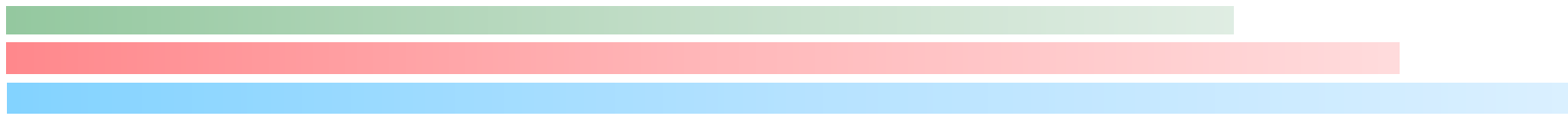# The Potential of "Big Data" in Personalized Mental Healthcare

Prof. Dr. med. Michael Kaess

Universitätsklinik für Kinder- und Jugendpsychiatrie und Psychotherapie, Bern

Mental Health among Youth in Switzerland

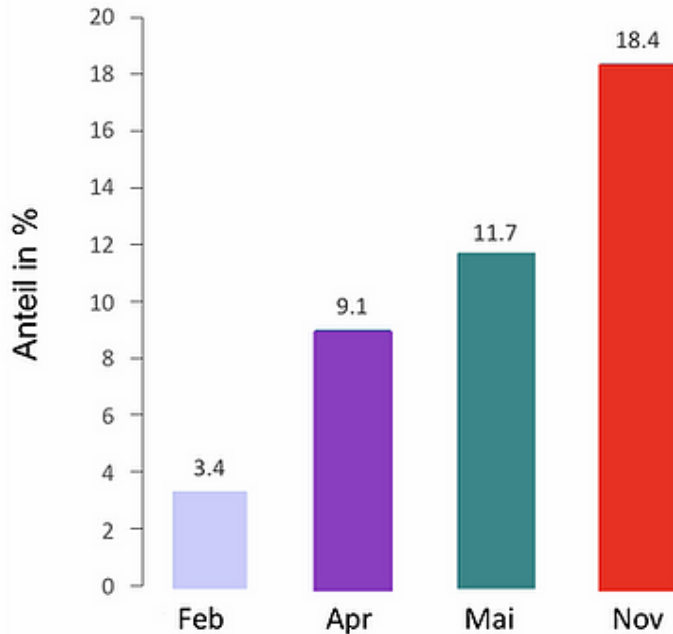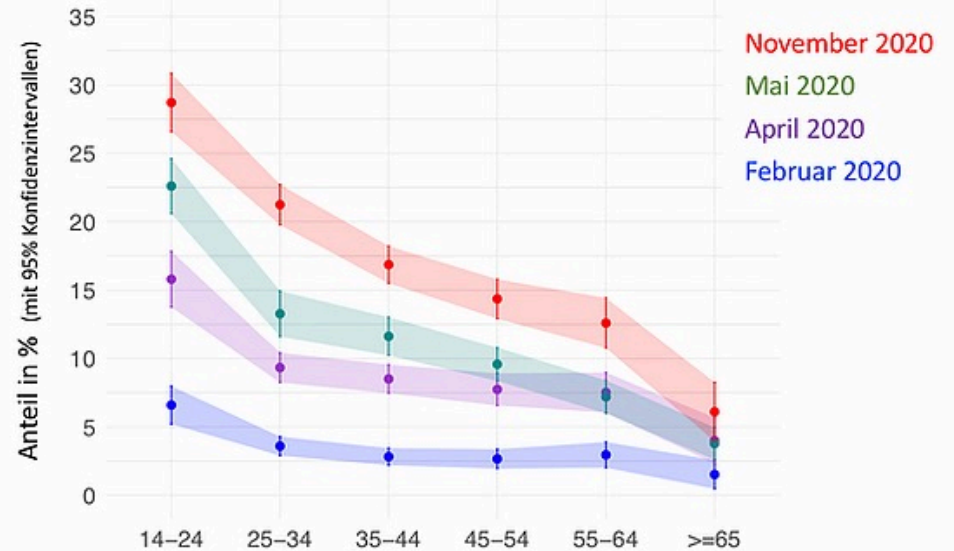Abbildung 1: Anteil Personen mit schweren depressiven Symptomen im 2020

Abbildung 2: Anteil Personen mit schweren depressiven Symptomen im 2020 in Abhängigkeit des Alters

November 2020
Mai 2020
April 2020
Februar 2020

Personalized Mental Healthcare

- **Personalized Healthcare**
  Diagnostic, preventive or therapeutic interventions that are specifically and optimally to a particular individual

- **Big Data („health-related data")**
  All data from a variety of sources that potentially describe the health status of an individual

- **Phenotype**
  Set of observable characteristics of an individual resulting from the interaction of its biology with the environment

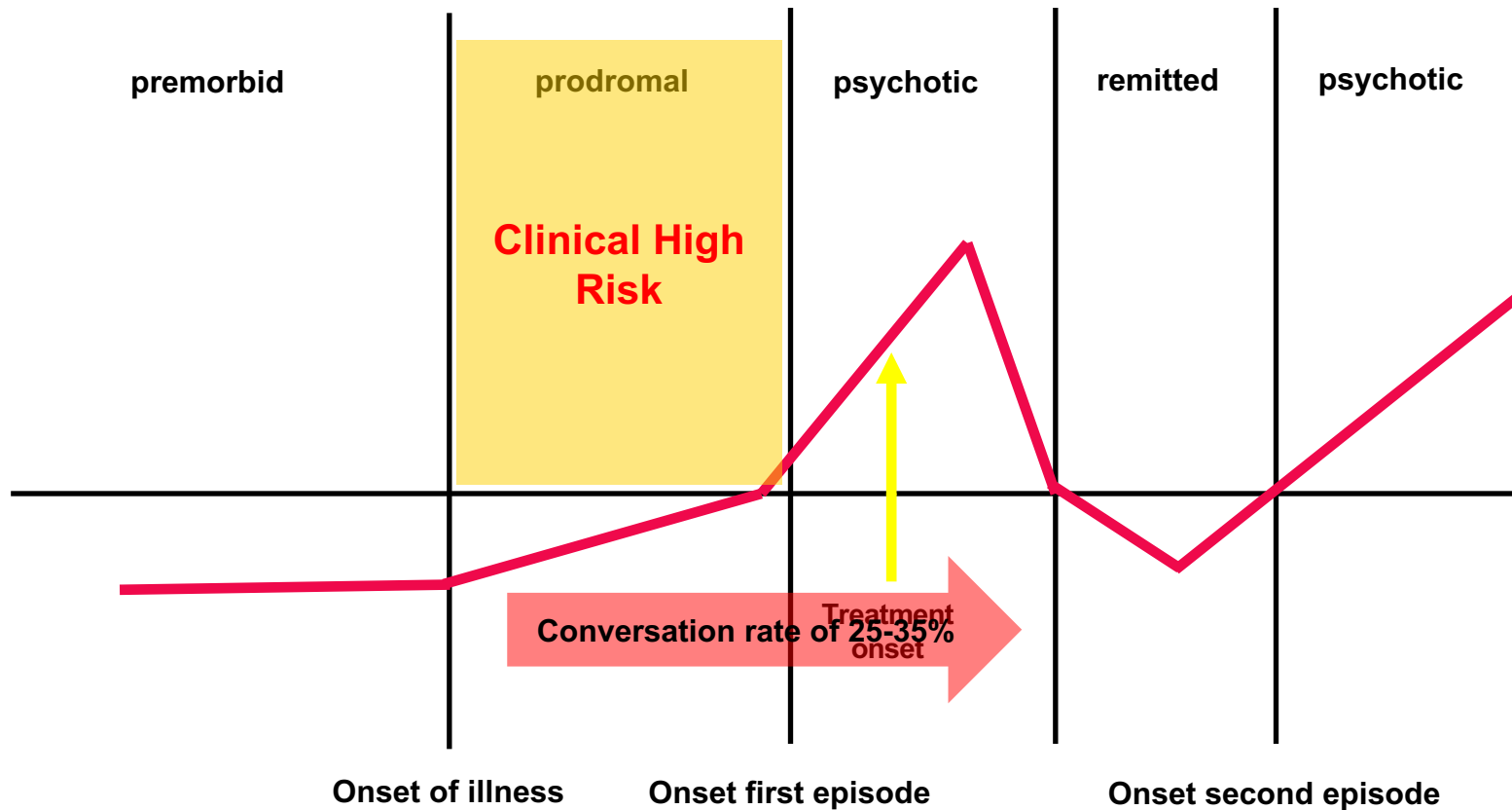# Data-Driven Phenotypes in Mental Illness

Prediction of:
- Course of illness
- Poor outcomes/ risks
- Treatment response

Identfication of:
- Mechanisms of disease
- Treatment targets

Example „Early Psychosis"
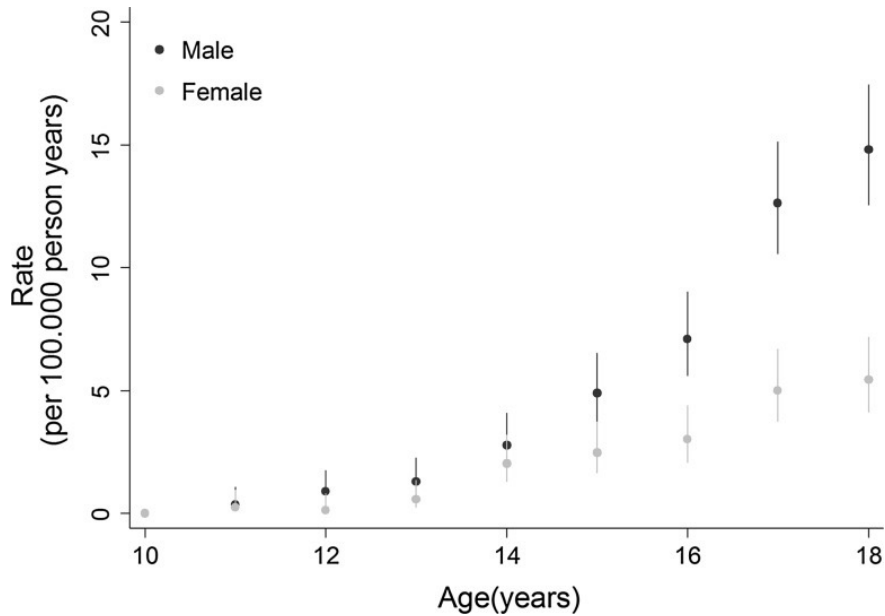

premorbid   prodromal   psychotic   remitted   psychotic

Clinical High Risk

Conversation rate of 25-35%

Treatment onset

Onset of illness   Onset first episode   Onset second episode

Fusar-Poli et al. *JAMA Psychiatry* 2016

Biological Phenotyping to Predict Psychosis Onset

Feature selection probability of reliable voxels (95% CI) across 52,800 classifiers
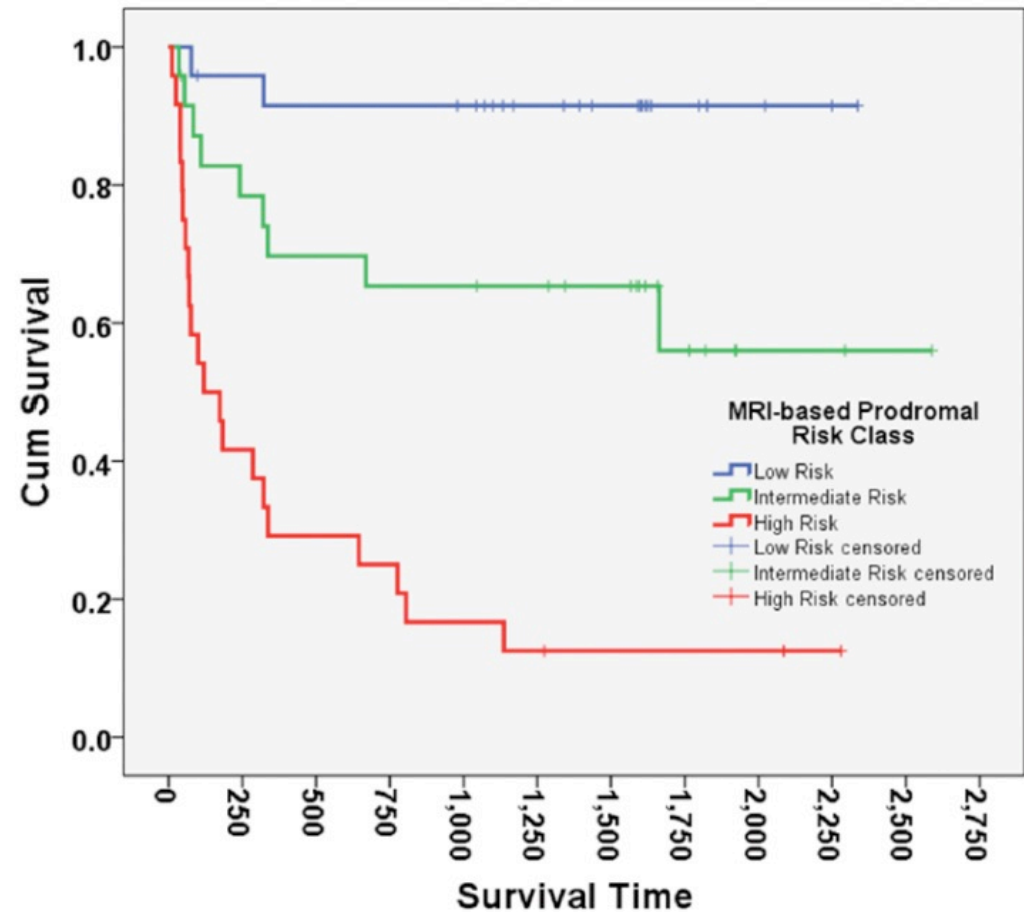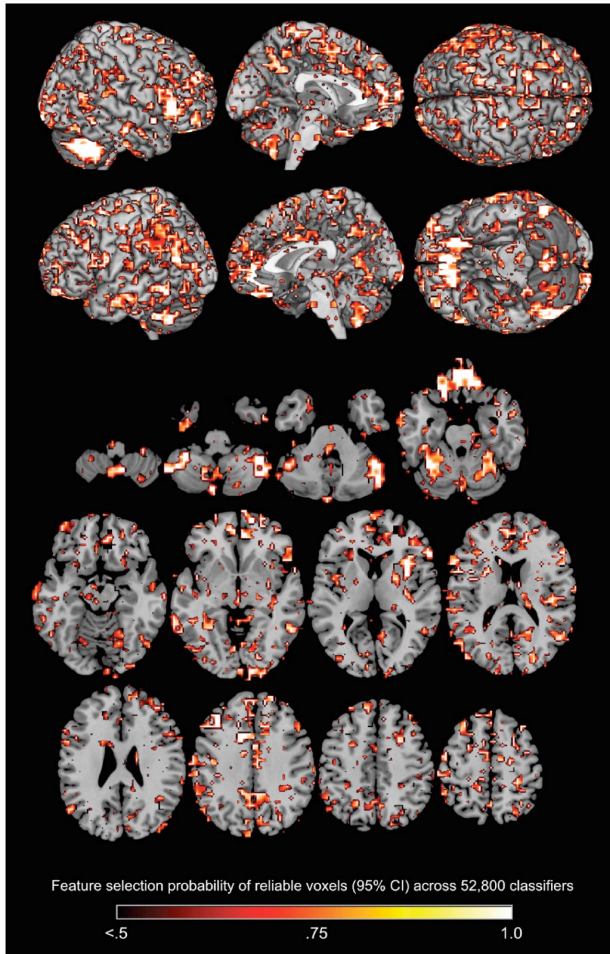
Example „Suicidal Behaviour"

Mean frequency of suicide attempts at age 15: 4-5%

Mean suicide rate at age 15: 0.004-0.005%

Steck et al. *Eur Child Adolesc Psychiatry* 2015; Kaess et al. *Eur Child Adolesc Psychiatry* 2021
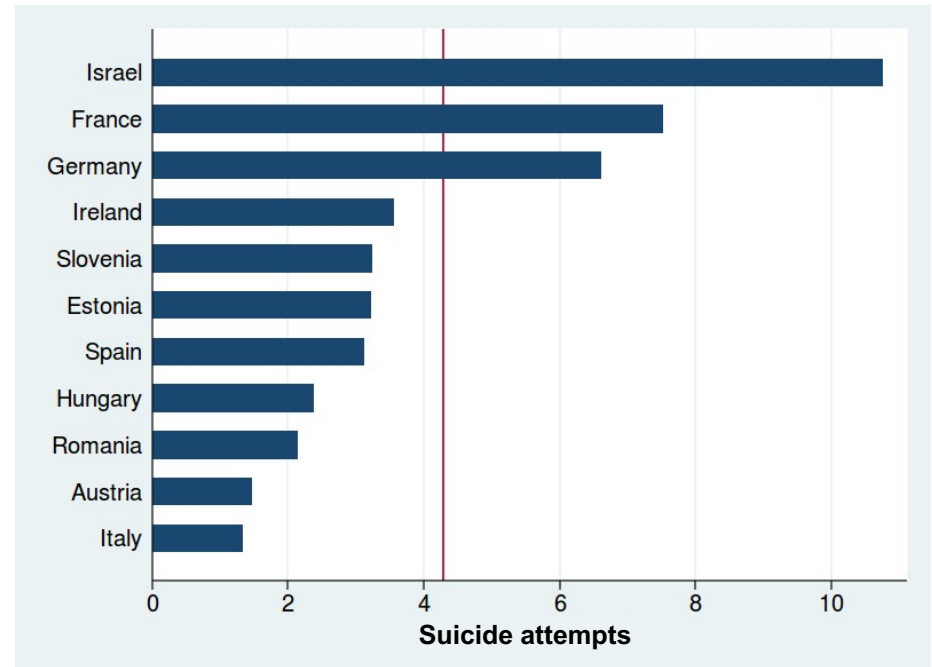
Data-Driven Suicide Prediction in Adult Veterans

Predictors: Socio-demographics, Army career, characteristics of the index visit, prior clinical factors, crime codes (victimization and perpetration), and contextual factors (e.g., unit-level characteristics, registered weapons).
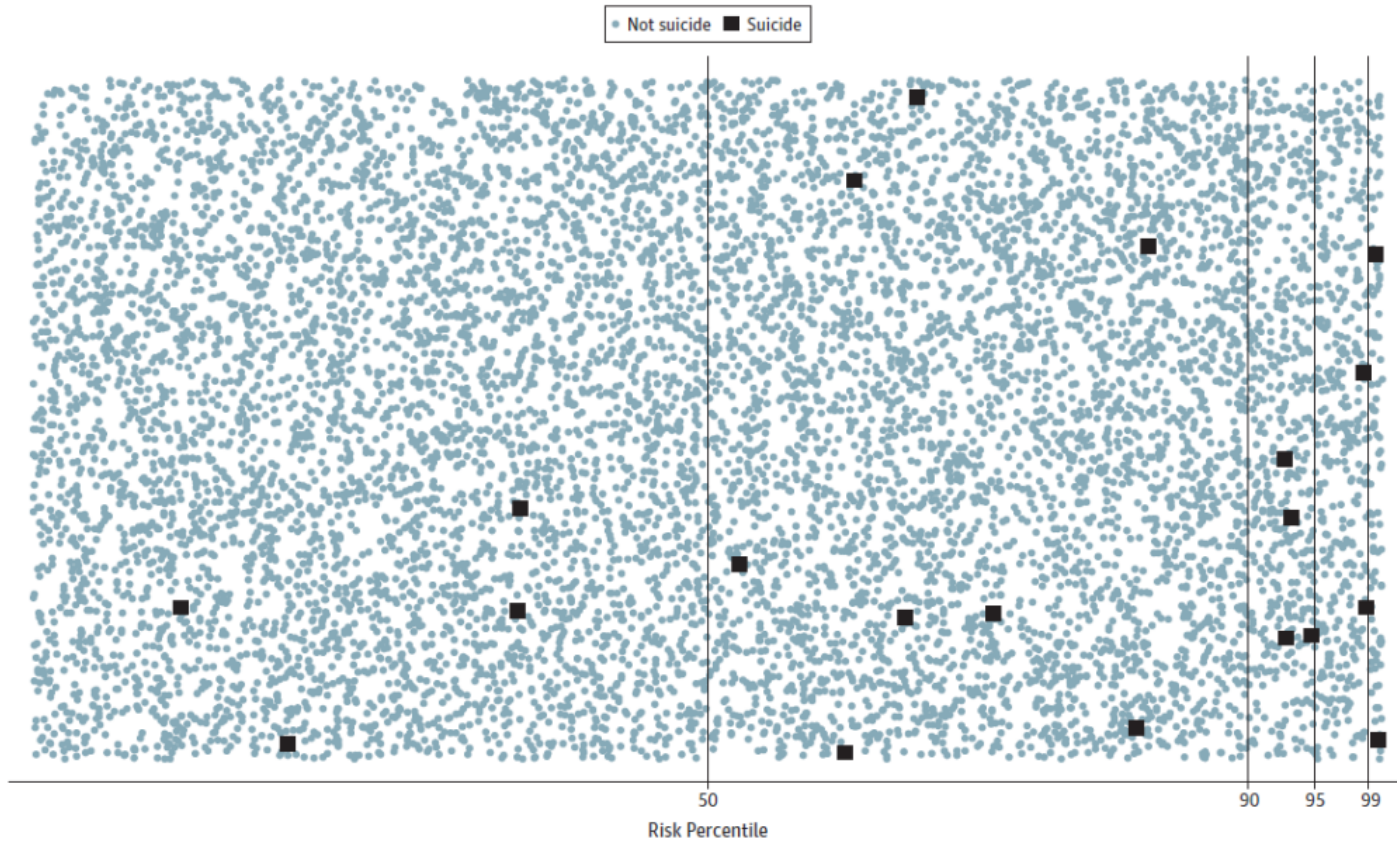

Kessler et al. *Molecular Psychiatry* 2017
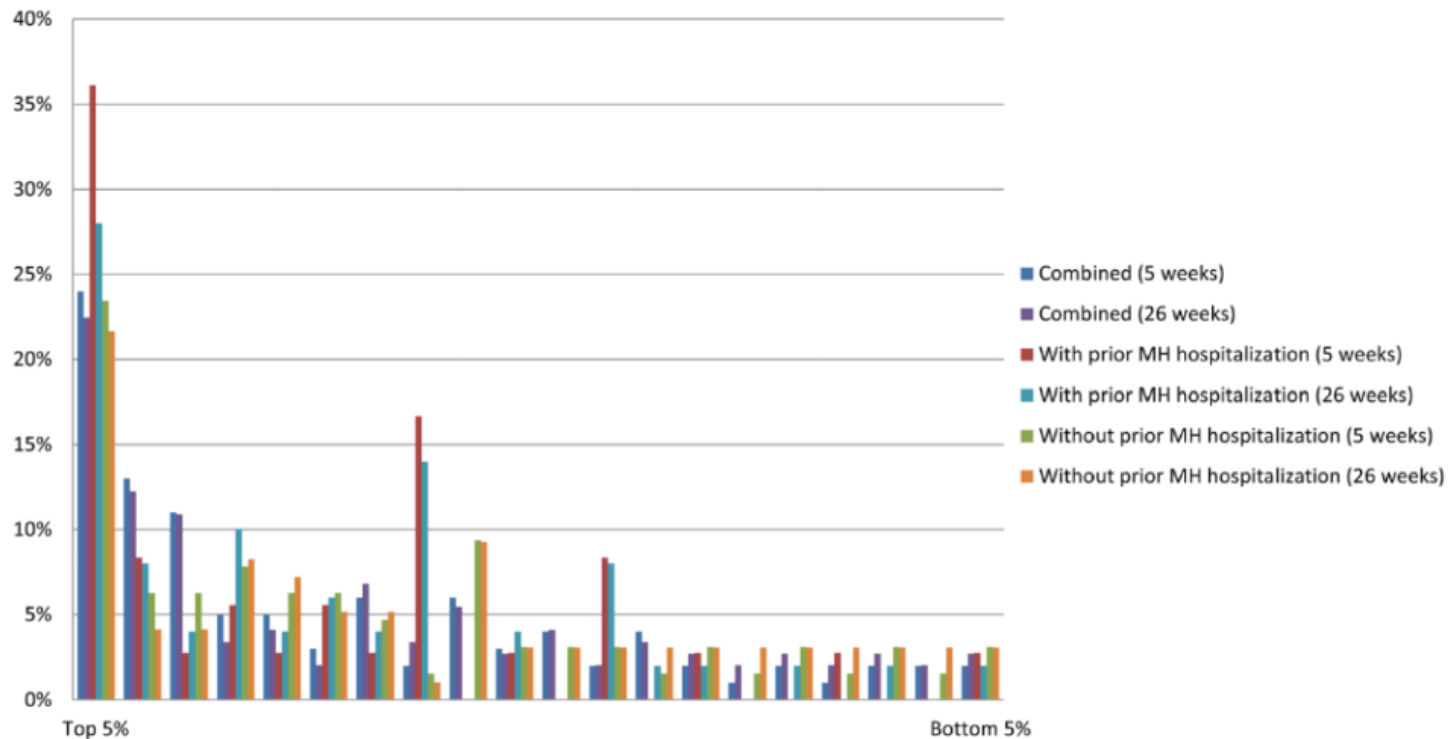
Prediction Models for Suicide Attempts and Deaths
A Systematic Review and Simulation

UNIVERSITÄRE
PSYCHIATRISCHE
DIENSTE BERN

Figure 2. Illustration of Implementing a Suicide Prediction Model

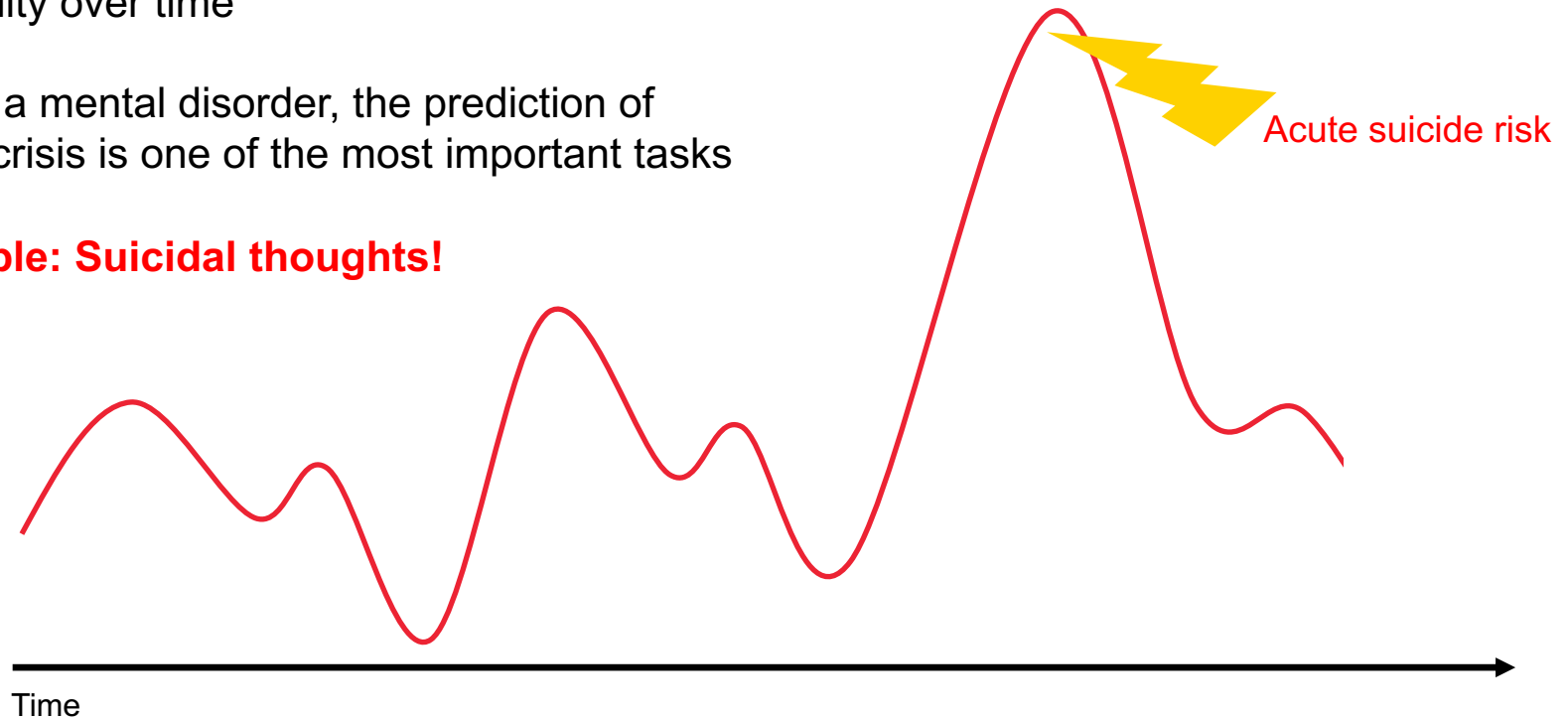
Legend: • Not suicide ■ Suicide

Risk Percentile

State Phenotypes in Mental Illness

Most psychiatric symptoms show remarkable instability over time

Within a mental disorder, the prediction of acute crisis is one of the most important tasks

Example: Suicidal thoughts!

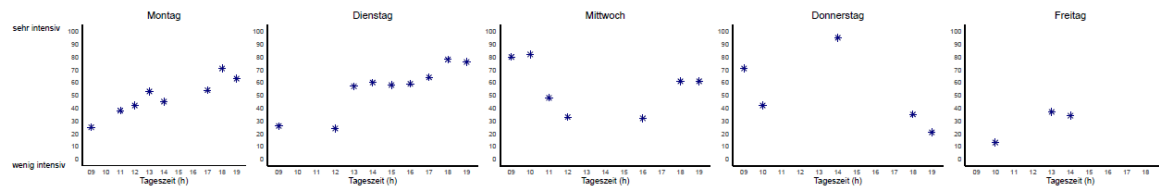Acute suicide risk

Time

Ecological Momentary Assessment of Affect and Suicidal Thoughts
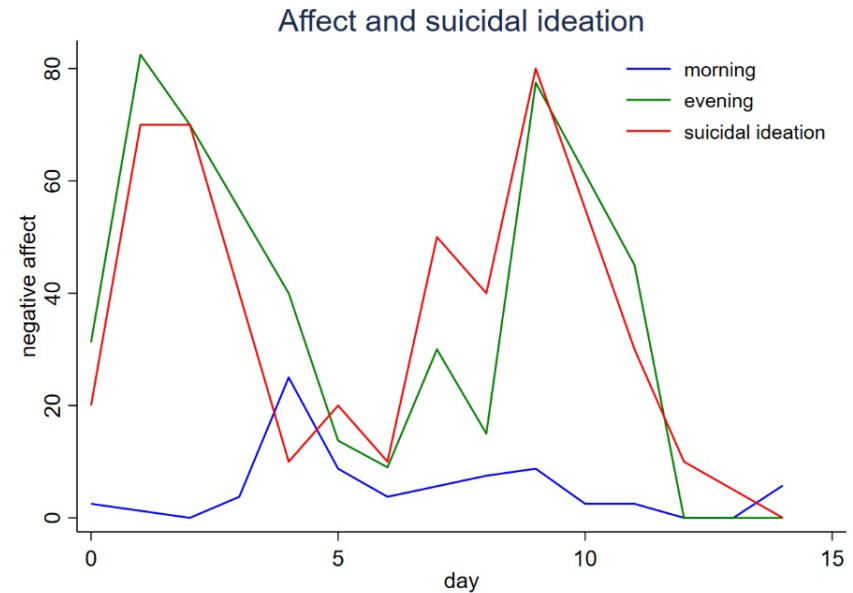

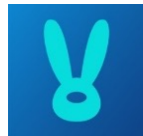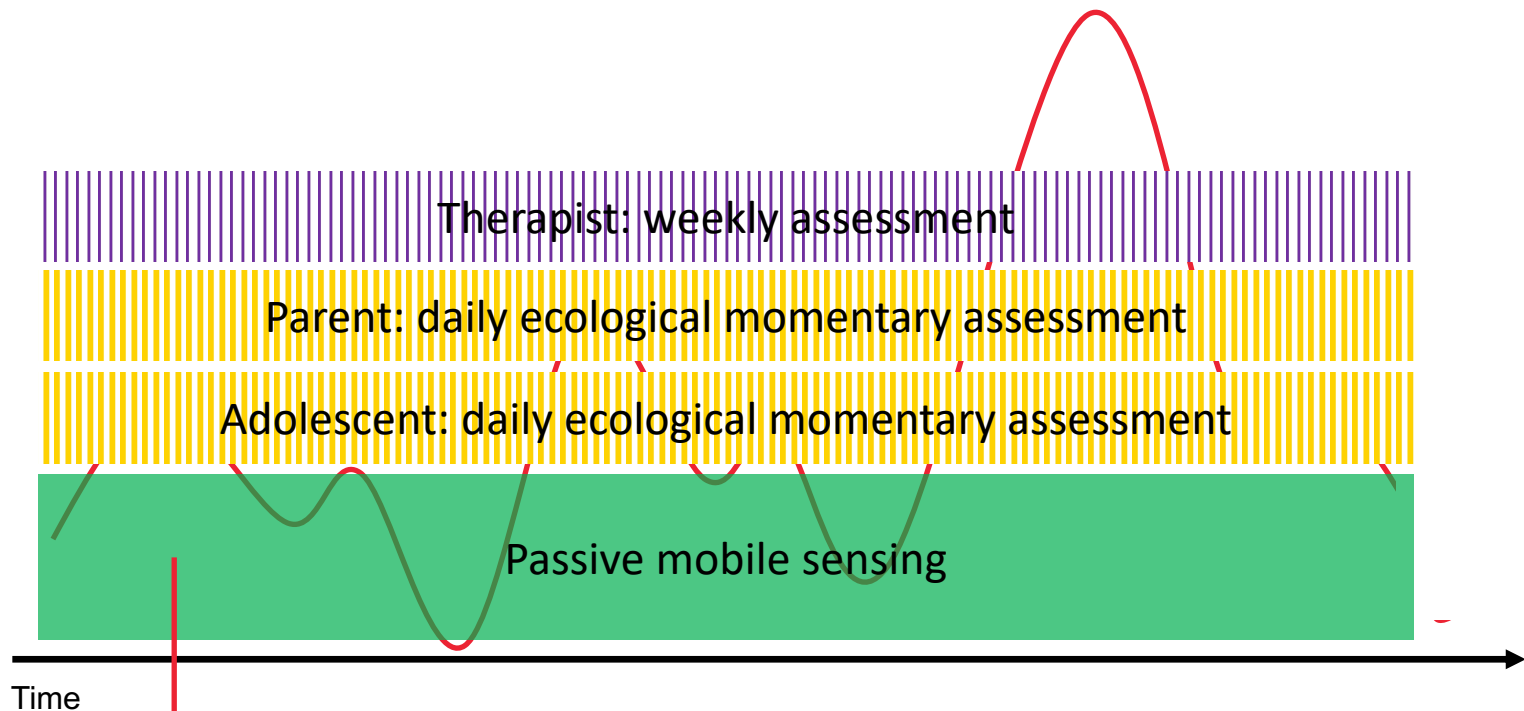Intensität von Suizidgedanken über den Tagesverlauf

Bemerkung:
Die Intensität der Suizidgedanken wurde nur beurteilt, wenn die Patientin/der Patient die Vorfrage:
"Hast du seit der letzten Befragung Suizidgedanken gehabt?" mit "JA" beantwortet hatte.

Strong intraindividual variability in both adolescents' affective and suicidal states!

SMART – Suicidality Monitoring in At-Risk Teens

Therapist: weekly assessment

Parent: daily ecological momentary assessment

Adolescent: daily ecological momentary assessment

Passive mobile sensing

Time

EARS: Effortless Assessment of Risk States
- Keyboard Logger
- Geolocation
- Phone Usage

Potential of Passive Mobile Sensing for Prevention and Intervention
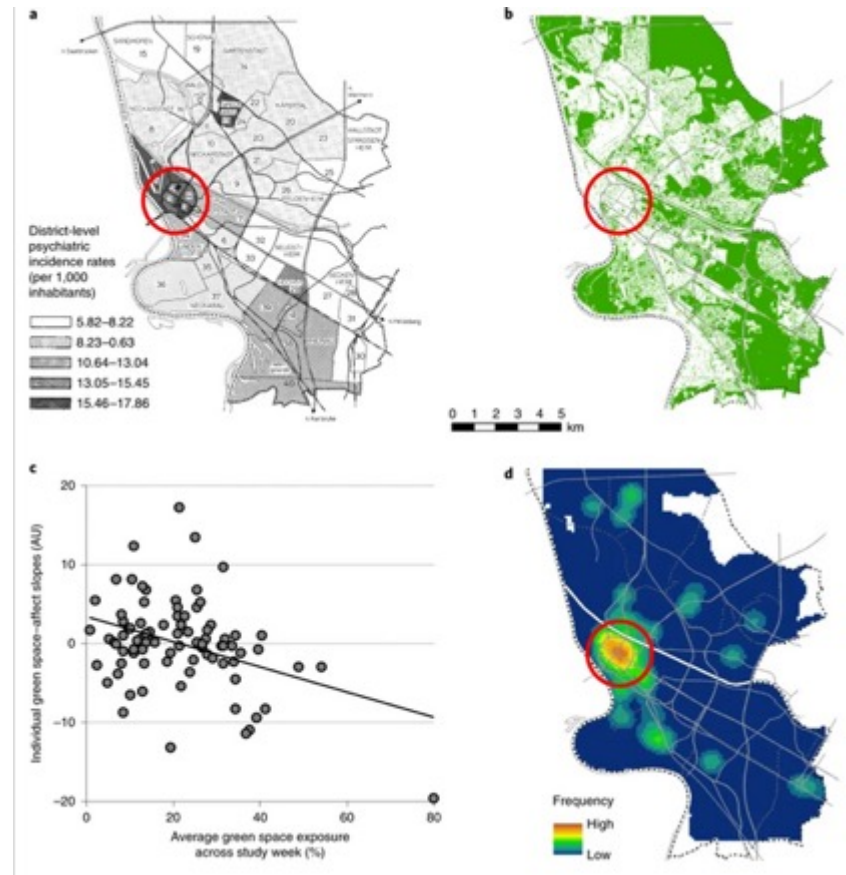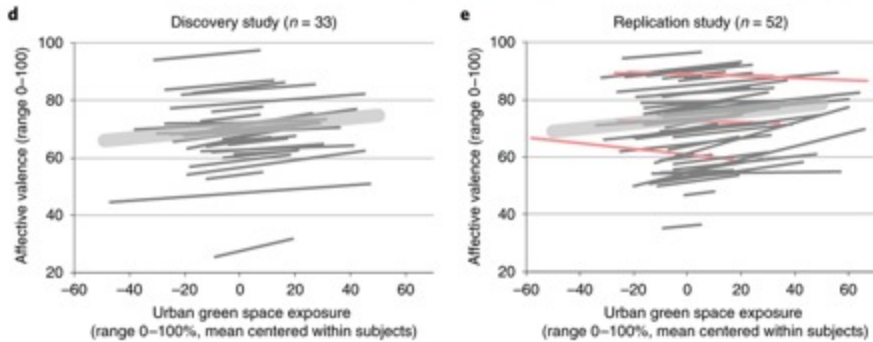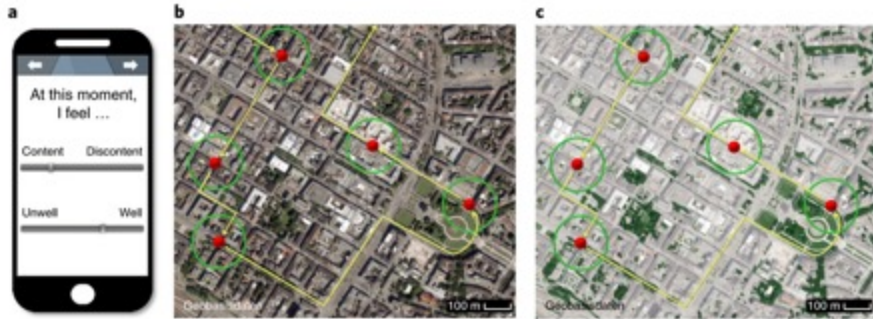
Thank you for Your Attention! Questions?

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