Developmental Origins of Suicide Mortality

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JCPP Advances Lecture Series
London - May 11, 2023
Conflicts of interest: None

Funding: NIH

Content warning: Suicide
Vulnerability to suicide is partly established early in development, even before birth
Outline

- Developmental study of suicide
- Research
  - Prenatal factors
  - Neurocognitive factors
  - Adverse childhood experiences
- Final remarks
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- Developmental study of suicide
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Suicide is rare
≈8 per 100,000 pop.
High-risk populations

- Depression in an outpatient setting
- Depression in an inpatient setting
- Depression in an inpatient setting following suicide ideation or attempt
Depression in an inpatient setting following suicide ideation or attempt

High-risk population ≠ General population
Suicide is a MULTICAUSAL phenomenon

- Intergenerational factors
  - Genetics, Environment
- Distal factors
  - (eg. Childhood abuse)
- Proximal factors
  - (eg. Psychiatric disorders)
  
  High-risk population

Evidence of developmental origins of psychiatric disorders

- Depression
- Psychosis
- ADHD

AIM:
- Prenatal sociodemographic factors
- Pregnancy and birth factors
- Early childhood factors
The developmental origins of suicide mortality: a systematic review of longitudinal studies

Pablo Vidal-Ribas, Theemeshni Govender, Jing Yu, Alicia A. Livinski, Denise L. Haynie & Stephen F. Gilman

*European Child & Adolescent Psychiatry* (2022) | [Cite this article]
Pregnancy / birth factors:
- Low birth weight/length
- Birth-related traumas
- Being born in Spring
- Smoking during pregnancy

Parental & child factors:
- Parental death by external causes
- Parental stressors/disability
- Childhood health problems
- Traumatic brain injury
- Adverse emotional experiences

Sociodemographic factors:
- Young maternal age
- Young father or older than 30
- Single marital status
- Parents with low education
- Later born children
- Immigrant status
- International/national adoptees
- Residing in institutional care
- Having contact with social services/child welfare

INCREASED VULNERABILITY TO SUICIDE

Vidal-Ribas et al., 2022 Europ Child Adolesc Psychiat
See also, Orri et al., 2019 Lancet Psychiatry
Very few studies...

... combining exposures.

... examining childhood exposures.

... outside Scandinavia and United Kingdom.
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- Final remarks
Collaborative Perinatal Project (CPP) Cohort

1959-1966 Birth > > > > > > > > > > > > > > > > 7 years

N > 59,000 pregnancies at 12 U.S. sites.
Collaborative Perinatal Project (CPP) Mortality Linkage Study

CPP Cohort
Birth 1959-1966

U.S. National Death Index (NDI)
Vital status 1979 -> 2016 (13 -> 57 years)

DEATH (and cause) or ALIVE

N>59,000
Birth 1959-1966

CPP Cohort

Birth
1959-1966

NDI Linkage

Vital status
1979 - - - - - - > - - - - - - > - - - - - - > 2016 (13 --> 57 years)

Alive by end of 2016*
Death by SUICIDE
Death by other causes*

Sociodemographic Factors
- Race
- Sex
- Family structure
- Household density
- Poverty ratio
- Parental education
- Parental occupation
- Birth order

Pregnancy, Birth, and Neonatal Factors
- Pregnancy complication score
- Birth and delivery complication score
- Neonatal complication score
- Maternal age
- Maternal psychiatric history
- Birth weight
- Small for gestational age
- Smoking during pregnancy

N=49,853

Statistical Analysis:
Incidence rate per 100,000 person-years
Cox proportional hazard models
- Unadjusted
- Adjusted

Vidal-Ribas et al., 2022 Transl Psychiatry

* Censored
288 suicide cases
214 males (74%)
74 females (26%)

Incidence Rate
15.6 per 100,000
(95%CI, 13.9-17.5)
CONCLUSIONS

Prenatal sociodemographic and pregnancy-related factors independently associated with suicide risk in offspring
Outline

➢ Developmental study of suicide

➢ Research
  ✓ Prenatal factors
  ✓ Neurocognitive factors
  ✓ Adverse childhood experiences

➢ Final remarks
Cognitive performance and suicide risk: For who?

Lower cognitive performance and academic achievement

Children?  Adolescent  Young adult
Previous study

N=49,853

CPP Cohort
Birth
1959-1966

Socio-demographic factors
- Parental education
- Parental occupation
- Birth order

Pregnancy & birth factors
- Pregnancy complications

NDI Linkage
Vital status
1979 -- 57 years

Death by SUICIDE
Death by other causes*
Alive by end of 2016*

* Censored

7 years

Neurocognitive factors
- Intelligence - WISC:
  - Verbal IQ
  - Performance IQ
  - Full-Scale IQ
- Academic Skills - WRAT:
  - Reading
  - Spelling
  - Arithmetic

CPP Cohort
Sociodemographic factors
Pregnancy & birth factors
Neurocognitive factors
Survival by Verbal IQ Score in Childhood

Survival probability

<table>
<thead>
<tr>
<th>Neurocognition at age</th>
<th>Unadjusted HR (95% CI)</th>
<th>Adjusted HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FULL SCALE IQ</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;85</td>
<td>1.40 (0.78, 2.52)</td>
<td></td>
</tr>
<tr>
<td>85-115</td>
<td>1.53 (0.89, 2.60)</td>
<td></td>
</tr>
<tr>
<td>&gt;115</td>
<td>Ref.</td>
<td></td>
</tr>
<tr>
<td><strong>VERBAL IQ</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;85</td>
<td>1.59 (0.81, 3.12)</td>
<td>1.76 (0.86, 3.60)</td>
</tr>
<tr>
<td>85-115</td>
<td>1.97 (1.05, 3.71)</td>
<td>1.97 (1.03, 3.78)</td>
</tr>
<tr>
<td>&gt;115</td>
<td>Ref.</td>
<td>Ref.</td>
</tr>
<tr>
<td><strong>PERFORMANCE IQ</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;85</td>
<td>1.27 (0.79, 2.03)</td>
<td></td>
</tr>
<tr>
<td>85-115</td>
<td>1.23 (0.82, 1.84)</td>
<td></td>
</tr>
<tr>
<td>&gt;115</td>
<td>Ref.</td>
<td></td>
</tr>
<tr>
<td><strong>SPELLING</strong></td>
<td></td>
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</tr>
<tr>
<td>&lt;90</td>
<td>2.02 (1.16, 3.51)</td>
<td>1.61 (0.90, 2.88)</td>
</tr>
<tr>
<td>90-110</td>
<td>1.52 (0.89, 2.60)</td>
<td>1.36 (0.78, 2.35)</td>
</tr>
<tr>
<td>&gt;110</td>
<td>Ref.</td>
<td>Ref.</td>
</tr>
<tr>
<td><strong>READING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;90</td>
<td>2.01 (1.27, 3.17)</td>
<td>1.67 (1.02, 2.72)</td>
</tr>
<tr>
<td>90-110</td>
<td>1.42 (0.91, 2.22)</td>
<td>1.34 (0.84, 2.13)</td>
</tr>
<tr>
<td>&gt;110</td>
<td>Ref.</td>
<td>Ref.</td>
</tr>
<tr>
<td><strong>ARITHMETIC</strong></td>
<td></td>
<td></td>
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<tr>
<td>&lt;90</td>
<td>1.49 (0.74, 2.98)</td>
<td></td>
</tr>
<tr>
<td>90-110</td>
<td>1.53 (0.80, 2.92)</td>
<td></td>
</tr>
<tr>
<td>&gt;110</td>
<td>Ref.</td>
<td></td>
</tr>
</tbody>
</table>

1 Adjusted for race, sex, sociodemographic index and pregnancy complications.

Vidal-Ribas et al., In press. J Child Psychol Psychiatry
CONCLUSIONS

Prenatal sociodemographic and pregnancy-related factors independently associated with suicide risk in offspring.

Lower childhood neurocognitive performance is associated with vulnerability to suicide through middle-adulthood.
Outline

- Developmental study of suicide
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- Final remarks
This is not new!

But most studies...

... retrospective.

... ideation and attempt as outcome.

... “children” = everyone under 18!

... ACEs by total score or individually
Adverse Childhood Adversities (ACEs) increase risk for...

... death by any cause?

... death by suicide?

... death by other causes?
N=49,853

CPP Cohort
Birth
1959-1966

NDI Linkage
Vital status
1979 - - - - - - > - - - - - - > 2016 (13 --> 57 years)

Death by SUICIDE
Death by other causes*
Alive by end of 2016*

* Censored

ADVERSE CHILDHOOD EXPERIENCES
ADVERSE CHILDHOOD EXPERIENCES (ACEs).
- Parent harshness at 8 months
- Parent neglect at 8 months
- History of family mental illness between birth and age 7
- Divorce/separation at age 7
- Two or more marital changes between birth and age 7
- Parental (age 1 and 7) or sibling death (between birth and age 7)
- Foster care at ages 1 and 7
- Five or more residential changes between birth and age 7
- Household highly crowded (person/room > 1.5) at age 7
- Welfare receipt at age 7
- Poverty at age 7
- Income decline between birth and age 7
- Severe chronic conditions of children at age 7

Cumulative score

\[ ACE_1 + ACE_2 + ACE_3 + ... = \sum_{ACE_j} \]

Latent classes
Five latent classes of early childhood adversities identified in the CPP cohort

Yu et al., 2022 Lancet Reg Health Am
Risk of premature all-cause mortality for individuals in each latent class of ACEs

Yu et al., 2022 Lancet Reg Health Am
Suicide death by ACEs

All-cause mortality by ACEs

- Poverty & Parental Separation
- Poverty & Crowded Housing

Risk of suicide

Risk of Premature Mortality

Age (years)

- Family instability
- Poverty & crowded housing
- Family Instability
- Parental Harshness & Neglect
- Low Adversity
- Poverty & Crowded Housing

Risk of suicide by age for different ACEs.
Poverty & Crowded Housing
Family Instability
Low Adversity

Risk of suicide

Age

Suicide death by ACEs

Risk of substance-related death

Age

Substance-related death by ACEs

Poverty & Parental Separation
Family Instability

Poverty & Parental Separation
Parental Harshness & Neglect
<table>
<thead>
<tr>
<th>ACEs classes</th>
<th>Classes and score SEPARATELY HR (95%CI)</th>
<th>Classes and score TOGETHER HR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Adversity Ref. Ref.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental Harshness &amp; Neglect</td>
<td>1.57 (0.84, 2.91)</td>
<td>1.37 (0.69, 2.72)</td>
</tr>
<tr>
<td>Family Instability</td>
<td>1.92 (1.32, 2.79)</td>
<td>1.75 (1.14, 2.68)</td>
</tr>
<tr>
<td>Poverty &amp; Crowded Housing</td>
<td>1.38 (0.97, 1.96)</td>
<td>1.25 (0.83, 1.89)</td>
</tr>
<tr>
<td>Poverty &amp; Parental Separation</td>
<td>1.37 (0.97, 1.94)</td>
<td>1.14 (0.67, 1.95)</td>
</tr>
<tr>
<td>Cumulative ACEs</td>
<td><strong>1.10 (1.02, 1.17)</strong></td>
<td>1.05 (0.94, 1.18)</td>
</tr>
</tbody>
</table>

1 Adjusted for race, sex, and parental education.

Type of ACEs matters above number of ACEs
CONCLUSIONS

Prenatal sociodemographic and pregnancy-related factors independently associated with suicide risk in offspring.

Lower childhood neurocognitive performance associated with vulnerability to suicide through middle-adulthood.

Adverse childhood experiences associated with suicide risk and type of ACEs matters.
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Uhhm...

How does it work?
Genetic and environmental family factors

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Changes:
- Epigenetics
- Neural systems
- Immune
- Neuroendocrine
- Social
- Psychological

Proximal factors:
- Psychiatric disorders
- Altered decision making*
- Personality traits*
- Stressful life events
- Socioeconomic disadvantage

Increased sensitivity to stressful environments and proximal factors

INCREASED VULNERABILITY TO SUICIDE
Vulnerability to suicide is partly established early in development, even before birth.
Thank you

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Work performed as part of:
Social and Behavioral Sciences Branch
Division of Population Health Research
National Institute of Child Health and Human Development
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