Opioids and Suicide:

Learning from Survivors of Loss

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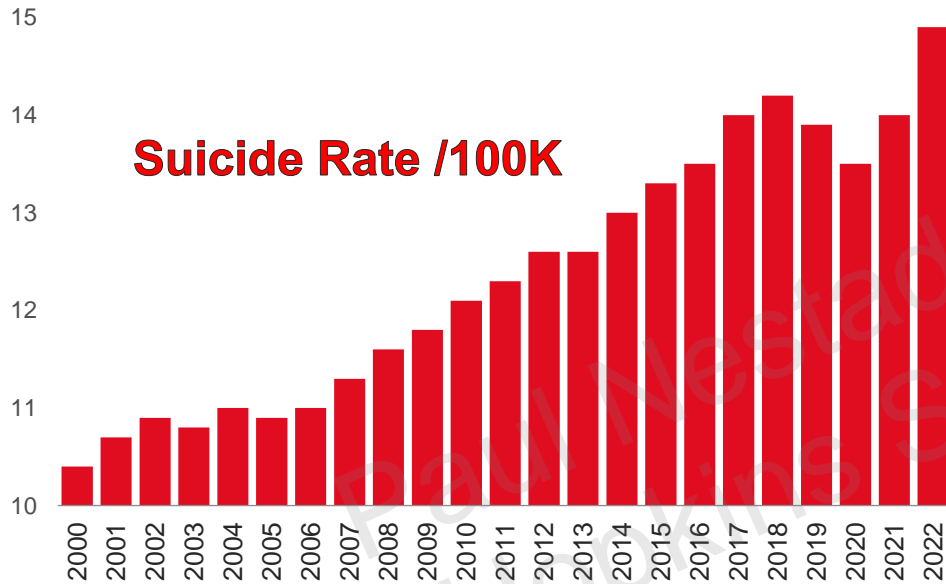
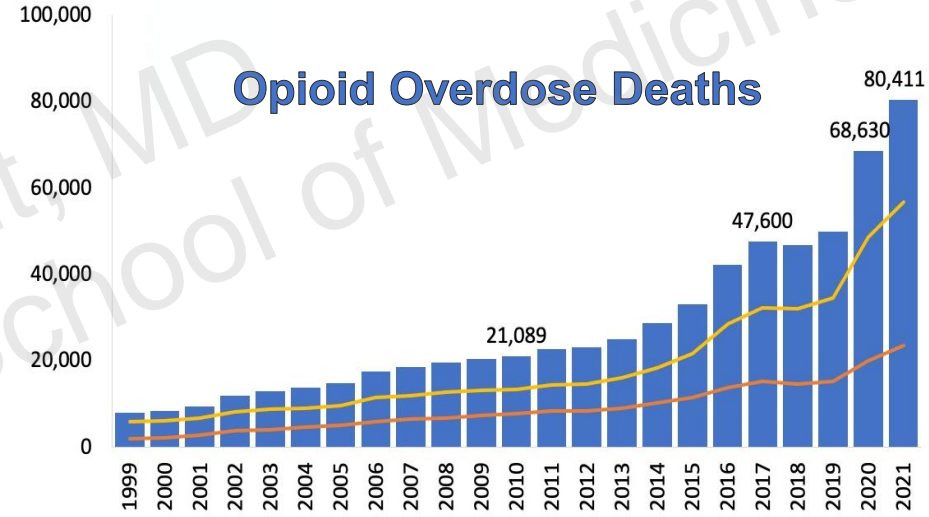# Suicide and Opioid Overdose: Concurrent Public Health Crises

Suicide Rate /100K

Opioid Overdose Deaths

100,000 — 80,411
80,000 — 68,630
60,000 — 47,600
40,000
21,089
20,000
0

CDC WONDER

Research Connection | American Foundation for Suicide Prevention

Common Risk Factors/ Proximal Indicators

Accidental OD

Changes In Opioid Purity/ Adulterants

Changes In Tolerance (Jail, Detox)

Poor Nutrition

Cardiac Or Respiratory Illness

Hepatic Or Renal Illness

Lack Of Access To Narcan

Suicide

History of Suicide Attempt

Giving Away Possessions

Saying Goodbye

Shift In Mood/Behavior

Loss/ Grief

Severe Insomnia

Investigating

Methods/Stockpiling

Feeling Burdensomeness

Age >85

Shared

Male

White Or Indigenous

Middle Age

Substance Use Disorders

Depression, Anxiety, Psychosis

Chronic Pain

Trauma Exposure

Hopelessness

Recklessness/ Impulsive

Housing/Food Insecurity

Unemployment

Family, Legal, Other Stressors

Healthcare Access

Benzodiazepine Use

Access To Opioids

Opiates increase suicide risk in three important ways

► Opiates are **depressants** which increase the risk of Major Depressive Disorder
  ► >6 months of opiate treatment associated with **53% increase in MDD** *(Sherrer 2014)*
  ► Pts with MDD are 2x as likely to use opioids for reasons other than pain *(Grattan 2012)*

► Opiates are **addictive** and create substance use disorders
  ► Opiate use disorder associated with **13.5x risk of suicide** *(Wilcox 2004)*

► Opiates are a particularly **lethal method** of suicide attempt
  ► RR of **death with opioids is 5x** that of other substances in SA *(Miller 2020)*
  ► Their presence is akin to a **loaded gun** in the house

Nestadt & Bohnert (2020)

Disentangling Overdose Intent

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Different Risk Groups, Different Interventions

► Ideally, we would **target interventions** for accidental overdose or for suicide prevention towards the **subgroups at highest risk for each**, allocating **resources** appropriately

   ► **Overlapping interventions** are important, but only **part of the picture**

► Identifying the **demographic and clinical subgroups** most at risk for **suicide** would allow us to better **screen**, apportion **mental healthcare access**, apply **anti-suicide therapeutic** strategies (*CBT, CAMS, Lethal Means Counseling, etc*.)

► For those at risk of **accidental overdose**, the priority should be **SUDs groups**, **Medication Assisted Treatment**, **Narcan**, non-opioid **pain management**, etc.

► In reality, we not only **cannot distinguish** most of these deaths, we don't even know the **true rate** of either **manner of death**

Determining Manner of Death

► **Manner of death determination** is the basis of the mortality data that guide **research, policy, practice**, **funding** allocation and national **prioritization**
  ► Epidemiologic research is only as good as our **case definitions**
  ► It is essential that this classification is accurate.

► In fact, it is not always easy to determine if an **overdose death** was **intentional** or not

► Medical Examiners must place the decedent in one of two groups, both sharing **similar backgrounds** and **risk factors**, but who ultimately die by very different behaviors
 ► After the overdose, they look much the **same**

Undetermined Manner

▶ In the **UK**, the official **suicide rates are calculated** to include all deaths determined intentional **PLUS all adult overdoses of undetermined manner** (open verdict)

▶ In Maryland, ~**75% of opioid overdose deaths** are left "**undetermined manner**"
   ▶ Far above the **national average of 8%**

▶ These undetermined manner deaths are **not counted in our suicide rates**

▶ In a state particularly **hard hit by opioid deaths**, we are greatly **underreporting** the true **burden of suicide in Maryland**

▶ But by **how much**, and in **which groups**?
   ▶ National studies found women and POC most likely to be undercounted

Olfson et al. 2020; Nestadt 2020; Rocket et al. 2020

Machine Learning to Distinguish Manner of Death
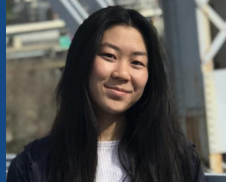
Because there are some cases that **ME's feel certain are suicides or accidents**, could we use machine learning to **sort the undetermined cases** into categories that look most like the known cases?

- ▶ **UTAH**: 2nd highest rate of **undetermined cases** (27%, at time of study)
  - ▶ Early adopter of including **accidental overdose** in NVDRS reports

- ▶ Extracted **all fatal opioid overdoses** 2012-15 (n= 2,665)
- ▶ Narrowed UVDRS's 875 variables to 39 key features
- ▶ Trained 4 different ML methods on 80% of the data (LR, RFC, SVM, ANN)
- ▶ Tested remaining 20% of data using majority vote to determine manner
  - ▶ Accuracy ranged from **92-95%**

Years	Original Suicides	MV Classified Suicides	Combined Suicides	Under-reported By (%)
2012	121	49	170	29%
2013	102	43	145	30%
2014	117	64	181	35%
2015	125	73	198	37%
Total	465	229	694	**33%**

- ▶ Overall, **32% of undetermined deaths were reclassified as suicides**, increasing Utah's reported **suicide rate by 33%**
- ▶ Consistent with small (n = 41) previous study using CART which redetermined 30% of UT deaths to suicide *(Donaldson 2006)*

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What Does this Mean for Maryland?

► What if **30% of Maryland's undetermined** opioid overdose deaths were **reclassified?**

   ► Maryland has a much higher rate of opioid OD *and* of undetermined class (>75%)

      ● 2020 Suicide rate increases from **10.3** /100k to **20.4** /100k

      ● Increasing Maryland from **47**[th] in suicide rate to **7**[th] **in the US**

   ► Poisoning deaths are disproportionately common in **women and POC**

► This would have dramatic implications on how the **state prioritizes suicide prevention**

► Potentially **retargeting efforts** to populations at **high risk for opioid overdose**, including **urban areas** and those with **substance use disorders**

Comparing Opioid Deaths in Maryland

- We identified **3,676** all well characterized Maryland opioid ODs (2006-2021.Q2)
  - **373 suicides** + **3,303 accidents**
  - Excluded 13,738 "undetermined"

- Logistic regression, with **adjustment** for noted variables of interest→

- Categorization as **suicide** found:
  - **Twice** as likely in Women
  - **4.8x** in Whites
  - Strong associations with **specific toxicology**

Predictors of *Suicide* as Cause of Death in Opioid Overdose – Adjusted Logistic Regression Odds		
	OR (CI 95%)	Pr(>|z|)
Female	2.19 (1.73- 2.78)	**<0.001**
White	4.79 (3.36- 6.82)	**<0.001**
Age <40	1	-
Age 40-59	1.77 (1.34- 2.35)	**<0.001**
Age 60+	4.54 (3.24- 6.36)	**<0.001**
Antidepressant	2.03 (1.60- 2.59)	**<0.001**
Cocaine	0.18 (0.12- 0.28)	**<0.001**
Benzodiazepine	1.42 (1.09- 1.85)	**<0.01**
Alcohol	1.26 (0.98- 1.63)	0.076
Multiple Opioids	0.63 (0.48- 0.82)	**<0.001**

Psychological Autopsy (PA)

▶ A **psychological biography** that establishes a **pathway** to an intended death

▶ **In-depth** evaluation of a **specific case** by a trained **clinical investigation** team
  ▶ **Full review** of the decedent's case
    ● **Medical and other Records** (Schools, DOJ, VA, homeless services, etc)
    ● **Social Media** (public facing, private when available)
    ● **Extended Interviews** with family, collateral informants

Distal	**Proximal**
➢ Character/ Personality	➢ Last Days and hours
➢ Developmental History	➢ State of Mind
➢ Psychiatric History	➢ Intentionality
➢ Emotional Life and Coping Style	➢ Access to Lethal Means

Modified from Lanny Berman

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Benefits of Psychological Autopsy

► **Teaching tool** to improve **risk assessments**

► **Therapeutic tool** to **aid survivors** deal with suicide *(Henry & Greenfield, 2009)*
  ► To accept death as suicide
  ► To answer "Why?"
  ► To decrease self-blame, guilt, denial; to have a new perspective
  ► To help prevent the next suicide: Altruism
  ► To derive support/alleviate isolation

► **Research tool** to **identify** missed points of **intervention and prevention**

Psych Autopsy: Use Cases

► Best suited to examine **specific groups** or answer **specific questions**

► Data collected can **later be re-examined** for new questions or testing

> ► Current PA work at the **Johns Hopkins Center for Suicide Prevention:**
>
> > ► Suicides among **young Black males**
> >
> > ► **Overdose** deaths of **unclear intent**
> >
> > ► **Youth firearm** suicides
> >
> > > o In the context of **gun = safety culture**

Psychological Autopsy Can Clarify Manner of Death

Death investigation systems which have invoked PA in a subset of deaths have **dramatically reduced the number of undetermined manner cases**

► **Utah**, which previously left **25-39%** of overdoses **undetermined** recently **invested in PA** and now leaves **less than 7% undetermined**

► **California** has used **PA systematically** and reduced the undetermined rate to **4%**

► However, PA is **expensive and time consuming**

► Unlikely to be pursued by a **burdened MD-OCME** at this time

SATURDAY, FEBRUARY 19, 2022

Chief medical examiner resigns

Beleaguered state office faced year of departures and backlog of autopsies

By Meredith Cohn

Dr. Victor W. Weedn resigned Friday as chief of the medical examiners' office for Maryland after a tumultuous year of staff departures and a backlog of autopsies at least two hundred deep.

In an email to the Baltimore office's staff Friday afternoon, he wrote: "I am resigning my position as Chief Medical Examiner as of today. Thank you for your support throughout my tenure. Good luck."

A state commission that oversees the Office of the Chief Medical Examiner met early Friday morning and immediately went into closed session.

The Maryland Post Mortem Examiners Commission announced Friday afternoon that Dr. Pamela E. Southall, a

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Next Steps: Use of Psych Autopsy to Validate Analytic Methods

► Methods such as our Utah **Machine Learning** study or **CART** make estimates to categorize previously undetermined cases based on a **well-trained algorithm** but this is:
  ► Not confidently **generalizable**
  ► **Not reliable** enough for the **basis of official reports**

► However, **PA on a subset of recategorized cases** may be used as a **validator of these estimates**, as the closest to a **gold standard** available for investigation

► If the **analytic predictor** can draw upon a **broad range of clinical and descriptive data** on each decedent, and then is **validated by psychological autopsy**, we may be able to:
  ► Accurately estimate the **magnitude** and **direction** of Manner of Death errors
  ► **Identify factors** which lead to **misclassification**
  ► **Define indicators** which can be used in **future cases** to **estimate the intentionality** of deaths **without full Psych Autopsy**

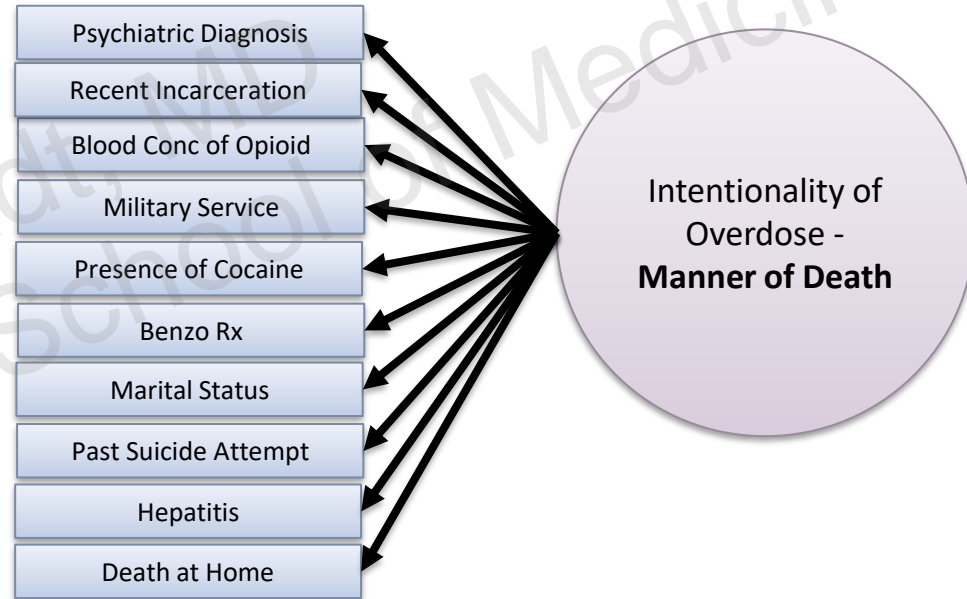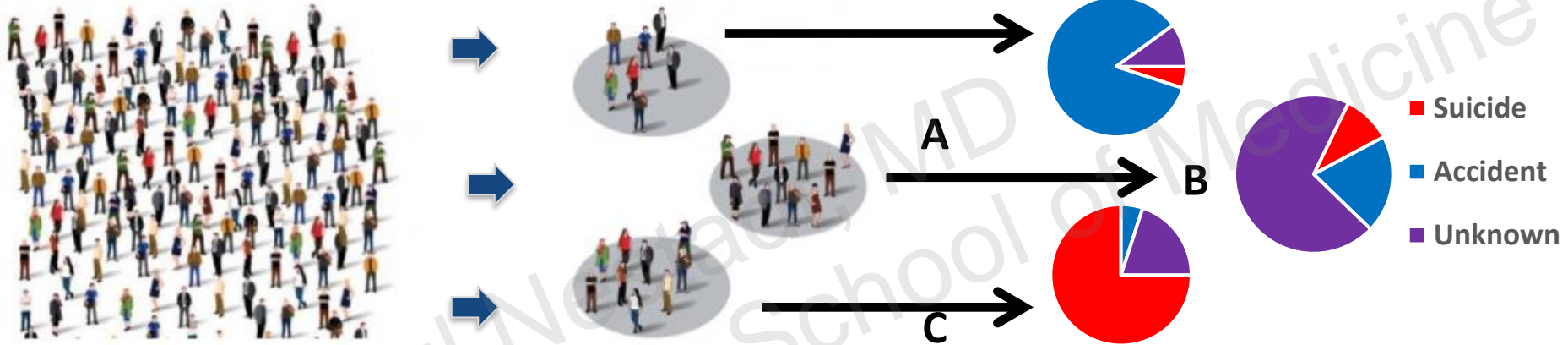# Starting Data: Maryland Suicide Data Warehouse
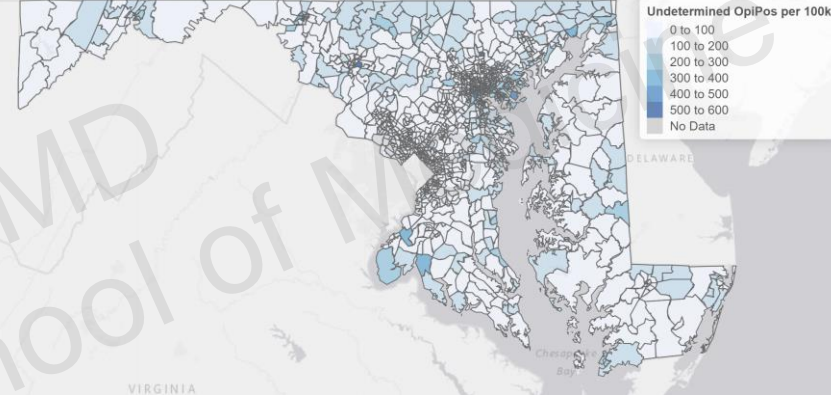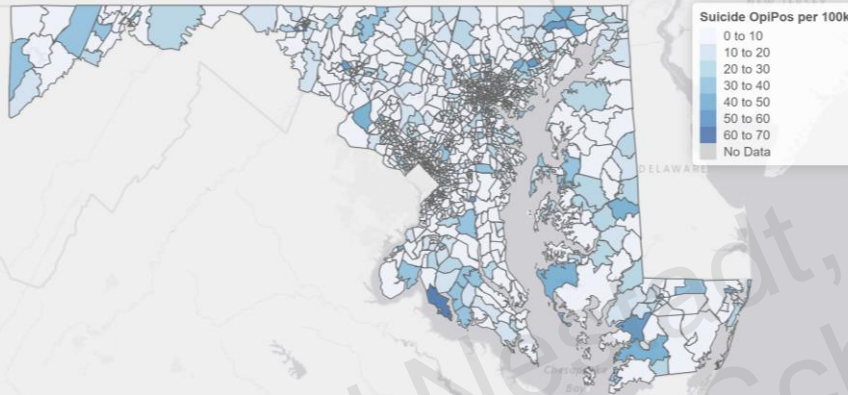
Maps by Chris Kitchen
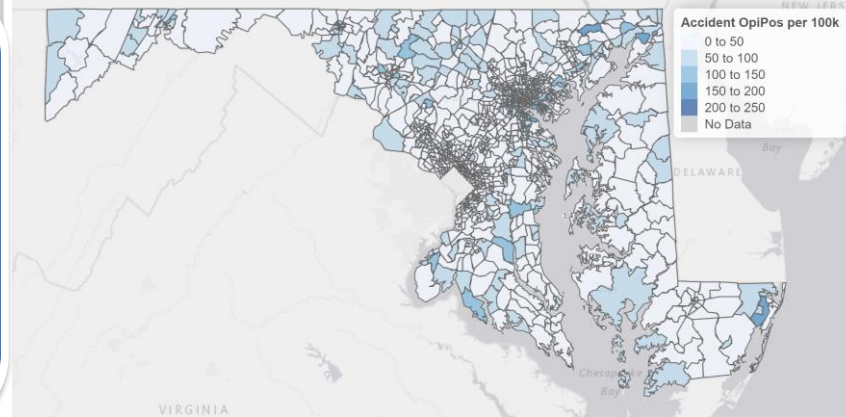
Hadi Kharrazi has harmonized detailed clinical data from CRISP, HCUP, Epic, SEPH, and the VA among other sources with the decedent data provided by the OCME to create an unique set of features available for most suicide and overdose deaths in Maryland (2012-2020)

Latent Class Analysis

- Latent variables/ constructs
  - **Cannot measure directly**
  - Look for "**clues**"

- **Latent class analysis**:
  - Identify **subgroups based on patterns** in the within-person co-occurrence of indicators

- Class enumeration process to select the "best" number of classes

| Psychiatric Diagnosis |
| Recent Incarceration |
| Blood Conc of Opioid |
| Military Service |
| Presence of Cocaine |
| Benzo Rx |
| Marital Status |
| Past Suicide Attempt |
| Hepatitis |
| Death at Home |

Intentionality of Overdose - **Manner of Death**

Latent Class Analysis to Estimate Manner of Death

- ■ Suicide
- ■ Accident
- ■ Unknown

LCA differentiates distinct classes of decedents within the **combined opioid decedent** population

Not accounting for OCME determined manner of death

The new classes can then be characterized by the **predominance of decedents** of specific known manners

Revisiting OCME determination

Undetermined decedents' **membership in a predominantly suicidal class** may be a predictor of true suicide status

To be validated with Psych Autopsy

Latent Classes Emerge

► Used key features from the MSDW and OCME data (clinical, toxicology, demographic)

► Two classes emerged, making up 40% and 60% of the cases respectively

► Both were mostly undetermined deaths (most overdoses in MD)
   ► 87% of suicides found in Class 1
   ► 70% of accidents in Class 2
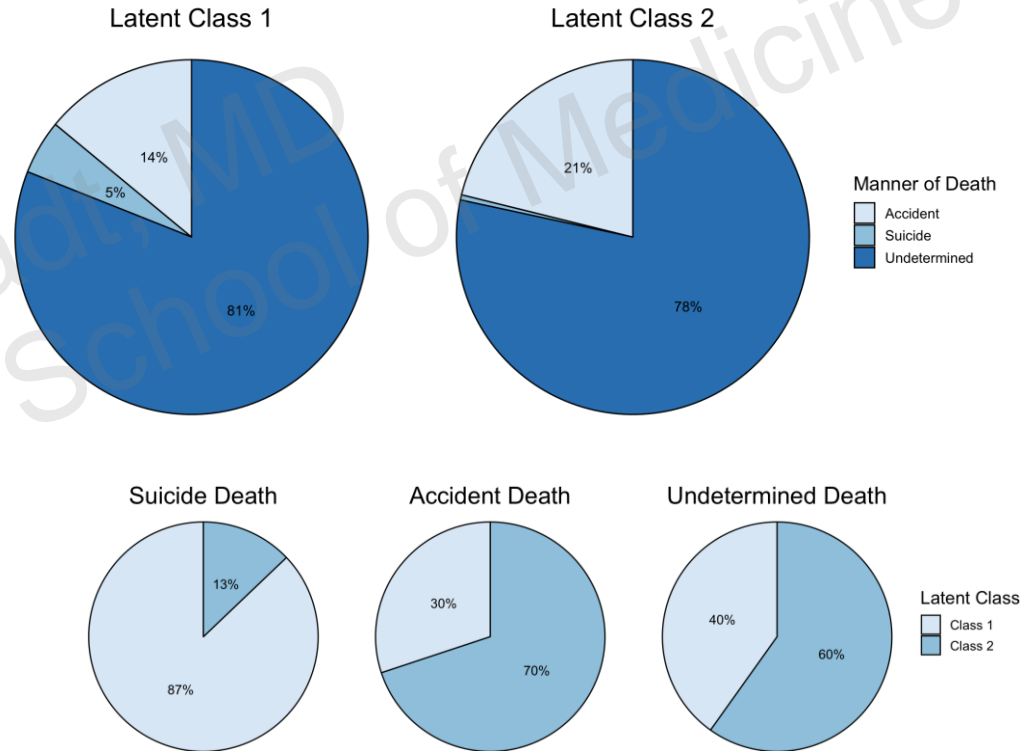
Validation by Psychological Autopsy (PA)

► Subset of **"undetermined"** cases included in the **defined latent classes** will be recruited for **psychological autopsy**
  ► **Interviewers blinded** to class membership

► **Interviews** with next-of-kin and other collaterals, **record review**, social media investigations and **discussion with expert team** will result in **decision on manner of death**

  ► **Comparison of PA results and LCA predictors** will determine validity of LCA and specifically the strongest identified features as predictors of true manner of death

  ► These can be used in **abbreviated investigations** by OCME in the future
    ► Potentially developed into a formal **MOD Decision Aide**

Bump in the Road

► Chief Medical Examiner's **resignation** threw the Maryland OCME into chaos for years

► **Recruitment was placed on hold** by each successive interim Chief

  ► Unable to pursue outside recruitment channels

► By the time we sent out NOK invitation letters, 55% of addresses were invalid

  ► Population with high levels of **indigence, loneliness, and tenuous social networks**

  ► Contrasts with our youth studies

► BUT: We finally **consented our first two cases** this month

The race is not to the swift or the battle to the strong … but time and chance happen to them all.

\- Ecclesiastes

Lessons Learned and Future Directions

► The **Psych Autopsy** method, including direct help from those who have survived loss, holds great promise

► Cannot rely on **death investigator cooperation** alone

► **Legislated** a statewide **Suicide Fatality Review Committee**
  ► Legislation gives us **greater access** to data and NOK
  ► Review a selection of cases in the state, **integrating available data with psychological autopsy**
  ► Ability to use PA for in-depth investigations of groups at **unique risk** (LGBT, Internet forums, geriatric, etc.)

► **Model for other states**

Thank you