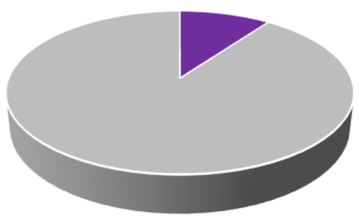
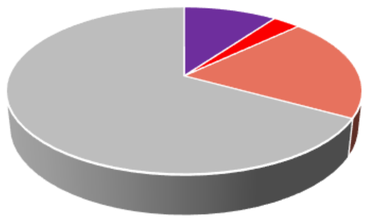
Genetics of Mental Illness

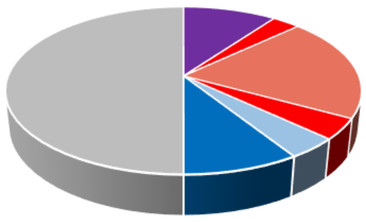
1.Risk factors:



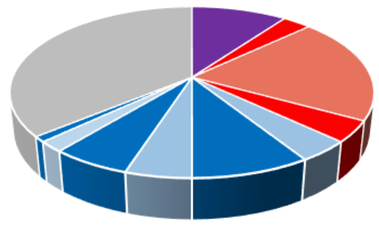
1. Everyone has some risk to develop a mental illness



2. Genetic factors add to the risk

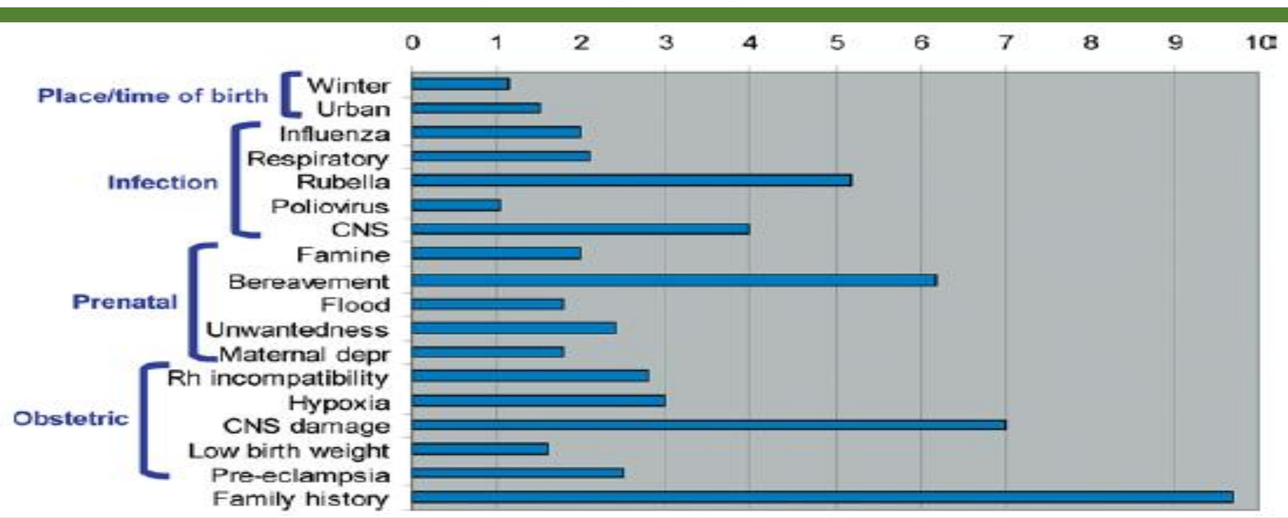


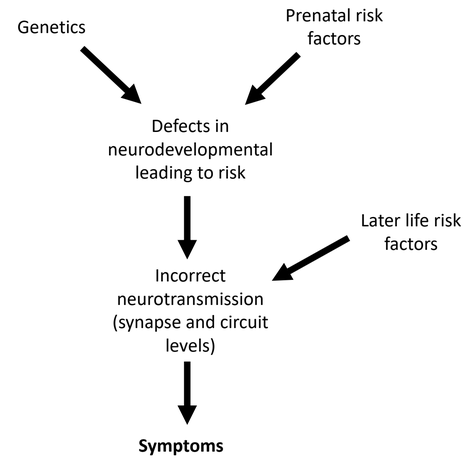
3. Environment adds to the risk



4. Events in life may affect the development of mental illness

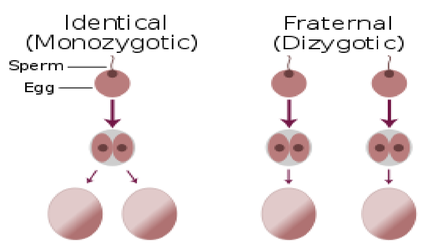
Mental illnesses are not simple diseases. No one gene can be considered a cause nor one environmental factors. Mental illnesses are polygenic and multifactorial diseases which means that many different environmental factors and many different genes together can cause the disease to manifest.





2. Genetics

Twin studies have opened many doors in discovering if genes have any connection with certain illnesses like essential hypertension, diabetes and mental disorders like schizophrenia, major depression or a manic disorder.



Wikipedia

In Scandinavia twin studies have been conducted to see how do mental illnesses occur among twins.

The resulting conclusion was that the if one of the twins is diagnosed with metal illness then the other twin is also.

The percentage of the diagnosis in one and another twin for schizophrenia and major depression can be seen in table 1.

Country	Sweden	Denmark
Number of twin pairs	15,493	31,524
Diagnosis	Major depression	Schizophrenia
Monozygotic	38%	79%
Dizygotic	12%	33%

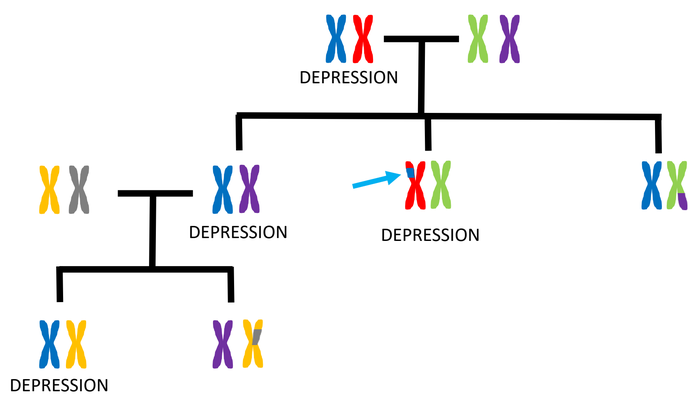
Kendler et al. 2006,

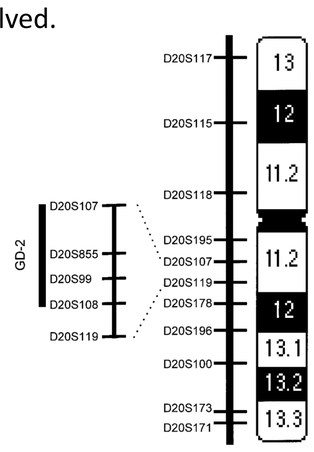
Hilker et al. 2017.

3. Identifying Risk Genes

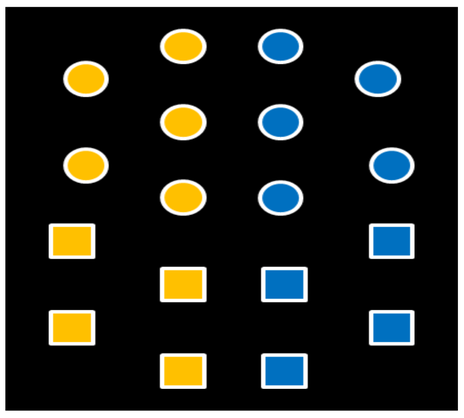
Regions of the genome involved in mental illness can be discovered by looking at families in which a particular illness is common.

A linkage analysis investigates whether the diagnosis segregates with chromosomal makers in the family – which suggests which genes, or groups of genes, are most likely to be involved.





After defining the genome region of interest the research continues with the association study.



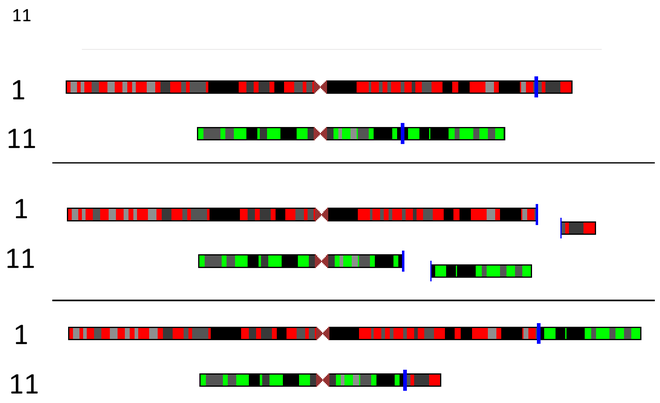
- Association analysis requires a large population of unrelated individuals
- Comparison of cases and controls
- Select a candidate gene or region of interest
- Genotype variants (SNPs/haplotypes) of genes of interest within this region

- Is one variant more common in cases than controls?

Different genetic approaches detect different types of risk factor

4. Disrupted in Schizophrenia (DISC1)

In 1970s a cytogenetic research in Scotland was conducted on boys who were in a juvenile prison. One boy had an unusual translocation between chromosome 1 and 11. Afterwards the linkage study of his family followed and what was discovered was that all the family members with the translocation suffer from one form of mental illness, schizophrenia specially.



Further analysis was performed on this translocation and after mapping of the break on chromosome 1 two new genes were identified and they were named Disrupted in Schizophreina 1 and Disrupted in Schizophrenia 2 (DISC1 and DISC2).

Jacobs et al 1970