THE WORLD HEALTH ORGANIZATION ESTIMATES

ONE PERSON DIES OF SUICIDE EVERY 40 SECONDS
SUICIDE IS THE SECOND LEADING CAUSE OF DEATH IN YOUTHS BETWEEN 15 AND 29 YEARS OLD
Utah has the 5th highest suicide rate in the country, with between 500–600 cases per year.
Suicide is the leading cause of death in Utah for people under the age of 25.
What causes suicide?

What can we do to help?
Original Contribution

Acute Air Pollution Exposure and Risk of Suicide Completion

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The author wishes to thank Dr. Charles Neuringer for his assistance with the preparation of this manuscript.
We have used unique population-based data resources to identify 22 high-risk extended pedigrees that show clustering of suicide over twice that expected from demographically adjusted incidence rates. In this initial study of genetic risk factors, we focused on two high-risk pedigrees. In the first of these (pedigree 12), 10/19 (53%) of the related suicides were female, and the average age at death was 30.95. In the second (pedigree 5), 7/51 (14%) of the suicides were female and the average age at death was 36.90. Six decedents in pedigree 12 and nine in pedigree 5 were genotyped with the Illumina HumanExome BeadChip. Genotypes were analyzed using the Variant Annotation, Analysis, and Search program package that computes likelihoods of risk variants using the functional impact of the DNA variation, aggregative scoring of multiple variants across each gene and pedigree structure. We prioritized variants that were: (1) shared across pedigree members, (2) rare in other Utah suicides not related to these pedigrees, (3) ≤ 5% in genotyping data from 398 other Utah population controls and (4) ≤ 5% frequency in publicly available sequence data from 1358 controls and/or in dbSNP. Results included several membrane protein genes (ANOS1, and TMEM141 for pedigree 12 and FAM38A and HRCT1 for pedigree 5). Other genes with known neuronal involvement and/or previous associations with psychiatric conditions were also identified including: NRCX1, GAPDH, CDK12, and OPTN4 in pedigree 12, and TRADD, and HTR2A in pedigree 5.
WHAT CAN WE DO TO HELP?

Select relevant cases to perform genetic analysis
Contribute to our understanding of suicide
Ultimately be able to predict and prevent suicide
The Utah Suicide Research Study (USRS) has over 6000* DNA samples from completed suicide cases...

over twice the size of other genetic studies of completed suicides.

* 6013 as of 9/01/2018
> 19,000 CASES IN UTAH SINCE 1904
UTAH POPULATION DATABASE

- Multi-Generational Genealogies (1700s)
- Demographic Information
- Geographic/Environmental Exposure
- Clinical Information
Age
Gender
Race
Bipolar
#diagnosis bipolar
depression
#diagnosis depression
asthma
#diagnosis asthma
obesity
schizophrenia
cause of death
weapon used
...
Attributes can...

- Prioritize which genes may be of interest in a shared region in the genome.
- Attributes can also reveal co-occurring conditions.
- Suggest subgroups for future target intervention and prevention studies.
1. Select Families of Interest
1. Select Families of Interest

2. De-cycle and linearize graph
1. Select Families of Interest

2. De-cycle and linearize graph

3. Plot attributes in table
De-Cycling
De-Cycling
Linearizing
Linearizing
Can't show many people
Aggregation
Aggregation

One row for every person of interest

Shared rows for relatives

One row for every person of interest
<table>
<thead>
<tr>
<th>KindredID</th>
<th>RelativeID</th>
<th>sex (F)</th>
<th>deceased</th>
<th>suicide</th>
<th>Bipolar (True)</th>
<th>MaxBMI</th>
<th>Depression (True)</th>
<th>AgeID_Depression</th>
<th>cause_death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>903988</td>
<td>45%</td>
<td>59%</td>
<td>9%</td>
<td>47%</td>
<td>50%</td>
<td>0</td>
<td>65</td>
<td>gunshot woun...</td>
</tr>
<tr>
<td>9</td>
<td>903988</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
Hiding
Hiding

Empty Row

Only data for affected people
LINEAGE IN ACTION
Table Attributes & Sorting
Data Driven Family Selection
Multiple Families
New Attribute of Interest
REAL INSIGHTS FROM REAL DATA

CASE STUDIES
Figure S5: Personality Disorder (PD) Families 10724, 540781 and 565350 identified by browsing families with increased numbers of personality disorders, sorted to show all the PD cases together. These cases are also disproportionately female (10/17).
CURRENT & FUTURE WORK

- Using Lineage for several other datasets (cancer, longevity...)
- Improve multi-family exploration
- Find phenotype patterns across families
- Add genetic data
JUNIPER: A TREE+TABLE APPROACH TO MULTIVARIATE GRAPH VISUALIZATION
WED, @ 11AM, GRAPHS AND TREES