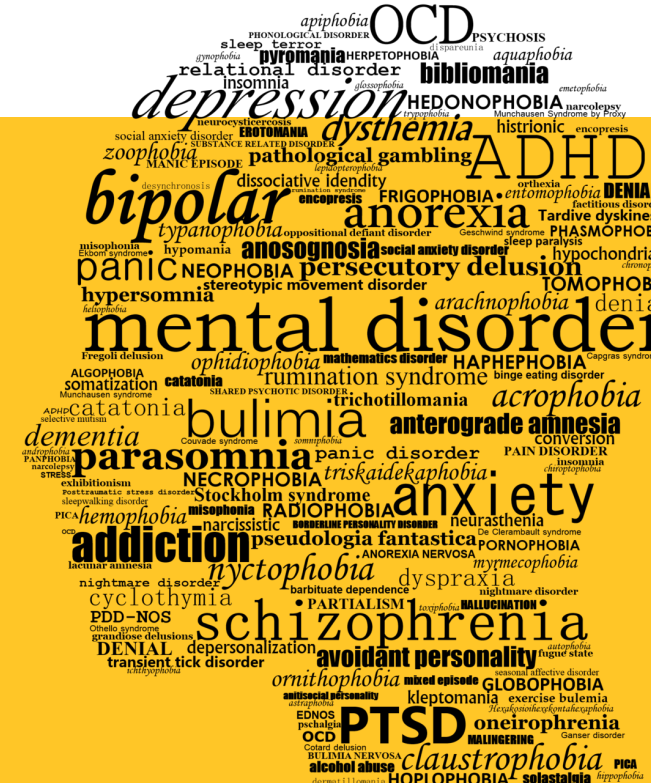


# Dynamics of Mental Illness in Arizona

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Applied Mathematics



## Introduction and Objectives:

### Goals and Concepts-

- Research goal involves assessing the mental illness discharge data of hospitals within Arizona to determine if predictive patterns can be found across a variety of demographics.
- Mentally Ill, within the context of this research, is ascribed by hospital staff within the discharge reports of patients. Medical records must remain anonymous, so the only data obtainable via government sources is yearly population counts.
- Demographics used for this research include age, race, and gender. Each of these is self identified by the patient when possible and determined by the hospital staff if the answer is definitive. If neither the patient can self identify, nor the staff can make a determination, then the label of "unknown" is used. In some graphs this category is excluded due to having irrelevant numbers.

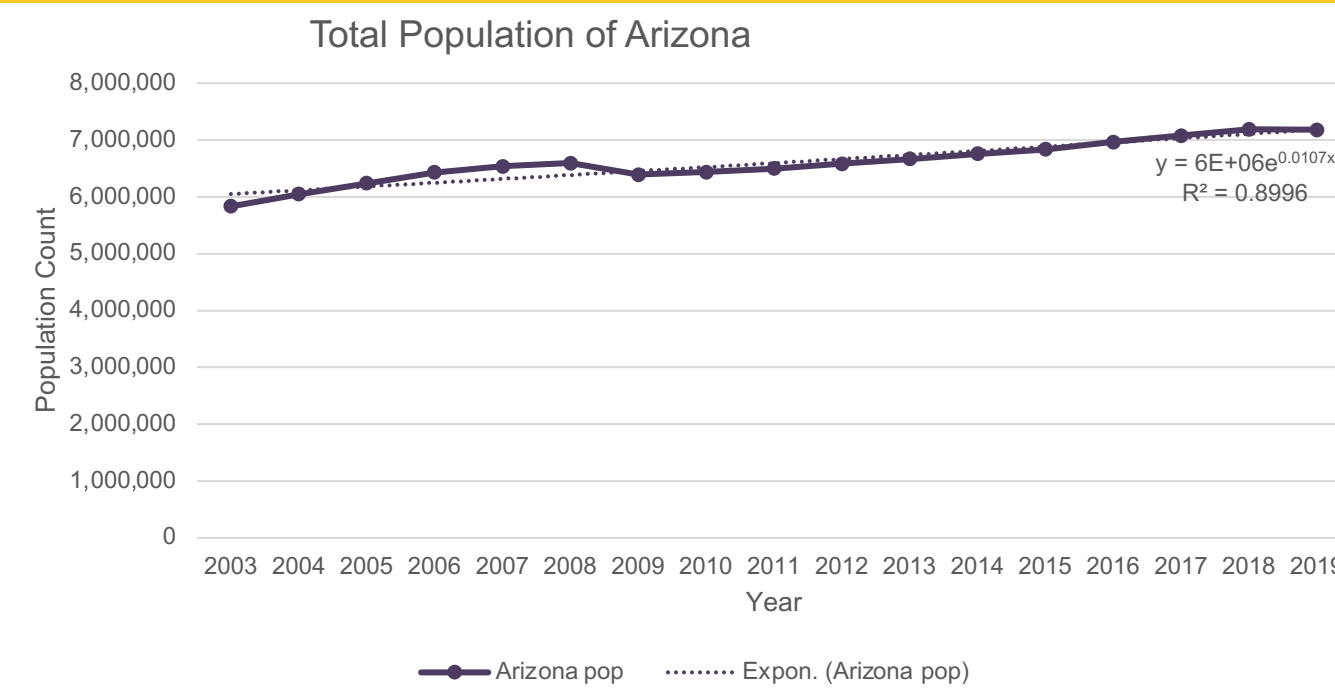
### Objectives and Steps-

- Initial objectives include processing government health data into usable tables of information filtered by demographic and incremented by year.
- Fitting exponential equations to each given data set relative to an estimated population model which provides a basis for analysis.
- Converting to percentages additionally enables increased depth in analysis relative to total Arizona population and relative to individual demographics equally.
- Finally, fitted equations are combined into a collective view of Arizona's total population

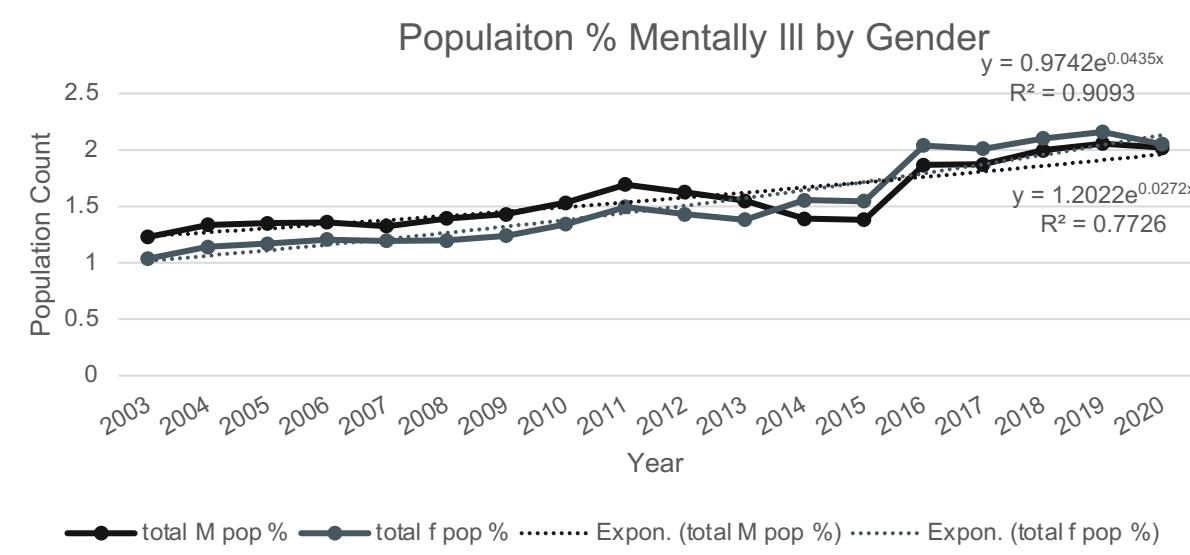
## Results

### Population Basis

- Before engaging in any analysis it is necessary to establish an equivalent basis for comparison.
- All data is presented here in population percentage and relative percentage.
- Population percentage is the percentage of the total population of Arizona, and relative is the percentage of the population of that category.

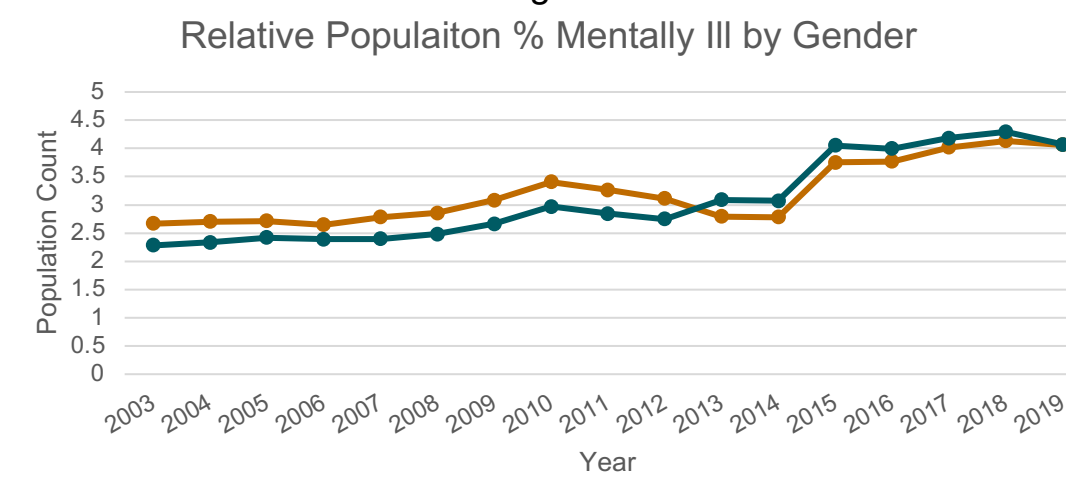


Equation Description	Equation with R2 Value
% of Population that is Female and Mentally Ill	$y=0.9742e^{0.0435x}$ [R2 = 0.9093]
% of Population that is Male and Mentally Ill	$y=1.2022e^{0.0272x}$ [R2 = 0.7726]
Total Arizona Population	$y=6E+06e^{0.0107x}$ [R2=0.8996]



### Gender

- Gender is shown to be a largely irrelevant variable.
- Graphically it is shown that each makes up roughly 50%.
- The Unknown/Other category was too small to consider significant.

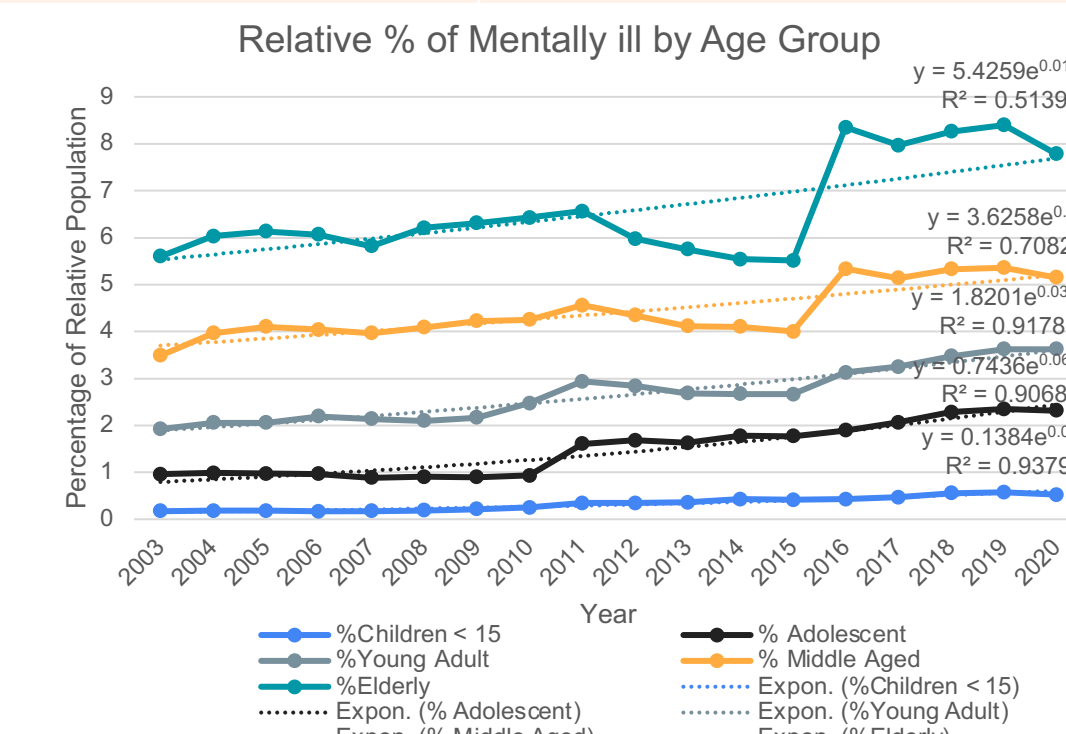
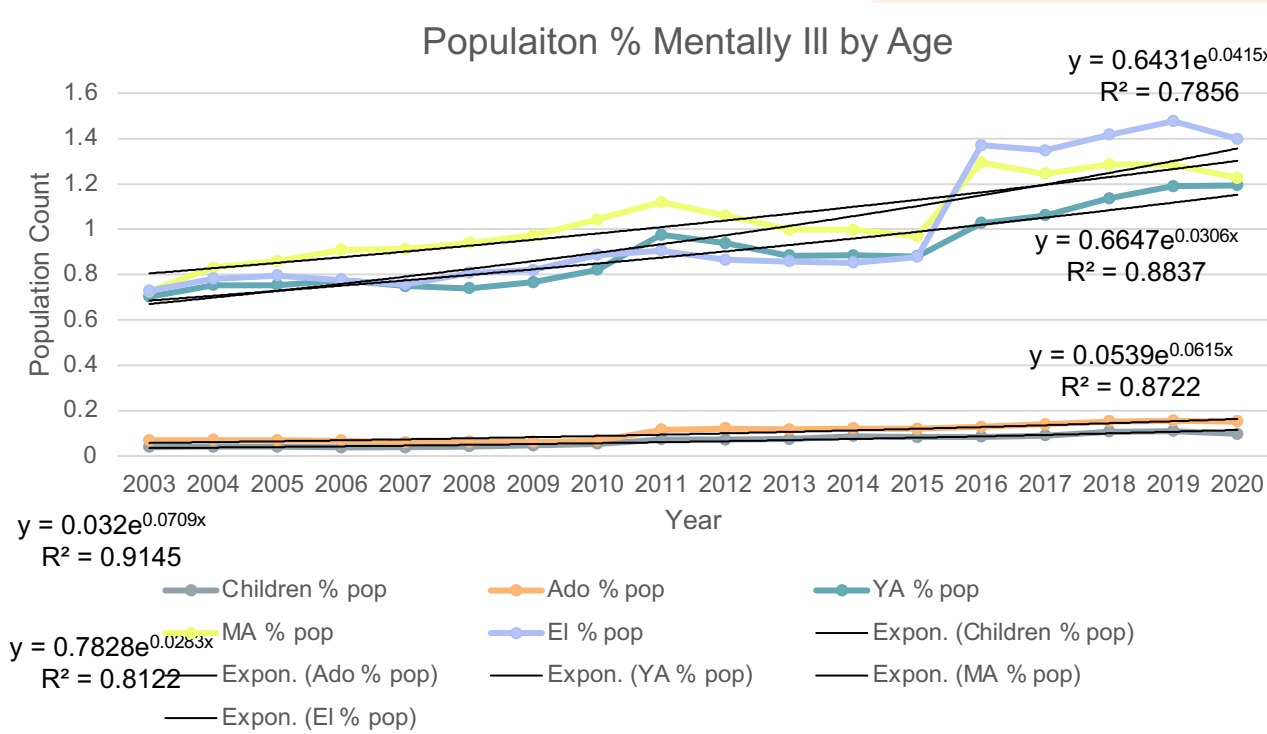


### Age Group

Age group presented a right oriented distribution, with the right side of the graph representing older age groups.

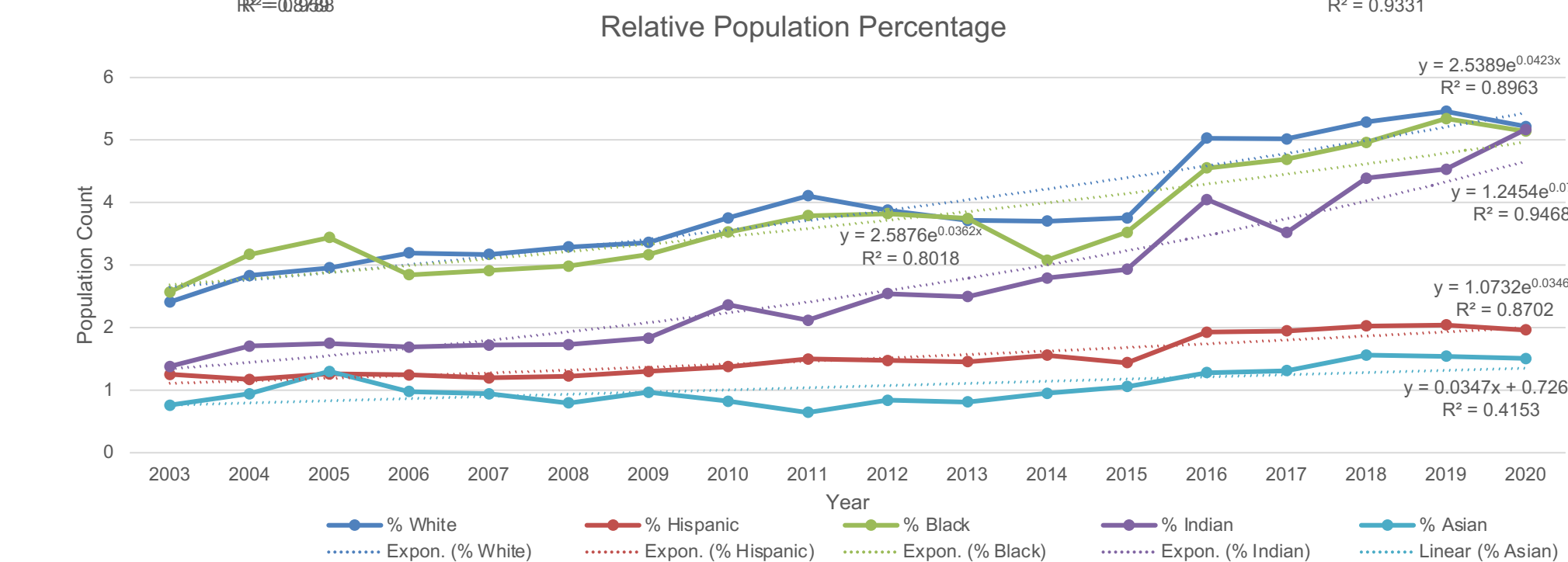
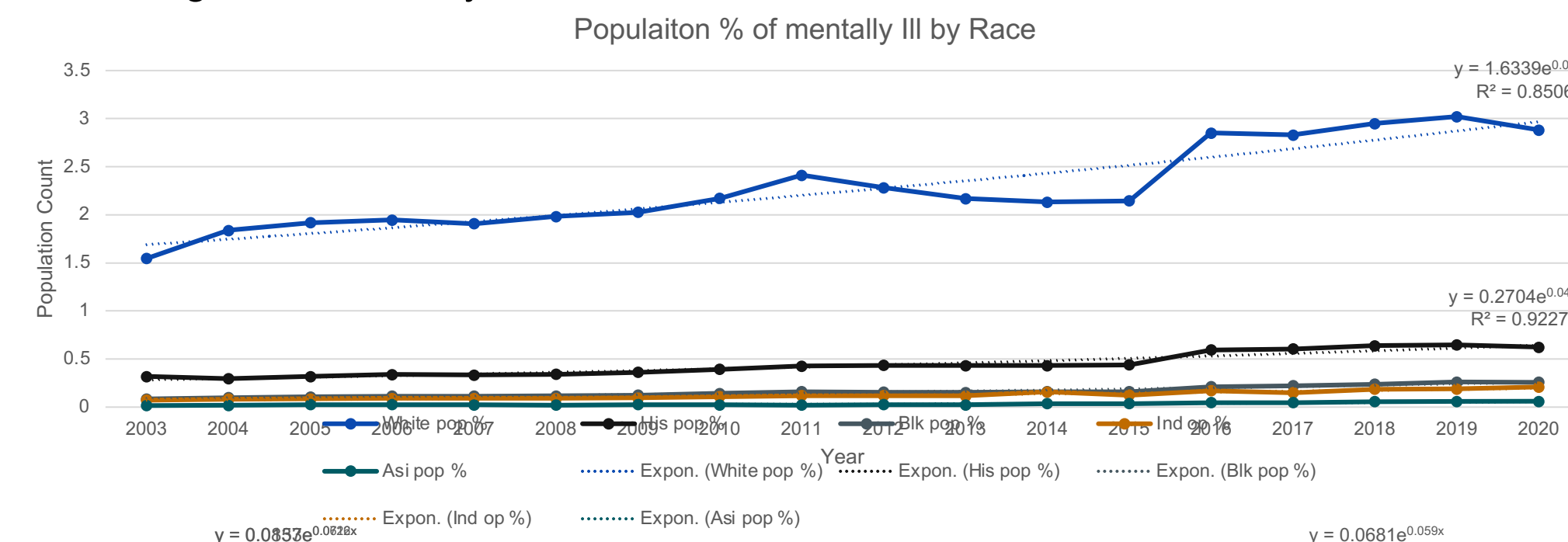
Mental illness is especially prevalent in groups of ages 65 and older, while the age group with the greatest first time diagnosis is inbetween 20-44 years of age.

Equation Description	Equation with R2 Value
% of Population that is Less than 15 and Mentally Ill	$y=0.032e^{0.0709x}$ [R2 = 0.9145]
% of Population that is 15-19 and Mentally Ill	$y=0.0539e^{0.0615x}$ [R2 = 0.8722]
% of Population that is 20-44 and Mentally Ill	$y=0.6647e^{0.0306x}$ [R2 = 0.8837]
% of Population that is 45-64 and Mentally Ill	$y=0.7828e^{0.0283x}$ [R2 = 0.8122]
% of Population that is 65 or older and Mentally Ill	$y=0.6431e^{0.0415x}$ [R2 = 0.7856]
Total Arizona Population	$y=6E+06e^{0.0107x}$ [R2=0.8996]



### Race

Race presents one of the most diverse distributions within the analyzed categories. Given that Arizona has a majority White racial makeup, the population graphs show that a majority of mentally ill are White as well. However, when compared to each individual population [as in dividing the population of white mentally ill by the total white population] the distribution of races changes dramatically.



## Conclusion(s)

- Taking a targetted approach towards mentia health that focuses on the elderly and early diagnosis could be hugely beneficial since these groups are most in need and least addressed respectively.
- Spikes in mental illness correlate with changes to the DSM-5, showing that perceived increases in mentally ill could also be natural expansions in the definition of mental illness.
- While an overarching perspective on mental illness provides some helpful information, taking a relative approach reveals new perspectives that will aid in future research.

## Literature Cited & Acknowledgements

- Arizona Department of health Services
- World Health Organization
- American Psychological Association



### Data:

- Data retrieved from Arizona Department of Health Services and can be accessed here →
- Definitions retrieved from the WHO and APA websites under [WWW.who.int](http://WWW.who.int) and [WWW.APA.org](http://WWW.APA.org)



### Methods:

- Programs used include Microsoft Excel and R.
- Sorting commands and scatter plot equation fitting are both used in equal part to parse data.
- Official websites for organizations such as WHO and the APA are referenced in order to interpret mental health data in the same terms as the rest of the world.