Linking Heroin Price and Heroin Overdose

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Presentation Objectives

- Describe the study and the background
- Describe the effect of changes in the heroin market, specifically price, on the number of heroin overdoses
- Discuss some preliminary thoughts about how the emergence of prescription opiates interact with heroin

Multi-methodological Research

- Clinical-Ethnographic
  - Clinical work in syringe exchanges
  - Multi-city participant observation
- Epidemiological
  - US governmental data on heroin
  - Hospital survey data
- Support by NIH/NIDA grant number: RO1DA2759
  - PI: Daniel Ciccarone, MD, MPH

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Heroin: More dangerous?

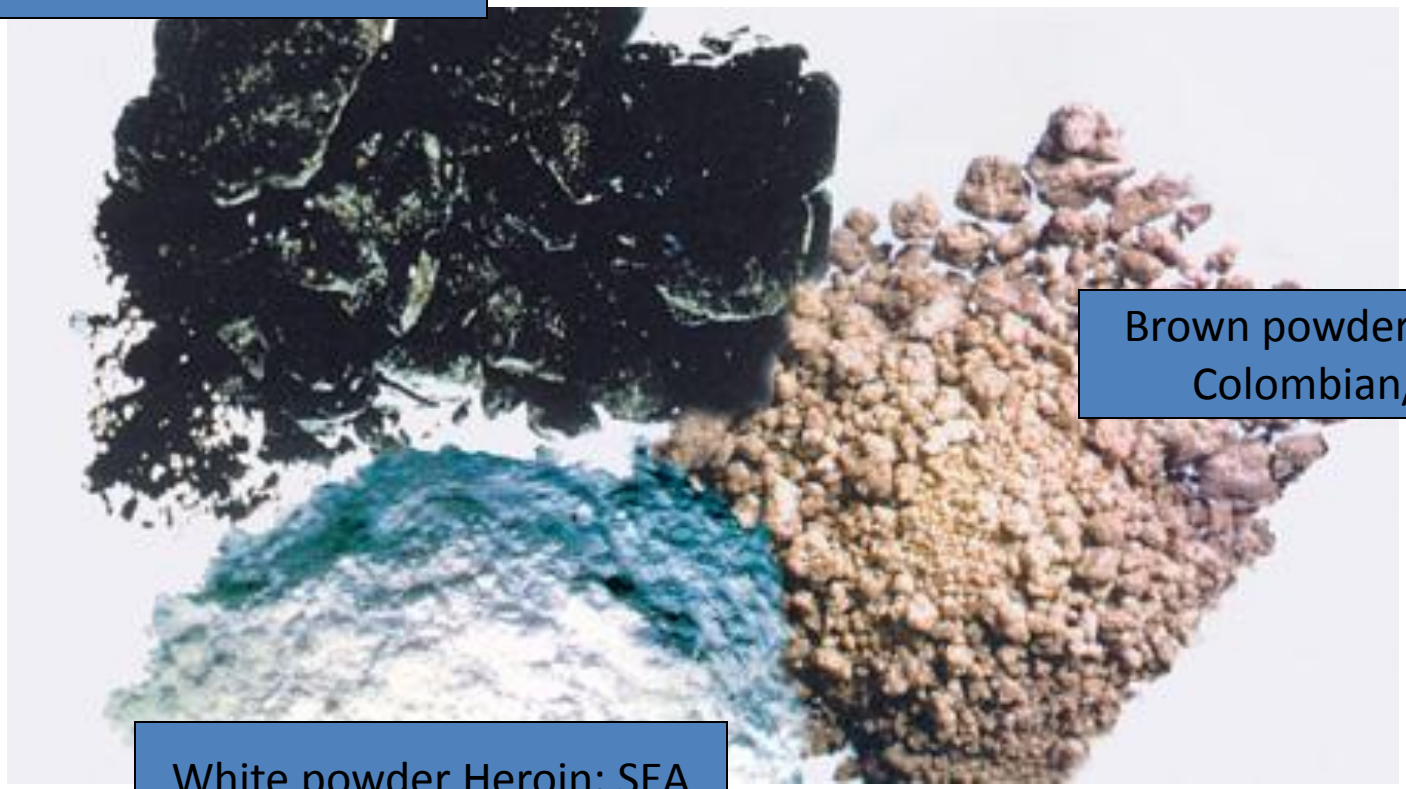
- Through the 1990's and into the 2000's heroin appeared to be becoming more popular and also more dangerous
  - In a number of cities, heroin-related overdose deaths have risen dramatically
  - Bacterial complications from injection drug use are also increasing
  - "Lived experience"
- The "risk environment" for heroin users was changing and we wanted to understand how that mapped on to bodies

Heroin Risk Environment

- Types of heroin
- Source of Heroin
  - Changes in market thus price and purity
- Prescription opiate availability

Heroin Types: Sources

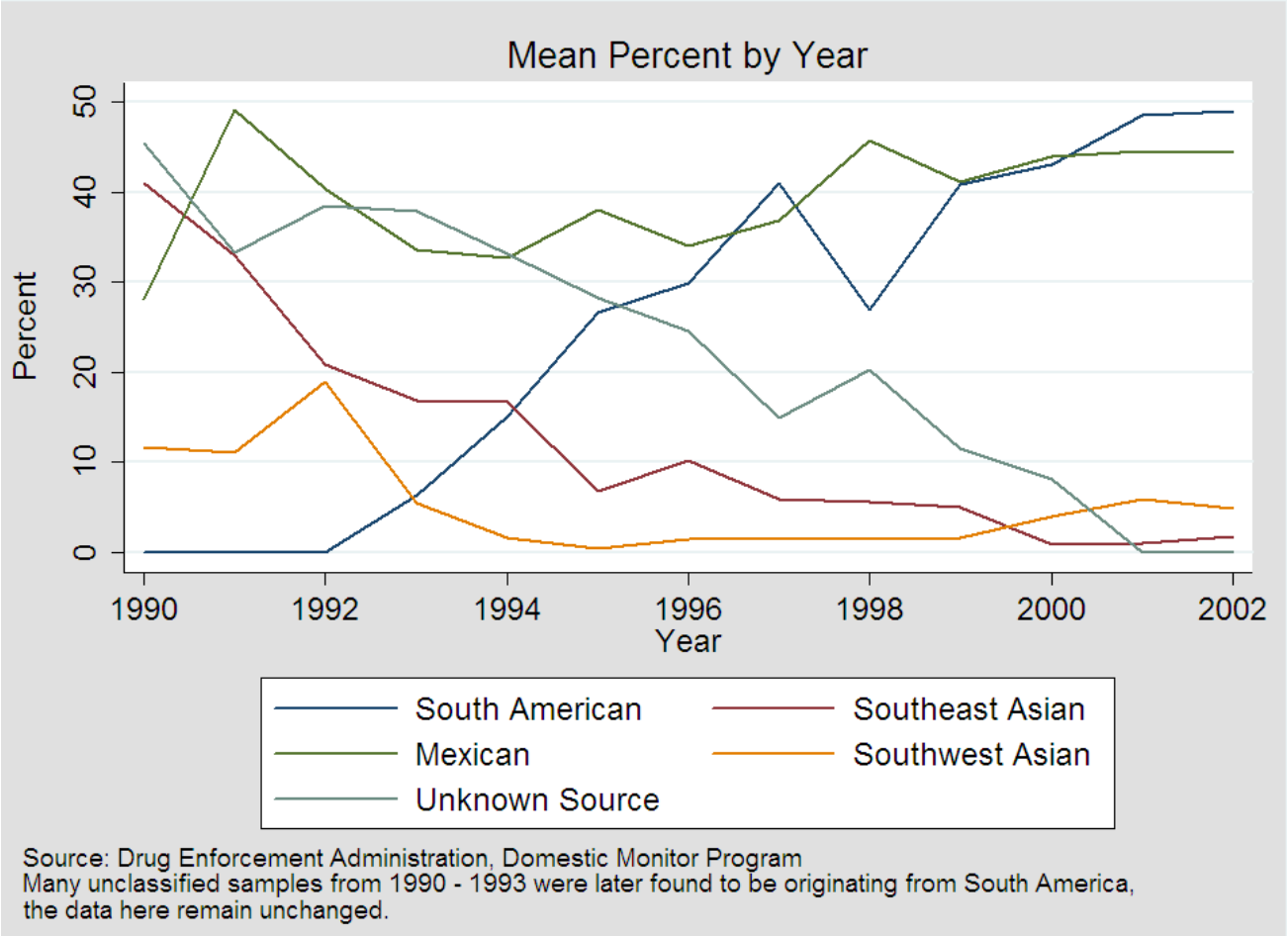
Black Tar Heroin: Mexican



Brown powder Heroin: Colombian/SWA

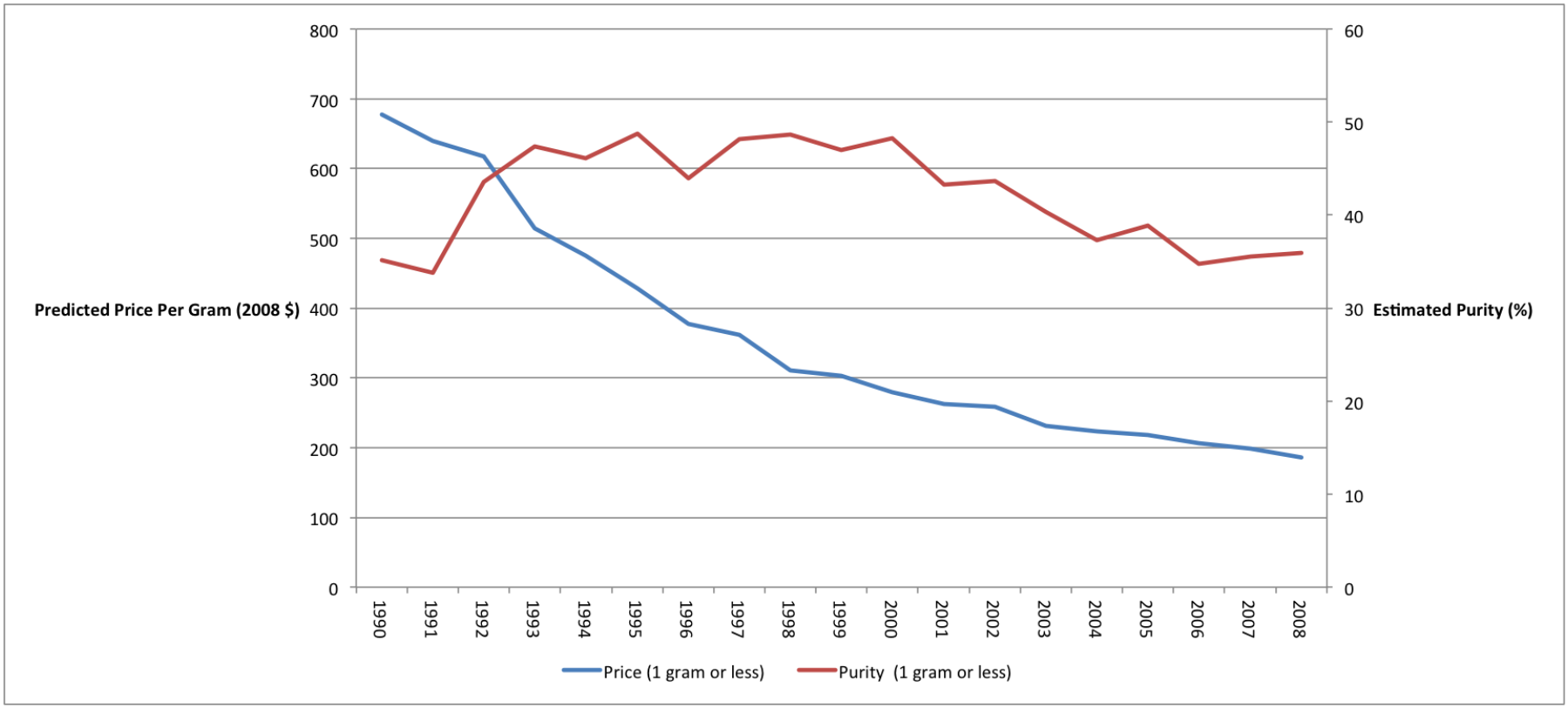
White powder Heroin: SEA

Results: US Heroin Suppliers Reduced from Four to Two



Source: Drug Enforcement Administration, Domestic Monitor Program
Many unclassified samples from 1990 - 1993 were later found to be originating from South America, the data here remain unchanged.

Heroin Price and Purity



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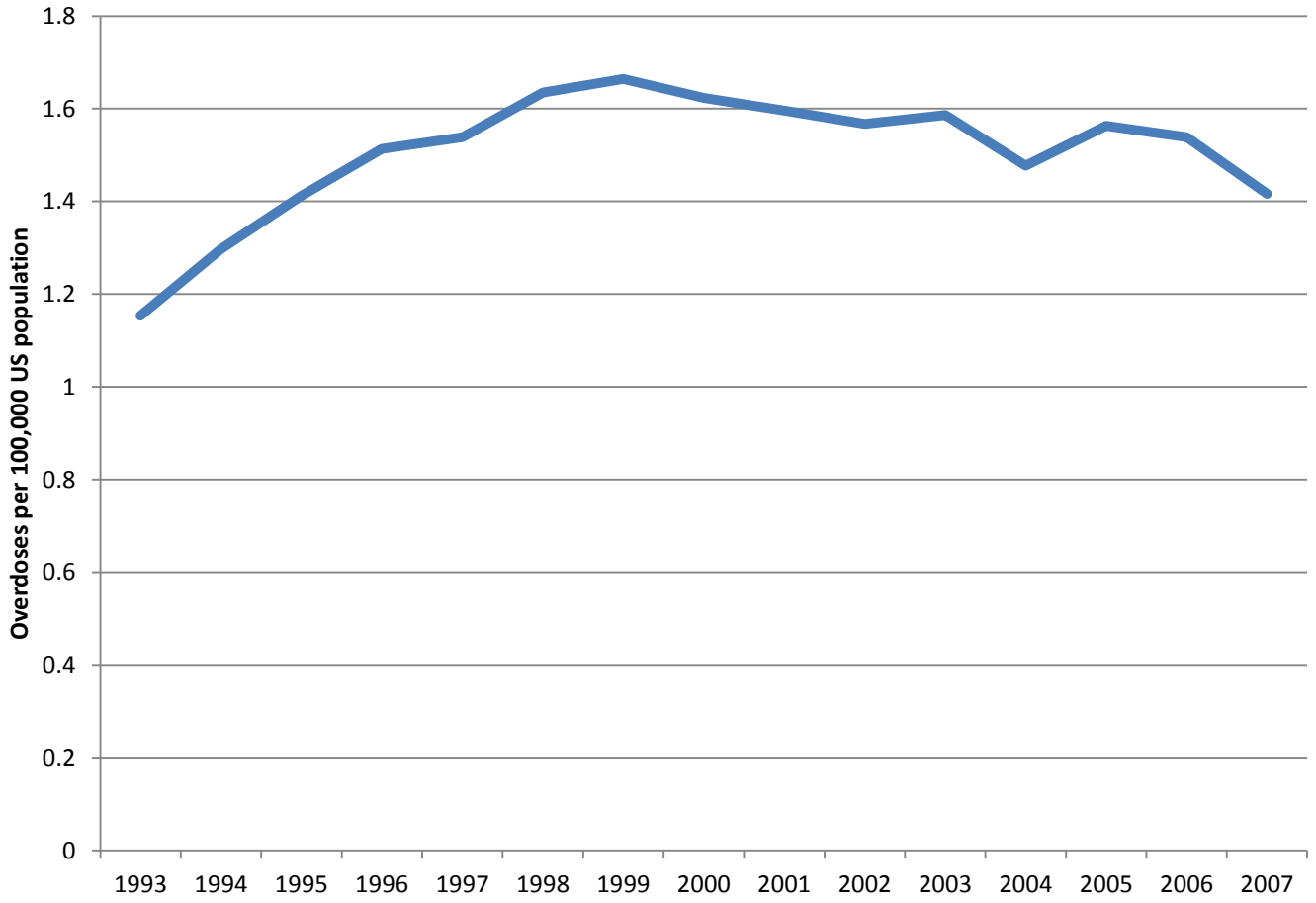
Heroin Overdose Hospital Admissions



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Data Sources (1)

- Price data from DEA STRIDE database
  - Combination of investigative purchases and exploratory purchases
  - Price data estimated by 2 multilevel models
    - LogPurity estimated with separate random slopes for location and year
    - Price estimated as price per expected pure gram (LogPurity) with separate random slopes for location and year

Data Sources (2)

- Heroin OD Nationwide Inpatient Survey (NIS)
  - Stratified sample of approximately 20% of US community hospitals representing 5 to 8 million hospital admissions annually
  - States included in the NIS represent about 95% of the US population
  - All payer data (Medicaid, Medicare, Private Insurance and uninsured)
  - Years 1993 to 2007

Data Sources (3)

- Used primary ICD-9 diagnosis codes
  - Heroin Overdose : 965.01 or an E code of E850.0
- Used Census and SEER data to construct MSA level variables

Price Analysis

- Multilevel models predicting the logged number of heroin overdoses per hospital per year.
- Random intercepts for MSAs and Hospitals and random slope for price (2008 dollars per MG pure)
- Adjust for economic conditions in MSAs (poverty and UE), demographics of MSA (Gender, race, age, population size)
- Measure change in HOD associated with change in price (2008 dollars per MG pure)

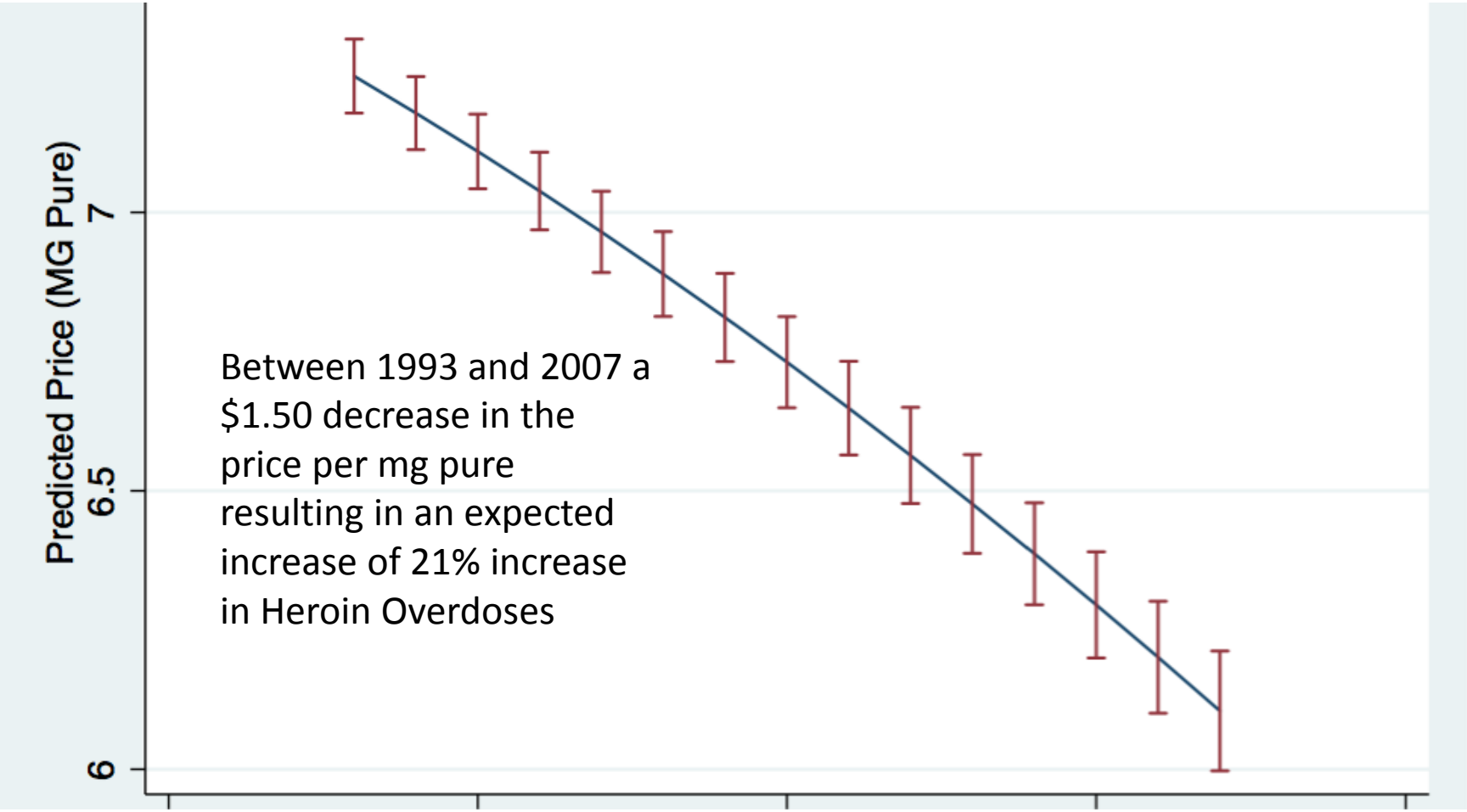
21 MSAs in Study

- Baltimore
- Boston
- Buffalo
- Chicago
- Cleveland
- Denver
- Kansas City
- Los Angeles
- Miami
- Milwaukee
- Minneapolis
- New York
- Philadelphia
- Pittsburgh
- Phoenix
- Portland
- San Diego
- San Francisco
- Seattle
- St Louis
- Tampa

Price Results

- Variation in the relationship between price and heroin overdose by locality (statistically significant variation in random price slope)
- A $1 increase in the price/mg pure results in a 14% decrease in the number of heroin overdoses ($p = 0.003$)

Price of Heroin Overtime



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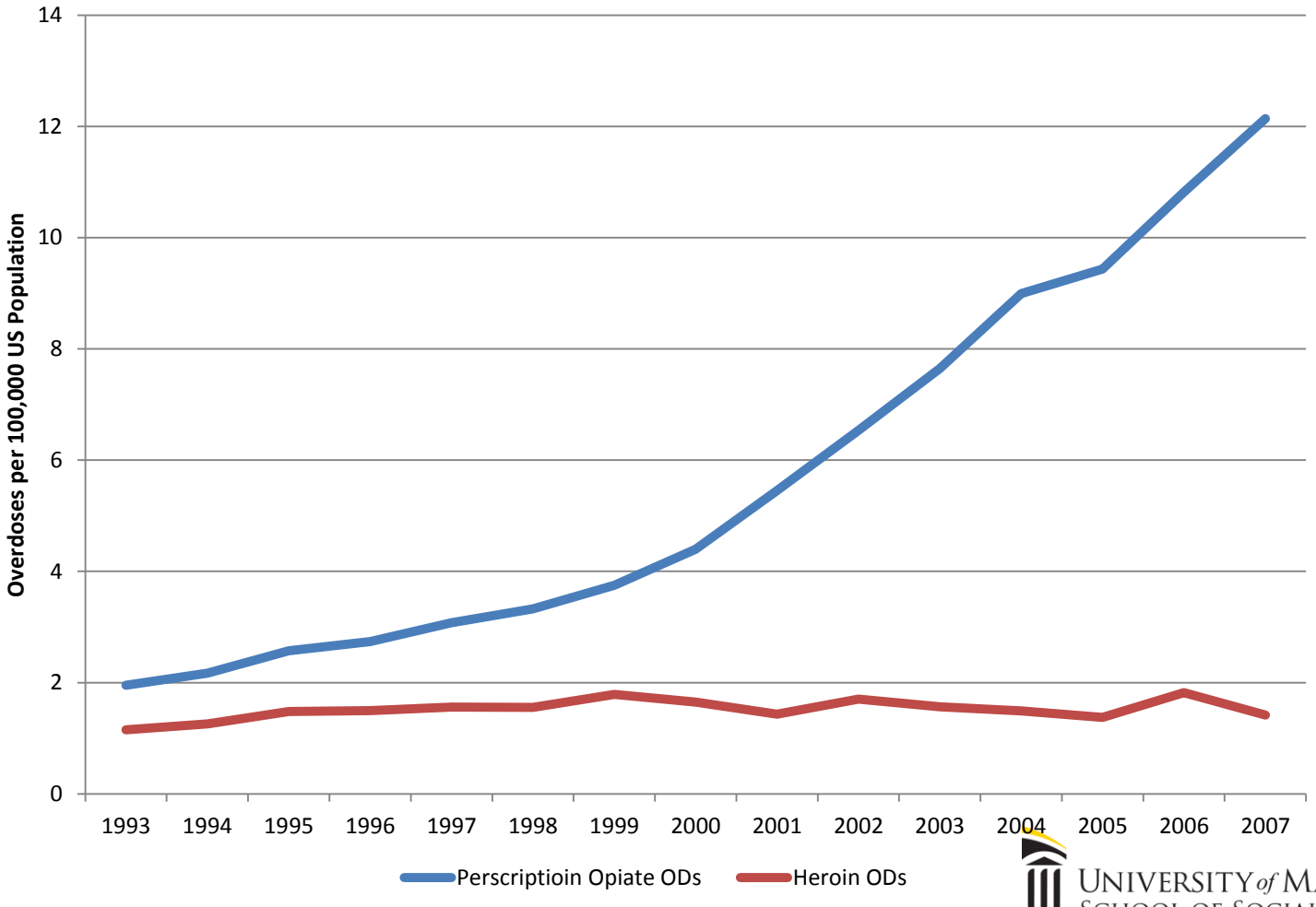
Other Risk Environment Questions

- Data suggest that price may not decrease much more and purity is no longer increase (good news)
- But prescription opiates have changed the picture of overdoses

Opiate Overdose Admissions



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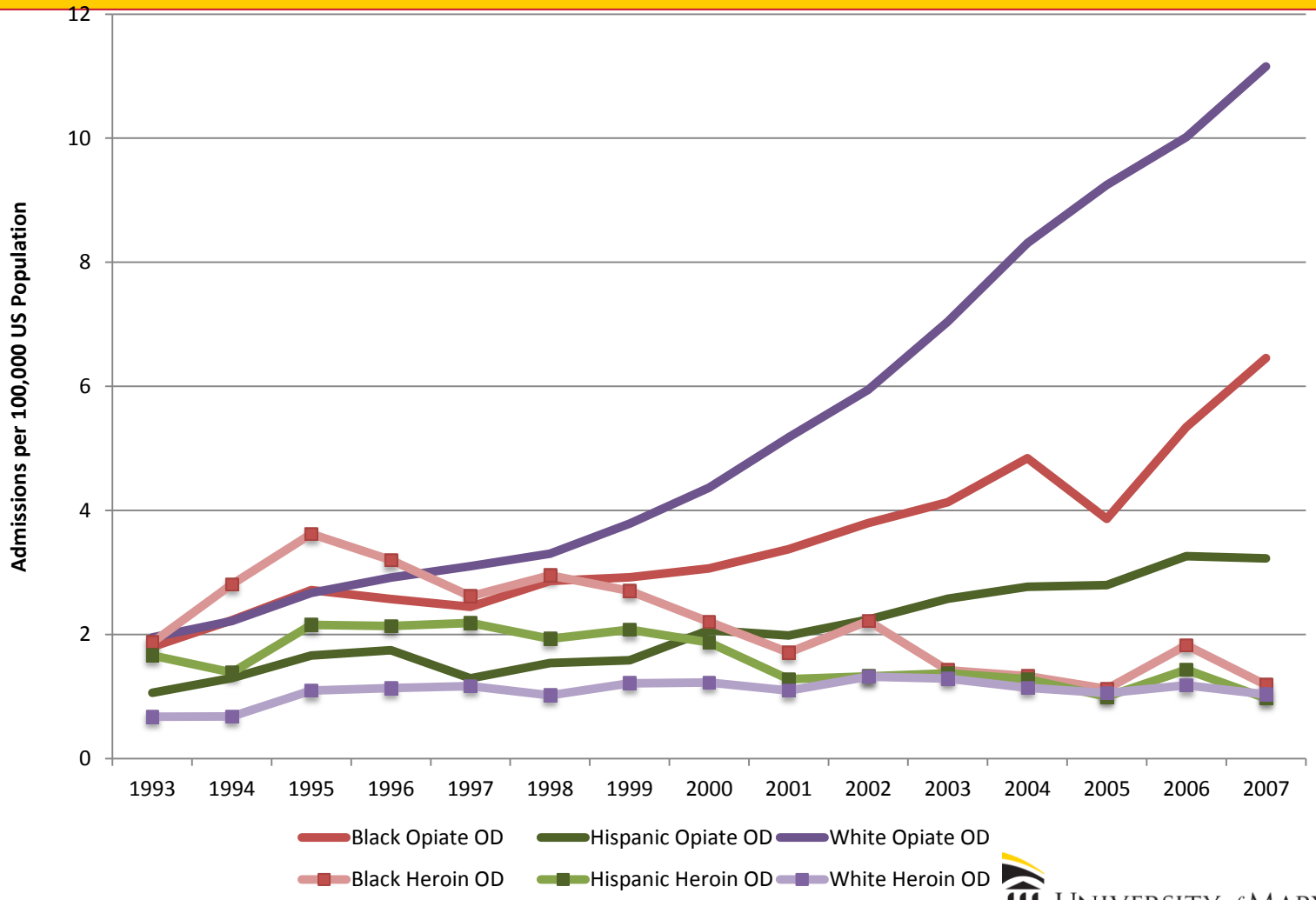
Race and OD Hospital Admissions



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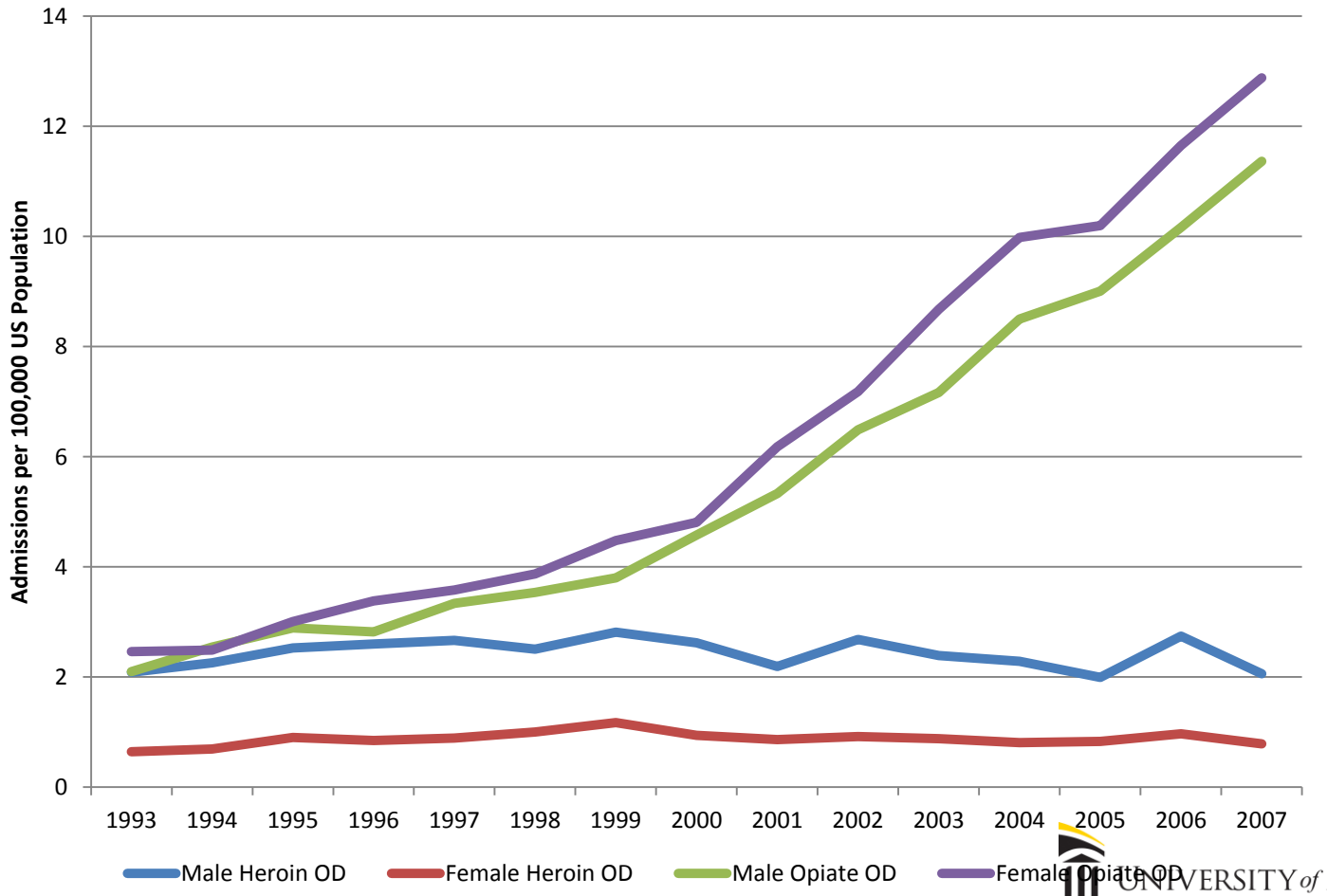
Gender



Discussion

- Changes in price ($1 increase lowers HOD by 14%) have a direct effect on individual heroin users risk of overdose
- Increasingly the availability of prescription are an emerging risk of increase in heroin overdoses.
- Do other structural heroin market factors affect individual users: Type of heroin, adulterants, ect