

**ENVIRONMENTAL-RISK (E-RISK) LONGITUDINAL TWIN STUDY
CONCEPT PAPER FORM**

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Provisional Paper Title: In the eye of the beholder: perceptions of neighbourhood disorder and psychotic experiences in adolescence.

Date: 19/03/17

Objective of the study and its significance:

Background

Epidemiological research shows that young people living in urban neighbourhoods are more likely to have subclinical psychotic phenomena such as attenuated hallucinations, delusions and other unusual thoughts and experiences (Spauwen et al., 2006, Polanczyk et al., 2010, Newbury et al., 2016, Newbury et al., under review). Understanding why urban residence is linked to adolescent psychotic experiences is important to establish, because these early phenomena are associated with a significantly elevated adulthood risk for schizophrenia (Poulton et al., 2000, Fisher et al., 2013) and other serious mental health problems including substance abuse (Dhossche et al., 2002), depression (Dhossche et al., 2002), and suicidal behaviour (Fisher et al., 2013, Kelleher et al., 2012). With urban upbringing becoming increasingly pervasive in Western countries (Dye, 2008), identifying the link between urbanicity and early psychotic experiences is a growing public health concern.

Evidence from our own (Newbury et al., 2016, Newbury et al., under review) and others research (Allardyce et al., 2005, Kirkbride et al., 2014) suggests that neighbourhood-level adversity, such as crime and disorder, partly explains the association between urbanicity and subclinical and clinically-relevant psychosis outcomes. There is a growing consensus that these types of neighbourhood-level social exposures increase risk for early psychotic phenomena by elevating background and acute sources of social stress (Krabbendam and van Os, 2005, Heinz *et al.*, 2013, Lederbogen *et al.*, 2011, Selten *et al.*, 2013).

However, studies to date have often derived neighbourhood measures from census data assigned to broad geostatistical units. These types of neighbourhood measures have the advantage of being objective, but they do not establish the extent to which the neighbourhood social

characteristic(s) in question was personally experienced or perceived by the individuals under study. Given that neighbourhood-level social adversity is purported to increase risk for psychotic phenomena via a social stress pathway, and that delusions and hallucinations involve altered perceptions of reality, we might expect that *personal perceptions* of the neighbourhood (e.g., “my neighbourhood is dangerous”) would be intrinsic to the association between neighbourhood conditions and psychotic experiences. To date, only two studies have investigated the role of personal perceptions of neighbourhood disorder (“disorder” refers to social and physical signs of threat such as graffiti, vandalism, gang activity, muggings and burglaries) in adolescent mental health problems, with both demonstrating that personal perceptions of neighbourhood disorder were associated with mental health problems above and beyond objective crime rates (Polling et al., 2014, Goldman-Mellor et al., 2016). However, these cross-sectional studies were not able to investigate the direction of the association between perceptions of the neighbourhood and mental health problems; or control for potential compositional effects and other common sources of bias and confounding. Further, there is currently no research on the role of perceptions of neighbourhood disorder in relation to adolescent psychotic experiences.

Few datasets other than E-Risk have the depth and coverage to investigate the role of perceptions of neighbourhood adversity in psychotic phenomena whilst considering potential sources of bias and confounding such as compositional effects, biased recall due to earlier and contemporaneous thought, mood or substance problems, and gene-environment correlations.

Objectives

This paper has four main goals.

- 1) We will test whether adolescents living in urban neighbourhoods perceive their immediate neighbourhoods as more disordered; and whether urban (versus rural) neighbourhoods have higher rates of (objectively measured) violent crime.
- 2) We will evaluate the association between adolescents’ perceptions of their neighbourhood with psychotic experiences at age 18, and test whether perceptions of neighbourhood disorder are associated with adolescent psychotic experiences above and beyond official violent crime rates. We will also test whether the association between perceptions of neighbourhood disorder and adolescent psychotic experiences is explained by background family characteristics and contemporaneous mood and substance problems; and whether perceptions of neighbourhood disorder are specifically associated with adolescent psychotic experiences rather than depression or anxiety.
- 3) We will examine the directionality of the association between adolescent psychotic experiences and perceptions of neighbourhood disorder by 1) testing whether earlier childhood psychotic symptoms predict adolescent perceptions of neighbourhood disorder after considering childhood perceptions of neighbourhood safety, and 2) testing whether childhood perceptions of neighbourhood safety predict adolescent psychotic experiences after considering childhood psychotic symptoms.
- 4) We will investigate the contribution of genetic and environmental factors to adolescents’ perceptions of neighbourhood disorder using the classical twin design. We will estimate

the genetic and environmental sources of covariance between adolescent psychotic experiences and perceptions of neighbourhood disorder, using cross-twin cross-trait correlations and bivariate twin model fitting.

Significance

This paper will inform us on the importance of personal perceptions of neighbourhood disorder to psychotic experiences in adolescence. With a growing focus on adolescence as a potentially modifiable period for improving mental health trajectories, understanding the role of young people's personal perceptions of their surroundings in relation to early psychotic experiences could increase our understanding about the aetiology of these subclinical phenomena and lead to insights into potential intervention strategies. This paper will also estimate the genetic and environmental influences both on perceptions of neighbourhood disorder and on the correlation between personal perceptions of neighbourhood disorder and adolescent psychotic phenomena. Overlapping genetic contributions between neighbourhood appraisals and psychotic experiences could suggest that genetic risk for psychotic experiences also leads to greater sensitivity to neighbourhood adversity. In contrast, overlapping environmental contributions would be consistent with the argument that neighbourhood adversity promotes the development of psychotic phenomena by elevating background levels of social stress.

Statistical analyses:

Research questions and statistical analysis

- 1) Do adolescents living in urban (versus rural) neighbourhoods rate their neighbourhoods as having higher levels of neighbourhood disorder? Do urban (versus rural) neighbourhoods have higher objectively measured violent crime rates?
 - Test the bivariate associations between urbanicity at age 18 and participant-rated neighbourhood disorder at age 18 in a linear regression model.
 - Test the bivariate association between urbanicity at age 18 and official violent crime rates in a linear regression model.
- 2) Are perceptions of higher levels of neighbourhood disorder associated with a greater likelihood of reporting psychotic experiences?
 - Test the association between participants' perceptions of neighbourhood disorder and adolescent psychotic experiences in an ordinal logistic regression model.
 - The model will be adjusted for official crime rates to test whether perceptions of disorder are associated with psychotic experiences above and beyond objective levels of violent crime.
 - The model will also be adjusted for potential confounders including neighbourhood-level deprivation, family SES, family psychiatric history, maternal psychosis, and adolescent mood and substance problems at age 18, to test whether the association between neighbourhood perceptions and adolescent psychotic experiences is explained by poverty, compositional effects, or by biased reporting due to current mood or psychological state.

- The associations between neighbourhood perceptions and adolescent anxiety and depression will also be calculated to test specificity.

3) What is the directionality of the association adolescent psychotic experiences and perceptions of neighbourhood disorder?

- In a multivariate ordinal logistic regression model, we will test whether childhood perceptions of neighbourhood safety at age 12 are associated with adolescent psychotic experiences after controlling for childhood psychotic symptoms at age 12.
- In a multivariate linear regression model, we will test whether childhood psychotic symptoms are associated with adolescent perceptions of neighbourhood disorder after considering childhood perceptions of neighbourhood safety.
- The longitudinal design of this analysis will give an indication of whether psychotic phenomena influence perceptions of the neighbourhood; or conversely, whether perceptions of the neighbourhood influence psychotic phenomena.

[To obtain robust estimates, this analytic step could be repeated using a cross-lag model in Mplus.]

[Analyses in steps 1-3 will be adjusted for the non-independence of twin observations. Sensitivity analyses will also be conducted using the verified psychotic symptoms as the outcome measure.]

4) What are the genetic and environmental contributions to adolescents' perceptions of neighbourhood disorder? What are the genetic/environmental sources of covariance between adolescent psychotic experiences and adolescents' perceptions of neighbourhood disorder?

- Using the classical twin design, we will estimate the heritability of adolescents' perceptions of neighbourhood disorder by calculating pairwise correlations between MZ twin pair versus DZ twin pair neighbourhood ratings. The classical twin method attributes the similarity between reared-together twins to additive genetic (A) and shared environmental (C) factors, and the differences between them to nonshared environmental (E) factors. Therefore, a univariate model will be fitted to neighbourhood appraisals to decompose variation into A, C and E components.
- We will then decompose the ACE contributions to the shared variance between adolescent psychotic experiences and perceptions of neighbourhood disorder using a bivariate twin model.

[Structural equation model fitting and maximum-likelihood estimation in the OpenMx package in R will be used in both cases. Analyses will be restricted to the 85.0% (N=1742) of twin pairs who lived together at age 18. We will also repeat analyses in step 4, replacing perceptions of neighbourhood disorder with perceptions of social cohesion, to test whether the genetic and environmental sources of variance and covariance differ for perceptions of favourable (versus adverse) neighbourhood characteristics.]

Variables Needed at Which Ages (names and labels):

NB. highlighted in yellow are those which are not currently in the data dictionary

Study: E-Risk

- FAMILYID Unique family identifier
- ATWINID Twin A ID (ex chkdg)
- BTWINID Twin B ID (ex chkdg)
- RORDERP5 Random Twin Order
- RISKS Sample Groups
- COHORT Cohort
- SAMPSEX Sex of Twins: In sample
- ZYGOSITY Zygoty

Age 5

- SESWQ35 Social class composite
- IQ5E Elder twin IQ at age 5
- IQ5Y Younger twin IQ at age 5

Age 10

- nmove1510 Number of residence changes 5 to 10, LHC

Age 12

- ppsych01e12 Age-12 childhood psychotic symptoms (Elder)
- ppsych01y12 Age-12 childhood psychotic symptoms (Younger)
- str06ec12
- str06yc12 Self-perceived unsafe neighbourhood variable at age 12 for Elder and Younger twin as used in Amber Beckley's paper on victim-offender overlap, from the self-report stress scale
- p12cacor Neighbourhood deprivation
- ph12code_num ONS urbanicity (number code 1-10)
- ph12cat_num ONS urbanicity (categorical least to most urban)
- s2cohe SCOPIC 2 social cohesion
- s2ndsrd SCOPIC 2 disorder
- fhanypm12 Family psychiatric history
- ppsych12 Mother psychosis – symptom count
- lc5m12 N changes of address – since age 10

Age 18

- ppsych01e18 Age-18 adolescent psychotic symptoms - elder
- ppsych01y18 Age-18 adolescent psychotic symptoms – younger
- psyexpe18 Age-18 adolescent psychotic experiences scale – elder
- psyexpy18 Age-18 adolescent psychotic experiences scale – younger
- psyexpce18 Age-18 adolescent psychotic experiences category – elder
- psyexpcy18 Age-18 adolescent psychotic experiences category – younger
- dxmdee18 Major depressive episode, DSM4, Elder
- mdesxe18 MDE – Symptom scale, Elder
- dxgade18 Gen anxiety disorder, DSM4-based, Elder
- gadsxe18 GAD – Symptom scale, Elder
- dxalcdepe18 Alcohol dependent, DSM4-based, Elder
- dxmarje18 Marijuana dependent, DSM4-based, Elder
- violent2011 Monthly average violent crime in one mile radius for 2011
- violent2011_qrtl Monthly average violent crime in one mile radius for 2011 - quartile
- ← these two variables were constructed by Candice Odgers

- p18cacor Neighbourhood deprivation
- ph18code_num ONS urbanicity (number code 1-10)
- ph18cat_num ONS urbanicity (categorical least to most urban)
- ← these are currently being derived by Candice Odgers

- neighrhde1218 Neighbourhood address across phases 12 and 18 – Elder
- neighrhdy1218 Neighbourhood address across phases 12 and 18 - Younger
- twin18e18 Live with twin at age 18 – Elder
- twin18y18 Live with twin at age 18 – Younger

- p18endsrdr Disorder – full scale – Elder
- p18yndsdr Disorder – full scale – Younger
- nb13ae18 Disorder – litter, broken glass, rubbish in public places – Elder
- nb13ay18 Disorder – litter, broken glass, rubbish in public places – Younger
- nb13be18 Disorder – run down buildings, abandoned cars, etc. – Elder
- nb13by18 Disorder – run down buildings, abandoned cars, etc. – Younger
- nb13ce18 Disorder – people being drunk and unruly – Elder
- nb13cy18 Disorder – people being drunk and unruly – Younger
- nb13de18 Disorder – people selling or using drugs – Elder
- nb13dy18 Disorder – people selling or using drugs – Younger
- nb13ee18 Disorder – Young people hanging about – Elder
- nb13ey18 Disorder – Young people hanging about – Younger
- nb13fe18 Disorder – Homes broken into and burgled – Elder
- nb13fy18 Disorder – Homes broken into and burgled – Younger

- p18ecohe Cohesion – full scale - Elder
- p18ycohe Cohesion – full scale - Younger
- nb7e18 Cohesion – people are willing to help neighbours – Elder
- nb7y18 Cohesion – people are willing to help neighbours – Younger
- nb8e18 Cohesion – close knit community – Elder
- nb8y18 Cohesion – close knit community – Younger
- nb9e18 Cohesion – neighbours can be trusted – Elder
- nb9y18 Cohesion – neighbours can be trusted – Younger
- nb10e18 Cohesion – neighbours get on with each other – Elder
- nb10y18 Cohesion – neighbours get on with each other - Younger
- nb11e18 Cohesion – neighbours share values – Elder
- nb11y18 Cohesion – neighbours share values – Younger

- nb12e18 Dangerousness – safe place to live? – Elder
- nb12y18 Dangerousness – safe place to live? – Younger

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Data Security Agreement

Provisional Paper Title	In the eye of the beholder: perceptions of neighbourhood disorder and psychotic experiences in adolescence.
Proposing Author	Joanne Newbury
Today's Date	10/03/17

Please keep one copy for your records

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- JN I am current on Human Subjects Training (CITI (www.citiprogram.org) or training in human subject protection through my post or courses.
- JN My project is covered by Duke or King's IRB OR I have /will obtain IRB approval from my home institution.
- JN I will treat all data as "restricted" and store in a secure fashion.
- JN I will not share the data with anyone, including students or other collaborators not specifically listed on this concept paper.
- JN I will not post data online or submit the data file to a journal for them to post. Some journals are now requesting the data file as part of the manuscript submission process. The E-Risk Study cannot be shared because the Study Members have not given informed consent for unrestricted open access. Speak to Terrie or Avshalom for strategies for dealing with data sharing requests from Journals.
- JN Before submitting my paper to a journal, I will submit my draft manuscript and scripts for data checking, and my draft manuscript for co-author mock review, allowing three weeks.
- JN I will submit analysis scripts and new variable documentation to project data manager after manuscript gets accepted for publication.
- JN I will return all data files to the Data Manager after the project is complete. Collaborators and graduates of DPPP may not take a data file away from the DPPP office. The data remains the property of the Study and cannot be used for further analyses without express, written permission.
- JN I will ensure geographical location information, including postcodes or geographical coordinates for the E-Risk study member's homes or schools, is never combined or stored with any other E-Risk data (family or twin-level data)

Signature:



CONCEPT PAPER RESPONSE FORM

A. To be completed by the proposing author

Proposing Author:

✓ I have read the E-Risk data-sharing policy guidelines and agree to follow them

Provisional Paper Title: In the eye of the beholder: perceptions of neighbourhood disorder and psychotic experiences in adolescence.

Potential co-authors: Helen Fisher, Candice Odgers, Louise Arseneault, Terrie Moffitt, Avshalom Caspi, Helena Zavos, Jessie Baldwin.

Potential Journals: Journal of Child Psychology and Psychiatry

Intended Submission Date (month/year): 09/2017

Please keep one copy for your records and return one to Louise (louise.arseneault@kcl.ac.uk)

B. To be completed by potential co-authors:

Approved Not Approved Let's discuss, I have concerns

Comments:

Please check your contribution(s) for authorship:

- Conceptualizing and designing the longitudinal study
- Conceptualizing and collecting one or more variables
- Data collection
- Conceptualizing and designing this specific paper project
- Statistical analyses
- Writing
- Reviewing manuscript drafts
- Final approval before submission for publication
- Acknowledgment only, I will not be a co-author

Signature: