Supplementary Material

Sexual Orientation and Mental Health over the Life Course in a Birth Cohort.

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This material supplements, but does not replace, the peer-reviewed article*.*

Supplement:

Confounding factors

In order to examine the extent to which the associations between the latent class measure of sexual orientation and mental health/substance use outcomes may have been confounded by childhood/adolescent background and family factors, a series of potential confounding factors were drawn from the study database. A wide range of confounding factors were considered, spanning socio-economic, family and individual factors as well as family violence and child abuse (see Supplementary Table 3). The selection of potential confounding factors was guided by previous research on sexuality done with this cohort (Fergusson *et al.*, 1999, Fergusson *et al.*, 2005). Preliminary analysis identified 14 factors for inclusion as covariates. The 14 factors were:

*Sex*

Cohort members’ sex was recorded at birth. There were no known cases of changes in sex or gender identity amongst the CHDS cohort to age 35 years.

*Socio-economic status (birth)*

Family SES was assessed at the time of the survey child’s birth using the Elley-Irving scale of socio-economic status for New Zealand (Elley and Irving, 1976). Scale scores ranged from 1 (“Professional”) to 6 (“semi/unskilled labour”) based on the nature of the employment of the child’s parent (usually the father).

*Parental educational achievement*

Information about parental educational qualifications were collected at the time of birth of the cohort member. Parental education was assessed on a three point scale of: lacked educational qualifications, gained secondary (high school) qualifications, or gained tertiary qualifications. A dichotomous variable was created reflecting those whose mother and father lacked formal educational qualifications.

*Changes of Parents (0-15 years)*

Data concerning changes of parents were collected at annual intervals throughout childhood. Any change of parents from separation, divorce, parental death, remarriage and other change of parents, such as fostering, were included. The variable was constructed by counting the number of changes of parents from birth to age 15.

*Exposure to Childhood Sexual Abuse (0-16 years)*

Participants were retrospectively questioned about childhood sexual abuse (before age 16 years) at ages 18 and 21 (Fergusson *et al.*, 1996). Exposure to childhood sexual abuse experiences were measured by multiple questions that assessed whether the abuse was non-contact (e.g. indecent exposure, exposure to sexual images) or contact abuse. Contact sexual abuse was further classified into contact with the perpetrator (such as inappropriate touching, fondling) or attempted or completed oral, anal or vaginal intercourse. Participants were considered to have experienced contact sexual abuse if they reported it at age 18 or 21 years. Overall 11.6% of the cohort reported sexual abuse involving contact.

*Parental Intimate Partner Violence (0-16 years)*

At age 18, sample members were questioned concerning their experience of parental intimate partner violence during their childhood (prior to age 16 years). The questioning was based on a series of eight items derived from the Conflict Tactics Scale (CTS: Straus, 1979). The items were chosen on the basis that the behaviours could have been readily observed and reported on by the participant, and also to span the potential range of violent behaviour from verbal abuse to physical assault. Separate questioning was conducted for violence initiated by the father against the mother and for violence initiated by the mother against the father, and scale items were combined into a single scale score representing overall exposure across both parents (Fergusson and Horwood, 1998). The resulting scale had good reliability (α = 0.88).

*Conduct Problems, Internalising Symptoms and Attention Problems (ages 7-9)*

At ages 7, 8, and 9 years, information on child behaviour problems was obtained from parental and teacher report. Parental reports were obtained from an interview with the child’s mother using a behaviour questionnaire that combined items from the Rutter, Tizard, and Whitmore (1970) and Conners (1970) parental questionnaires. Parallel to the maternal report, the child’s class teacher was asked to complete a combined version of the Rutter et al. (1970) and Conners (1969) teacher questionnaires. Factor analysis of the item-level report data showed that it was possible to select items from these reports that formed uni-dimensional scales reflecting the extent of parent-reported and teacher reported conduct disordered behaviour, attention problems and anxious/withdrawn behaviour. For the purposes of the present analysis, the parent and teacher reports were summed and the resulting scores averaged over the three year period to produce scale score measures reflecting the extent of the child’s tendencies to conduct problems, anxious/withdrawn behaviour and attention problems at ages 7-9 (α = 0.93; 0.91; 0.97, Fergusson and Horwood, 1993).

*Neuroticism (age 14)*

Neuroticism was assessed at age 14 using the short form of the Eysenck Personality Inventory (Eysenck and Eysenck, 1964). The Cronbach’s Alpha coefficient for this scale was 0.89.

*Novelty seeking (age 16)*

When sample members were aged 16 years they were administered the novelty seeking items of the Tridimensional Personality Questionnaire (Cloninger, 1987). Thirty-one relevant items assess the extent to which the individual is "impulsive, exploratory, fickle, excitable, quick-tempered, extravagant and disorderly" (Cloninger, 1987; p. 575). These items were summed to produce an overall novelty seeking measure (α= 0.76).

*IQ (8-9 years)*

Intellectual ability was assessed at ages eight and nine using the Revised Wechsler Intelligence Scale for Children (WISC-R, Wechsler, 1974). The measure used in this analysis is the average of the total IQ score across the two assessments. The reliability of this scale, assessed by split half methods, was 0.93.

*GPA (11-13 years)*

School performance was assessed via teachers’ ratings in each of five areas of the curriculum (reading, handwriting, written expression, spelling, mathematics) using a 5-point scale ranging from very good to very poor. To provide a global measure of the child’s educational achievement over the interval from 11-13 years, the teacher ratings were summed across years and curriculum areas and then averaged to provide a teacher rating grade point average for each child.

*Self-esteem (age 15)*

Self-esteem was assessed at age 15 using the global measure from the Coopersmith Self Esteem Inventory (1981). The overall measure of self-esteem was generated by summing of the four subscale scores (general, academic, social, and home). The full scale score used in these analyses was found to be internally consistent (a = 0.87).

Supplement:

Derivation of the Latent Class Model of Sexuality

This supplement describes the process of model fitting used to derive the four-class model of sexuality analysed in the main paper and described in the supplementary tables.

Data reduction

Given the large number of observed measures of sexual identity, attraction, fantasy and same-sex behaviour available to the study and the relative sparseness in some response categories (see Supplementary Table 2), an initial data reduction was conducted to reduce the dimensionality of the data. Specifically:

1. The observed reports of sexual identity and attraction at ages 25, 30 and 35 were reduced from five categories to three by combining the categories of bisexual, mostly homosexual and homosexual onto one group.

2. The observed reports of same-sex experience and same-sex relationships were combined over all ages from age 18 to 35 to provide two summary measures of lifetime ever same-sex experience and lifetime ever same-sex relationship.

With these changes the resulting data set comprised a total of 12 measures: four measures of sexual identity (at ages 21, 25, 30 and 35) each with three response categories; three measures of same-sex attraction (at ages 25, 30 and 35) each with three response categories; three measures of sexual fantasy (at ages 25, 30 and 35) each with three response categories; and two dichotomous measures of lifetime same-sex experience and lifetime same-sex relationships.

Determining the number of classes

A series of latent class models were fitted to the observed response patterns on the measures of sexuality for a sample of 1040 participants who gave reports on measures of sexuality on at least two occasions from age 18-35 years. Model fitting was conducted using Mplus version 7.11 (Muthén and Muthén, 2013) using full information maximum likelihood estimation methods that were robust to missing data under the assumption that data were missing at random.

Initially two-class through five-class models were fitted to the data with participant sex fitted as a known class. These models permitted the probability of latent class membership to vary with participant sex, while at the same time constraining the response probabilities on the observed item data to be the same for males and females. The relative fit of the models was assessed using the Bayesian Information Criterion (BIC) supplemented by inspection of model parameters and model residuals. Values of BIC for the four models were respectively 7197 (two-class), 6784 (three-class), 6770 (four-class), 6787 (five-class). This analysis identified the four-class model as the preferred model on the basis that it had the lowest BIC. Further inspection suggested that both the model parameters and residuals were well-behaved for this model.

The four-class model was then compared against an alternative unconstrained model that permitted the item response probabilities to vary between males and females. Again comparison of the BIC for each model suggested that the constrained model provided a more parsimonious representation of the data than the unconstrained model (constrained model BIC=6770, unconstrained model BIC=7266).

On the basis of this analysis the four-class model with response probabilities constrained equal for males and females was selected as the preferred model.

Describing the properties of the best fitting model

Supplementary Table 4 shows the fitted model parameters for the final four-class model. Examination of the table shows that the four classes could be characterised in the following manner:

Class 1 (Heterosexual): This class comprised 82.0% of the sample (91.0% of males and 73.4% of females). Participants in this class were characterised by a response pattern reflecting exclusively heterosexual identity, attraction, fantasy and behaviour, with response probabilities for the exclusively heterosexual response options ranging from 0.975 to 1.00.

Class 2 (Mostly heterosexual): This class comprised 12.6% of the sample (5.7% of males 19.3% of females). The response probabilities for this class show a mixed pattern reflecting a predominantly heterosexual pattern of response on measures of identity, attraction and fantasy (response probabilities 0.629 to 0.966) but with a substantial minority of responses reflecting a mostly heterosexual or bisexual response pattern from age 25 onwards. Over half of this group reported lifetime same-sex experience (0.527) but only a minority reported a same-sex relationship (0.133).

Class 3 (Bisexual): This class comprised 3.5% of the sample (2.0% males and 4.9% of females). This group strongly endorsed mostly heterosexual identity (0.555 to 0.741); strong attraction to the opposite sex (0.639 to 0.792); and both sexes sexual fantasy (0.480 to 0.572). Nearly all reported a same-sex experience (0.928) and the majority a same-sex relationship (0.627).

Class 4 (Gay/lesbian): This class comprised 1.9% of the sample (1.4% of males and 2.5% of females). With the exception of sexual identity at age 21, this group consistently described their identity, attraction and fantasy as bisexual or homosexual (0.500 to 1.00). All of this group reported having engaged in a same-sex relationship.

Overall entropy for the final model was 0.96, indicating very strong discrimination of the latent classes.

Assignment to latent classes

To facilitate further analysis of the linkages between sexuality and mental health, participants were assigned to latent classes on the basis of the posterior probabilities of latent class membership conditional on the fitted model parameters. Participants were assigned to the class with the highest posterior probability of membership. The assigned membership probabilities varied only very slightly from the model prevalence estimates described above.

Supplement:

Sexual Fluidity

A limitation of the latent class analysis is that it does address the issue of fluidity or change in sexuality over time. Changes in the reporting of sexuality are reflected in the response probabilities of the latent class model rather than directly in the classification of latent class membership over time. Problems of data sparseness precluded in-depth analysis of sexual fluidity within the latent class framework. However, it was possible to conduct limited exploration of this issue using the observed report data on sexual identity, attraction and fantasy at ages 25, 30 and 35 to examine: (a) factors associated with fluidity in reports of sexuality; and (b) whether fluidity in reporting was related to experience of mental disorder. For the purposes of this analysis fluidity was defined as a two point shift of category in sexual identity or attraction, or a one point shift in sexual fantasy, between the assessments at ages 25 to 30 and 30 to 35.

Overall 12% of the sample were classified as giving fluid responses to sexuality questions and 76% of those giving fluid responses were female; 46% of those classified into sexual minority classes gave fluid responses compared to 4% in the heterosexual class. On logistic regression three factors were identified as significant (p<0.05) predictors of fluidity: sex, history of sexual abuse and maternal overprotection in childhood. Specifically women, those who had been exposed to more severe sexual abuse and those whose mothers adopted a more over-controlling parenting style were more likely to be fluid in their reporting of sexuality.

Supplementary Table 6 shows rates of mental health problems in each latent class cross-classified by fluidity of reporting. For the purposes of data display the bisexual and gay/lesbian classes have been combined to reduce problems of data sparseness. Examination of the table provides little evidence to suggest that fluidity was systematically related to the experience of mental health problems. Those who were fluid in their reporting had higher rates of some disorders at some time points and lower rates at other times. These observations were confirmed by extending the fitted regression models linking sexuality latent class to mental health outcomes to include fluidity, and test for statistical interactions with the fluidity measure. This analysis showed no evidence of statistically significant main effects for fluidity, or interactions of fluidity with time or sexuality latent class.

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Supplementary Table 1: Sexuality questions asked of CHDS participants between the ages of 18-35 years

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sexuality questions** | **Age asked** | | | | |
|  | **18** | **21** | **25** | **30** | **35** |
| **Sexual behaviour:** |  |  |  |  |  |
| *Have you ever had a sexual relationship with a partner of the same-sex?* |  |  |  |  |  |
| *Have you ever had any kind of sexual experience with a partner of the same-sex?* |  |  |  |  |  |
| **Sexual identity:** |  |  |  |  |  |
| *Which of the statements best describes your sexual preference?:* |  |  |  |  |  |
| 1. I am heterosexual and choose partners of the opposite sex |  |  |  |  |  |
| 2. I am homosexual (gay) and choose partners of the same-sex |  |  |  |  |  |
| 3. I am bisexual and may choose partners of either sex |  |  |  |  |  |
| *Which of the following best describes your feelings about your sexual orientation or identification at present?:* |  |  |  |  |  |
| 1. 100% heterosexual (attracted to persons of the opposite sex – straight) |  |  |  |  |  |
| 2.  Mostly heterosexual (straight) |  |  |  |  |  |
| 3. Bisexual (equally attracted to men and women) |  |  |  |  |  |
| 4. Mostly homosexual (gay/lesbian) |  |  |  |  |  |
| 5. 100% homosexual (gay/lesbian; attracted to persons of the same-sex) |  |  |  |  |  |
| 9.  Not sure |  |  |  |  |  |
| **Sexual attraction:** |  |  |  |  |  |
| *Which of the following best describes your sexual feelings at present?:* |  |  |  |  |  |
| 1. I am only attracted to people of the same-sex as me, and I will only be sexual with people of the same-sex as me |  |  |  |  |  |
| 2. I am strongly attracted to people of the same-sex as me, and most of my sexual experiences will be with persons of the same-sex as me |  |  |  |  |  |
| 3. I am equally attracted to men and women and would like to be sexual with both |  |  |  |  |  |
| 4. I am strongly attracted to people of the opposite sex, and most of my sexual experience will be with people of the opposite sex |  |  |  |  |  |
| 5. I am only attracted to people of the opposite sex, and I will only be sexual with people of the opposite sex |  |  |  |  |  |
| **Sexual fantasy:** |  |  |  |  |  |
| *When you think or daydream about sex, do you think about?:* |  |  |  |  |  |
| 1. Males only |  |  |  |  |  |
| 2. Females only |  |  |  |  |  |
| 3. Both males and females |  |  |  |  |  |

Supplementary Table 2: Distribution of observed responses and sample sizes for sexuality questions by age and sex

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Total** | | | | **Males** | | | | **Females** | | | |
|  | **Age asked % (n)** | | | | **Age asked % (n)** | | | | **Age asked % (n)** | | | |
|  | **21** | **25** | **30** | **35** | **21** | **25** | **30** | **35** | **21** | **25** | **30** | **35** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Sexual identity:** | (n=1011) |  |  |  | (n=496) |  |  |  | (n=515) |  |  |  |
| 1. Heterosexual | 98.0 (991) | na | na | na | 98.2 (487) | na | na | na | 97.9 (504) | na | na | na |
| 2. Homosexual | 0.3 (3) | na | na | na | 0.2 (1) | na | na | na | 0.4 (2) | na | na | na |
| 3. Bisexual | 1.7 (17) | na | na | na | 1.6 (8) | na | na | na | 1.8 (9) | na | na | na |
|  |  | (n=992) | (n=983) | (n=959) |  | (n=483) | (n=477) | (n=461) |  | (n=509) | (n=506) | (n=498) |
| 1. 100% heterosexual | na | 90.0 (889) | 90.2 (887) | 91.6 (878) | na | 93.8 (453) | 94.8 (452) | 94.1 (434) | na | 85.7 (436) | 86.0 (435) | 89.2 (444) |
| 2.  Mostly heterosexual | na | 8.4 (83) | 7.1 (70) | 6.2 (59) | na | 5.0 (24) | 3.6 (17) | 4.3 (20) | na | 11.6 (59) | 10.5 (53) | 7.8 (39) |
| 3. Bisexual | na | 0.8 (8) | 1.2 (12) | 0.8 (8) | na | 0.2 (1) | 0.6 (3) | 0.4 (2) | na | 1.4 (7) | 1.8 (9) | 1.2 (6) |
| 4. Mostly homosexual | na | 0.8 (8) | 0.4 (4) | 0.4 (4) | na | 0.8 (4) | 0.0 (0) | 0.0 (0) | na | 0.8 (4) | 0.8 (4) | 0.8 (4) |
| 5. 100% homosexual | na | 0.4 (4) | 1.0 (10) | 1.0 (10) | na | 0.2 (1) | 1.1 (5) | 1.1 (5) | na | 0.6 (3) | 1.0 (5) | 1.0 (5) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Sexual attraction:** |  | (n=997) | (n=985) | (n=960) |  | (n=485) | (n=478) | (n=462) |  | (n=512) | (n=507) | (n=498) |
| 1. Only to same-sex | na | 0.7 (7) | 0.9 (9) | 1.2 (11) | na | 0.4 (2) | 0.8 (4) | 1.1 (5) | na | 1.0 (5) | 1.0 (5) | 1.2 (6) |
| 2. Strongly to same-sex | na | 0.5 (5) | 0.3 (3) | 0.3 (3) | na | 0.6 (3) | 0.2 (1) | 0.2 (1) | na | 0.4 (2) | 0.4 (2) | 0.4 (2) |
| 3. Equally to men/women | na | 0.8 (8) | 1.3 (13) | 0.8 (8) | na | 0.2 (1) | 0.6 (3) | 0.2 (1) | na | 1.4 (7) | 2.0 (10) | 1.4 (7) |
| 4. Strongly to opposite sex | na | 8.5 (85) | 7.4 (73) | 5.7 (55) | na | 4.3 (21) | 3.8 (18) | 3.5 (16) | na | 12.5 (64) | 10.9 (55) | 7.8 (39) |
| 5. Only to opposite sex | na | 89.5 (892) | 90.1 (887) | 92.0 (883) | na | 94.4 (458) | 94.6 (452) | 95.0 (439) | na | 84.8 (434) | 85.8 (435) | 89.2 (444) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Sexual fantasy:** |  | (n=996) | (n=985) | (n=959) |  | (n=485) | (n=478) | (n=462) |  | (n=511) | (n=507) | (n=497) |
| 1. Opposite sex only | na | 91.0 (906) | 91.8 (904) | 91.5 (877) | na | 96.1 (466) | 96.4 (461) | 96.5 (446) | na | 86.1 (440) | 87.4 (443) | 86.7 (431) |
| 2. Both-sex | na | 7.2 (72) | 6.3 (62) | 7.0 (67) | na | 2.1 (10) | 2.1 (10) | 2.2 (10) | na | 12.1 (62) | 10.3 (52) | 11.5 (57) |
| 3. Same-sex only | na | 1.8 (18) | 1.9 (19) | 1.6 (15) | na | 1.9 (9) | 1.5 (7) | 1.3 (6) | na | 1.8 (9) | 2.4 (12) | 1.8 (9) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Sexual behaviour:** |  |  |  | (n=1040) |  |  |  | (n=511) |  |  |  | (n=529) |
| Ever reported a same-sex sexual experiencea | na | na | na | 14.3 (149) | na | na | na | 8.2 (42) | na | na | na | 20.2 (107) |
| Ever reported a same-sex sexual relationshipb | na | na | na | 5.7 (62) | na | na | na | 3.3 (17) | na | na | na | 8.5 (45) |

a asked at ages 25, 30 and 35

b asked at ages 18, 21, 25, 30 and 35

Supplementary Table 3: Sexuality group and covariate childhood variables

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | N | Heterosexual %/  Mean (SD) | Mostly Heterosexual %/  Mean (SD) | Bisexual  %/  Mean (SD) | Gay/lesbian %/  Mean (SD) | *p* |
| **Socio-economic status** |  |  |  |  |  |  |
| Low family socio-economic status at birth (%) | 1040 | 24.7 | 25.2 | 22.2 | 35.0 | **0.0423** |
| Father lacks formal educational qualifications (%) | 1007 | 49.6 | 38.7 | 36.1 | 42.1 | **0.0571** |
| Mother lacks formal educational qualifications (%) | 1040 | 50.5 | 46.6 | 41.7 | 45.0 | 0.6037 |
| **Family factors** |  |  |  |  |  |  |
| Changes of parents (to age 15) Mean (SD) | 1040 | 1.2 (2.3) | 1.0 (1.9) | 1.8 (3.1) | 3.1 (4.9) | **0.0011** |
| **Family violence and child abuse** |  |  |  |  |  |  |
| Any childhood sexual abuse (to age 16) (%) | 1037 | 10.1 | 31.3 | 33.3 | 45.0 | **<0.0001** |
| Parental intimate partner violence (to age 16) (% > Q3) | 1009 | 20.9 | 26.9 | 28.6 | 42.1 | **0.0526** |
| **Individual factors** |  |  |  |  |  |  |
| Attention problems (ages 7-9) Mean (SD) | 1007 | 20.2 (4.9) | 18.7 (4.4) | 20.2 (5.8) | 20.5 (6.4) | **0.0173** |
| Conduct problems (ages 7-9) Mean SD) | 1007 | 49.9 (7.7) | 48.5 (6.9) | 51.2 (8.5) | 52.8 (11.1) | **0.0519** |
| Neuroticism (age 14) Mean (SD) | 1040 | 14.1 (3.7) | 14.7 (3.8) | 15.1 (3.6) | 15.5 (3.2) | **0.0776** |
| Novelty seeking (age 16) Mean (SD) | 1040 | 18.1 (4.9) | 18.5 (4.8) | 20.3 (4.5) | 18.5 (4.7) | **0.0556** |
| IQ (ages 8-9) Mean (SD) | 1040 | 102.5 (14.2) | 106.2 (15.6) | 112.9 (15.7) | 100.7 (14.0) | **<0.0001** |
| GPA (ages 11-13) Mean (SD) | 1040 | 2.6 (0.8) | 2.3 (0.9) | 2.1 (0.8) | 2.5 (0.9) | **<0.0001** |
| Self-esteem (age 15) Mean (SD) | 1040 | 41.3 (5.8) | 40.2 (6.4) | 40.8 (5.4) | 38.9 (4.9) | **0.0688** |
| Internalising symptoms (ages 7-9) | 1007 | 26.0 (3.5) | 25.6 (3.4) | 27.1 (3.4) | 28.0 (4.9) | **0.0097** |

Supplementary Table 4: Fitted latent class model parameters (standard errors) for 4-class model

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Heterosexual** | **Mostly Heterosexual** | **Bisexual** | **Gay/lesbian** |
| **Probability of latent class membership** | 0.820 (0.012) | 0.126 (0.010) | 0.035 (0.006) | 0.019 (0.004) |
|  |  |  |  |  |
| **Response probabilities** |  |  |  |  |
| **Sexual identity (21 years)** |  |  |  |  |
| 1. Heterosexual | 1.000 (-)a | 0.966 (0.016) | 0.704 (0.097) | 0.741 (0.098) |
| 2. Bisexual | 0.000 (-)a | 0.034 (0.016) | 0.296 (0.097) | 0.111 (0.072) |
| 3. Homosexual | 0.000 (-)a | 0.000 (-)a | 0.000 (-)a | 0.148 (0.079) |
| **Sexual identity (25 years)b** |  |  |  |  |
| 1. 100% heterosexual | 0.994 (0.003) | 0.658 (0.058) | 0.030 (0.030) | 0.150 (0.080) |
| 2.  Mostly heterosexual | 0.006 (0.003) | 0.342 (0.058) | 0.853 (0.071) | 0.050 (0.049) |
| 3. Bisexual/homosexual | 0.000 (-)a | 0.000 (-)a | 0.117 (0.062) | 0.800 (0.089) |
| **Sexual attraction (25 years)b** |  |  |  |  |
| 1. Only to opposite sex | 0.995 (0.003) | 0.704 (0.050) | 0.094 (0.084) | 0.000 (-)a |
| 2. Strongly to opposite sex | 0.005 (0.003) | 0.261 (0.049) | 0.792 (0.087) | 0.105 (0.071) |
| 3. Equally to men and women  or to same-sex | 0.000 (-)a | 0.036 (0.016) | 0.114 (0.061) | 0.895 (0.071) |
| **Sexual fantasy (25 years)** |  |  |  |  |
| 1. Opposite sex only | 0.994 (0.003) | 0.736 (0.047) | 0.369 (0.111) | 0.000 (0.017) |
| 2. Both-sex | 0.006 (0.003) | 0.264 (0.047) | 0.572 (0.107) | 0.000 (0.017) |
| 3. Same-sex only | 0.000 (-)a | 0.000 (-)a | 0.059 (0.039) | 1.000 (-)a |
| **Sexual identity (30 years)b** |  |  |  |  |
| 1. 100% heterosexual | 0.997 (0.003) | 0.629 (0.057) | 0.000 (-)a | 0.200 (0.435) |
| 2.  Mostly heterosexual | 0.003 (0.003) | 0.371 (0.057) | 0.883 (0.056) | 0.000 (0.447) |
| 3. Bisexual/homosexual | 0.000 (-)a | 0.000 (-)a | 0.117 (0.056) | 0.800 (0.052) |
| **Sexual attraction (30 years)b** |  |  |  |  |
| 1. Only to opposite sex | 0.984 (0.005) | 0.733 (0.045) | 0.304 (0.093) | 0.200 (0.089) |
| 2. Strongly to opposite sex | 0.006 (0.004) | 0.267 (0.045) | 0.696 (0.093) | 0.300 (0.102) |
| 3. Equally to men and women  or to same-sex | 0.010 (0.004) | 0.000 (-)a | 0.000 (-)a | 0.500 (0.112) |
| **Sexual fantasy (30 years)** |  |  |  |  |
| 1. Opposite sex only | 0.994 (0.003) | 0.680 (0.051) | 0.145 (0.086) | 0.000 (-)a |
| 2. Both-sex | 0.006 (0.003) | 0.284 (0.051) | 0.741 (0.092) | 0.158 (0.084) |
| 3. Same-sex only | 0.000 (-)a | 0.036 (0.016) | 0.115 (0.061) | 0.842 (0.084) |
| **Sexual identity (35 years)b** |  |  |  |  |
| 1. 100% heterosexual | 0.984 (0.005) | 0.778 (0.040) | 0.445 (0.100) | 0.100 (0.067) |
| 2.  Mostly heterosexual | 0.007 (0.004) | 0.209 (0.040) | 0.555 (0.100) | 0.400 (0.110) |
| 3. Bisexual/homosexual | 0.009 (0.003) | 0.014 (0.011) | 0.000 (-)a | 0.500 (0.112) |
| **Sexual attraction (35 years)b** |  |  |  |  |
| 1. Only to opposite sex | 0.994 (0.003) | 0.785 (0.043) | 0.302 (0.109) | 0.000 (-)a |
| 2. Strongly to opposite sex | 0.006 (0.003) | 0.215 (0.043) | 0.639 (0.105) | 0.000 (-)a |
| 3. Equally to men and women or  to same-sex | 0.000 (-)a | 0.000 (-)a | 0.059 (0.042) | 1.000 (-)a |
| **Sexual fantasy (35 years)** |  |  |  |  |
| 1. Opposite sex only | 0.983 (0.005) | 0.756 (0.045) | 0.520 (0.105) | 0.000 (-)a |
| 2. Both-sex | 0.015 (0.005) | 0.236 (0.045) | 0.480 (0.105) | 0.400 (0.110) |
| 3. Same-sex only | 0.003 (0.002) | 0.008 (0.008) | 0.000 (-)a | 0.600 (0.110) |
| **Sexual behaviour** |  |  |  |  |
| Ever reported same-sex sexual experience c: |  |  |  |  |
| No | 0.975 (0.006) | 0.473 (0.049) | 0.072 (0.083) | 0.000 (-)a |
| Yes | 0.025 (0.006) | 0.527 (0.049) | 0.928 (0.083) | 1.000 (-)a |
| Ever reported same-sex sexual relationship d: |  |  |  |  |
| No | 1.000 (-)a | 0.867 (0.030) | 0.373 (0.126) | 0.000 (-)a |
| yes | 0.000 (-)a | 0.133 (0.030) | 0.627 (0.126) | 1.000 (-)a |

a Parameter converged to 0 or 1 during estimation, standard errors are not estimable

b For the purpose of latent class analysis the measures of sexual identity and sexual attraction at ages 25, 30 and 35 years were reduced to three levels as shown above in order to minimise difficulties due to data sparseness in the response patterns

c asked at ages 25, 30 and 35

d asked at ages 18, 21, 25, 30 and 35

Supplementary Table 5: Rates of mental health and substance use disorders 21-35 years by

sex and sexuality group

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Heterosexual % (n) | Mostly Heterosexual % (n) | Bisexual % (n) | Gay/lesbian% (n) |
| **Major depression** |  |  |  |  |
| 18-21 years | 20.5 (170) | 37.5 (48) | 35.3 (12) | 40.0 (8) |
| Males | 16.0 (72) | 13.8 (4) | 30.0 (3) | 28.6 (2) |
| Females | 25.9 (98) | 44.4 (44) | 37.5 (9) | 46.2 (6) |
|  |  |  |  |  |
| 21-25 years | 17.2 (141) | 38.5 (50) | 52.9 (18) | 40.0 (8) |
| Males | 13.8 (61) | 27.6 (8) | 70.0 (7) | 42.9 (3) |
| Females | 21.2 (80) | 41.6 (42) | 45.8 (11) | 38.5 (5) |
|  |  |  |  |  |
| 25-30 years | 18.5 (149) | 28.1 (36) | 45.7 (16) | 40.0 (8) |
| Males | 16.4 (71) | 17.2 (5) | 50.0 (5) | 42.9 (3) |
| Females | 21.0 (78) | 31.3 (31) | 44.0 (11) | 38.5 (5) |
|  |  |  |  |  |
| 30-35 years | 16.0 (126) | 28.7 (35) | 38.2 (13) | 25.0 (5) |
| Males | 12.2 (51) | 35.7 (10) | 40.0 (4) | 0 (0) |
| Females | 20.4 (75) | 26.6 (25) | 37.5 (9) | 38.5 (5) |
| **Anxiety** |  |  |  |  |
| 18-21 years | 11.3 (94) | 19.5 (25) | 17.7 (6) | 25.0 (5) |
| Males | 6.9 (31) | 10.3 (3) | 10.0 (1) | 42.9 (3) |
| Females | 16.6 (63) | 22.2 (22) | 20.8 (5) | 15.4 (2) |
|  |  |  |  |  |
| 21-25 years | 12.0 (98) | 26.9 (35) | 35.3 (12) | 40.0 (8) |
| Males | 7.5 (33) | 20.7 (6) | 30.0 (3) | 42.9 (3) |
| Females | 17.2 (65) | 28.7 (29) | 37.5 (9) | 38.5 (5) |
|  |  |  |  |  |
| 25-30 years | 14.9 (120) | 25.8 (33) | 25.7 (9) | 40.0 (8) |
| Males | 11.6 (50) | 13.8 (4) | 20.0 (2) | 42.9 (3) |
| Females | 18.8 (70) | 29.3 929) | 28.0 (7) | 38.5 (5) |
|  |  |  |  |  |
| 30-35 years | 13.0 (102) | 22.1 (27) | 26.5 (9) | 40.0 (8) |
| Males | 10.5 (44) | 21.4 (6) | 30.0 (3) | 28.6 (2) |
| Females | 15.8 (58) | 22.3 (21) | 25.0 (6) | 46.2 (6) |
| **Suicidal ideation** |  |  |  |  |
| 18-21 years | 7.1 (59) | 10.9 (14) | 23.5 (8) | 25.0 (5) |
| Males | 6.4 (29) | 3.5 (1) | 30.0 (3) | 28.6 (2) |
| Females | 7.9 (30) | 13.1 (13) | 20.8 (5) | 23.1 (3) |
|  |  |  |  |  |
| 21-25 years | 4.3 (35) | 8.5 (11) | 23.5 (8) | 15.0 (3) |
| Males | 4.5 (20) | 6.9 (2) | 30.0 (3) | 28.6 (2) |
| Females | 4.0 (15) | 8.9 (9) | 20.8 (5) | 7.7 (1) |
|  |  |  |  |  |
| 25-30 years | 3.0 (24) | 7.0 (9) | 14.3 (5) | 15.0 (3) |
| Males | 3.2 (14) | 0 (0) | 20.0 (2) | 28.6 (2) |
| Females | 2.7 (10) | 9.1 (9) | 12.0 (3) | 7.7 (1) |
|  |  |  |  |  |
| 30-35 years | 1.5 (12) | 1.6 (2) | 14.7 (5) | 10.0 (2) |
| Males | 1.9 (8) | 3.6 (1) | 10.0 (1) | 0 (0) |
| Females | 1.1 (4) | 1.1 (1) | 16.7 (4) | 15.4 (2) |
| **Nicotine dependence** |  |  |  |  |
| 18-21 years | 24.0 (199) | 22.7 (29) | 50.0 (17) | 15.0 (3) |
| Males | 24.9 (112) | 13.8 (4) | 40.0 (10) | 14.3 (1) |
| Females | 23.0 (87) | 25.3 (25) | 54.2 (13) | 15.4 (2) |
|  |  |  |  |  |
| 21-25 years | 23.0 (188) | 19.2 (25) | 35.3 (12) | 30.0 (6) |
| Males | 26.5 (117) | 13.8 (4) | 30.0 (3) | 28.6 (2) |
| Females | 18.8 (71) | 20.8 (21) | 37.5 (9) | 30.8 (4) |
|  |  |  |  |  |
| 25-30 years | 22.0 (177) | 18.0 (23) | 25.7 (9) | 20.0 (4) |
| Males | 25.9 (112) | 10.3 (3) | 30.0 (3) | 28.6 (2) |
| Females | 17.5 (65) | 20.2 (20) | 24.0 (6) | 15.4 (2) |
|  |  |  |  |  |
| 30-35 years | 15.9 (125) | 17.2 (21) | 23.5 (8) | 10.0 (2) |
| Males | 18.2 (76) | 10.7 (3) | 20.0 (2) | 14.3 (1) |
| Females | 13.3 (49) | 19.2 (18) | 25.0 (6) | 7.7 (1) |
| **Alcohol abuse** |  |  |  |  |
| 18-21 years | 28.5 (236) | 33.6 (43) | 26.5 (9) | 10.0 (2) |
| Males | 38.2 (172) | 37.9 (11) | 40.0 (4) | 14.3 (1) |
| Females | 16.9 (64) | 32.3 (32) | 20.8 (5) | 7.7 (1) |
|  |  |  |  |  |
| 21-25 years | 21.1 (173) | 26.9 (35) | 26.5 (9) | 10.0 (2) |
| Males | 28.3 (125) | 20.7 (6) | 50.0 (5) | 28.6 (2) |
| Females | 12.7 (48) | 28.7 929) | 16.7 (4) | 0 (0) |
|  |  |  |  |  |
| 25-30 years | 13.6 (109) | 15.6 (20) | 14.3 (5) | 10.0 (2) |
| Males | 19.2 (83) | 17.3 (5) | 20.0 (2) | 14.3 (1) |
| Females | 7.0 (26) | 15.2 (15) | 12.0 (3) | 7.7 (1) |
|  |  |  |  |  |
| 30-35 years | 14.6 (115) | 16.4 (20) | 14.7 (5) | 10.0 (2) |
| Males | 20.6 (86) | 28.6 (8) | 40.0 (4) | 0 (0) |
| Females | 7.9 (29) | 12.8 (12) | 4.2 (1) | 15.4 (2) |
| **Cannabis abuse** |  |  |  |  |
| 18-21 years | 7.7 (64) | 9.4 (12) | 8.8 (3) | 5.0 (1) |
| Males | 11.1 (50) | 10.3 (3) | 10.0 (1) | 0 (0) |
| Females | 3.7 (14) | 9.1 (9) | 8.3 (2) | 7.7 (1) |
|  |  |  |  |  |
| 21-25 years | 12.5 (102) | 13.9 (18) | 23.5 (8) | 20.0 (4) |
| Males | 21.0 (93) | 20.7 (6) | 40.0 (4) | 42.9 (3) |
| Females | 2.4 (9) | 11.9 (12) | 16.7 (4) | 7.7 (1) |
|  |  |  |  |  |
| 25-30 years | 5.6 (45) | 10.9 (14) | 17.1 (6) | 5.0 (1) |
| Males | 8.8 (38) | 13.8 (4) | 30.0 (3) | 14.3 (1) |
| Females | 1.9 (7) | 10.1 (10) | 12.0 (3) | 0 (0) |
|  |  |  |  |  |
| 30-35 years | 6.1 (48) | 9.0 (11) | 8.8 (3) | 5.0 (1) |
| Males | 9.6 (40) | 21.4 (6) | 20.0 (2) | 0 (0) |
| Females | 2.2 (8) | 5.3 (5) | 4.2 (1) | 7.7 (1) |
|  |  |  |  |  |
| **All disorders** | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| 18-21 years | 0.99 (1.16) | 1.34 (1.34) | 1.62 (1.58) | 1.20 (1.47) |
| Males | 1.04 (1.14) | 0.90 (1.01) | 1.60 (1.17) | 1.29 (1.89) |
| Females | 0.94 (1.18) | 1.46 (1.39) | 1.63 (1.74) | 1.15 (1.28) |
|  |  |  |  |  |
| 21-25 years | 0.90 (1.13) | 1.34 (1.30) | 1.97 (1.64) | 1.55 (1.82) |
| Males | 1.02 (1.20) | 1.10 (1.47) | 2.50 (1.51) | 2.14 (2.73) |
| Females | 0.76 (1.02) | 1.41 (1.24) | 1.75 (1.67) | 1.23 (1.09) |
|  |  |  |  |  |
| 25-30 years | 0.78 (1.02) | 1.02 (1.12) | 1.43 (1.24) | 1.30 (1.56) |
| Males | 0.85 (1.06) | 0.72 (0.96) | 1.70 (1.06) | 1.71 (2.21) |
| Females | 0.69 (0.95) | 1.15 (1.15) | 1.32 (1.31) | 1.08 (1.12) |
|  |  |  |  |  |
| 30-35 years | 0.67 (0.97) | 0.95 (1.09) | 1.26 (1.19) | 1.00 (1.26) |
| Males | 0.73 (1.06) | 1.21 (1.23) | 1.60 (1.26) | 0.43 (0.79) |
| Females | 0.61 (0.86) | 0.87 (1.04) | 1.13 (1.15) | 1.31 (1.38) |
| **Sample sizes** |  |  |  |  |
| 18-21 years | 829 | 128 | 34 | 20 |
| Males | 450 | 29 | 10 | 7 |
| Females | 379 | 99 | 24 | 13 |
|  |  |  |  |  |
| 21-25 years | 819 | 130 | 34 | 20 |
| Males | 442 | 29 | 10 | 7 |
| Females | 377 | 101 | 24 | 13 |
|  |  |  |  |  |
| 25-30 years | 804 | 128 | 35 | 20 |
| Males | 432 | 29 | 10 | 7 |
| Females | 372 | 99 | 25 | 13 |
|  |  |  |  |  |
| 30-35 years | 786 | 122 | 34 | 20 |
| Males | 418 | 28 | 10 | 7 |
| Females | 368 | 94 | 24 | 13 |

Supplementary Table 6: Rates of mental disorder and substance abuse in fluid and

non fluid sexuality groups at ages 25-35.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Heterosexual (n=853) | Mostly heterosexual (n=131) | Bisexual/gay/  lesbian (n=56) |
|  | % (n) | % (n) | % (n) |
| Major depression | |  |  |
| 21-25 years (n=217/1003) | |  |  |
| Stable | 17.6 (137/778) | 31.5 (23/73) | 42.3 (11/26) |
| Fluid | 9.8 (4/41) | 47.4 (27/57) | 53.6 (15/28) |
| 25-30 years (n=209/987) | |  |  |
| Stable | 19.0 (145/763) | 31.0 (22/71) | 44.4 (12/27) |
| Fluid | 9.8 (4/41) | 24.6 (14/57) | 42.9 (12/28) |
| 30-35 years (n=179/962) | |  |  |
| Stable | 15.8 (118/746) | 30.9 (21/68) | 30.8 (8/26) |
| Fluid | 20.0 (8/40) | 25.9 (14/54) | 35.7 (10/28) |
|  |  |  |  |
| Anxiety |  |  |  |
| 21-25 years (n=153/1003) | |  |  |
| Stable | 11.7 (91/778) | 24.7 (18/73) | 34.6 (9/26) |
| Fluid | 17.1 (7/47) | 29.8 (17/57) | 39.3 (11/28) |
| 25-30 years (n=170/987) | |  |  |
| Stable | 14.9 (114/763) | 25.4 (18/71) | 33.3 (9/27) |
| Fluid | 14.6 (6/41) | 26.3 (15/57) | 28.6 (8/28) |
| 30-35 years (n=146/962) | |  |  |
| Stable | 12.7 (95/746) | 25.0 (17/68) | 19.2 (5/26) |
| Fluid | 17.5 (7/40) | 18.5 (10/54) | 42.9 (12/28) |
|  |  |  |  |
| Suicidal ideation | |  |  |
| 21-25 years (n=57/1003) | |  |  |
| Stable | 4.4 (34/778) | 6.9 (5/73) | 15.4 (4/26) |
| Fluid | 2.4 (1/41) | 10.5 (6/57) | 25.0 (7/28) |
| 25-30 years (n=41/987) | |  |  |
| Stable | 2.9 (22/741) | 7.0 (5/71) | 18.5 (5/27) |
| Fluid | 4.9 (2/41) | 7.0 (4/57) | 10.7 (3/28) |
| 30-35 years (n=21/962) | |  |  |
| Stable | 1.5 (11/746) | 1.5 (1/68) | 7.7 (2/26) |
| Fluid | 2.5 (1/40) | 1.9 (1/54) | 17.9 (5/28) |
|  |  |  |  |
| Nicotine dependence | |  |  |
| 21-25 years (n=231/1003) | |  |  |
| Stable | 22.6 (176/778) | 17.8 (13/73) | 34.6 (9/26) |
| Fluid | 29.3 (12/41) | 21.1 (12/57) | 32.1 (9/28) |
| 25-30 years (n=213/987) | |  |  |
| Stable | 21.6 (165/763) | 18.6 (13/71) | 25.9 (7/27) |
| Fluid | 29.3 (12/41) | 17.5 (10/57) | 21.4 (6/28) |
| 30-35 years (n=156/962) | |  |  |
| Stable | 15.6 (116/746) | 17.7 (12/68) | 19.2 (5/26) |
| Fluid | 22.5 (9/40) | 16.7 (9/54) | 17.9 (5/28) |
|  |  |  |  |
| Alcohol abuse |  |  |  |
| 21-25 years (n=219/1003) | |  |  |
| Stable | 21.5 (167/778) | 31.5 (23/73) | 23.1 (6/26) |
| Fluid | 14.6 (6/41) | 21.1 (12/57) | 17.9 (5/28) |
| 25-30 years (n=136/987) | |  |  |
| Stable | 13.5 (103/763) | 18.3 (13/71) | 14.8 (4/27) |
| Fluid | 14.6 (6/41) | 12.3 (7/57) | 10.7 (3/28) |
| 30-35 years (n=142/962) | |  |  |
| Stable | 14.9 (111/746) | 22.2 (15/68) | 15.4 (4/26) |
| Fluid | 10.0 (4/40) | 9.3 (5/54) | 10.7 (3/28) |
|  |  |  |  |
| Cannabis abuse | |  |  |
| 21-25 years (n=132/1003) | |  |  |
| Stable | 12.5 (97/778) | 19.2 (14/73) | 30.8 (8/26) |
| Fluid | 12.2 (5/41) | 7.0 (4/57) | 14.3 (4/28) |
| 25-30 years (n=66/987) | |  |  |
| Stable | 5.6 (43/763) | 14.1 (10/71) | 18.5 (5/27) |
| Fluid | 4.9 (2/41) | 7.0 (4/57) | 7.1 (2/28) |
| 30-35 years (n=63/962) | |  |  |
| Stable | 6.0 (45/746 | 11.8 (8/68) | 11.5 (3/26) |
| Fluid | 7.5 (3/40) | 5.6 (3/54) | 3.6 (1/28) |