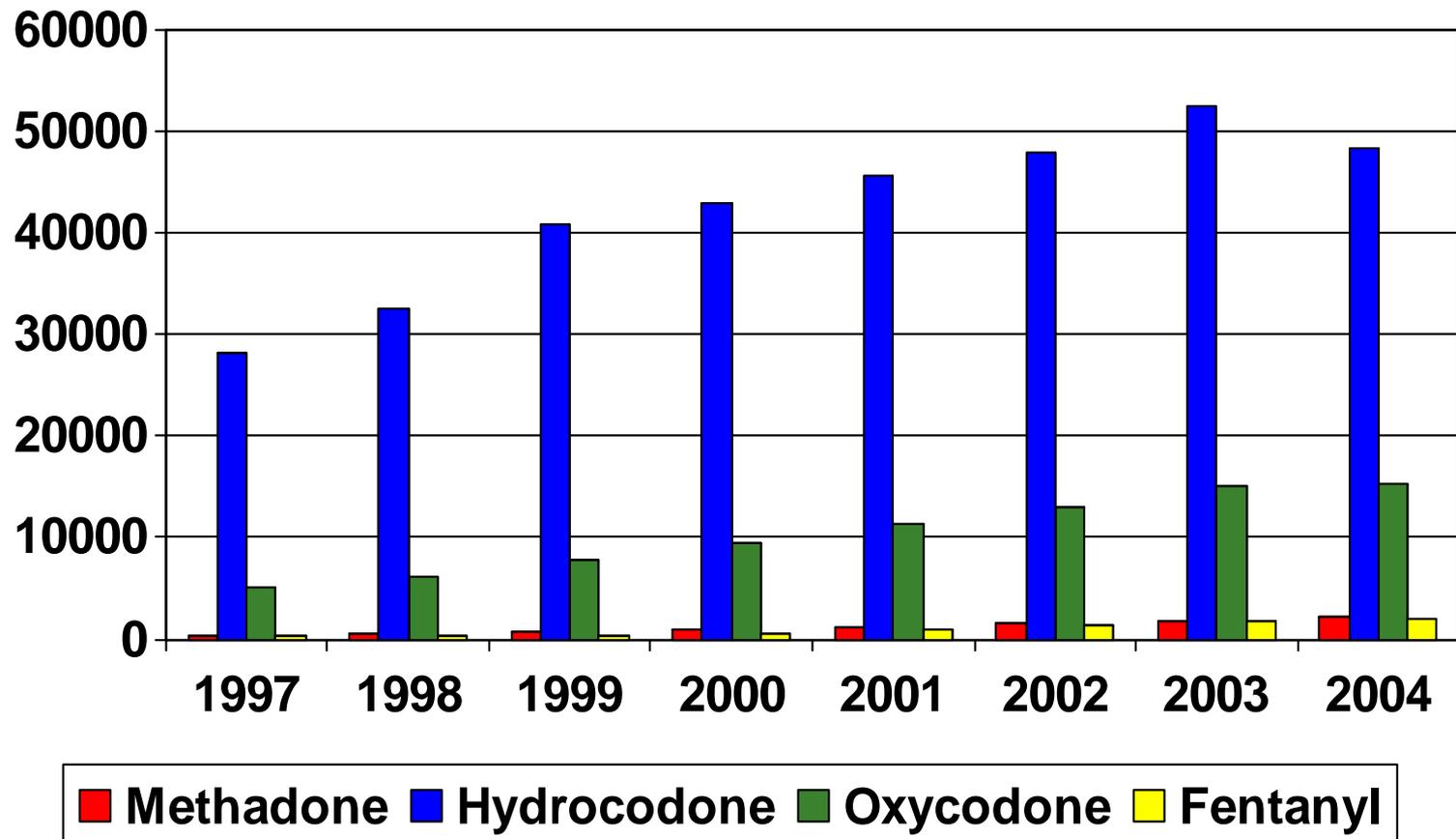
Preliminary Analysis of CSDB



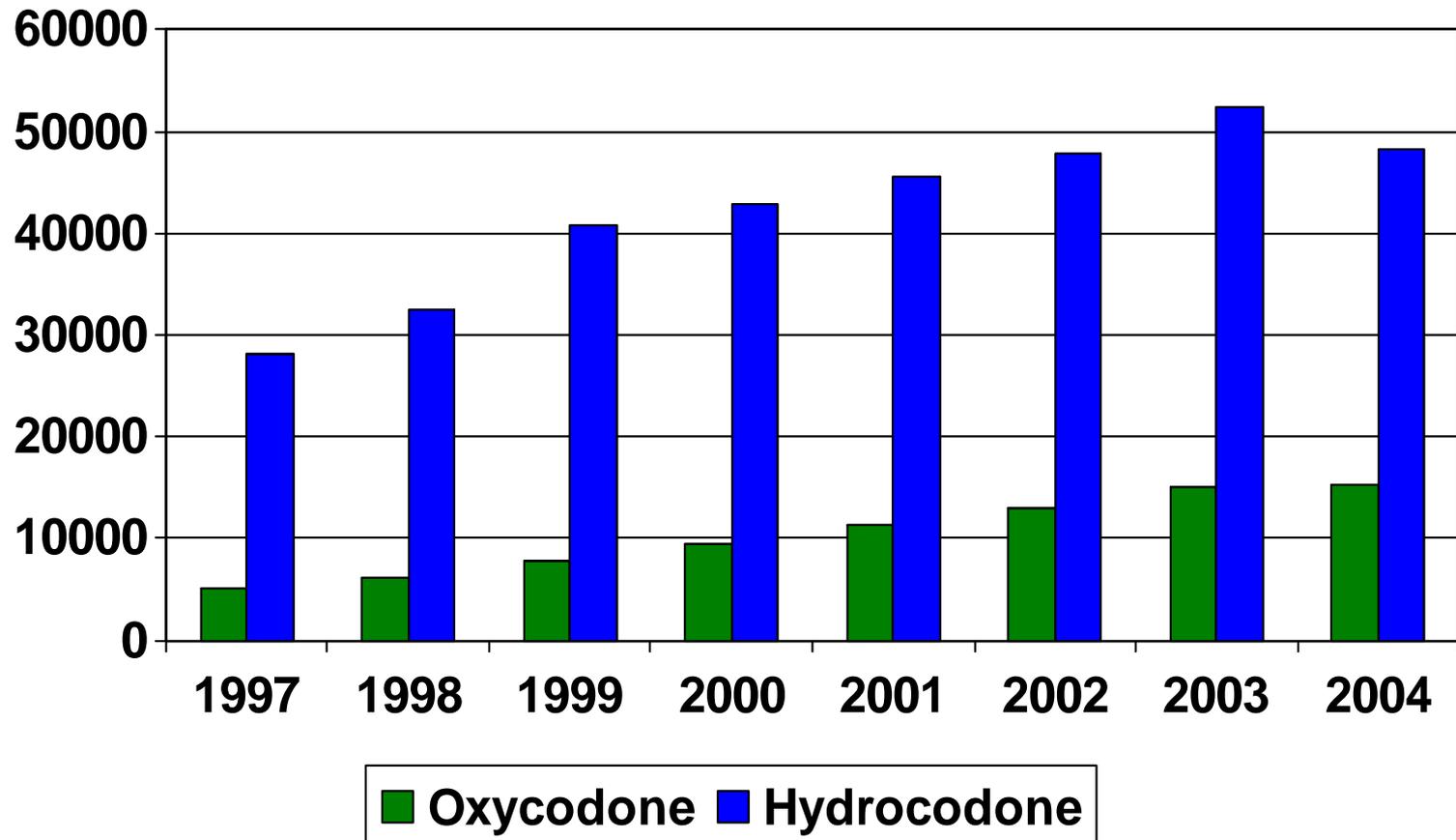
2004 Utah Population = 2,469,230

2004 Utah Population \geq 18 = 1,698,118

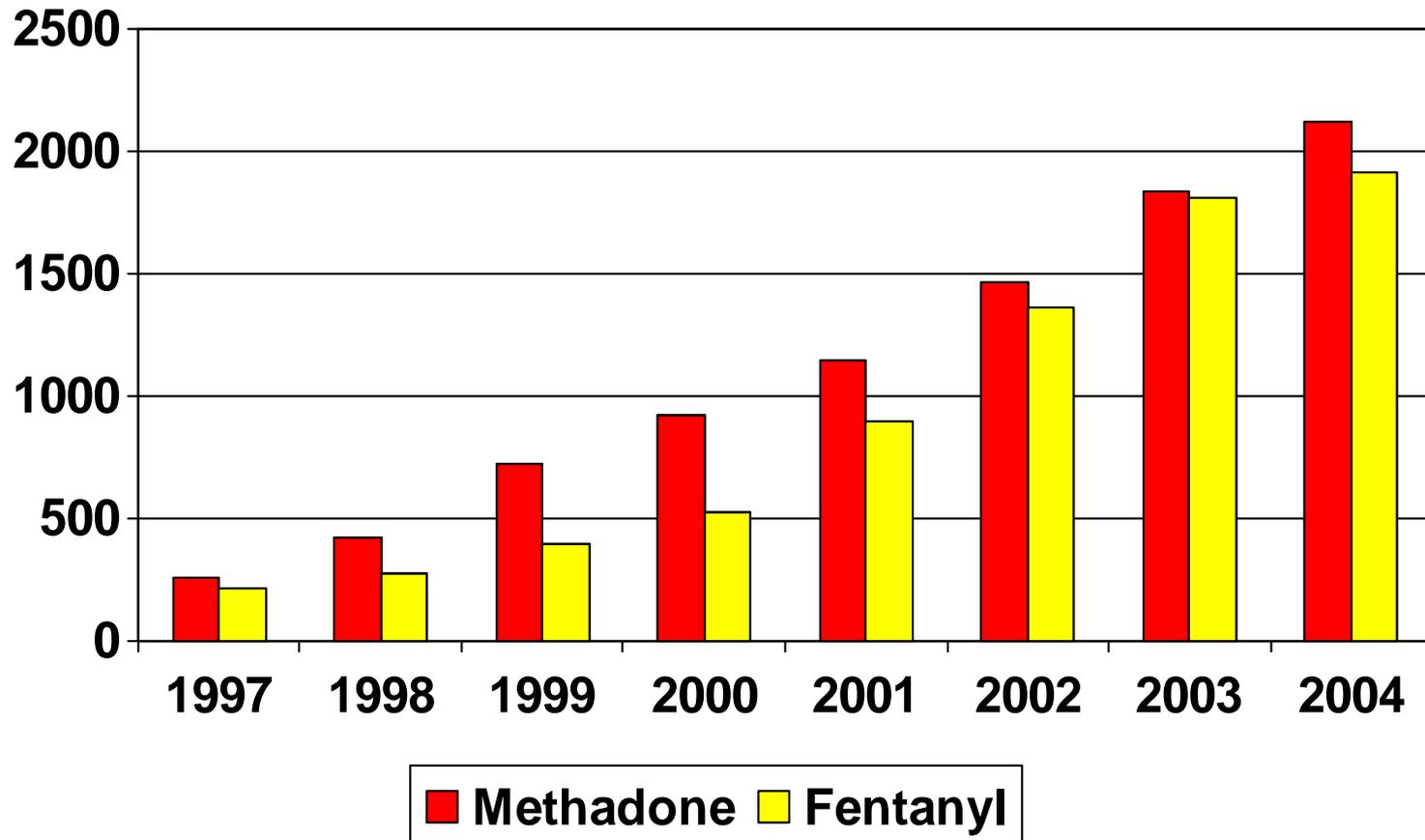
Number of Prescriptions per 100,000 Population and Year



Number of Prescriptions per 100,000 Population and Year



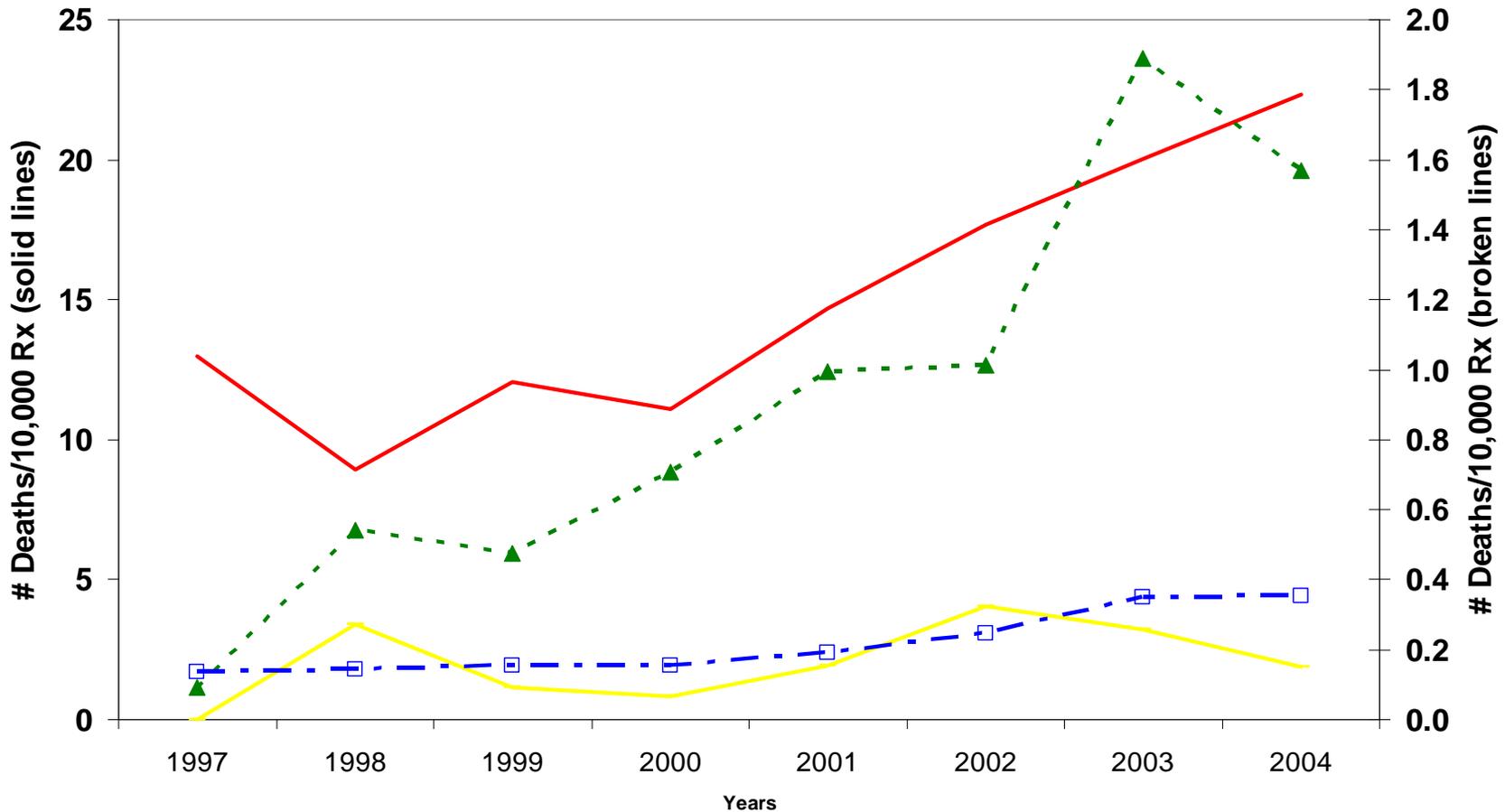
Number of Prescriptions per 100,000 Population and Year



Ecologic Analysis – Deaths adjusted for prescription volume

- Un-linked data
 - Cannot infer causality
 - Attempt to adjust for volume of prescribing
 - Are deaths increasing out of proportion with increases in prescribing for these drugs?
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Drug Specific Death Rates Adjusted for the Number of Rx



— Fentanyl — Methadone -▲- Oxycodone -□- Hydrocodone

Methodology

- De-duplicated CSDB 1999-2004
 - Linked CSDB to death certificate database and medical examiner data
 - Identified populations of interest
 - All decedents – anyone with a CSDB record that died of any cause
 - Poisoning decedents – anyone with a CSDB record that died with primary cause X42, X44, Y12, Y14
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ICD-10 Codes Used to Identify Poisoning Decedents

ICD-10 Code	Description
X42	Accidental poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified
X44	Accidental poisoning by and exposure to other and unspecified drugs, medicaments and biological substances
Y12	Poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified, undetermined intent
Y14	Poisoning by and exposure to other and unspecified drugs, medicaments and biological substances, undetermined intent

Research Questions

- What proportion of narcotics poisoning decedents had a valid controlled substance prescription at time of death?
 - ...within other time intervals of death?
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Results

- CSDB includes 22,215,483 records.
 - Drug class H3A that includes the narcotic pain medications comprises 51.9% of the total number of prescriptions in the CSDB for the study years
 - Able to separate drugs primarily indicated for cough suppression that include opioids using the NDC included with the CSDB record
 - *Able to identify extended release preps*
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Results

- 734 poisoning decedents identified
 - 47% (374) had an active narcotic Rx at time of death
 - 57% filled within 30 days of death,
 - 63% within 90 days of death, and 75% within 365 days of death.
 - No evidence of a filled opioid prescription from 1999 through the date of death for only 15% (115) of these decedents
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Concordance

- Using drugs identified on toxicology (ME)
 - Did they have an active prescription for every drug identified on toxicology as contributing to death?
 - 43% YES
 - Demographics did not differ by concordance status.
 - We consider the reported concordance to be a lower bound.
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Specialty of Prescribers

- In partnership with UMA
 - Used their database which includes provider specialty (self-report; not 100% complete)
 - Does not include DEA number
 - Linked using last name, first name, middle initial and address (if needed) to the DEA number dataset from DOPL
 - Does not include specialty
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Limitations

- Lacking specialty for some providers
 - CSDB includes records
 - With DEA number missing
 - Invalid DEA numbers
 - e.g. EXPIRED, 999999999, NEED THIS
 - Self report specialty data
 - * in process of comparing the distribution of specialties reported in UMA data to Utah workforce data
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Results

- Distribution of specialties in entire CSDB
 - Distribution of specialties for narcotics prescriptions in entire CSDB
 - Specialties of active narcotics prescriptions at time of death for all decedents
 - Specialties of active narcotics prescriptions at time of death for narcotics poisoning decedents
 - Relative contributions
-

Specialty of Narcotic Prescribers – Entire CSDB

SPECIALTY	Rank	Frequency	Percent
FP/M	1	1813541	28.22
IM	2	893083	13.9
ORS	3	739237	11.5
EM	4	528548	8.22
OBG	5	342443	5.33
RET	6	259177	4.03
GS	7	205442	3.2
PMR	8	194030	3.02
AN	9	137008	2.13
U	10	134210	2.09

Specialty of Prescribers – Active Narcotics Among All Deaths

SPECIALTY	Rank	Frequency	Percent
FP/M	1	5863	38.57
IM	2	4269	28.09
PAL	3	1084	7.13
ONC	4	628	4.13
PMR	5	349	2.3
RET	6	340	2.24
ORS	7	259	1.7
HEM	8	242	1.59
EM	9	233	1.53
PUD	10	167	1.1

Specialty of Prescribers – Active Narcotics Among Poisoning Deaths

SPECIALTY	Rank	Frequency	Percent
FP/M	1	95	33.22
IM	2	52	18.18
ORS	3	23	8.04
PMR	4	23	8.04
AN	5	21	7.34
EM	6	10	3.5
N	6	10	3.5
P	7	7	2.45
RET	7	7	2.45
RHU	7	7	2.45

Is it what we would expect?

- We've heard a lot about how the Rx drug overdose problem is driven by over- or casual prescribing by primary care providers (PCP)
 - PCP write the most prescriptions but are not over-represented among the deaths
 - Contribute highest magnitude of deaths
 - In proportion with expectation based on prescribing
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Relative Contribution

SPECIALTY	Entire CSDB		All Decedents		Narcotic Poisoning Decedents		Narcotic Poisoning Decedents: All Decedents
	Rank	%	Rank	Count (%)	Rank	Count (%)	
Anesthesiology	14	1.29	11	164 (1.08)	5	21 (7.34)	6.8
Psychiatry	3	6.95	21	61 (0.4)	7	7 (2.45)	6.1
Rheumatology	17	1.01	19	77 (0.51)	7	7 (2.45)	4.8
Orthopedic Surgery	4	6.2	7	259 (1.7)	3	23 (8.04)	4.7
Neurology	9	1.91	15	134(0.88)	6	10 (3.5)	4.0
Physical Medicine and Rehabilitation	10	1.89	5	349 (2.3)	4	23 (8.04)	3.5
General Practice	16	1.05	17	103 (0.68)	8	6 (2.1)	3.1
Urology	12	1.34	18	98 (0.64)	9	5 (1.75)	2.7
Emergency Medicine	6	4.78	9	233 (1.53)	6	10 (3.5)	2.3
Pediatrics	7	4.76	16	134 (0.88)	9	5 (1.75)	2.0
Retired	8	4.12	6	340 (2.24)	7	7 (2.45)	1.1
Family Medicine/Practice	1	31.97	1	5863 (38.57)	1	95 (33.22)	0.9
Internal Medicine	2	16.74	2	4269 (28.09)	2	52 (18.18)	0.6

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- Some specialties wrote a greater proportion of active narcotics at death than would be expected based on their prescribing for all decedents.
 - Working on how to compare to entire CSDB with a valid measure
-

Drug Categories

- Entire CSDB
 - Some drug categories appear relatively more frequently among any cause decedents than in entire CSDB
 - e.g. morphine, fentanyl – used in end of life care
 - Comparison of active narcotics prescriptions at time of death among narcotics poisoning decedents to all decedents
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- Working on a way to quantify relative burden of narcotics among poisoning decedents to entire CSDB
-

Drug Category	Frequency	Percent
Hydrocodone (H3A)	7164766	32.34
Antianxiety Drugs (H2F)	3080535	13.9
Oxycodone (H3A)	1911383	8.63
Non-Barbiturate, Sedative Hypnotics (H2E)	1750903	7.9
Anti-Narcolepsy/Anti-Hyperkinesia Agents (H2V)	878758	3.97
Anorexic Agents (J8A)	876655	3.96
Propoxyphene (H3A)	801492	3.62
Anticonvulsants (H4B)	783788	3.54
Codeine (H3A)	766360	3.46
Narcotic Analgesic and Non-salicylate Analgesic Combination (H3U)	671714	3.03
Adrenergics, Aromatic, Non-Catecholamine (J5B)	670218	3.03
Narcotic Antitussives -1st Generation (B3Q)	354240	1.6
Narcotic Antitussive-Expectorants (B4S)	311401	1.41
Methadone (H3A)	206412	0.93
Antidiarrheals (D6D)	183249	0.83
Morphine (H3A)	179843	0.81
Fentanyl (H3A)	171536	0.77
Meperidine (H3A)	157217	0.71
Skeletal Muscle Relaxants (H6H)	148571	0.67
Barbiturates (H2D)	145641	0.66
Cough and Cold Preparation (B3K)	129344	0.58

	Entire CSDB N=11,495,797		Active Narcotics Rx at time of death (n = 21,390 prescriptions)		Active Narcotics Rx at time of death among narcotics poisoning decedents (n=536 prescriptions)		
	Count	%	Count	%	Count	%	Ratio to all decedents
METHADONE	206,412	1.8	1,075	5.0	115	21.5	4.27 (3.59, 5.07)
MORPHINE	179,843	1.6	6,436	30.1	38	7.1	0.24 (0.17, 0.32)
FENTANYL	171,536	1.5	3,956	18.5	33	6.2	0.33 (0.24, 0.46)
OXYCODONE	1,911,383	16.6	3,913	18.3	150	28.0	1.53 (1.33, 1.76)
AGONIST- ANTAGONIST	75,883	0.7	15	0.1	2	0.4	5.32 (1.22, 23.21)
HYDROCODONE	7,164,766	62.3	4,677	21.9	169	31.5	1.44 (1.27, 1.64)
MEPERIDINE	157,217	1.4	131	0.6	3	0.6	0.91 (0.29, 2.86)
PROPOXYPHEN E	801,492	7.0	679	3.2	15	2.8	0.88 (0.53, 1.46)
CODEINE	766,360	6.7	316	1.5	11	2.1	1.39 (0.77, 2.52)

Next Steps

- Examine relationship between changes in dose and risk of death
 - Include the emergency department data –
 - History of non-fatal overdose may predict risk
 - Examine prescription history among *illicit* drug overdose decedents
 - Geographic description of poisoning and prescribing in Utah
-

Questions...

NO EXIT

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PHARMACEUTICAL FOLK SONGS

* SING
TO THE
TUNE OF
"TURN, TURN
TURN."

FOR EVERY PROBLEM,
PILLS, PILLS, PILLS,
THERE ARE PRESCRIPTIONS,
PILLS, PILLS, PILLS,
... OR EXPENSIVE,
NONPRESCRIPTION,
PHARMACEUTICALS.

A PILL TO BE STRONG,
A PILL TO DIE,
A PILL TO HAVE SEX,
A PILL TO GET HIGH,
PILLS TO BE SMART,
PILLS TO LOSE WEIGHT,
A PILL TO SLEEP,
AND PILLS TO STAY
AWAKE...
(REPEAT REFRAIN)



SINGER