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# Introduction to PHDW

## Primary Goals and Structure[[1]](#footnote-1)

The Public Health Data Warehouse (PHDW) provided by the Massachusetts Department of Public Health (MDPH) and operationalized by the Office of Population Health (OPH) is a individually linked database across state government agencies with the goal to address and improve upon public health issues, with an initial focus of opioid overdoses.

The PHD has three primary goals:

1. To link data from within DPH across other state agencies to effectively create a population health database to inform policies aimed at reducing morbidity and mortality
2. To establish a governance structure which enables fair, secure, and appropriate access to the PHD to study and address public health priorities
3. To coordinate multi-disciplinary teams comprised of DPH and external staff to design and conduct studies to provide actionable recommendations to address DPH priorities

The PHD has four structural cornerstones to support itself:

1. *Governance*: ensuring a sustainable inter-agency data warehouse by establishing guiding principles, organizational structure for decision making, and stakeholder access and roles
2. *Legal*: establishing accountability for a secure data environment and the collaborative framework in which data contributors and users operate
3. *Technical*: provides expertise for defining the technical architecture, linkage algorithms, data configuration and the overall analytics principles for the environment, and develops a roadmap for PHD future expansion to account for new computing environments
4. *Operations*: oversees the funding and implementation strategy for program sustainability, and provides ongoing support for the management of daily PHD functions

# Technical Overview

The PHD has many different datasets which make up the database of PHD, the variables of these datasets can change or be added to, the full updated documentation/data dictionaries can be seen at the [PHD Website](https://www.mass.gov/info-details/public-health-data-warehouse-phd-technical-documentation).

## OUDCount.SAS

Documentation on variable selection and creation for the SAS script creating yearly counts of OUD, stratified by Race, Sex, and Age.

### PHDSPINE.DEMO

This file is a demographics linking and consolidation within the database. For our purposes, we pull out the PHD ID, Sex, and Race for use in developing tables later.

### PHDAPCD.MEDICAL

In this dataset, we are extracting information from the All-Payer’s Claims Database. Here, the data is constructed as row-wise visits from members of the PHD database – from this dataset, we extract Age, Visit Year, and the PHD ID to provide further demographic information (Age) which is then linked back to the spine.

In the interest of identifying patients with opioid use disorders (OUD), we also extract variables encoding the ICD codes for principle and following diagnoses (MED\_ICD1-25) and procedures done during the visit (MED\_ICD\_PROC1-7). These two sets of variables are compared against the code list in Appendix A and setup as a binary: 1 if they are in the list and 0 if not – this works as the creation of the OUD\_APCD variable.

### PHDCM.ED\*

The PHD casemix emergency department (ED) datasets (ED, ED\_DIAG, and ED\_PROC) are a set of linked tables via their internal ED\_ID; this allows us to identify care occurring in a single ED visit. These IDs are unique to a given year, so filtering based on the year of interest is required. Because of this linked nature, for us to receive an accurate count of how many patients have OUD, we must first extract meaningful data from each individual table and then merge them together as a final step in creating the casemix ED table.

For each of the datasets our plan of analysis roughly follows the same steps – we extract PHD ID, ED diagnoses, admission year, and ED ID. In the \*.ED dataset, we also extract principle encode. The principle encode and diagnoses are compared against the ICD table in Appendix A and setup as a binary: 1 if they are in the list and 0 if not as creation of intermediate OUD status variables.

As a final step, each of the tables are joined together on their unique ED ID, we then check to see if there is any record of OUD in any of the tables, following the same step above and constructing a final binary variable, OUD\_ED.

### PHDCM.HD\*

The PHD casemix hospital discharge (HD) datasets (HD and HD\_DIAG), unlike their ED counterparts, are not linked through an internal ID, so we only need to extract relevant variables such as HD\_DIAG and HD\_PROC while using admission year as a filter. Both relevant variables are compared against the ICD list in Appendix A to construct the OUD\_HD binary variable.

### PHDCM.OO\*

The PHD casemix outpatient observation (OO) visits table are the final piece of the CM tag. Like the above cases, we extract ID, OO\_DIAG1-6 and OO\_PROC1-4 using admission date as a filter for our target year. We compare the diagnosis and procedure codes against the table in Appendix A and construct the binary OUD\_OO variable.

### PHDDEATH

The death table is simple, where all we need to do is construct our OUD variable based on the column OPIOID\_DEATH, filtered by year of interest.

### PHDPMP.PMP

The prescription monitoring program (PMP) dataset is also largely straightforward, we look to see if PHD IDs are associated with a buprenorphine prescription, if yes the binary is set to 1.

### PHDMATRIS

In the MATRIS dataset, we construct our binary from the OPIOID\_ORI\_MATRIS and OPIOID\_ORISUBCAT\_MATRIS columns. When we take our age variable for use later, we must ensure to go through what units age is in as some are recorded in years while others are recorded in minutes, seconds, months, etc. The type of age unit is defined in AGE\_UNITS\_MATRIS, so a simple elif tree can be formed.

### Final Merge

In the final merge for the OUD counts script, we take our created tables from APCD, CM (where CM is a middle-merge for CM ED, HD, and OO) Death, MATRIS, and PMP and full join them together. The full join prevents us from losing a patient if they appear in one dataset but not another. We sum across all possible binaries, if a patient has strictly greater than 0 for the sum of all their constructed binary variables, they have been identified with OUD, leading to the construction of the final binary variable.

For age group stratification, we take all possible age variables found and take the *minimum*. This is because of someone doesn’t have an age in any of the given datasets, we give them the value ‘999’ whereas knowns age groups are a range of 2-9 (see age group format in Appendix A.)

## DeathCount.SAS

Documentation on creation of the SAS script counting deaths per year stratified by overdose deaths (y/n)

### PHDDEATH.DEATH

Within the PHD, there is a DEATH dataset holding all of the deaths in Massachusetts, for just the raw death count, we can extract the year variable as a filter to our year of interest. The final stratification is simply along the OPIOID\_DEATH column with a binary 1 if yes and 0 if no. We create the frequency table along the binary as our final output.

## ICDFrequency.SAS

Documentation on the creation of the SAS script creating a frequency table of ICD codes in the Casemix and APCD datasets.

### PHDAPCD.MEDICAL and PHDCASEMIX.\* MERGE

Within the PHD, for our interests, the APCD and Casemix datasets are the only sets where we scan for ICD Codes. We full join all variables containing ICD codes on the PHDID of each dataset, dropping our year filter along the way. This creates the series of wide datasets – an ID column followed by many columns of ICD diagnoses.

We PROC TRANSPOSE to long format the data, generating a single column of IDs and a single column of ICD codes (think rbind in R). We filter to ICD codes of interest and send it through a PROC FREQ statement to receive a frequency table of ICDs.

# Appendix A

## ICD Codes Table

### ICD9 Codes

|  |  |
| --- | --- |
| 30400 | Opioid type dependence, unspecified |
| 30401 | Opioid type dependence, continuous |
| 30402 | Opioid type dependence, episodic |
| 30403 | Opioid type dependence, in remission |
| 30470 | Combinations of opioid type drug with any other drug dependence, unspecified |
| 30471 | Combinations of opioid type drug with any other drug dependence, continuous |
| 30472 | Combinations of opioid type drug with any other drug dependence, episodic |
| 30550 | Opioid abuse, unspecified |
| 30551 | Opioid abuse, continuous |
| 30552 | Opioid abuse, episodic |
| 30553 | Opioid abuse, in remission |
| E8500 | Accidental poisoning by heroin |
| E8501 | Accidental poisoning by methadone |
| E8502 | Accidental poisoning by other opiates and related narcotics |
| 96500 | Poisoning by opium (alkaloids), unspecified |
| 96501 | Poisoning by heroin |
| 96502 | Poisoning by methadone |
| 96509 | Poisoning by other opiates and related narcotics |
| 9701 | Poisoning by opiate antagonists |

### ICD10

|  |  |
| --- | --- |
| F1120 | Opioid dependence, uncomplicated |
| F1121 | Opioid dependence, in remission |
| F1110 | Opioid abuse, uncomplicated |
| F11120 | Opioid abuse with intoxication, uncomplicated |
| F11121 | Opioid abuse with intoxication delirium |
| F11122 | Opioid abuse with intoxication with perceptual disturbance |
| F11129 | Opioid abuse with intoxication, unspecified |
| F1114 | Opioid abuse with opioid induced mood disorder |
| F11150 | Opioid abuse with opioid-induced psychotic disorder with delusions |
| F11151 | Opioid abuse with opioid-induced psychotic disorder with hallucinations |
| F11159 | Opioid abuse with opioid-induced psychotic disorder, unspecified |
| F11181 | Opioid abuse with opioid-induced sexual dysfunction |
| F11182 | Opioid abuse with opioid-induced sleep disorder |
| F11188 | Opioid abuse with other opioid-induced disorder |
| F1119 | Opioid abuse with unspecified opioid-induced disorder |
| F11220 | Opioid dependence with intoxication, uncomplicated |
| F11221 | Opioid dependence with intoxication delirium |
| F11222 | Opioid dependence with intoxication with perceptual disturbance |
| F11229 | Opioid dependence with intoxication, unspecified |
| F1123 | Opioid dependence with withdrawal |
| F1124 | Opioid dependence with opioid-induced mood disorder |
| F11250 | Opioid dependence with opioid-induced psychotic disorder with delusions |
| F11251 | Opioid dependence with opioid-induced psychotic disorder with hallucinations |
| F11259 | Opioid dependence with opioid-induced psychotic disorder, unspecified |
| F11281 | Opioid dependence with opioid-induced sexual dysfunction |
| F11282 | Opioid dependence with opioid-induced sleep disorder |
| F11288 | Opioid dependence with other opioid-induced disorder |
| F1129 | Opioid dependence with unspecified opioid-induced disorder |
| F1190 | Opioid use, unspecified, uncomplicated |
| F11920 | Opioid use, unspecified with intoxication, uncomplicated |
| F11921 | Opioid use, unspecified with intoxication delirium |
| F11922 | Opioid use, unspecified with intoxication with perceptual disturbance |
| F11929 | Opioid use, unspecified with intoxication, unspecified |
| F1193 | Opioid use, unspecified with withdrawal |
| F1194 | Opioid use, unspecified with opioid-induced mood disorder |
| F11950 | Opioid use, unspecified with opioid-induced psychotic disorder with delusions |
| F11951 | Opioid use, unspecified with opioid-induced psychotic disorder with hallucinations |
| F11959 | Opioid use, unspecified with opioid-induced psychotic disorder, unspecified |
| F11981 | Opioid use, unspecified with opioid-induced sexual dysfunction |
| F11982 | Opioid use, unspecified with opioid-induced sleep disorder |
| F1199 | Opioid use, unspecified with unspecified opioid-induced disorder |
| F1111 | Opioid abuse, in remission |
| F1113 | Opioid abuse, in withdrawal |

### HCPCS Codes

|  |  |
| --- | --- |
| H0047 | Alcohol and/or other drug abuse services, not otherwise specified |
| J0592 | Injection, buprenorphine hydrochloride, 0.1 mg |
| G2068 | Medication assist tx bupre oral |
| G2069 | Medication assist tx bupre inject |
| G2070 | Medication assist tx bupre implant insertion |
| G2071 | Medication assist tx bupre implant removal |
| G2072 | Medication assist tx bupre implant insertion and removal |
| G2073 | Medication assist tx naltrexone |
| G2074 | Medication assist tx weekly bundle not including the drug |
| G2075 | Medication assist tx medication not otherwise specified |
| G2076 | Intake activities (medicare-enrolled opioid treatment program) |
| G2077 | Periodic Assessment (medicare-enrolled opioid treatment program) |
| G2079 | Take-home bupre oral |
| J0570 | Bupre implant 74.2mg |
| J0571 | Bupre oral 1mg |
| J0572 | Bupre/naloxone up to 3mg |
| J0573 | Bupre/naloxone 3.1 to 6mg |
| J0574 | Bupre/naloxone 6.1 to 10mg |
| J0575 | Bupre oral more than 10mg |
| H0020 | Alcohol and/or drug services; methadone administration |
| G2067 | Medication assist tx, methadone weekly bundle |
| G2078 | Take-home methadone, up to 7 day additional supply |
| S0109 | Methadone oral 5mg |
| J1230 | Methadone injection, up to 10mg |
| G2080 | Each additional 30 minutes of counseling in a week of medication assist tx |
| G2081 | Patients age 66+ in institutional special needs plans (snp) |

### ICD Procedure Codes

|  |  |
| --- | --- |
| HZ91ZZZ | Pharmacotherapy for Substance Abuse Treatment, Methadone Maintenance |
| HZ81ZZZ | Medication Management for Substance Abuse Treatment, Methadone Maintenance |
| 9464 | Drug rehabilitation |

### T Codes

|  |  |
| --- | --- |
| T40.0X1A | Poisoning by opium, accidental (unintentional), initial encounter |
| T40.0X2A | Poisoning by opium, intentional self-harm, initial encounter |
| T40.0X3A | Poisoning by opium, assault, initial encounter |
| T40.0X4A | Poisoning by opium, undetermined, initial encounter |
| T40.0X1D | Poisoning by opium, accidental (unintentional), subsequent encounter |
| T40.0X2D | Poisoning by opium, intentional self-harm, subsequent encounter |
| T40.0X3D | Poisoning by opium, assault, subsequent encounter |
| T40.0X4D | Poisoning by opium, undetermined, subsequent encounter |
| T40.1X1A | Poisoning by heroin, accidental (unintentional), initial encounter |
| T40.1X2A | Poisoning by heroin, intentional self-harm, initial encounter |
| T40.1X3A | Poisoning by heroin, assault, initial encounter |
| T40.1X4A | Poisoning by heroin, undetermined, initial encounter |
| T40.1X1D | Poisoning by heroin, accidental (unintentional), subsequent encounter |
| T40.1X2D | Poisoning by heroin, intentional self-harm, subsequent encounter |
| T40.1X3D | Poisoning by heroin, assault, subsequent encounter |
| T40.1X4D | Poisoning by heroin, undetermined, subsequent encounter |
| T40.2X1A | Poisoning by other opiates, accidental (unintentional), initial encounter |
| T40.2X2A | Poisoning by other opiates, intentional self-harm, initial encounter |
| T40.2X3A | Poisoning by other opiates, assault, initial encounter |
| T40.2X4A | Poisoning by other opiates, undetermined, initial encounter |
| T40.2X1D | Poisoning by other opiates, accidental (unintentional), subsequent encounter |
| T40.2X2D | Poisoning by other opiates, intentional self-harm, subsequent encounter |
| T40.2X3D | Poisoning by other opiates, assault, subsequent encounter |
| T40.2X4D | Poisoning by other opiates, undetermined, subsequent encounter |
| T40.3X1A | Poisoning by methadone, accidental (unintentional), initial encounter |
| T40.3X2A | Poisoning by methadone, intentional self-harm, initial encounter |
| T40.3X3A | Poisoning by methadone, assault, initial encounter |
| T40.3X4A | Poisoning by methadone, undetermined, initial encounter |
| T40.3X1D | Poisoning by methadone, accidental (unintentional), subsequent encounter |
| T40.3X2D | Poisoning by methadone, intentional self-harm, subsequent encounter |
| T40.3X3D | Poisoning by methadone, assault, subsequent encounter |
| T40.3X4D | Poisoning by methadone, undetermined, subsequent encounter |
| T40.4X1A | Poisoning by other synthetic narcotics, accidental (unintentional), initial encounter |
| T40.4X2A | Poisoning by other synthetic narcotics, intentional self-harm, initial encounter |
| T40.4X3A | Poisoning by other synthetic narcotics, assault, initial encounter |
| T40.4X4A | Poisoning by other synthetic narcotics, undetermined, initial encounter |
| T40.4X1D | Poisoning by other synthetic narcotics, accidental (unintentional), subsequent encounter |
| T40.4X2D | Poisoning by other synthetic narcotics, intentional self-harm, subsequent encounter |
| T40.4X3D | Poisoning by other synthetic narcotics, assault, subsequent encounter |
| T40.4X4D | Poisoning by other synthetic narcotics, undetermined, subsequent encounter |
| T40.601A | Poisoning by unspecified narcotics, accidental (unintentional), initial encounter |
| T40.601D | Poisoning by unspecified narcotics, accidental (unintentional), subsequent encounter |
| T40.602A | Poisoning by unspecified narcotics, intentional self-harm, initial encounter |
| T40.602D | Poisoning by unspecified narcotics, intentional self-harm, subsequent encounter |
| T40.603A | Poisoning by unspecified narcotics, assault, initial encounter |
| T40.603D | Poisoning by unspecified narcotics, assault, subsequent encounter |
| T40.604A | Poisoning by unspecified narcotics, undetermined, initial encounter |
| T40.604D | Poisoning by unspecified narcotics, undetermined, subsequent encounter |
| T40.691A | Poisoning by other narcotics, accidental (unintentional), initial encounter |
| T40.692A | Poisoning by other narcotics, intentional self-harm, initial encounter |
| T40.693A | Poisoning by other narcotics, assault, initial encounter |
| T40.694A | Poisoning by other narcotics, undetermined, initial encounter |
| T40.691D | Poisoning by other narcotics, accidental (unintentional), subsequent encounter |
| T40.692D | Poisoning by other narcotics, intentional self-harm, subsequent encounter |
| T40.693D | Poisoning by other narcotics, assault, subsequent encounter |
| T40.694D | Poisoning by other narcotics, undetermined, subsequent encounter |

## Age Groups (PROC FORMAT Statement)

|  |  |
| --- | --- |
| LOW-10 | 999 |
| 11-20 | 2 |
| 21-30 | 3 |
| 31-40 | 4 |
| 41-50 | 5 |
| 51-60 | 6 |
| 61-70 | 7 |
| 71-80 | 8 |
| 81-90 | 9 |
| 91-HIGH | 999 |

1. Provided by: https://www.mass.gov/info-details/public-health-data-warehouse-phd-overview [↑](#footnote-ref-1)