



Thursday, March 12, 2020 | Metro Detroit

Welcome!

The presentation will begin shortly



@GLSummits

#AnalyticsSummit2020

Hosted by:



The Team





Andrea Smith
Director of Clinical Practice Improvement
Detroit Wayne Integrated Health Network



Robert B. Dunlap
Chief
Wayne County Sheriff's Office



Gregory Parrish
Analytics Manager
WIT Inc.

DETROIT WAYNE INTEGRATED HEALTH NETWORK (DWIHN)

Jail Diversion

**Andrea Smith, Director of Clinical Practice
Improvement**



Background

The Detroit Wayne Integrated Health Network (DWIHN) is a safety net organization that provides a full array of services and supports to roughly 80,000 adults with mental illness, individuals with developmental disabilities, children with serious emotional disturbances and persons with substance use disorders.



Goals

Reduce and/or eliminate jail time for individuals with mental illness (SMI) or substance use disorder (SUD).

Provide a safety net of community-based services that can provide treatment and support through care coordination.

- 1) Showing genuine concern for those impacted by mental illness and substance abuse**
- 2) A desire to develop talent otherwise lost to the jail system**
- 3) A desire to encourage diversity within the community and workforce**
- 4) Dedication to the elimination of stigmatization and criminalization of mental illness, substance use, and socioeconomically oppressed communities.**



Purpose

Mental health and substance abuse consumers make up a vast majority of the criminal justice system across the nation, including Wayne County, Michigan.

THE FACTS

93% Male

76% People of Color (PoC)

51% Age 31+

42% Without secure housing

Of the 30,000 individuals incarcerated in Wayne County Jail, approx. 1,800 were booked on misdemeanor charges. 83% of that 1,800 population were current or previous DWIHN consumers

It costs Wayne County millions of dollars annually to jail individuals with SMI or SUD.

\$8.5 M spent in 2017

\$6 M coming from DWIHN



Plan

DWIHN & Wayne County Jail continue working together to implement a seamless pre/post-jail system for individuals with SMI and/or SUD.

Update screening and Assessment systems

Improve in-jail services

Connect community integrated health services with the criminal justice system symbiotically

Step 1 – What data are available, and how do we utilize these data to identify goals and anticipated outcomes.

Plan

Block Grant awarded by the State of Michigan - this project used data from the Wayne County Jail (WCJ) system and the Detroit Wayne Integrated Health Network (DWIHN) to build and refine an algorithm to identify individuals with serious mental illness (SMI) at risk for committing criminal offenses.



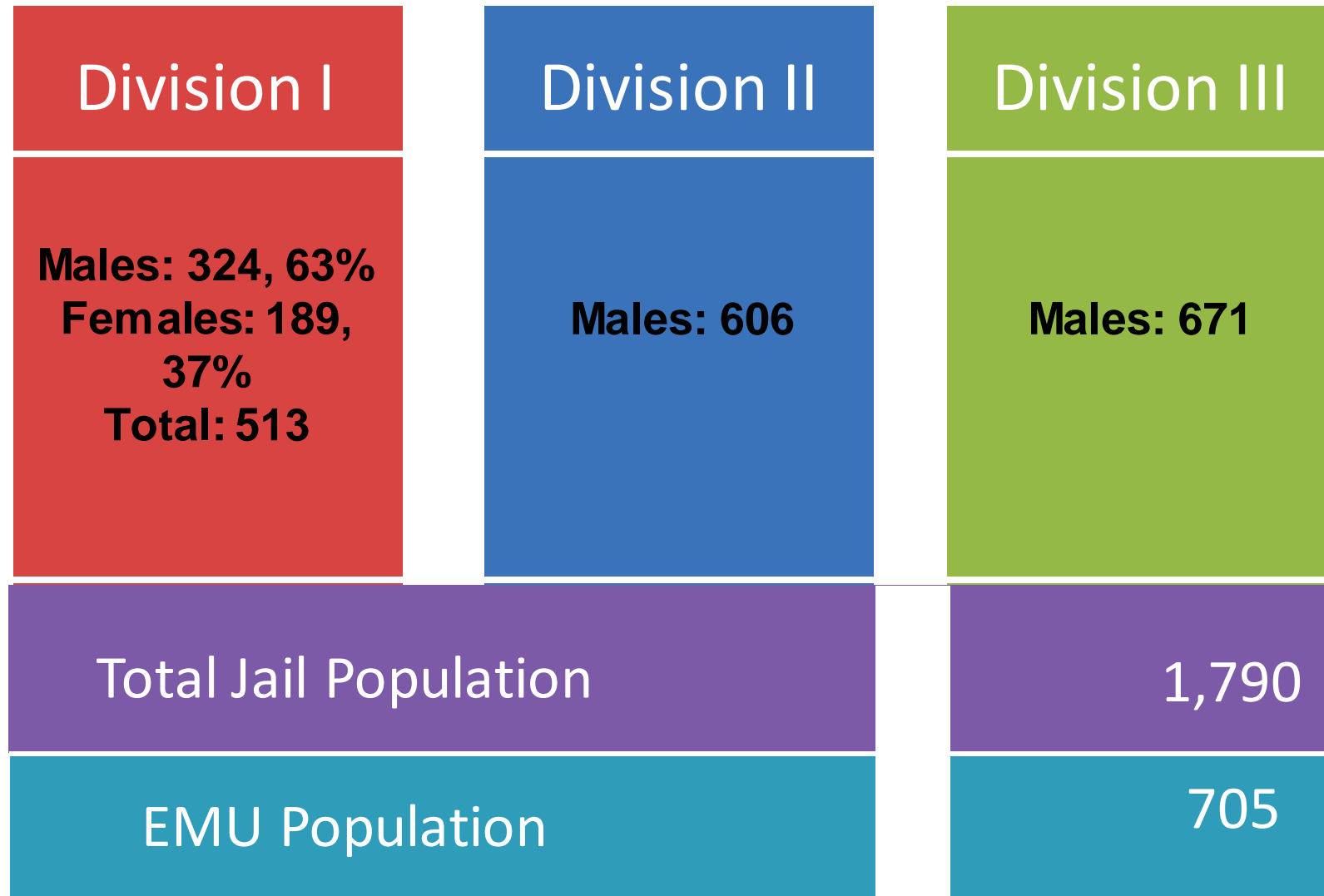


Robert B. Dunlap
Chief
Wayne County Sheriff's Office

WAYNE COUNTY JAIL SYSTEM



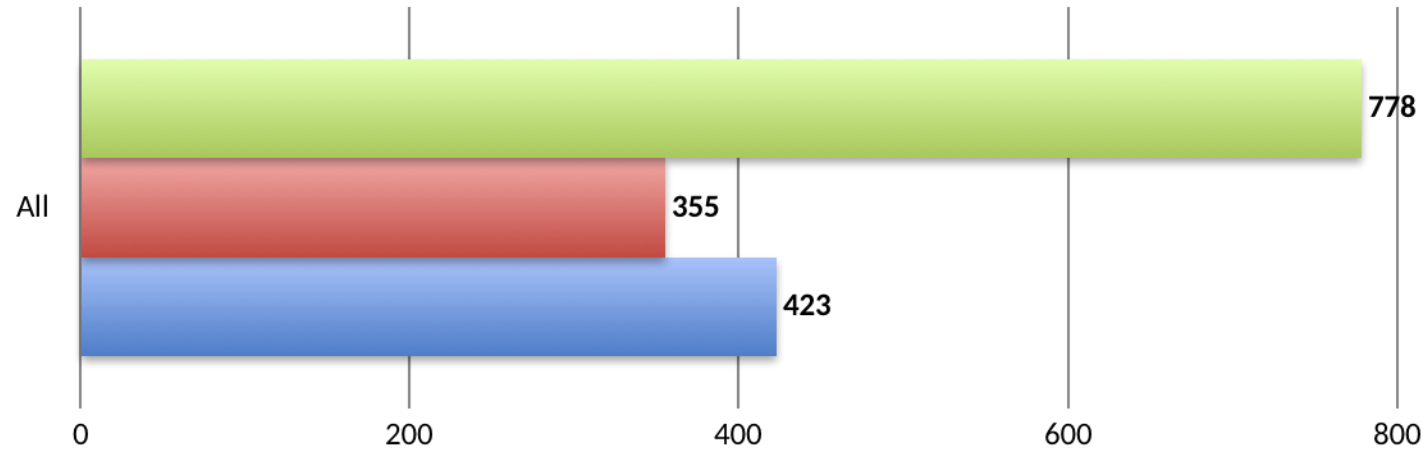
WAYNE COUNTY JAIL POPULATION 2017



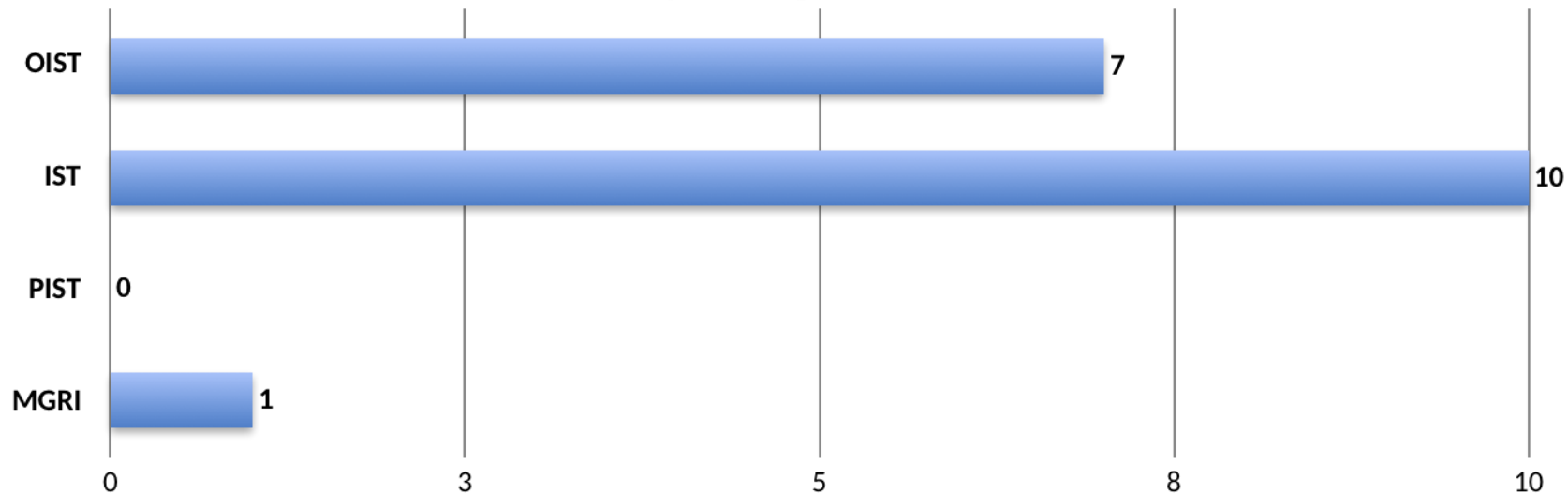
JAIL POPULATION HEALTH

Medical & Mentally Ill – All Divisions

Combined MH Meds Meds



Competency Evaluations



As of: October 2017

2015 – 2017 INMATE COSTS

	TOTAL			AVERAGE LENGTH OF STAY			COST OF STAY¥		
	Felony±	Misd.§	Ord. €	Felony±	Misd.§	Ord. €	Felony±	Misd.§	Ord. €
2015	10,513	7,787	7,520	30	15	14	\$50,462,400	\$18,688,800	\$16,844,800
2016	9,458	8,013	6,654	34	15	14	\$51,451,520	\$19,231,200	\$14,904,960
2017	7,001	5,976	5,998	34	12	16	\$38,085,440	\$11,473,920	\$15,354,880



±If an inmate has multiple arrests, he/she are counted once under the most severe §Misdemeanor €Ordinance ¥Costs are calculated by the daily rate x average length of stay x total number of inmates

Total 2017 Ordinance Violator & Misdemeanor 13107Bookings = 13107

Total 2017 Ordinance Violator Bookings = 5275

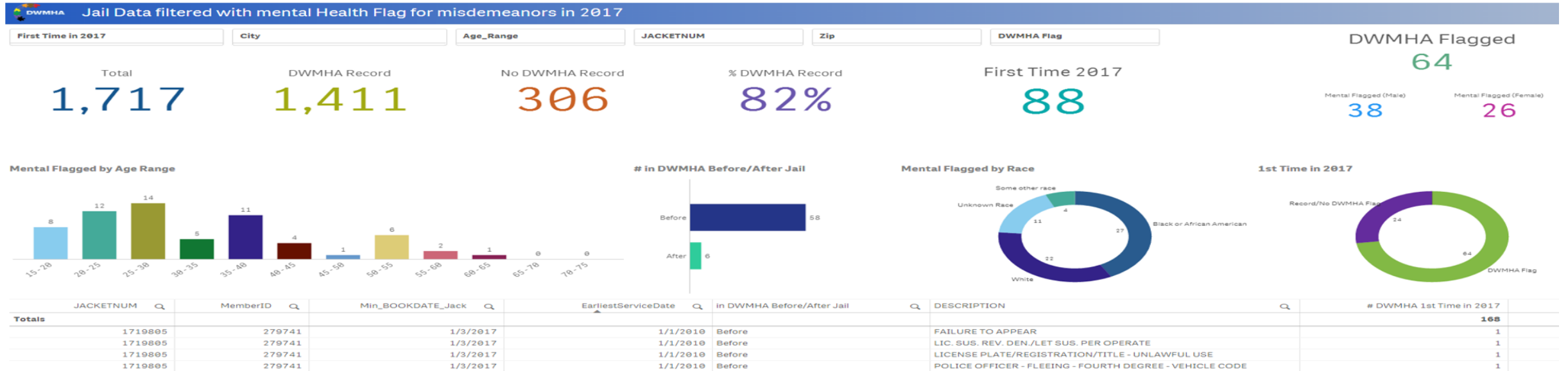
- 2017 Ordinance Violator Mental Health Consumer Bookings = 834
- 2017 Ordinance Violator Non-Mental Health Consumer Bookings = 4441

Total 2017 Misdemeanor Violator Bookings = 7832

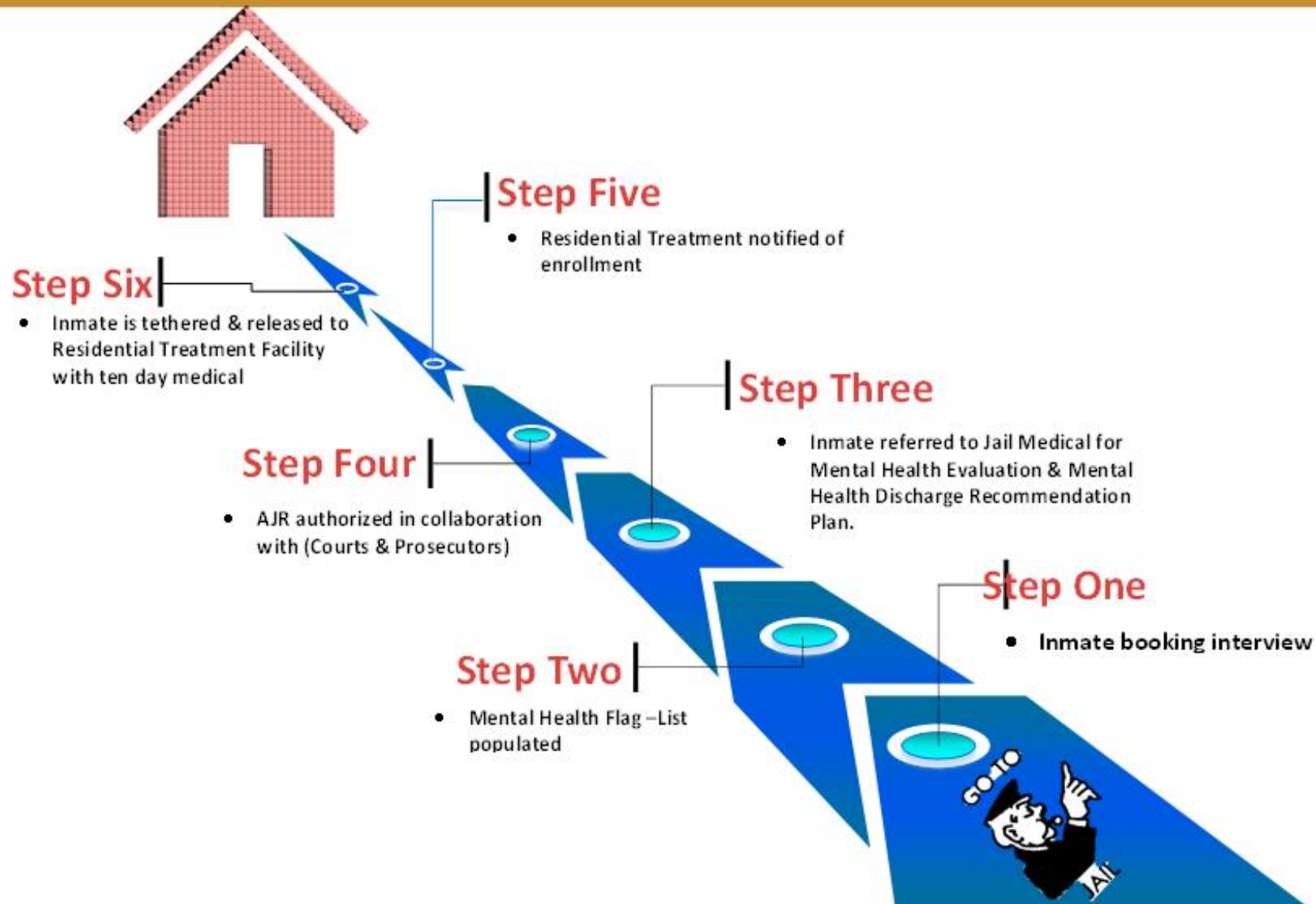
- 2017 Misdemeanor Mental Health Consumer Bookings = 953
- 2017 Misdemeanor Non-Mental Health Consumer Bookings = 6879

Total 2017 Ordinance Violator & Misdemeanor Mental Health ConsumersBookings = 1787

Total 2017 Ordinance Violator & Misdemeanor Non-Mental Health ConsumersBookings= 11320



AJR± RELEASE PROCESS



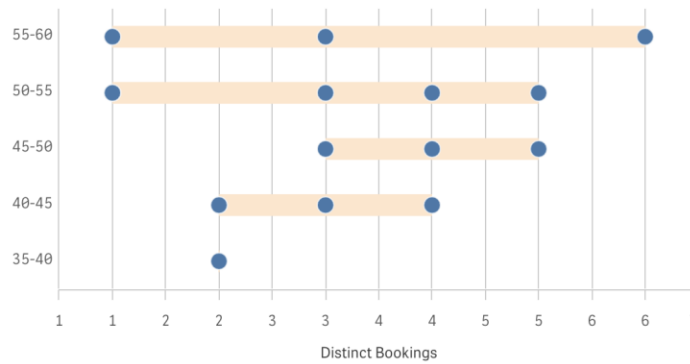
Case Study: "Charlie Brown"

2001-2020 Analysis of Booking Events



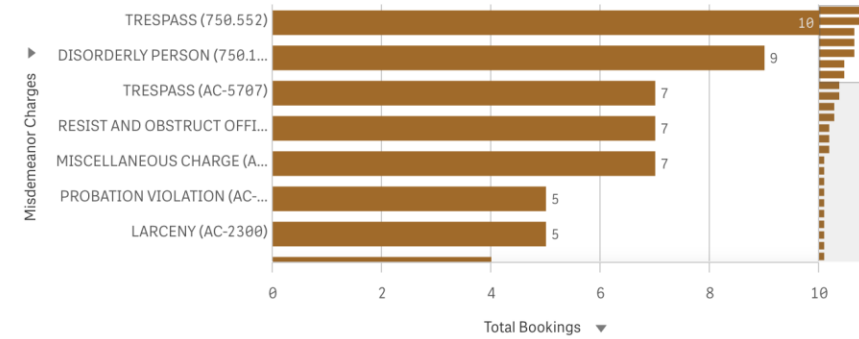
Distinct Persons: **1** Jail MH Consumer: **1** DWIHN Client: **1** DWIHN Population Pct: **100.0%** Jail MHC Pct: **100.0%** Misdemeanor Bookings: **30** Felony Bookings: **19** Total Bookings: **57** Estimated Cost (Current Yr): **\$336,160**

Bookings by Age Group



Top Violations by Statute

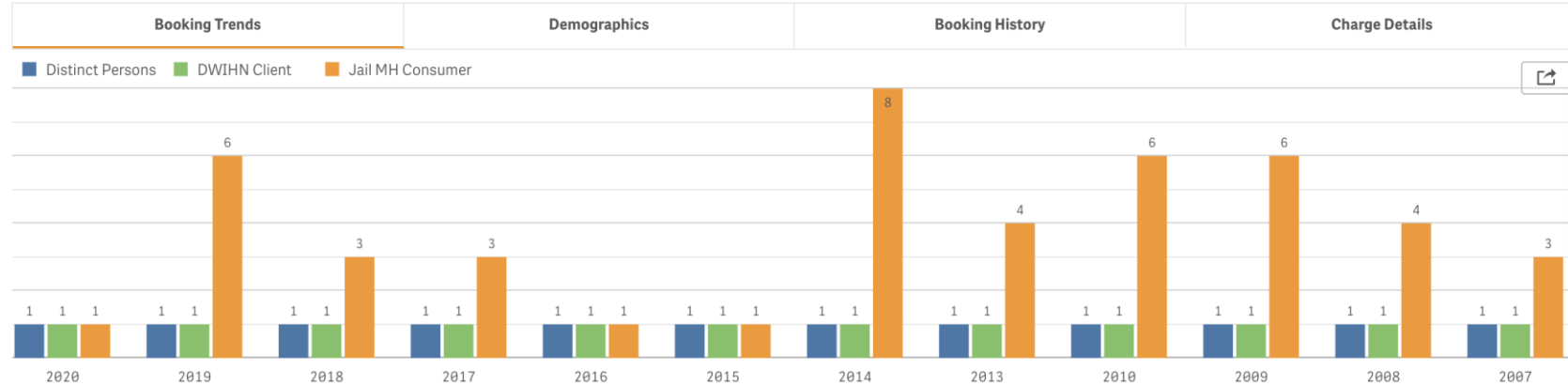
Toggle Selections on X or Y axis



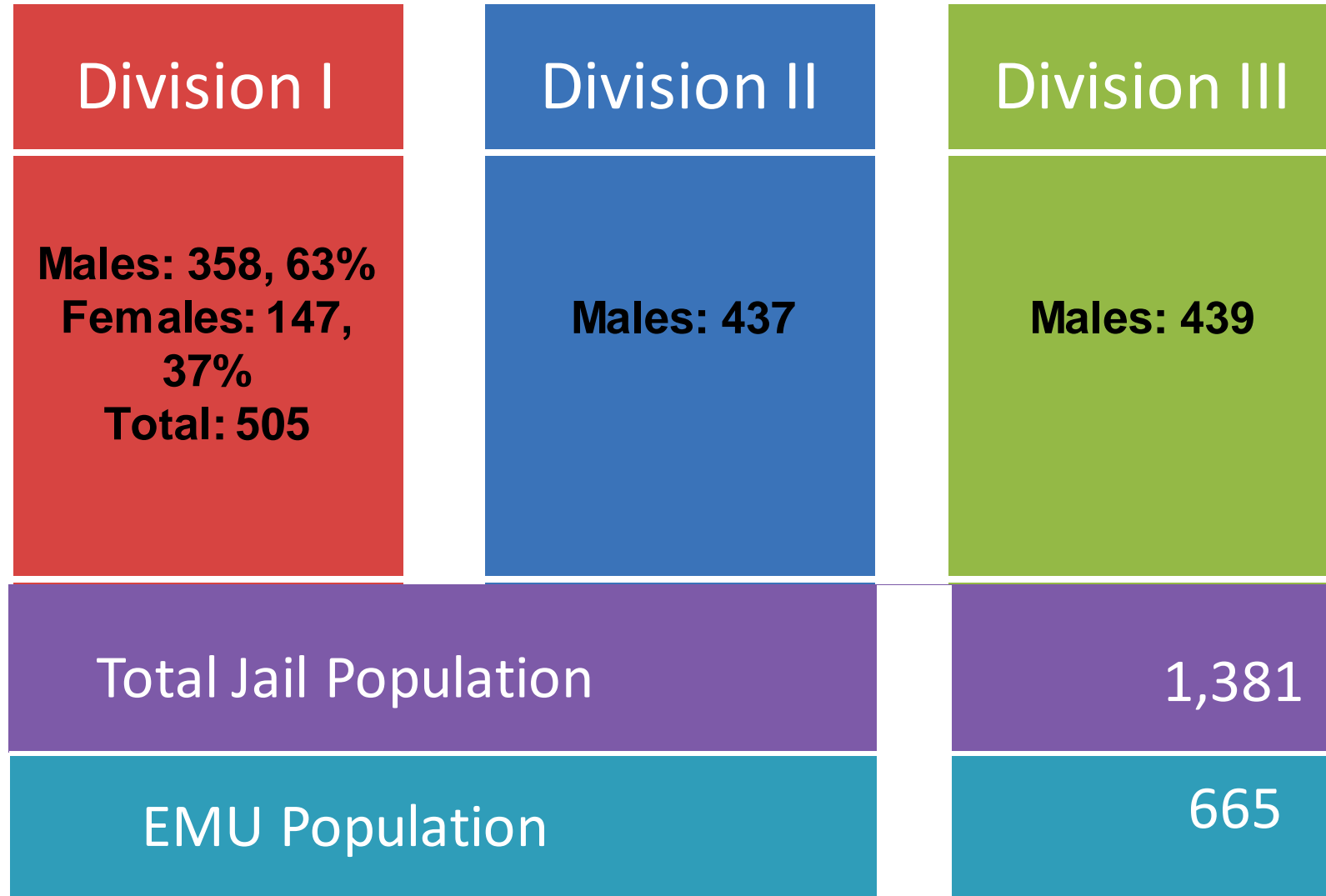
Select date range

- Booking Year
- DWIHN Client
- Jail MH Consumer
- Booking Type
- Department
- Statute
- Gender

- Dept Usage
- KPI
- Roster



WAYNE COUNTY JAIL POPULATION 2020



Potential Savings

409 persons x \$160/day x **365** days = **\$23,885,600**



Harness the Power of Analytics

www.witinc.com

info@witinc.com





PROJECT RESOURCES

**Gregory Parrish
Analytics Manager**

**Quaid Saifee
Huzefa Barwaniwala
Javier Ortiz
Vince McCoy
Ali Kanchwala
Pauljin Kochupyloth**



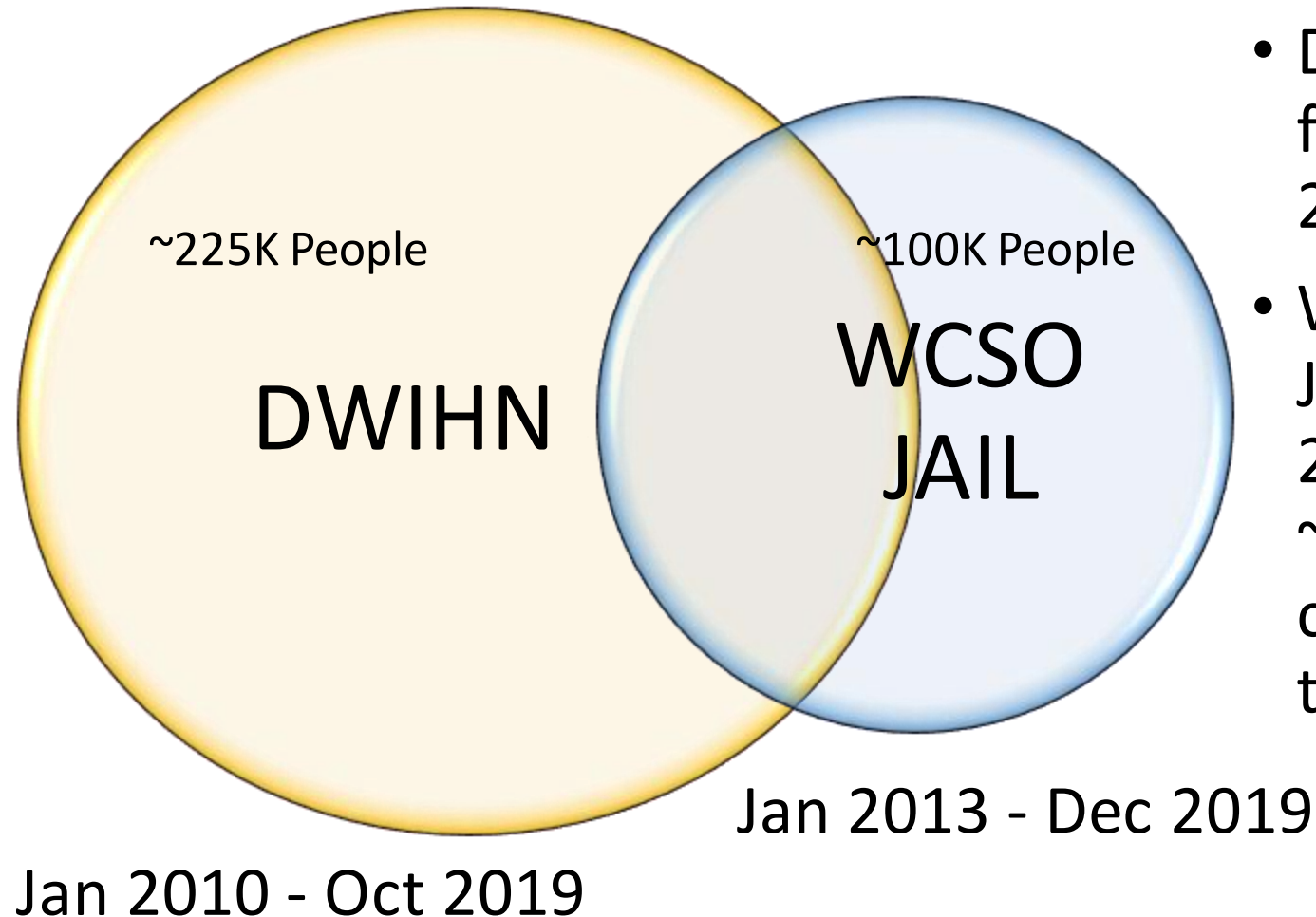
DWIHN Projects

Training Website

WCSSO JAIL Dashboard 2017

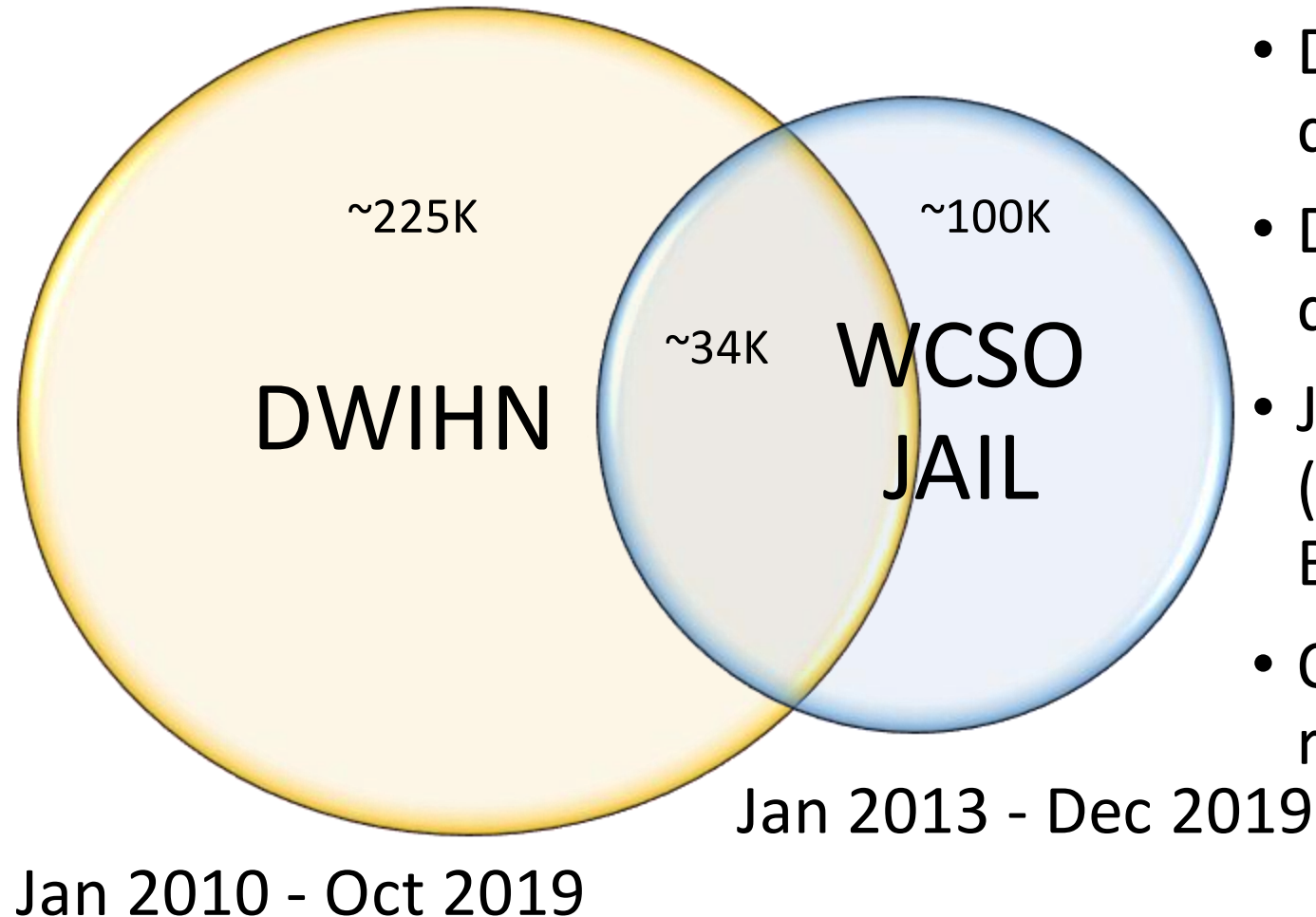
State of Michigan Grant 2019-2020

DWIHN and WCSO JAIL Datasets



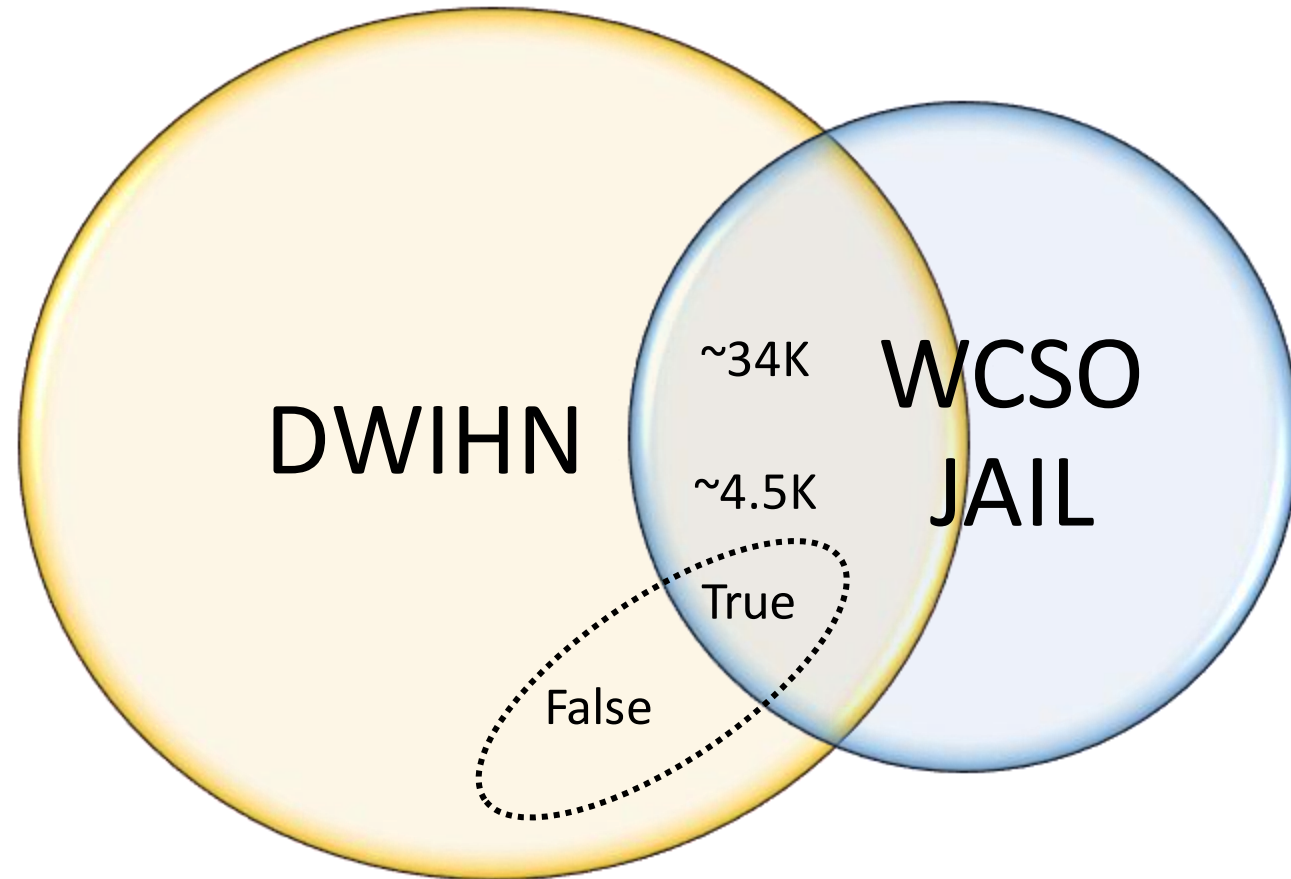
- DWIHN demographics data is from January 2010 to October 2019 and has ~225K people.
- Wayne County Sheriff's Office Jail booking data is from January 2013 to December 2019 and has ~100K people. Data also contains Jail history records of this group back to 2000.

DWIHN and WCSO JAIL Overlap



- Datasets with different IDs, different timeframes
- Data entered Names are difficult
- Joined datasets by Fuzzy Match (First Name, Last Name, Date of Birth), Misc exclusions
- Overlap of ~34K people having records in both systems

DWIHN and WCSO JAIL – True & False Targets



- Target only Misdemeanors ~4.5K, Exclude Felonies
- Reduce to only first occurrence as Misdemeanor and DWIHN record happened prior
- Reduce to only ICD 10 codes, post Oct 1, 2015
- ICD 10 frequency profile, too many codes, reduce to Top 15 codes
- Test dataset 1,955 (True 453 records, False 1502 records)

WIT ANALYTICS PARTNERS

WIT has developed technology partnerships with top business intelligence software vendors. Let us help you harness the full power of your enterprise or business intelligence platform, and help you maximize the return on your overall analytics investments.



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LEVERAGE ALL YOUR DATA



All Data



Combinations of Data



Governed Data

Qlik's Associative Engine

- ✓ Use all your data
- ✓ Explore without boundaries
- ✓ Speed of thought
- ✓ **Unexpected insights**

Wat + Alteryx

SELF-SERVICE DATA ANALYTICS

Input



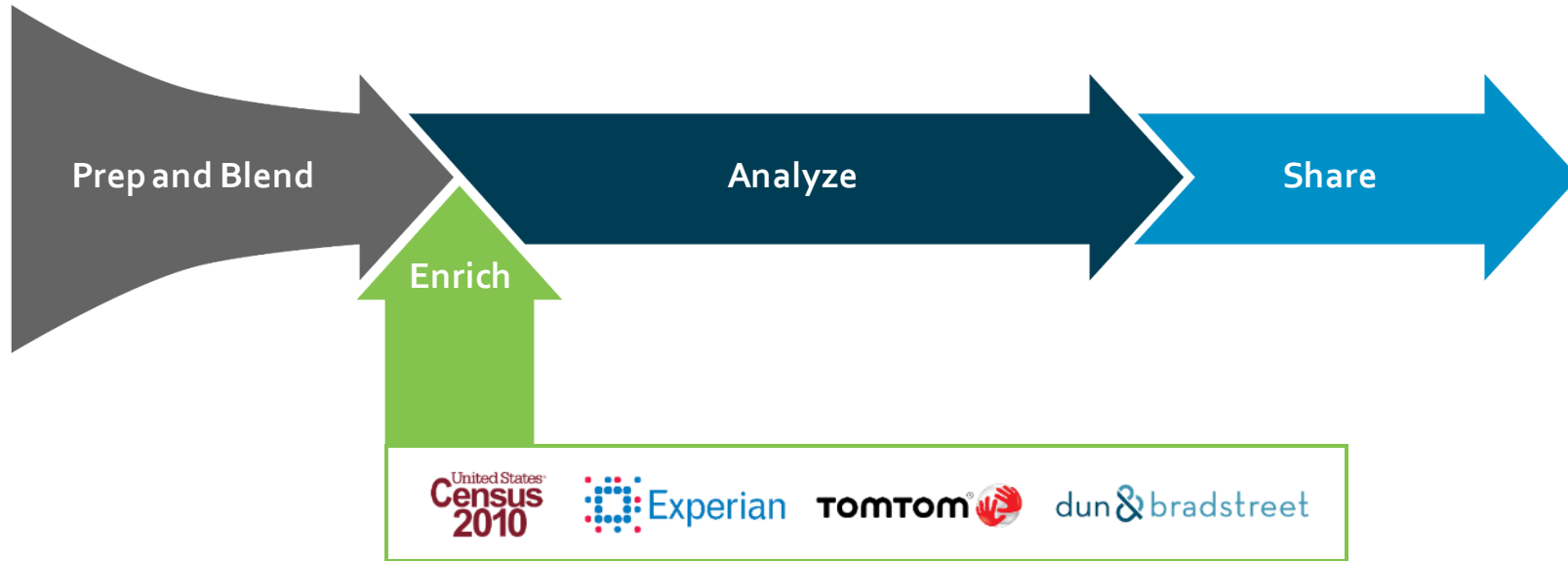
TERADATA



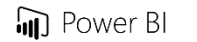
cloudera

Alteryx Platform

DESIGNER SERVER GALLERY



Output

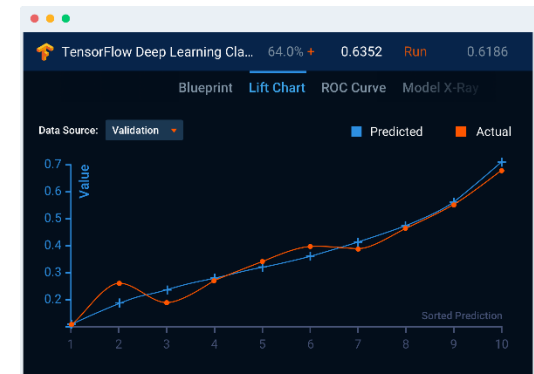
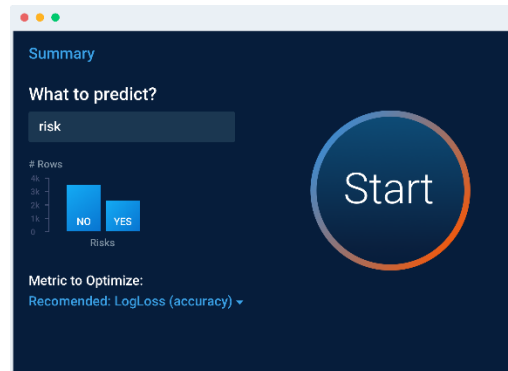
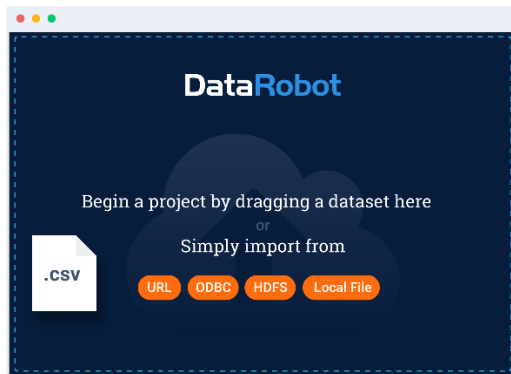
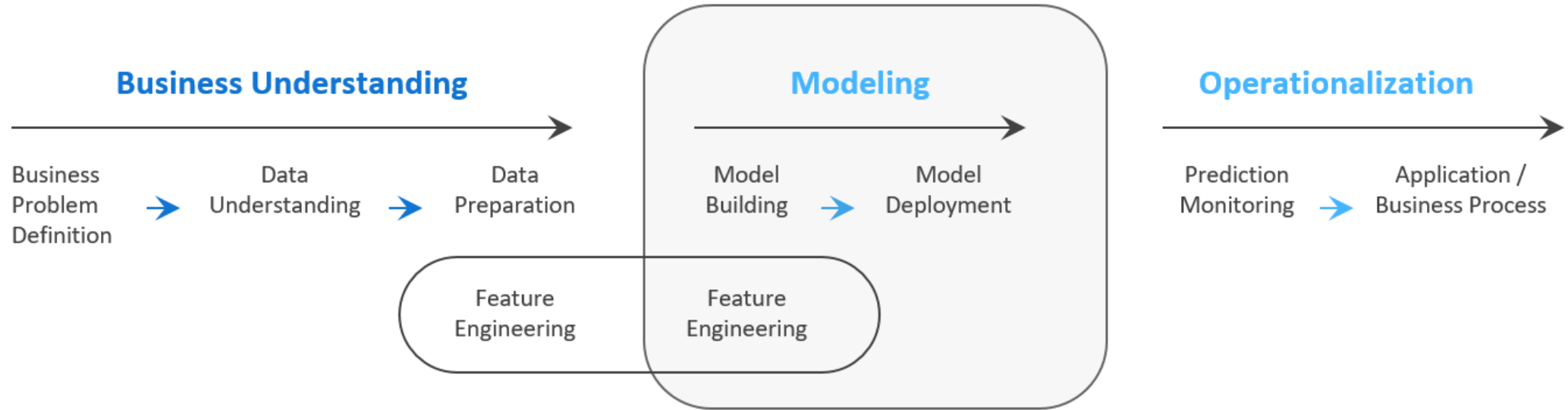


Oracle

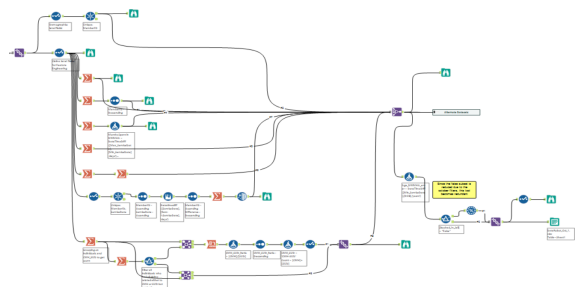
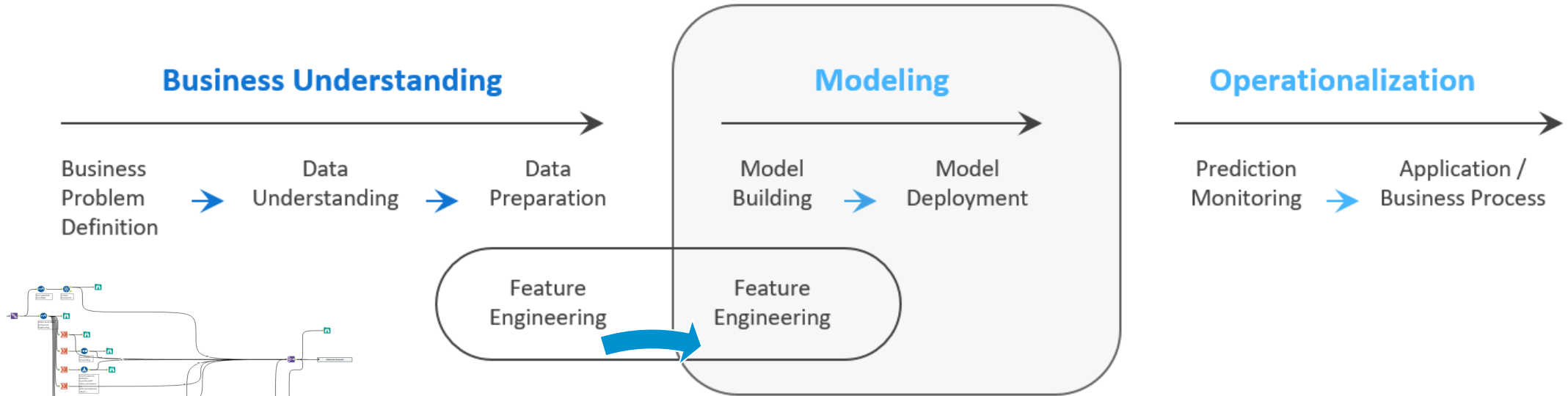


TERADATA

WAT + DataRobot AUTOMATED MACHINE LEARNING

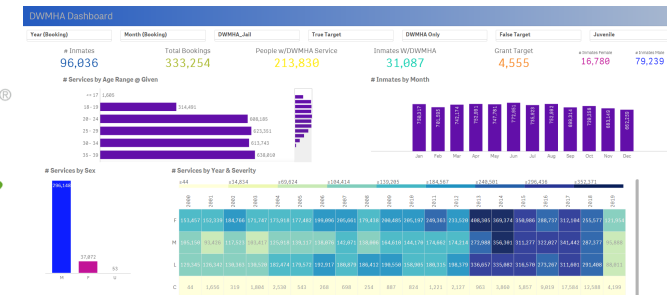


DataRobot



alteryx

Qlik



DWMHA Dashboard

Inmates
96,036

Total Bookings
333,254

People w/DWMHA Service
213,830

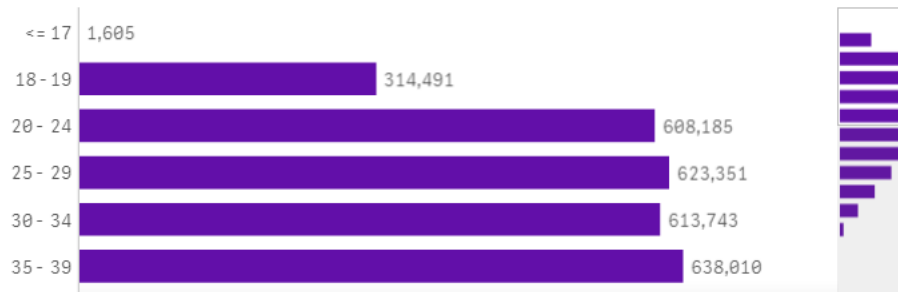
Inmates W/DWMHA
31,087

Grant Target
4,555

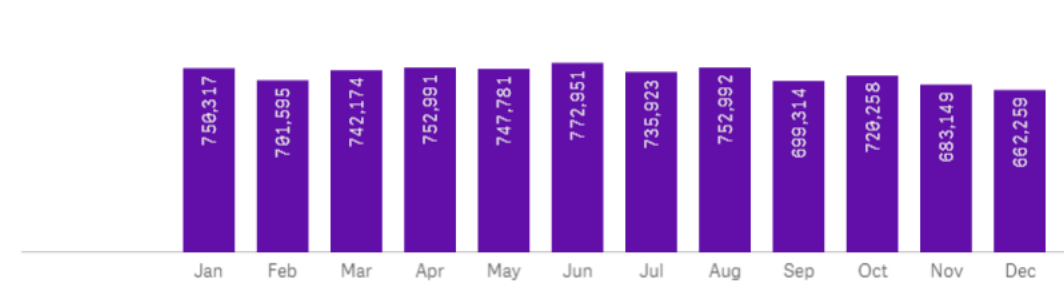
Inmates Female
16,780

Inmates Male
79,239

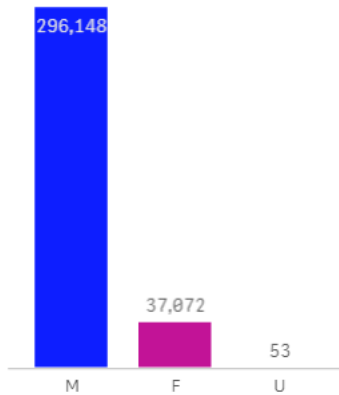
Services by Age Range @ Given



Inmates by Month



Services by Sex



Services by Year & Severity

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
≥44																				
F	153,457	152,339	184,766	171,747	173,918	177,482	199,096	205,661	179,438	200,485	205,197	249,363	233,520	408,305	369,374	350,986	288,737	312,104	255,577	121,954
M	105,150	93,426	117,523	103,417	125,918	139,117	138,076	142,071	138,006	164,610	144,170	174,662	174,214	272,988	356,301	311,277	322,027	341,442	287,377	95,888
L	129,345	126,342	130,363	130,520	182,474	179,572	192,917	180,879	186,412	190,550	158,905	180,315	198,379	336,657	335,082	316,570	273,267	311,601	291,408	88,011
C	44	1,656	319	1,804	2,530	543	268	698	254	887	824	1,221	2,127	963	3,860	5,857	9,019	17,584	12,588	4,199

2013-2019 Analysis of Booking Events



Distinct Persons
100,177

Jail MH Consumer
12,038

DWIHN Client
31,084

DWIHN Population Pct
31.0%

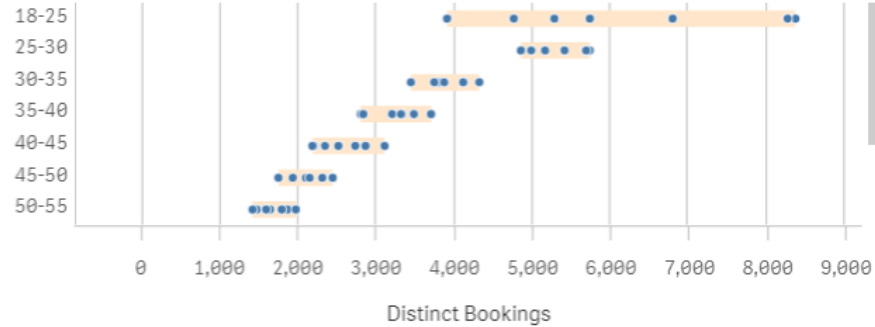
Jail MHC Pct
12.0%

Misdemeanor Bookings
96,798

Felony Bookings
92,080

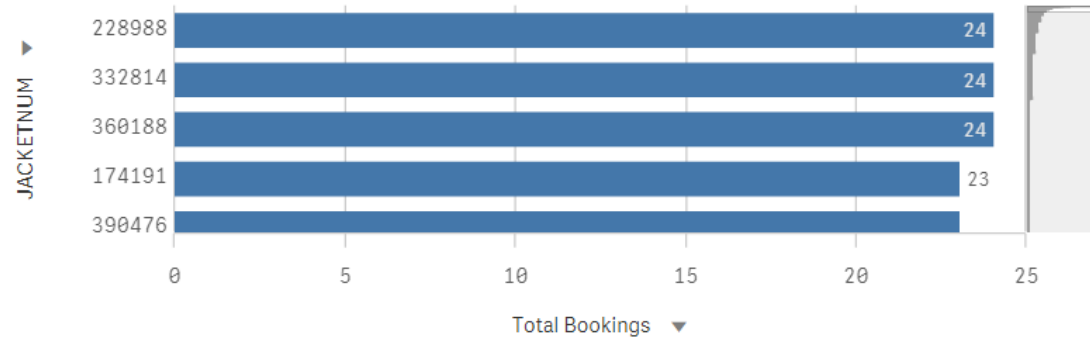
Total Bookings
188,878

Bookings by Age Group



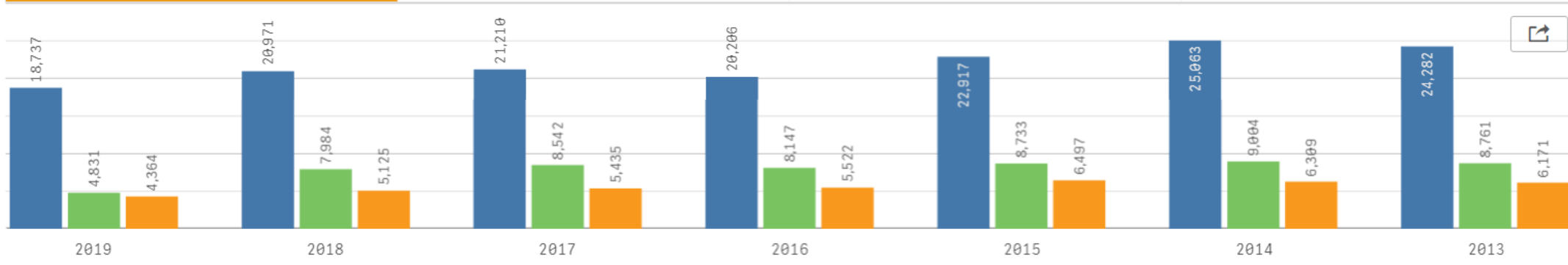
Top Violations by Statute

Toggle Selections on X or Y axis



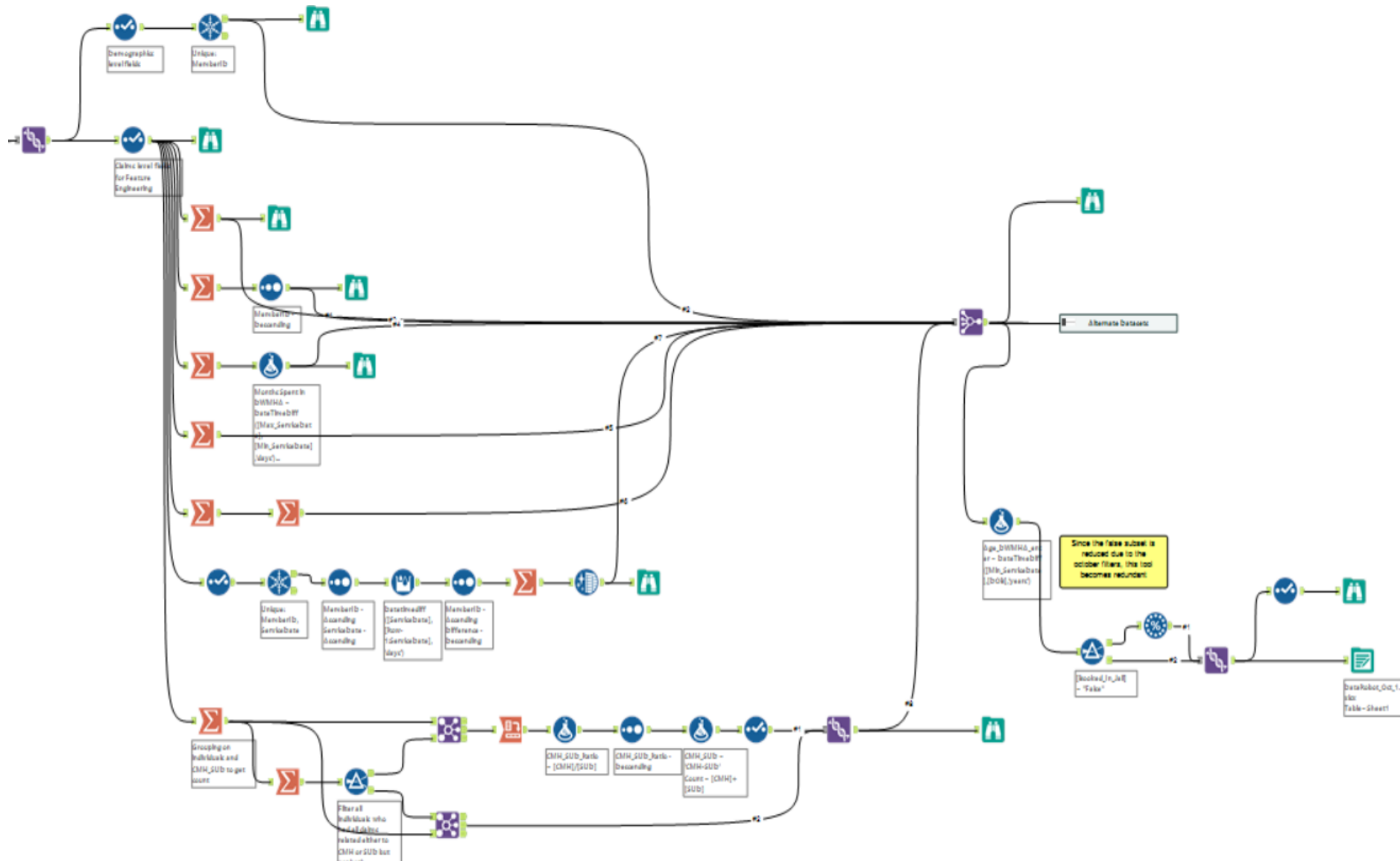
- Select date range
- Booking Year
- DWIHN Client
- Jail MH Consu...
- Booking Type
- Department
- Statute
- Gender

Booking Trends | Demographics | Booking History | Charge Details



- KPI
- Roster

Feature Engineering using Alteryx



DataRobot Data Models 41 Deployments Insights Jupyter Repository Prediction_DataSet_GUID

Leaderboard Learning Curves Speed vs Accuracy Model Comparison

Menu Search Add New Model Filter Models Export Metric LogLoss

Model Name & Description	Feature List & Sample Size	Validation	Cross Validation	Holdout
RandomForest Classifier (Gini) Ordinal encoding of categorical variables Missing Values Imputed RandomForest Classifier (Gini) M85 BP46 REF * 63.99% RECOMMENDED FOR DEPLOYMENT	List1 80.0%	0.4479 *	0.4381 *	0.4215
ENET Blender M90 M7+82+25 MOST ACCURATE	Multiple Feature Lists 63.99%	0.4548	0.4377	🔒
ENET Blender M89 M7+82+8+19+22+25...	Multiple Feature Lists 63.99%	0.4509	0.4378	🔒
AVG Blender M87 M7+82+25	Multiple Feature Lists 63.99%	0.4553	0.4380	🔒
RandomForest Classifier (Gini) Ordinal encoding of categorical variables Missing Values Imputed RandomForest Classifier (Gini) M7 BP46 REF	List1 63.99%	0.4582	0.4416	🔒

WORKERS
Using 0 of 4 total workers across all projects 04

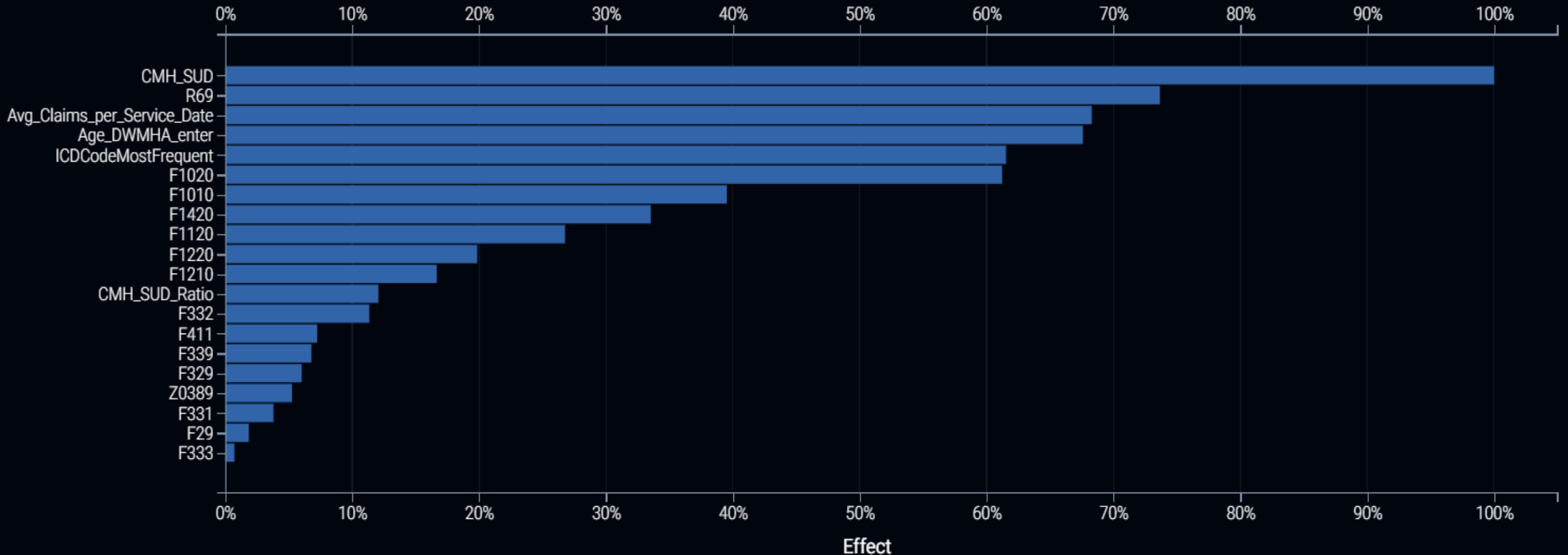
STATUS
Autopilot has finished

ACTIONS
Rerun Autopilot
Unlock project Holdout for all models

WIT used DataRobot to train the features for machine learning models which finds which columns (features) are most predictive. DataRobot trains 100s of machine learning models and ranks them according to the models predictive value, the most accurate models being on the top of the list, and the best model 'Recommended for Deployment' is on top of the list, "RandomForest Classifier". This model has the best validation and cross-validation score, and is the optimal model even though the "ENET Blender" has a slightly higher accuracy.

The Top Predictors

Feature Impact



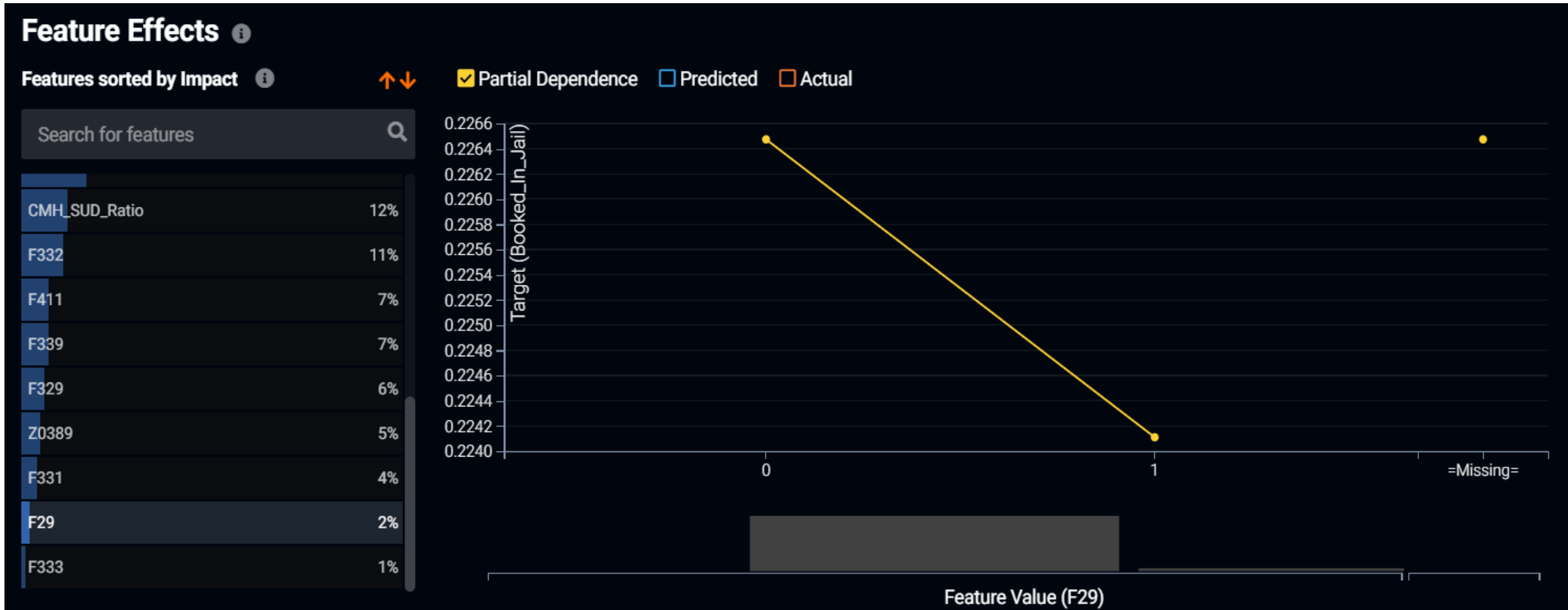
As shown above, CMH_SUD, R69 (Illness, unspecified), Avg_Claims_per_Service_Date, Age_DWIHN_enter are some of the top predictors which determine if an individual from DWIHN will go on to have a misdemeanor occurrence in the WCJ or not.

Positive Predictors



Many of the variables have positive impacts and association with graphs with increasing effects on the Target (Booked in Jail). The ICD 10 code for R69 is defined as illness, unspecified. This may be a catchall ICD code but it has a very strong correlation in our model.

Negative Predictors



Some variables have impact but it is in a negative direction with inverse effect on our Target prediction. The ICD 10 code for F29 is defined as unspecified psychosis not due to a substance or known physiological condition.

Top Features and Direction of Feature Prediction

Feature (listed highest to lowest predictive value)	Prediction Direction	Description
CMH_SUD	Highest positive for CMH-SUD, positive SUD, negative for CMH	CMH claims only, SUD claims only, CMH-SUD mix of claims
R69	Positive	ICD10 Code: Illness, unspecified
Avg_Claims_per_Service_Date	Mixed	Average Number of claims for the same service date.
Age_DWMHA_enter	Positive at younger ages, Negative at older ages	Consumer's age for first DWMHA claim
ICDCodeMostFrequent	Mixed	Top ICD Code for that consumer
F1020	Positive	ICD10 Code: Alcohol dependence, uncomplicated
F1010	Positive	ICD10 Code: Alcohol abuse, uncomplicated
F1420	Positive	ICD10 Code: Cocaine dependence, uncomplicated
F1120	Positive	ICD10 Code: Opioid dependence, uncomplicated
F1220	Positive	ICD10 Code: Cannabis dependence, uncomplicated
F1210	Positive	ICD10 Code: Cannabis abuse, uncomplicated
F332	Mixed	ICD10 Code: Major depressive disorder, recurrent severe without psychotic features
F411	Mixed	ICD10 Code: Generalized anxiety disorder
F339	Positive	ICD10 Code: Major depressive disorder, recurrent, unspecified
F329	Positive	ICD10 Code: Major depressive disorder, single episode, unspecified
Z0389	Positive	ICD10 Code: Encounter for observation for other suspected diseases and conditions ruled out
F331	Negative	ICD10 Code: Major depressive disorder, recurrent, moderate
F29	Negative	ICD10 Code: Unspecified psychosis not due to a substance or known physiological condition
F333	Negative	ICD10 Code: Major depressive disorder, recurrent, severe with psychotic symptoms
CMH ICD10 Code		
SUD ICD10 Code		





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Thursday, March 12, 2020 | Metro Detroit

Thank you for attending!



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