

# Urine Drug Screens

Help or Hindrance

William Banner MD PhD

# Case 1

- \* 26 month old presents with depressed LOC, dystonic movements, mydriasis, flushing and hives
- \* History of possible ingestion of cough medicine
- \* Parents are young, poorly dressed
- \* UDS positive for PCP
- \* Social service recommends police involvement and custody.

# Case 2

- \* 18 month old patient with rapidly progressing liver failure presents for evaluation.
- \* AST, ALT rising. INR 2.6, Ammonia 70, Bilirubin 15
- \* No history of medications being given
- \* Acetaminophen level of 12 mcg/ml
- \* Concern that this is APAP poisoning
- \* Parents not reliable/truthful

# Case 3

- \* 22 month old referred for liver failure
- \* History of rapid onset of decreased LOC
- \* Metabolic acidosis
- \* Bilirubin 14.6
- \* Ammonia of 88
- \* Spanish only, history of possible “aspirin” ingestion

# Case 4

- \* 3 month old presents with severe metabolic acidosis
- \* Mother with prior social services complaints
- \* Patient develops cerebral edema and dies
- \* Tox screen + for ethylene glycol
- \* Charges of murder filed against mother

# Methods of measuring toxins

- \* Basic chemistry and spectrophotometer
  - \* Enzymatic
- \* Immunoassay with spectrophotometer
  - \* EMIT
- \* GC-MS
  - \* Slow but sensitive and specific
  - \* Retention time and fragments

# Legal aspects of UDS

- \* DOT rules are in the Federal Register CFR part 40
- \* Very strict about testing and methods
  - \* Defined cut-offs and confirmation
  - \* Courts recognize standards
- \* Hospital tests are “standard of care” to make clinical decisions.
  - \* No defined requirements
  - \* In court you will likely be held to part 40 standards

# Example of methamphetamine

- \* Part 40 Positive test means
  - \* Immunoassay + at 500 ng/ml
  - \* GC/MS confirmation +250 ng/ml amph/250 ng/ml meth
  - \* Both must be present
  - \* Chiral confirmation as to type
- \* Hospital lab positive means
  - \* Immunoassay shows presence of amp/meth at 500 ng/ml



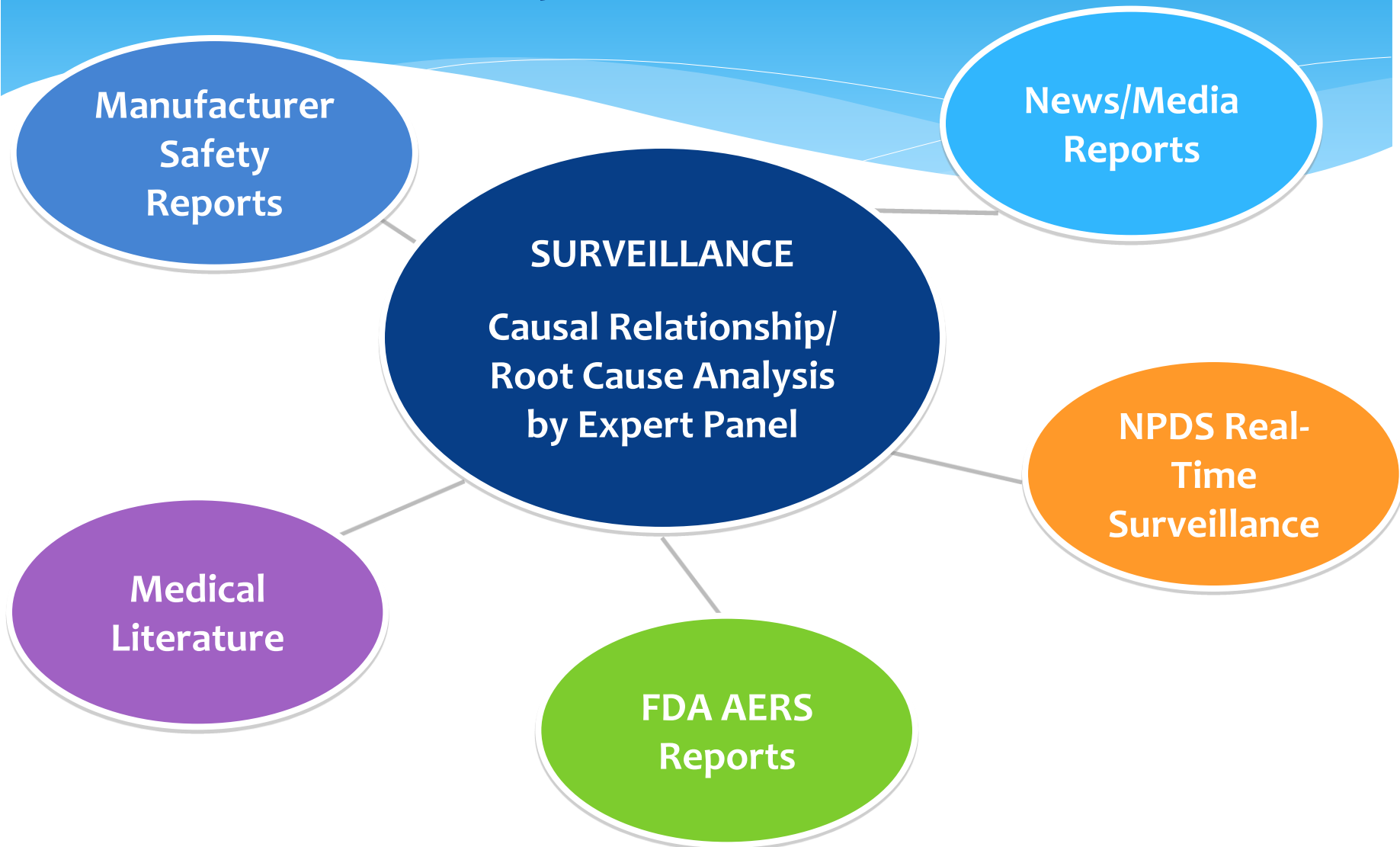
# Background

## Identified False Positives

Cough/Cold Ingredient	False Positive
Diphenhydramine	<ul style="list-style-type: none"><li>• TCA</li><li>• PCP</li></ul>
Dextromethorphan	<ul style="list-style-type: none"><li>• PCP</li></ul>
Pseudoephedrine	<ul style="list-style-type: none"><li>• Amphetamines</li></ul>
Phenylephrine	<ul style="list-style-type: none"><li>• Amphetamines</li></ul>
Chlorpheniramine/ Brompheniramine	<ul style="list-style-type: none"><li>• Amphetamines</li></ul>

# Methods

## Multi-System Surveillance



# Methods

## Case Inclusion Criteria

- Age < 12 years old
- $\geq 1$  Adverse Event
- Event occurred in US
- Event dates: January 1, 2008 – December 31, 2011
- Review by esteemed panel

# Methods

## Case Inclusion Criteria

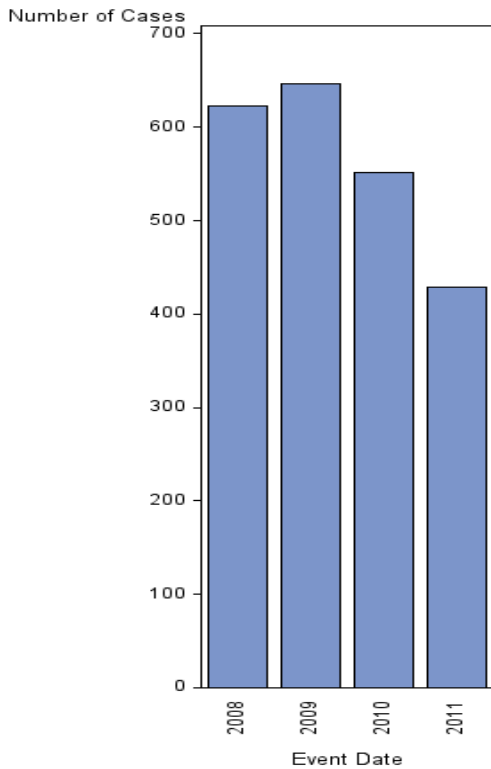
- Exposure to  $\geq 1$  cough/cold ingredient:
  - brompheniramine
  - chlorpheniramine
  - dextromethorphan
  - diphenhydramine
  - doxylamine
  - guaifenesin
  - phenylephrine
  - pseudoephedrine

# Methods

## Data Analysis

- Data abstracted:
  - Patient demographics
  - Reported ingredients ingested
  - Urine drug screens from case narratives
  - Report of social services involvement or legal referral
- Data described using descriptive statistics

# Data Overview



Cases Reviewed 2368//3977

68% non-therapeutic

38 fatalities

Not a study of efficacy

# Results

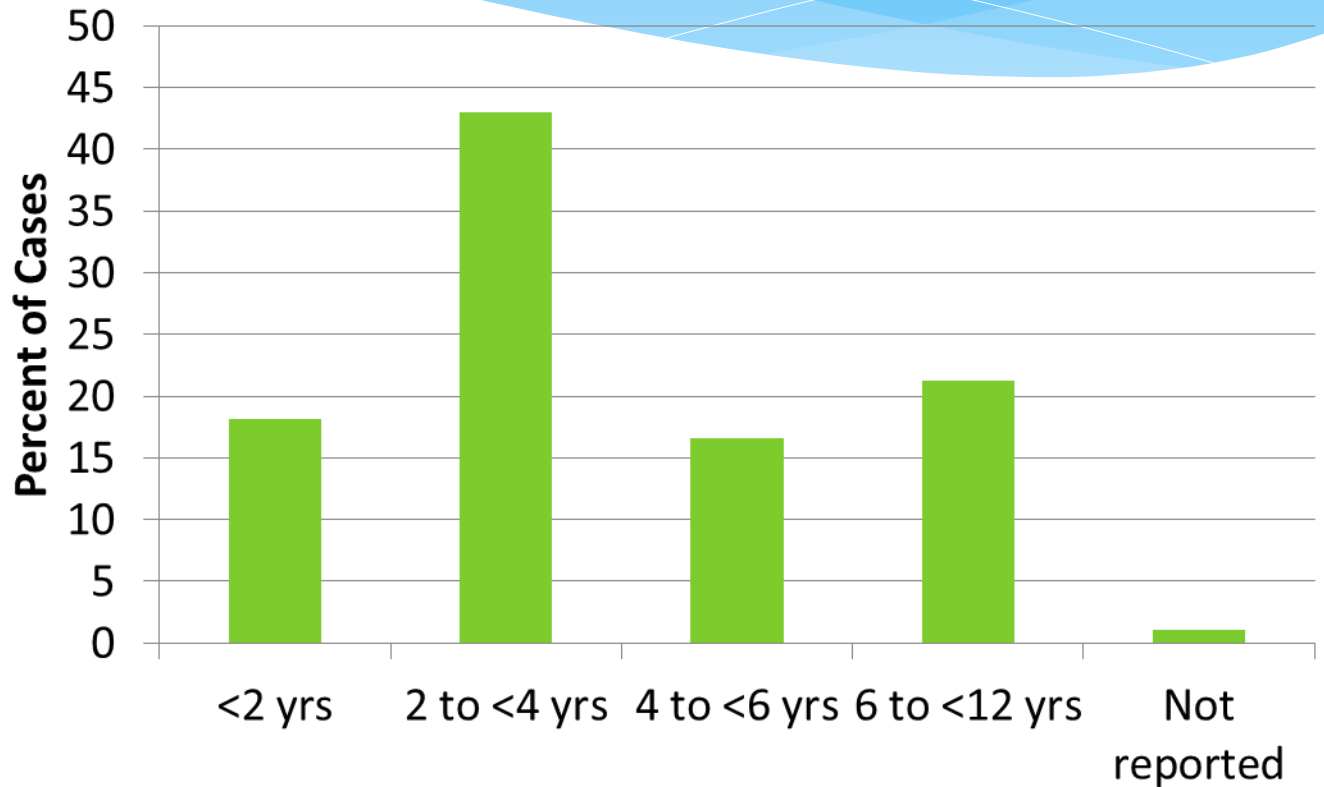
## Demographics

3977 Cases  
Reviewed

504 (13%)  
UDS reported

252 (51%)  
UDS +

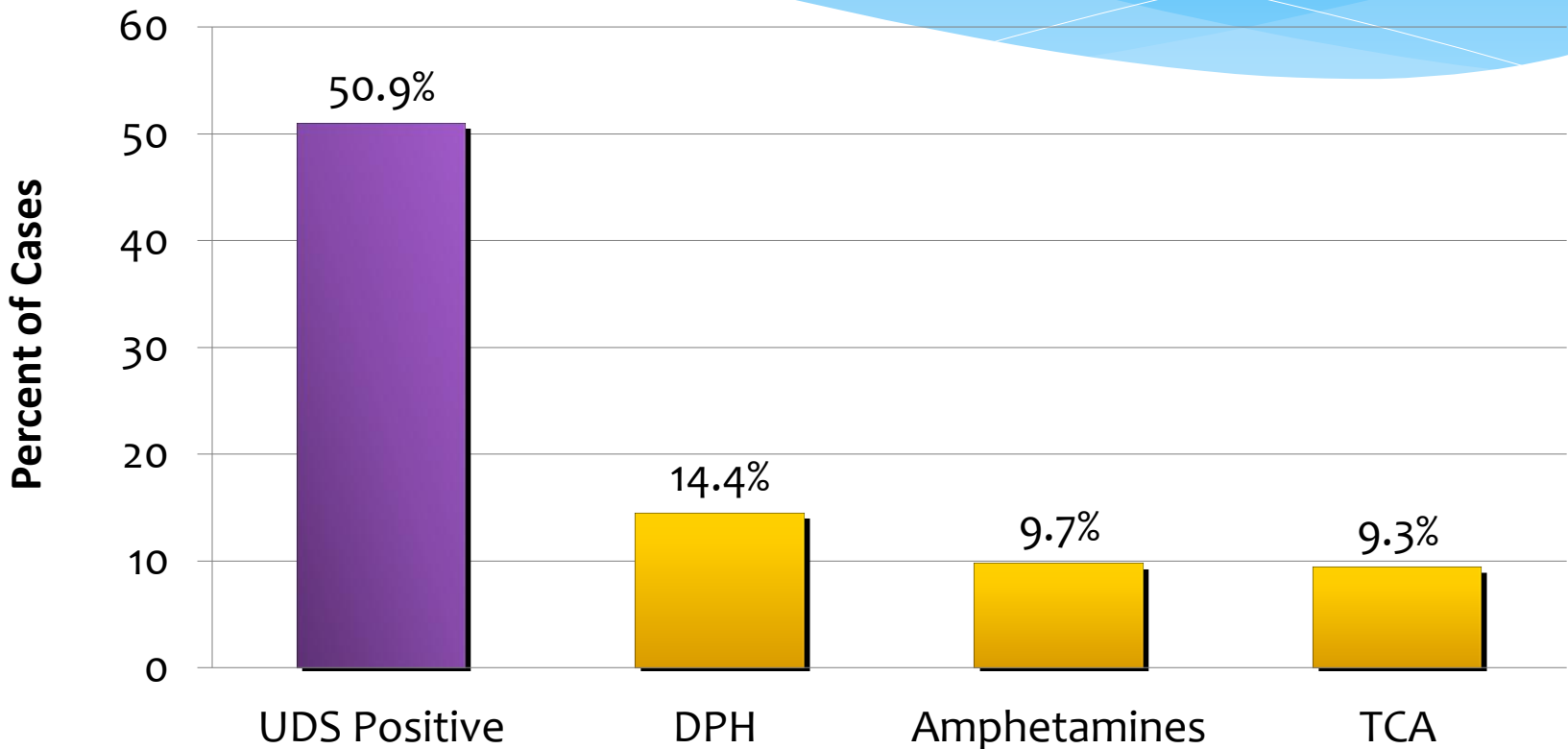
54% male



# Results

## Diphenhydramine (DPH)

- 216 DPH cases reported urine drug screens



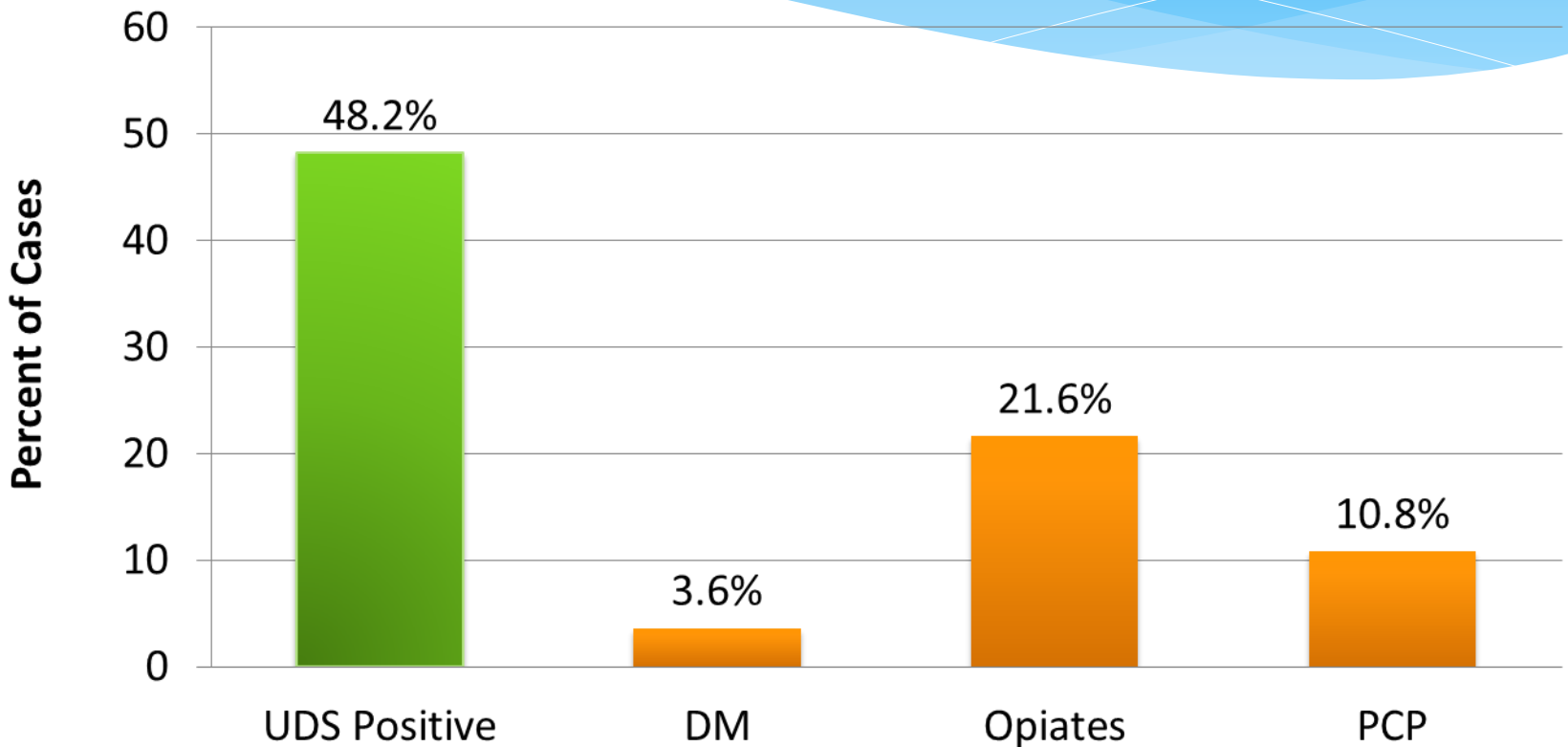
When DPH reported/nonreported= TCA + 25:3



# Results

## Dextromethorphan (DM)

139 DM cases reported urine drug screens

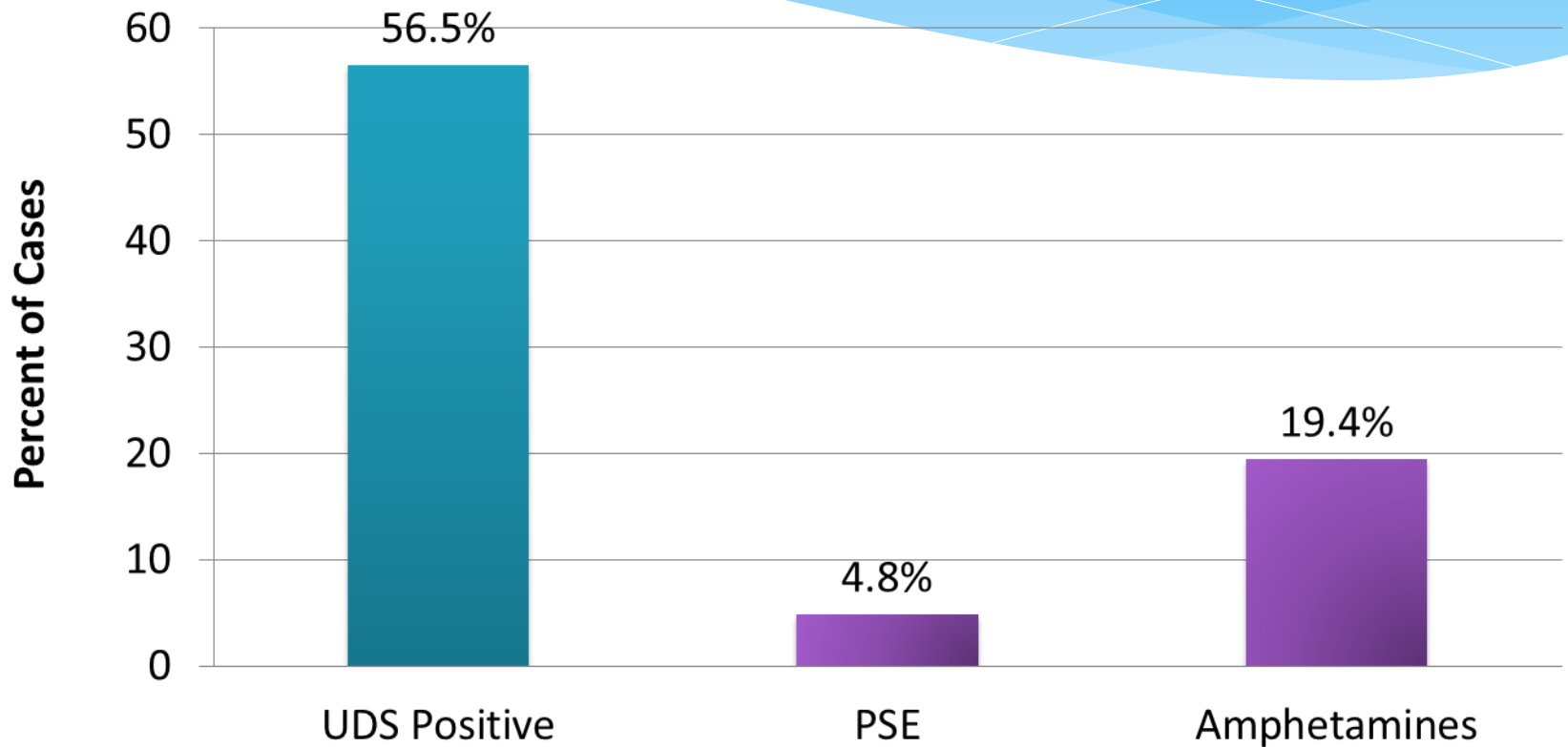


When DEX reported/nonreported= PCP + 21:1

# Results

## Pseudoephedrine (PSE)

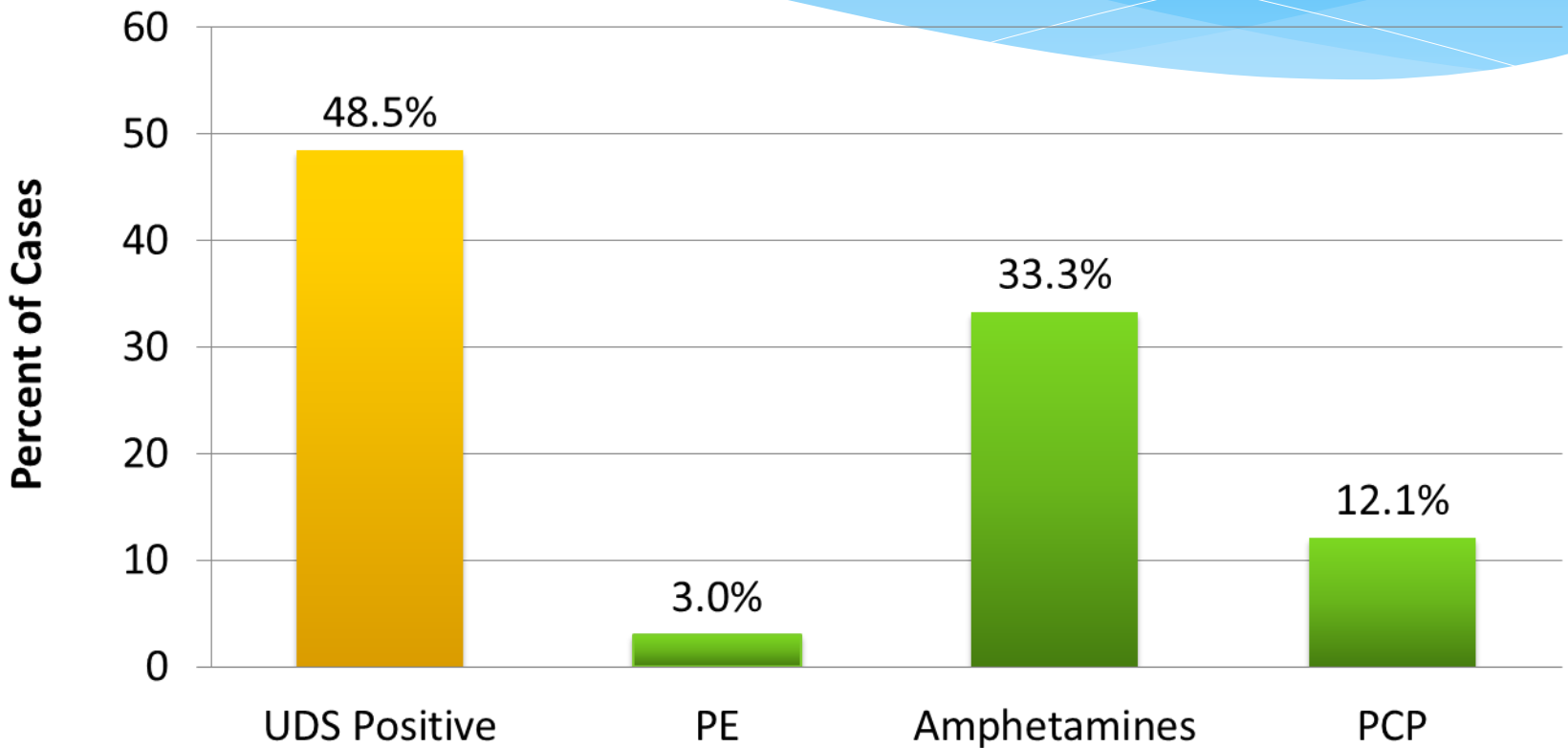
- 62 PSE cases reported urine drug screens



# Results

## Phenylephrine (PE)

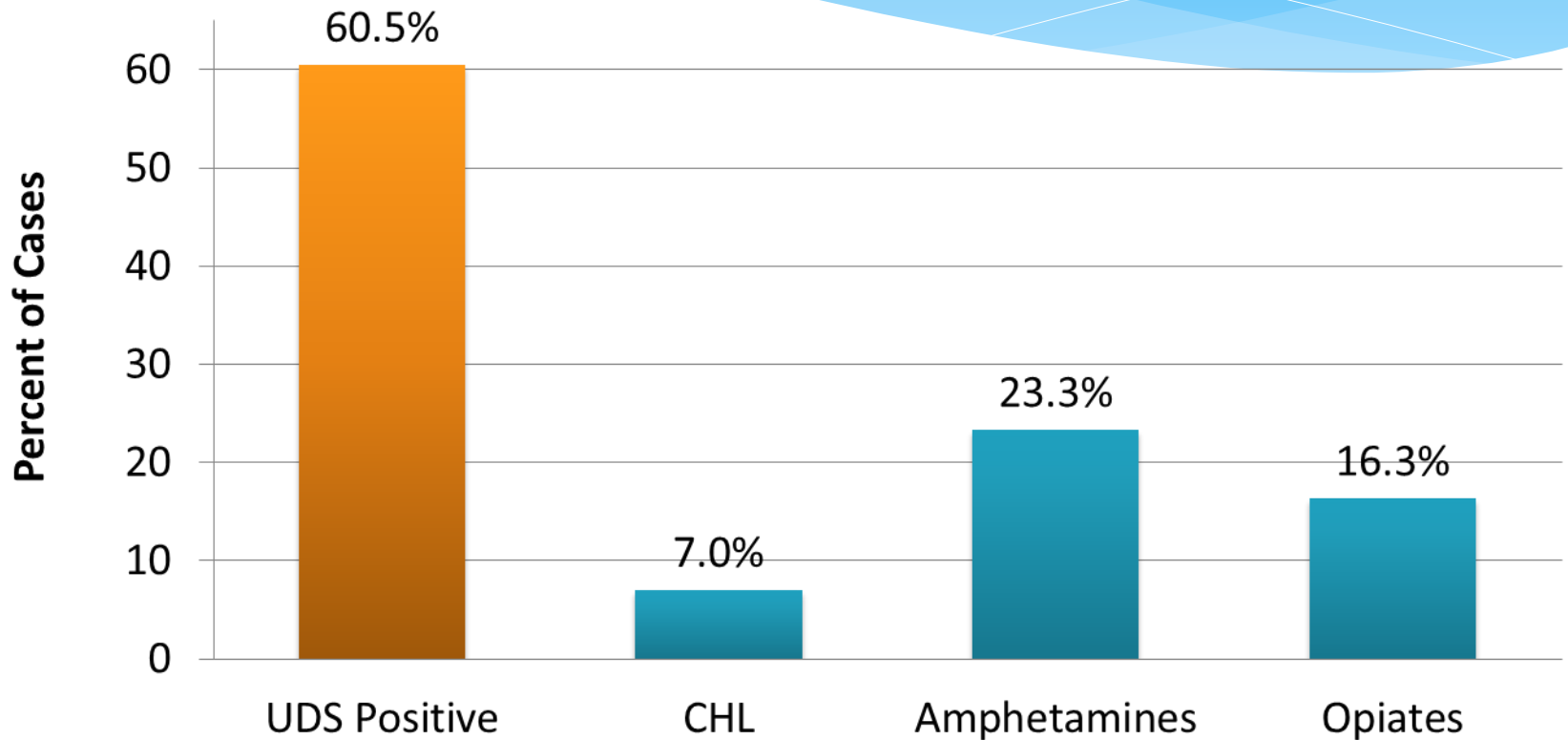
33 PE cases reported urine drug screens



# Results

## Chlorpheniramine (CHL)

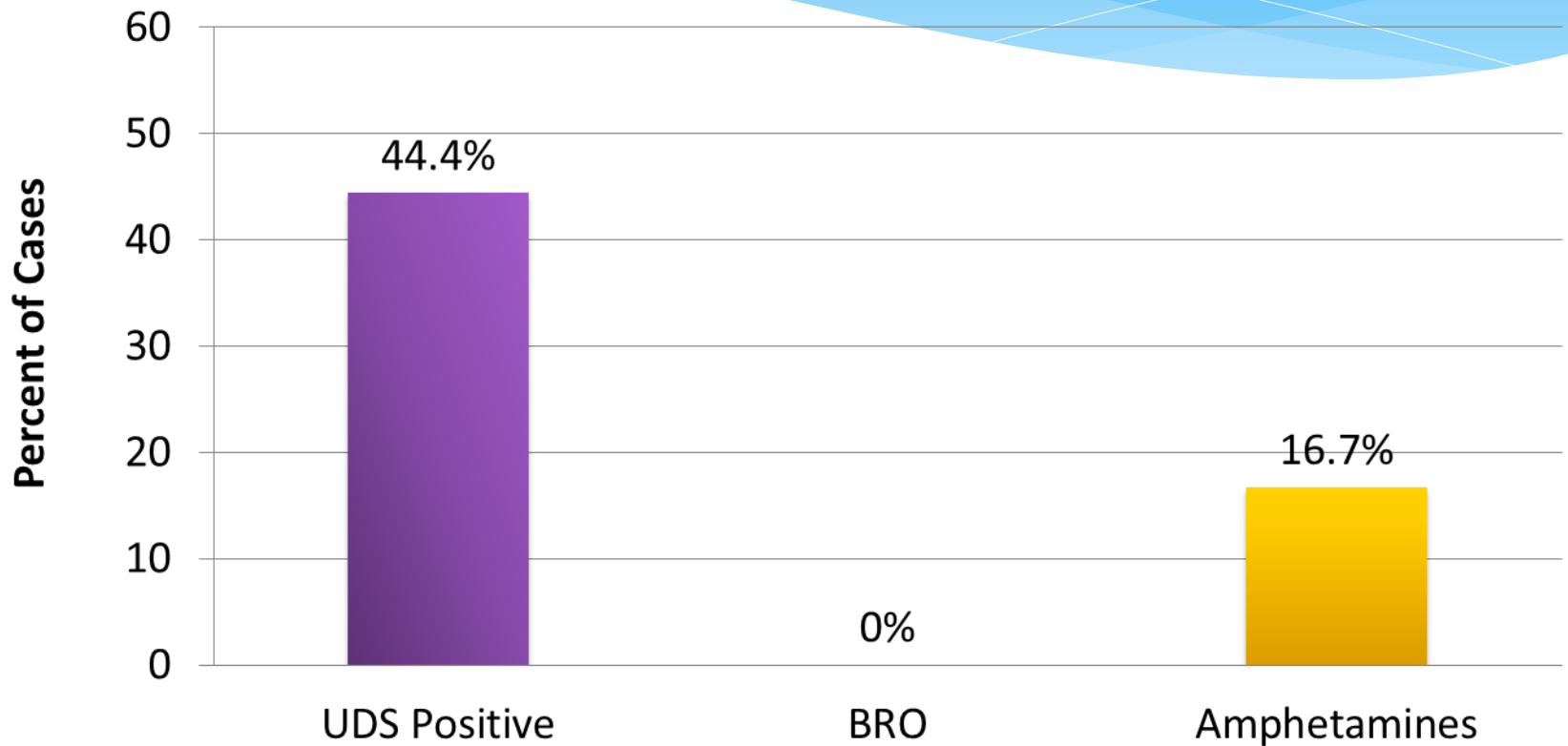
- 43 CHL cases reported urine drug screens



# Results

## Brompheniramine (BRO)

- 18 BRO cases reported urine drug screens



# Results

## Accuracy

	True Positives	False Positives
Diphenhydramine	14%	9% TCA 9% Amphetamines
Dextromethorphan	4%	22% Opiates 11% PCP
Pseudoephedrine	5%	19% Amphetamines
Phenylephrine	3%	33% Amphetamines 12% PCP
Chlorpheniramine	7%	23% Amphetamines 16% Opiates
Brompheniramine	0%	17% Amphetamines

# Case 1

- \* 26 month old presents with depressed LOC, dystonic movements, mydriasis, flushing and hives
  - \* C/w dex ingestion
- \* History of possible ingestion of cough medicine
- \* Parents are young, poorly dressed
- \* UDS positive for PCP
  - \* Distinctly possible as a false positive
  - \* Not confirmed
- \* Social service recommends police involvement and custody.
  - \* Before making legal accusations will require confirmation or risk liability or court failure.

# Results

## Impact

- Social services or legal involvement
  - 92/3140 (3%) of all cases
  - 36/191 (19%) of UDS positive cases



# Limitations

- Report of UDS not systematic
  - Relies on spontaneous reporting
  - Varies by case source
- All UDS are not created equal
  - Varied methodologies
  - Not always directly comparable
  - Analytical methods have changed/improved over time
- UDS ordered inconsistently

# Conclusions

## Cough/cold ingredient ingestions + UDS

- UDS are ordered infrequently
- UDS rarely confirm suspected ingredients
- UDS are more likely to give false information
- Positive UDS are associated with social service and legal interventions

# Case 2

- \* 18 month old patient with rapidly progressing liver failure presents for evaluation.
- \* AST, ALT rising. INR 2.6, Ammonia 70, Bilirubin 15
- \* No history of medications being given
- \* Acetaminophen level of 12 mcg/ml
  - \* Repeated at 2<sup>nd</sup> hospital
- \* Concern that this is APAP poisoning
- \* Parents not reliable/truthful

# Is this APAP poisoning?

- \* Both hospitals use the Abbott Architect autoanalyzer for acetaminophen.
- \* Bilirubin is known (by the lab anyway) to interfere with APAP assay.
- \* Would need to send out for a different method to verify.
- \* NAPQI-protein adduct assay should help to clarify role of APAP in some ingestions.
- \* Patient had acute viral hepatitis.

# Case 3

- \* 22 month old referred for liver failure
- \* History of rapid onset of decreased LOC
- \* Metabolic acidosis
- \* Bilirubin 14.6
- \* Ammonia of 88
- \* Spanish only, history of possible “aspirin” ingestion

# Before you list for transplant....

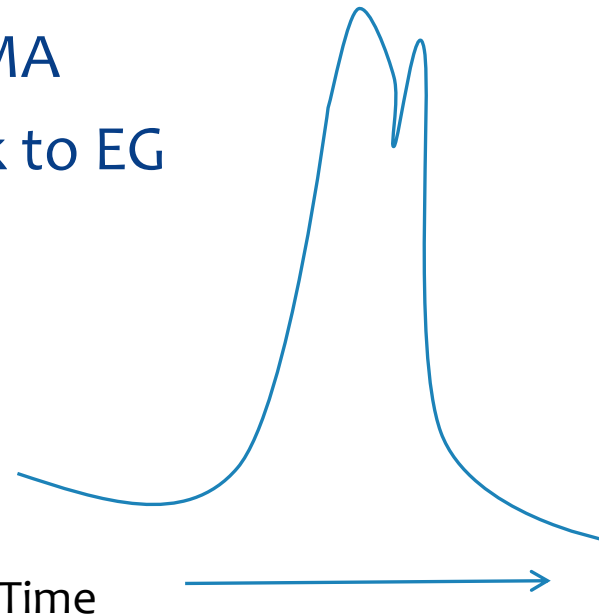
- \* In my Spanglish we determined that a medicine for back pain starting with N was involved.
- \* Sclera were non-icteric (helps to look at patient).
- \* Naproxen is known to give a false + bilirubin
- \* Ammonia was probably from difficult lab draw-repeat normal.
- \* Metabolic acidosis was real.

# Case 4

- \* 3 month old presents with severe metabolic acidosis
- \* Mother with prior social services complaints
- \* Patient develops cerebral edema and dies
- \* Tox screen + for ethylene glycol
- \* Charges of murder filed against mother

# The Trial

- \* EG was done by GC-MS
- \* Infallible??
- \* Another baby was born with MMA
- \* Propionic acid is a shoulder peak to EG
- \* Spectra was slightly similar
- \* Got convicted anyway.





# Conclusions

- \* Drug screens prone to errors
- \* History and physical are key- not secondary
- \* Confirm before you legally commit
- \* Nothing is infallible