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Post-partum psychosis in Scotland 1991 to 2006

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Summary

This study has investigated post-partum psychosis by linking hospital admissions with a psychotic diagnosis in the postnatal period to women members of the Scottish Longitudinal Study who gave birth between the 1991 census and the end of follow-up (2007). Admission rates were found to be towards the lower end of what has been found in comparable studies elsewhere, mainly in Scandinavia. The overall admission rate in the 3 months after a birth was 0.47 per 1000 births (95% confidence interval 0.29 to 0.74). Rates were much higher in those with a previous psychotic hospital admission at 1 in 10 births in the 3 months post-partum and 1 in 5 in the nine months post-partum.. Those with a previous psychotic hospitalisation accounted for over 70% of all cases identified. There was no evidence that rates varied by parity or by the age of the mother, but increased rates were found for births that were registered by the mother alone rather than jointly by both parents, for mothers from the most deprived areas and those from households where the head could not have a social class assigned, most often because they had never worked.

1 Introduction

Post-partum psychosis (PPP) is a mood disorder accompanied by features such as loss of contact with reality, hallucinations, severe thought disturbance and abnormal behaviour that occurs in the post-partum period [10]. It is distinct from post-natal depression in being a much more severe presentation and affects a must smaller proportion of mothers; a rate of between 1 and 2 per 1000 births is often quoted. The presenting symptoms of post-partum psychosis are wider than those that would be classified as psychoses (e.g. by ICD10 codes F20-F29) and include episodes that would otherwise be classified as affective disorders and bipolar disorder in particular. It is generally very severe and expected to lead to hosptalisation.

We use data for members of the Scottish Longitudinal Study (SLS) [1] linked to hospital admissions over the period 1972-2007. The SLS is a 5% sample of the Scottish population that makes anonymised administrative data available to researchers with strict controls on the release of information. For this analysis we have used data from the 1991 census of Scotland and data on births to SLS members from 1991 to 2006. as well as linked data on hospital admissions provided by the Information and Statistics Division of the NHS in Scotland (ISD).

2 Births to SLS members

The overall aim was therefore to link data on births to women and hospital admissions for a psychiatric illness with a diagnosis that was indicative of PPP.. Census data and births, including stillbirths (from April 1991 to 2006), were extracted from the Scottish Longitudinal Study (SLS) database for women aged 15 to 44 at any point between the 1991 census and the end of 2006. To identify birth events, multiple births (523 pairs of twins and 17 sets of triplets) were counted as a single event. Table 1 gives a summary of total numbers and events after the exclusion of those not present at the 1991 census, those with inconsistent records (e.g. age and sex discrepancies and records linking to fathers).

Table 1: Births between 1991 census and 2006 to SLS members present at census

Total women aged 0-44 in 1991		81,145
Number with a birth event (single or multiple) 1991-2006		23,766
By number of birth events per woman		
	1	12802
	2	8,426
	3	2,025
	4+	566
Total birth events		**37,941**
Singleton live births		37,220
Singleton stillbirths		181
Multiple births (all live)		519
Multiple births (some or all still)		21

3 Hospital admission data

These data were matched to the linked database held by ISD and who provided information on all hospital admissions for these women in the matching period from 1972 to 2006 giving dates of admission and discharge and up to 6 diagnoses with ICD9 or ICD 10 codes. The hospital admissions were checked and a few inconsistent records were removed. Briefly, the

admission data were a mixture of those from SMR01 records (non-psychiatric admissions) and those from SMR04 (psychiatric admissions). Each stay in a different hospital is separately recorded, including transfers to another institution for a procedure to be carried out. Day case admissions are also included. At each admission there are up to 6 diagnostic or operation codes entered. The records were amalgamated so as to produce a single record for each continuous inpatient stay (here referred to as a 'stay'). All diagnoses for any admission in the stay were attached to each stay (maximum of 28 diagnostic codes in the data). The diagnostic codes for each stay were checked for any code referring to a psychiatric diagnosis or one indicating self-harm (Table 2). The position of such diagnoses in the list of diagnoses was also noted. Admissions for poisoning were also investigated, but on detailed examination of the codes it was evident that most of the poisonings that would be associated with a psychiatric condition also included a self-harm code, so only the psychiatric and self-harm diagnoses were retained as relevant to post-partum psychosis (PPP).

Table 2: Codes used to identify stays with psychiatric, poisoning or self-harm diagnose.

	ICD9 3 digit codes	ICD10 codes*
Psychiatric admissions	290-313	Chapter F excluding codes beginning F7 (mental retardation) and F8 (developmental disorders)
Poisoning	960 to 979	T36 to T50
Self harm	E950-E959	X60 to X84

* ICD10 codes were used for admissions with date of discharge from 1997 onwards

Between the 1991 census and the end of 2006 there were 192,223 continuous inpatient stays linked to sls members of which 14,321 (7.5%) included a psychiatric diagnosis or one indicating self-harm (as defined in Table 2).

Examining the most common psychiatric diagnoses a surprisingly high proportion of stays had one or more code indicating that alcohol was involved. Appendix 1 gives the codes that identified such admissions. Table 3 shows which of these alcohol related diagnosis came from SMR1 (general hospitals), SMR4 (psychiatric hospitals) or a stay that involved transfers between the two types of hospital.

Table 3: Psychiatric and self-harm stays by whether any alcohol related diagnosis

Type of hospital(s) during stay	Total psychiatric and self-harm stays	Number alcohol related	% alcohol related
General	8,907	2,922	32.81%
Psychiatric	4,488	587	13.08%
General and Psychiatric	926	180	19.44%
Total	14,321	3,689	25.76%

Over one quarter of all the stays involve alcohol. A higher proportion of alcohol related stays are to general hospitals and may (for example) relate to alcohol related admissions to A&E.

For the purpose of studying post-partum psychosis it was decided to exclude all alcohol-related admissions and restrict the analysis to the 10,632 without an alcohol diagnostic code.

These data included 1,527 admissions to women who were part of the initial sample but had been excluded from the analyses. This was most commonly because they were present at the 2001 census, but not the 1991 census, or because of inconsistent data. Excluding these cases leaves **9,105** admissions to women in the 1991 census with a psychiatric or self-harm diagnosis between 1991 and 2006, but no alcohol codes.

4 Linking psychiatric or self harm stays to census data

The stays with a psychiatric or self harm diagnosis were merged with the 81,145 records of female SLS members present in the 1991 census. Admissions that linked to periods when the SLS member was under 13 (51 admissions) or over 46[1] (1,182 admissions) were excluded, leaving 7,872 admissions.

Table 4: Number of psychiatric or self harm stays in follow up excluding those linked to alcohol (see text for details).

Number of admissions		Percent
0	77,565	95.59
1	2,353	2.9
2	552	0.68
3	220	0.27
4	138	0.17
5 to 10	235	0.29
10 or more (max 68)	82	0.1
Any admission)	3580	4.41
Total sls members	81,145	100%

5 Diagnostic groups and identification of post-partum psychosis

Psychiatric diagnoses were grouped as given in the Appendix 1 Tables 1 and 2 and a breakdown of the numbers is given in Table 5. It has been noted [2] that ICD9 and 10 codes do not identify PPP well. There is no specific diagnostic code for PPP and some debate about its aetiology [12]. The ICD codes that have been used to identify such psychoses in other studies are given in Table 3. There are discrepancies in the ICD codes used. In particular, Nager et al [8,9] seem to omit some codes that clearly relate to psychotic episodes. Codes relating to depressive episodes pose some problems. It is reasonable to assume that only those with psychotic symptoms should be included (F323 and F333) whereas some papers have included some pure depressive codes. Table 5 therefore summarises how we have classified the episodes in this paper. We will use the term 'psychotic' in the rest of this report to identify admissions with one of these diagnosis, although this usage differs from what would be used by a more standard method of classification that grouped cases by the ICD 10 chapter subheadings.

[1] Although the ages at birth of interest were 15 to 45, the window is increased by 2 years to allow for the two pre-pregnancy and post-pregnancy years used in relating admissions to pregnancy.

Table 5: ICD codes used to identify post-partum psychosis. An x indicates that this code was used in this study and NA indicates that the ICD version (9 or 10) was not used in that paper. The classification (A,S,P) gives the groupings of 'affective disorder', 'schizophrenia and related' and 'puerperal' used in section 7

Codes	description	Kendall lell et al [4.5]	Valdimarsdottir et al [13]	Nager ret al [8,9]	Tschinkel; at al [11]	Harlow et al [3]	This study
ICD9							
295	Schizophrenic psychoses (S)	x	x	x	NA	x	x
296	Affective psychoses (A)	x	x	x	NA	x	x
297	Paranoid states	x	x	x	NA	x	x
298	Other non-organic psychoses (A)	x	x	x	NA	x	x
ICD10							
F20	Schizo-affective disorder (S)	NA	x	x	NA	x	x
F22	Persistent delusion (S)	NA	x		x		x
F23	Acute psychotic (S)	NA	x		x	x	x
F24	Induced delusion (S)	NA			x	x	x
F25	Acute and transient psychotic disorders (S)	NA	x	x	x	x	x
F28	Other non-organic psychoses (S)	NA	x		x	x	x
F29	Unspecified non-organic psychoses (S)	NA	x	x	x	x	x
F30	Manic episodes (A)	NA	X	x	x	x	x
F31	Bi polar disorders (A)	NA	X	x	x	x	x
F32	Depressive episodes (A)	NA	X	F322 F323	x	x	F323
F33	Severe /recurrent depressive (A)	NA	x	F332 F333	x	x	F333
F38/F39	Affective disorders (A)	NA		x	x		x
F53	Puerperal disorders without other classification (P)	NA	x	x	x		x

To look at patterns by other diagnoses, we have classified all psychiatric diagnoses into one of the categories given in Table 6. The psychosis diagnoses are those marked in the final column of Table 5. The codes for the other groupings are given in detail in Appendix tables along with detailed numbers where disclosure rules allow.

Stays were initially classified by the first psychiatric diagnosis in their list of codes. The diagnoses for stays other than those classified with a first psychotic diagnosis were checked for any psychotic diagnoses later in the list. This identified a further 78 stays that were reclassified as having a psychotic diagnosis. Of these 35 had a first diagnosis in the group "other", 30 of "depression" and 13 of "drug". A self harm code was allocated to those stays where there was a diagnosis of self harm but no other psychiatric diagnosis.

Table 6 (first 4 columns) classifies each hospital stay by this diagnostic group. The breakdown of diagnoses is also given for those women with a birth in the series, as this may be a more appropriate comparison group for the post partum admissions. These women have a lower rate of psychosis and a higher rate of drug related and self-harm admissions The later columns of Table 6 are described and discussed in section 6 below on post-partum admissions.

Table 6: Stays with psychiatric or self harm diagnosis by diagnostic group

	All stays				Admitted in 270 days after a birth			
Diagnosis group	**All women**		**To women with a birth in the follow-up period**		**All stays**		**Stays per birth, excluding repeated stays**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Psychosis	1536	**19.5**	339	**11.8**	42	**20.4**	36	**21.6**
Depressive	1460	**18.5**	562	**19.5**	43	**20.9**	30	**18.0**
Drug	671	**8.5**	375	**13.0**	23	**11.2**	18	**10.8**
Other	1846	**23.5**	601	**20.9**	45	**21.8**	37	**22.2**
Only self harm	2359	**30.0**	1004	**34.8**	53	**25.7**	46	**27.5**
All of the above	**7872**	100.0	**2881**	100.0	**206**	100.0	**167**	100.0

6 Incidence and prevalence of psychiatric or self harm diagnoses

Of the 81,145 SLS members 5,916 had had a psychiatric or self harm admission before the 1991 census. Excluding these we can calculate the incidence of a first admission by age with those not yet admitted by a given age as a denominator. The prevalence of any stay with an admission date at a given age can be calculated from a person-years analysis of the follow up data. Prevalence is here defined as the proportion of the cohort with one or more hospital admissions at a given age. The results are shown in Figure 1. The peaks are at age 18 where incidence is 0.54% and prevalence 0.69%. Margins of error (twice the standard error) for these rates range from 0.06% to 0.09%.

Figure 2 shows how the patterns of prevalence by five year age group vary by diagnostic group. The adolescent peak is due to self-harm diagnoses, for which the prevalence decreases sharply during the teenage years and then more gradually. The relatively steady prevalence with age in Figure 1, after adolescence, is in fact due to very different patterns for self harm (decreasing with age) and other psychiatric diagnoses, most of which increase. Drug-related admissions have a prevalence that rises until the mid twenties and then declines.

Readmissions will be contributing to these patterns. Figure 3 shows that the incidence of first psychiatric admissions by diagnostic groups is relatively constant (except for the self harm and drug-related groups) over the age range.

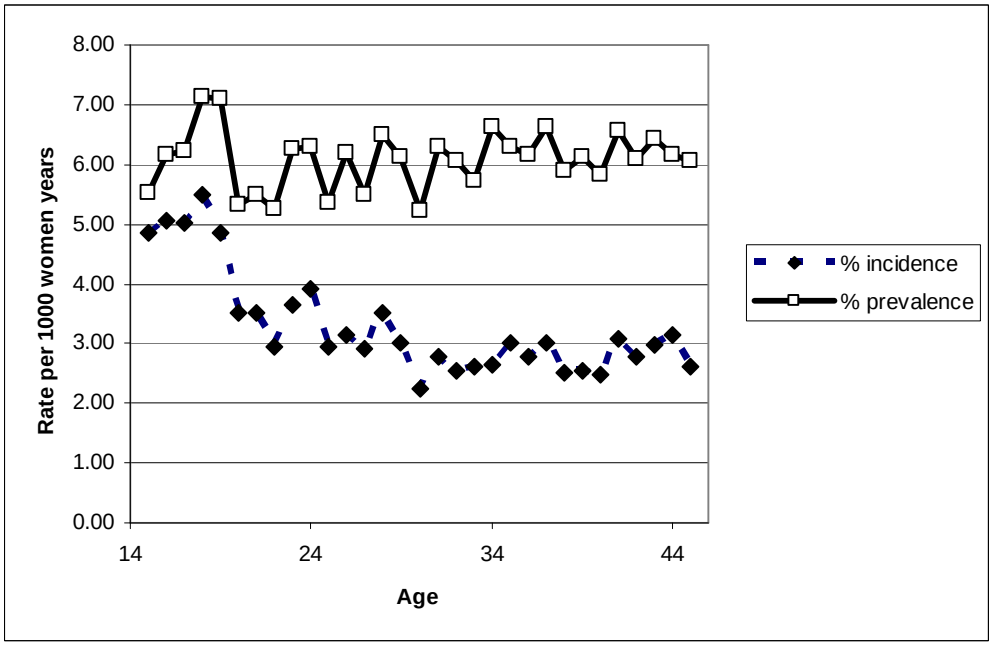

Figure 1: Incidence and prevalence of any self harm or psychiatric diagnosis by age

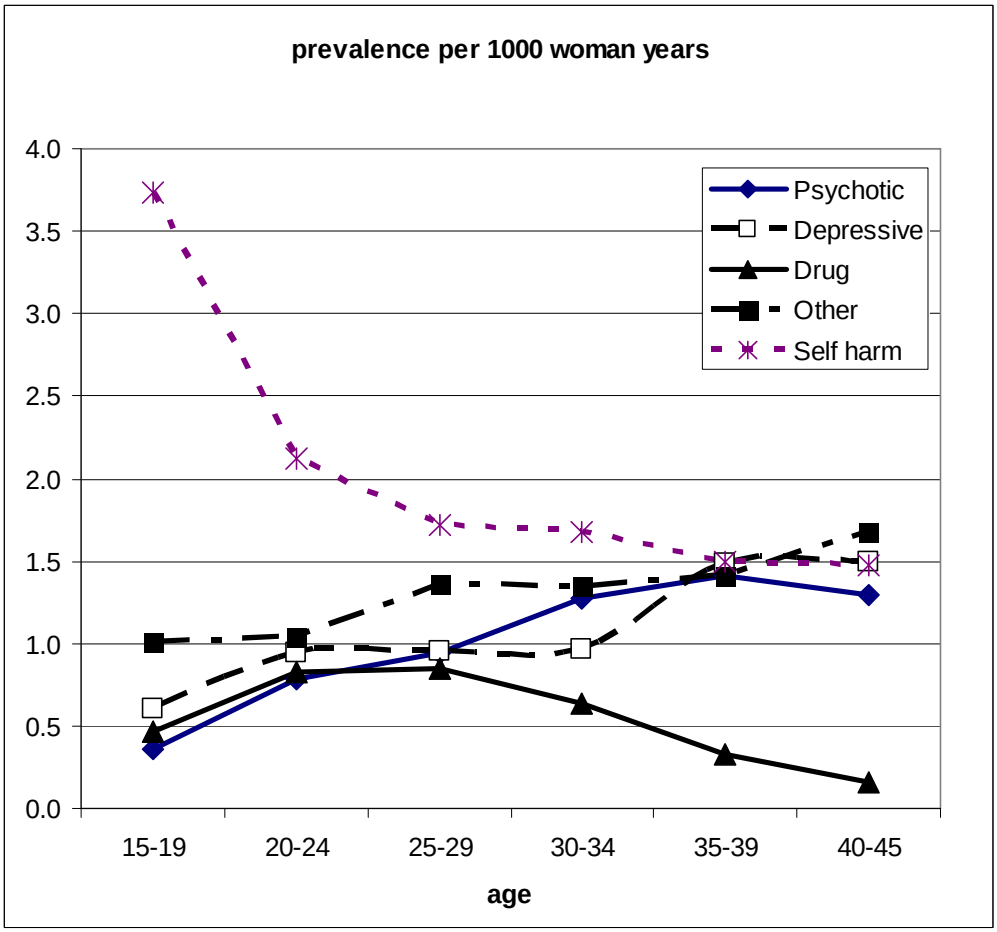

Figure 2: Prevalence per 1000 women years by diagnostic group for stay

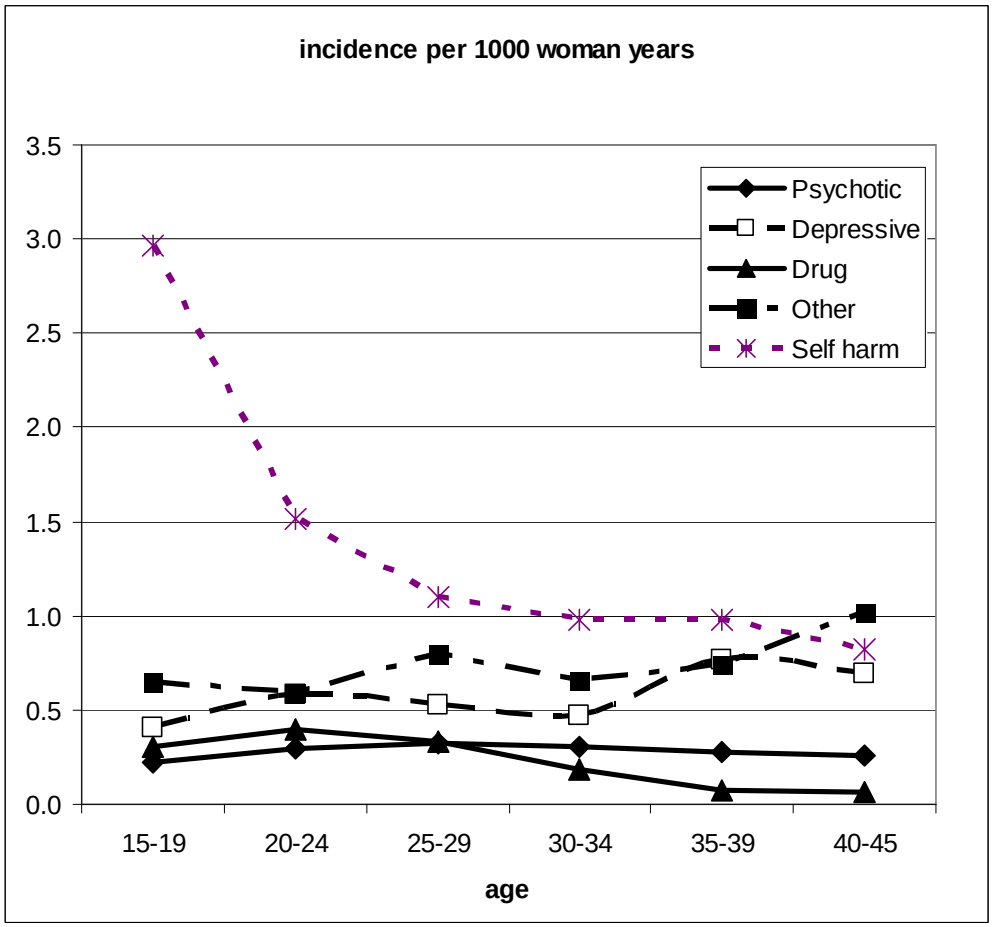

Figure 3: Incidence of hospital admissions per 1000 women years by diagnostic group of first listed psychiatric admission

7 Post-partum admissions

The hospital admissions were analysed in relation to the birth records. After excluding births to these women excluded as described above and those to women under 15 or over 46 a total of 37,941 birth events remained. For each hospital stay that followed a birth the number of days from the pregnancy preceding this admission was calculated. This allowed identification of all admissions in the 9 months (0 to 269 days) following each birth. The last four columns of Table 6 give the diagnostic group of all admissions. There were a total of 206 such admissions, but 39 of these were repeated stays after the same birth. The final two columns of Table 6 counts only one stay after each birth classified by the first admission except when a psychotic admission followed another admission when the stay was classified as psychotic. We can see that, overall, the breakdown of categories is very similar to those for all births, although there is an increase in the proportion of psychotic stays in the post-partum period when compared to women who gave birth in the follow up period.

Table 7 gives a breakdown of the numbers by the 90 day periods post-birth and expresses the cumulative rates per 1000 births. The rates of PPP even for a full 9 months after birth are at the low end of what others have found (see details in section 10). There are more cases of a psychotic diagnoses in the first post-partum period, as would be expected from previous work. The relative risk of a psychotic admission within 90 days and 270 days after a birth can be calculated from expected numbers based on age-specific prevalences as shown in Figure 3. Within 90 days of birth (18 cases) the RR becomes 1.92 (95% CI 1.21 to 3.05) and for the 36 cases within 270 days after birth it is lower at 1.28 (95% CI 0.92 to 1.77). Ten of the 18 cases of PPP occurred in the first 30 days post birth. For the first 30 day period the relative risk of a psychotic admission is 3.20 (95% CI 1.73 to 5.89).

Of the 36 cases identified as PPP in the 269 days after the birth 15 were classified as affective disorders (including bipolar), 8 cases as schizophrenia and related disorders and 13 had the specific code for a post-partum disorder (see table 5 for details of codes). The proportions of these diagnoses did not differ when diagnoses were made closer to the time of birth. In the first 89 days post-birth the numbers were 4, schizophrenia, 7 affective and 7 post-partum.

Table 7: Post-partum admissions per birth in the 269 days after a birth by diagnostic group

	Number of stays Days after birth when admitted			Rate per 1000 births Cumulative days post birth		
Diagnostic group	**0-89**	**90-179**	**180-269**	**0-89**	**0-179**	**0-270**
Psychosis	18	8	10	0.47	0.69	0.95
Depressive	9	10	11	0.24	0.50	0.79
Drug-related	6	4	8	0.16	0.26	0.47
Other	12	18	7	0.32	0.79	0.98
Only self harm	16	15	15	0.42	0.82	1.21

We can investigate the rates of post-partum psychosis for the 36 births identified in Tables 6 and 7 by the characteristics of the birth (Table 8).

Table 8: Rates of post-partum psychosis by birth characteristics

			N births	Rate per 1000 births	
	All births	**PPP births**	**0-29 days**	**0-89 days**	**0-269 days**
All	37941	36	0.26	0.47	0.95
Psychotic admission before birth]					
No	37822	12	0.05	0.13	0.32
Yes	119	24	67.23	109.24	201.68
Birth order					
1	19006	17	0.16	0.42	0.89
2	12847	13	0.31	0.54	1.01
3 or more	6088	6	0.49	0.49	0.99
Age at birth					
<26	12488	12	0.24	0.56	0.96
26-30	12193	10	0.33	0.33	0.82
31+	13260	14	0.23	0.53	1.06
Type of birth registration*					
Joint or married	35380	28	0.14	0.31	0.79
Sole	2561	8	1.95	2.73	3.12

A further 5 cases of PPP were joint registrations at different addresses. Information about the address of the parents was only available from 1996 onwards. For post 1996 births there was an increased rate of PPP from these 5 births of 1.98 per 1000 births.

Rates are very much higher in births to women with a history of psychotic hospital admissions, with these accounting for 24 (53%) of the 36 affected births. The rates are unaffected by the age at birth or by the birth order. Although the numbers are small, the rates are significantly higher for births that were registered by the mother alone, rather than jointly by both parents.

8 Rates of PPP related to linked census data

Rates of PPP were calculated by the three census characteristics shown in Table 8. Note that these are the characteristics of the household where the woman was resident at the time of the 1991 census and these characteristics may have changed as the date of birth is further from 1991. Thus they will represent the social background of the woman rather than her current status for births during the later part of the follow-up period.

Table 9: Rates of post-partum psychosis by characteristics of household where woman was resident at the 1991 census.

	N births		Rate per 1000 births		
	All births	PPP births	0-29 days	0-89 days	0-269 days
All	37941	36	0.26	0.47	0.95
Household tenure					
Not owner occupier	18364	17	0.32	0.54	0.97
Owner occupier	19289	18	0.16	0.41	0.93
Social class of head of household					
Not classified (Including never worked)	9004	13	0.44	0.78	1.44
Non manual occupations	13149	11	0.23	0.30	0.84
Manual occupations	15500	11	0.13	0.39	0.71
Deprivation quartile of neighbourhood					
Q1	7062	6	0.14	0.42	0.85
Q2	9828	6	0.10	0.10	0.61
Q3	9935	6	0.10	0.30	0.60
Q4 (most deprived)	11009	17	0.55	0.91	1.54

The rates of PPP are significantly higher for those from households with head unclassified, including those never worked, compared to households with a non-manual head. and those living in the most deprived areas. Other comaprisons of rates were not significant.

We can also examine the relationship with social factors for psychotic admissions to all women who gave birth in the follow up period, not just those in the post partum period. Figure 4 shows the ratio of prevalence rates between women with different census characteristics by age. The relationship with census characteristics for all admissions is similar to that for PPP. In particular there is an increased prevalence rate for those women coming from households where the head has no classification assigned for social class, which includes those who have never worked. compared to non-manual. A comparison of non-manual and manual social class shows little evidence of increased prevalence among women from households headed by someone with a manual social class compared to non-manual. There is a high prevalence ratio at all ages for the most deprived group compared to the least deprived, but very little difference between the least deprived and the other two deprivation categories (data not shown).

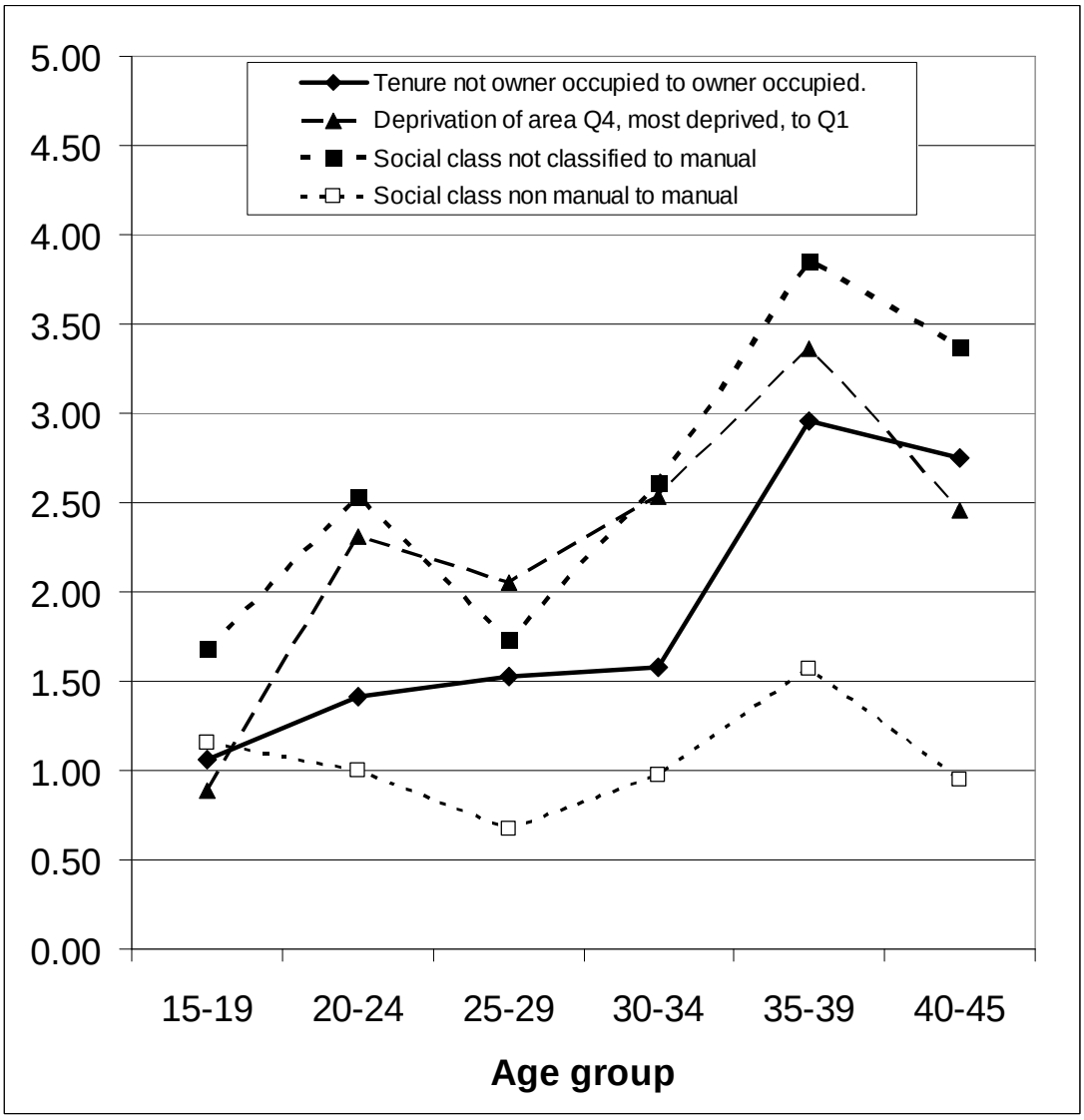

Figure 4: Ratio of prevalence rates of all stays with a psychotic diagnosis to women giving birth by characteristics of the of household where woman lived in the 1991 census

9 Repeated admissions in subsequent pregnancies

The 36 births with PPP identified above included three cases of two repeated births to the same woman, thus births to 33 individuals. Of these 33 cases only 9 (27%) went on to have a subsequent pregnancy of whom 3 (33%) had a subsequent admission for PPP. This suggests that there may be a lower rate of subsequent births in women affected by PPP at a first birth. But the numbers here are too small to confirm this since a comparison with the expected number of subsequent births for the age group and birth order gives a relative rate of 0.71 (95% CI 0.38 to 1.36).

10 Analysis of admissions within 2 years of birth

The analyses presented in the previous section give rates per birth concentrating only on the period after birth. Another approach adopted by Kendell et al [5] is to consider all admissions in the two years before or after a birth.One problem with this approach is that many

admissions would be counted twice since birth intervals are usually less than 4 years and it is not clear how this was dealt with in the paper by Kendell et al.. Our approach involved calculating the mid point between two births to a mother, and classifying stays before the mid-point to the previous birth and stays after the overlap to the later birth.

For each woman we identified the period of follow up between her 15th and 46th birthdays that lay between the date of the 1991 census and the 31st December 2006 (end of linked birth data). The time period was then divided into the following 17 time periods:-

Periods before birth divided into eight 90 day periods

Periods after birth divided into eight 90 day periods

Periods outside these times for those with a birth in the series

The periods after birth start on the day of birth (period 1) and are labelled subsequently. The pre-birth periods work backwards from -1 to -8, so that periods (-3 to -1) are during pregnancy. The rates per year were calculated by accumulating the follow up time in each period for each woman and thus obtaining total follow up time by period. Figure 5 plots the numbers of admissions in each subsequent 90 day period . Table 10 show numbers and Table 11 the corresponding rates. The 41 of psychotic stays in the first three post-birth periods in Table 10 exceed the 36 PPP admissions discussed above. This is because repeated admissions after the same birth are counted in Table 10, whereas the PPP analysis above uses only the first admission after each birth. Five of the 36 PPP cases had a second stay with a psychotic diagnosis in the first three periods.

The most striking feature of these data is not the peak of PPP in the first post-birth trimester (although this is notable) but the dramatic fall in admissions through the three periods when the women were pregnant. This is particularly strong for self-harm. Rates of self harm are high in the year before the women became pregnant and this is still true when the rates are adjusted for age with rates being significantly raised in the three pre-pregnancy 90 day periods. For psychotic admissions the numbers are low before and during pregnancy.and have the expected peak in the first post-birth trimester. For both psychotic and depressive admissions rates are significantly higher in the post-birth period compared to pre-pregancy or to periods outside of two years from a birth.

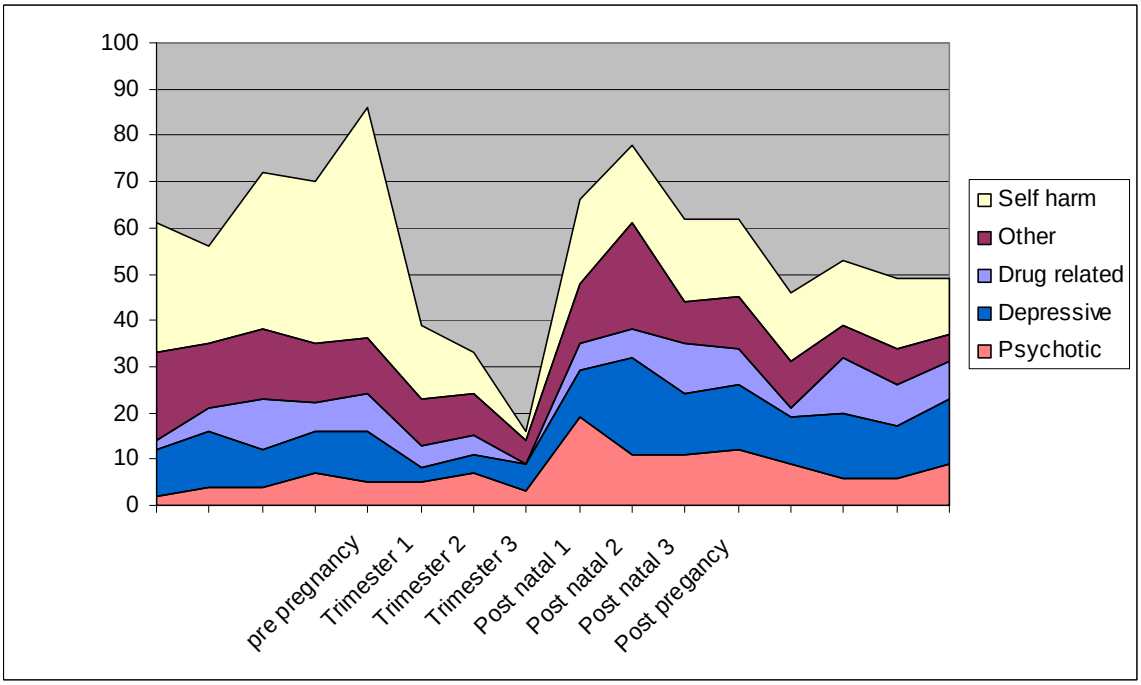

Figure 5: Number of hospital admissions within two years (8 90 day periods) of a birth

Table 10: Number of hospital stays with a psychiatric diagnosis by whether starting within two years (eight 90 day periods) of a birth by diagnostic group

		All	First diagnostic code				
	90 day period		Psychotic	Depress-ive	Drug related	Other	Self harm
Before	-8	61	Under 3	10	Under 3	19	28
birth	-7	56	4	12	5	14	21
	-6	72	4	8	11	15	34
	-5	70	7	9	6	13	35
	-4	61	5	11	8	12	50
Pregnancy	-3	39	5	3	5	10	16
	-2	33	7	4	4	9	9
	-1	16	3	6	0	5	<3*
After	1	66	19	10	6	13	18
birth	2	78	11	21	6	23	17
	3	62	11	13	11	9	18
	4	62	12	14	8	11	17
	5	46	9	10	2	10	15
	6	53	6	14	12	7	14
	7	49	6	11	9	8	15
	8	49	9	14	8	6	12
Not within 2 years of birth		1983	219	392	272	417	683

* to comply with SLS disclosure rules

Table 11: Rates per 1000 person years of hospital stays with a psychiatric diagnosis by whether starting within two years (8 90 day periods) of a birth by diagnostic group

		All	First diagnostic code				
	90 day period		Psychotic	Depress-ive	Drug related	Other	Self harm
Before	-8	10.9	0.36	1.79	0.36	3.41	5.02
birth	-7	9.49	0.68	2.03	0.85	2.37	3.56
	-6	11.4	0.63	1.27	1.74	2.37	5.38
	-5	10.30	1.03	1.32	0.88	1.91	5.15
	-4	11.8	0.69	1.51	1.10	1.65	6.87
Pregnancy	-3	5.07	0.65	0.39	0.65	1.30	2.08
	-2	4.19	0.89	0.51	0.51	1.14	1.14
	-1	2.03	0.38	0.76	0	0.64	<=0.25*
After	1	8.44	2.43	1.28	0.77	1.66	2.30
birth	2	10.1	1.43	2.73	0.78	2.99	2.21

3	8.4	1.49	1.76	1.49	1.22	2.44
4	8.97	1.74	2.02	1.16	1.59	2.46
5	7.21	1.41	1.57	0.31	1.57	2.35
6	9.01	1.02	2.38	2.04	1.19	2.38
7	9.08	1.11	2.04	1.67	1.48	2.78
8	9.78	1.8	2.79	1.6	1.2	2.39
Not pregnant	8.45	0.93	1.67	1.16	1.78	2.91

* to comply with SLS disclosure rules

analysis of Kendell et al used only admissions to a psychiatric hospital. Restricting admissions to those with a stay in a psychiatric hospital (ie excluding SMR1 only) has little effect on the psychotic rates, but reduces the overall rates, especially for pre-birth cases. Some details are given in the comparisons in the next section.

11 Comparisons with other studies

There have been several studies of PPP in Sweden [3,8,9,11], and one in Denmark [13] that have used data from population registers linked to hospital admissions. Although the Swedish studies are carried out by different teams there is considerable overlap in the data contributing to them, so they are not independent. Although they have approached the analysis of the data in different ways, their results are substantially in agreement. These studies have been based on the total populations for these countries with population register data linked to hospital admissions in a similar manner to this study and thus have large samples yielding precise estimates. Studies in the UK have used data from individual psychiatric hospitals in Scotland [4,5] and Wales [11]

The inclusion criteria for these studies have differed so that it is necessary to pull out different parts of the current report to make comparisons. Figure 6 illustrates the comparisons graphically.

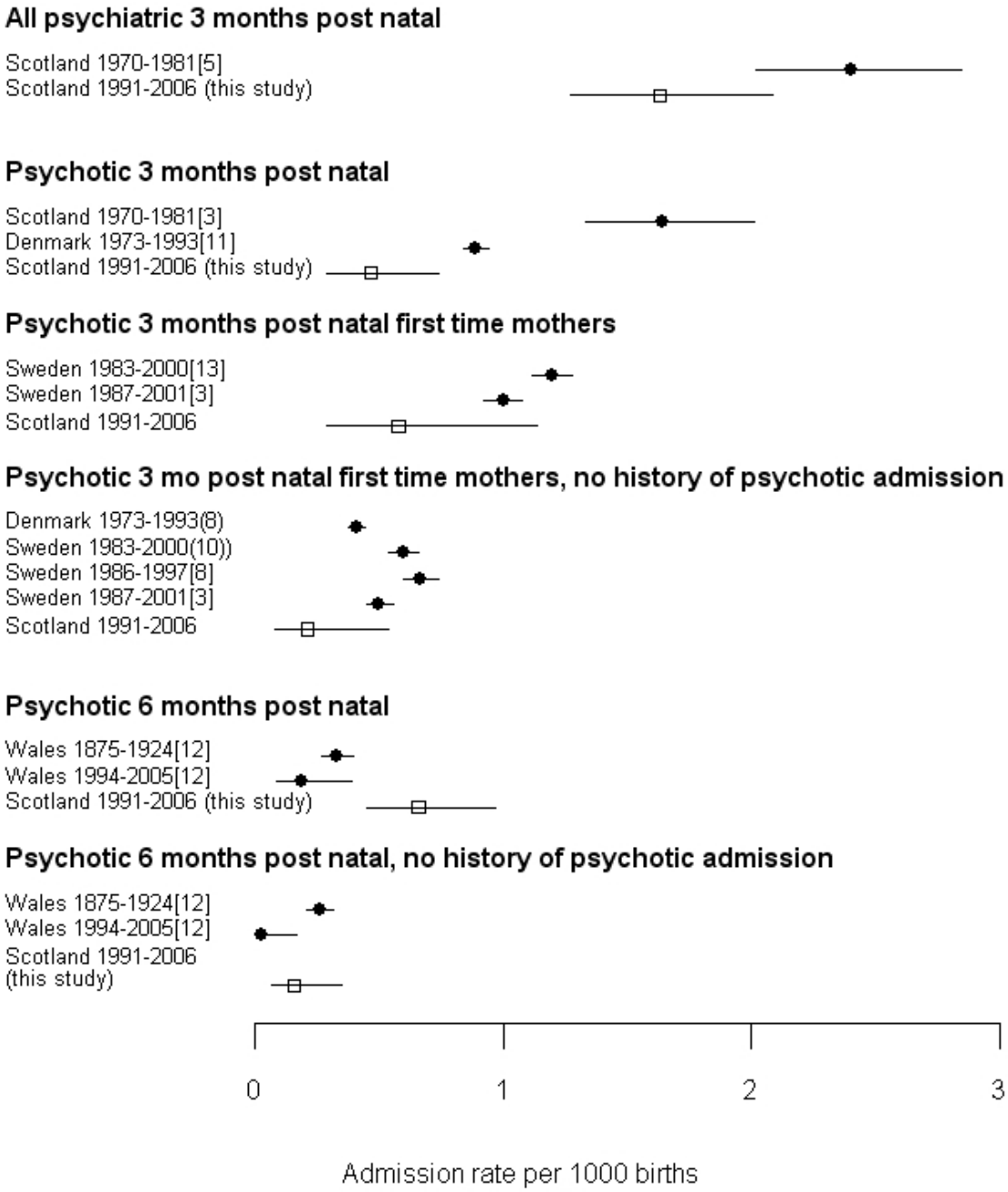

Figure 6: Comparisons of rates of ppp per birth found in different studies (open squares) with those found by other studies (closed circles). Lines show 95% confidence

The rates of PPP fround by Kendell et al in Scotland in the 1970s (1.64 : per 1000 births, 95% CI 1.33 to 2.01, in the 3 month post-birth) are higher than we have found (0.47 :per 1000 births, 95% CI 0.29 to 0.74) We can see that the Swedish and Danish studies using births form the 1980s and 90s give rates which at around 1 per 1000 for all mothers in 3 months are intermediate between the earlier Scottish study and the current one. The Welsh data [12] both from historical records and the more recent data give lower rates than were found in Scotland or in Scandinavia. This last finding may be due to the detailed studies of case notes used in the Welsh study to ensure the case was genuinely PPP, an approach that has not been used in other studies illustrated in Figure 6. However another study using data from one region of Denmark [14] examined case notes and found rates comparable to the other Danish studies presented in Figure 6.

12 Discussion

We have found rates of PPP in Scotland that are somewhat lower than the rates of one to two per thousand births that are usually quoted. We have shown that different ways of defining this condition can influence the rates and it is important that these are defined precisely. When allowing for these comparisons we find that our rates of PPP are lower than those found in Scotland in 1970-80 and those found in more recent population data in Sweden and Denmark.

Two thirds of the cases of PPP identified here had a history of a hospital admission for psychosis. This is higher than the rates around 50% found in Sweden [13] and Denmark [11]. In this study women with a history of psychotic hospital admission had a 1 in 5 chance of a further psychotic admission in the 9 months after birth. A study in London [7] using a somewhat different methodology, including identifying cases from notes, found an even higher rates of relapse, around 50% in the 6 months post-partum.

The Swedish studies [8,9,13,] found a strong relationship between age of the mother and admission for PPP. We have not found this relationship in our data. Although our numbers are small compared to the Swedish data we would have expected to have seen an effect if the relationship in our data was as strong as was found for the Swedish data.

The two major factors, apart from a previous history of psychosis, that increased the incidence of PPP in this study were living in a deprived neighbourhood and having the birth registered without a father (or without a father at the same address). These factors have also been identified in every other study where they have been studied [7,8,9,13]. These findings suggest that the provision of additional social support around childbirth, especially for women with a history of mental illness, could be a useful intervention that could reduce the prevalence of PPP. The SIGN Guidelines [10] suggest that women at high risk of PPP should receive specialist psychiatric review and mention limited evidence that lithium given around the time of the puerperum may be beneficial. It is possible that such initiatives as well as social support for women may have contributed to the lower rates of PPP found in this study. It is even possible that the implementation of this guideline may reduce the rate of PPP in Scotland in future.

One limitation of this study and almost all the others cited above is that cases have been ascertained from hospital admissions. In the one study where case notes for women with a previous history of psychosis were reviewed to identify PPP [7], 10 of the 12 PPP cases were admitted to hospital. The literature on this condition considers that all cases of PPP would be expected to be severe enough to require hospital admission. Even if this is no longer true then a case of PPP that can be managed without a hospital admission may well be less severe, and less damaging to the mother-infant relationship than one that results in hospital admission.

This study has identified some of interesting findings which are not concerned with the PPP admissions. The first of these is the very high proportion of psychiatric admissions among these young women that could be attributed to the abuse of alcohol. It would be interesting to explore this finding in more detail for both men and women and perhaps in relation to pregnancy for women. Secondly the very high incidence of self harm among young women is very striking and it would be interesting to relate this to both alcohol use and to drug abuse. Finally, the peak of self harm diagnoses just before pregnancy is interesting and may perhaps relate to well-established research finding that unprotected sex tends to be related to other risky behaviours. It is reassuring that hospital admissions for self-harm fall so dramatically during pregnancy.

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Appendix: Classification of admissions into groups according to first psychological admission

Table A0: Diagnostic codes for alcohol related stays excluded from the analysis, first alcohol related code per stay

ICD	Code	Diagnosis	N
ICD 9	2910	delirium tremens	6
	2918	other specified alcoholic psychoses	25
	2918 to 2915	alcoholic psychoses	5
	3039	alcohol dependence syndrome	215
	3050	nondependent abuse of alcohol	374
ICD10	F10	Mental and behavioural disorders due to use of alcohol	2546
	X65	Intentional self-poisoning by and exposure to alcohol	518
	Total	**All alcohol related**	**3689**

Table A1: ICD classification of psychiatric admissions, ICD9 codes and numbers of stays

Group	Code	Label	N
Psychotic	-296	affective psychoses	215
	-295	schizophrenic psychoses	177
	-298	other nonorganic psychoses	27
	-297	paranoid states	17
Depression	-311	depressive disorder, not elsewhere classified	196
	-309	adjustment reaction	26
Drug related	-304	drug dependence	71
	-305	nondependent abuse of drugs	51
	-292	drug psychoses	14
Other	-300	neurotic disorders	274
	-305	nondependent abuse of drugs	77
	-301	personality disorders	66
	-308	acute reaction to stress	35
	-307	special symptoms or syndromes including eating disorders	30
	-293	transient organic psychotic conditions	26
	-307	special symptoms or syndromes not elsewhere classified	24
	-309	adjustment reaction	18
	-306	physiological malfunction arising from mental factors	10
	-312	disturbance of conduct not elsewhere classified	6
	-310	specific nonpsychotic mental disorders following organic brain damage	5
	-313	disturbance of emotions specific to childhood and adolescence	5
		Others under 3	<3

Table A2: CD classification of psychiatric admissions, ICD 10 codes and number of stays

Group	Code	Label	
Psychotic	F209	Schizophrenia, unspecified	202
	F319	Bipolar affective disorder, unspecified	141
	F200	Paranoid schizophrenia	122
	F323	Severe depressive episode with psychotic symptoms	56
	F29X	Unspecified nonorganic psychosis	49
	F259	Schizoaffective disorder, unspecified	45
	F310	Bipolar affective disorder, current episode hypomanic	37
	F239	Acute and transient psychotic disorder, unspecified	34
	F300	Hypomania	30
	F313	Bipolar affect disorder cur epi mild or moderate depression	28
	F530	Mild mental and behav disord assoc with the puerperium NEC	24
	F250	Schizoaffective disorder, manic type	24
	F312	Bipolar affect disorder cur epi manic with psychotic symp	20
	F220	Delusional disorder	19
	F205	Residual schizophrenia	19
	F311	Bipolar affect disord cur epi manic without psychotic symp	18
	F316	Bipolar affective disorder, current episode mixed	17
	F333	Recurrent depress disorder cur epi severe with psyc symp	16
	F39X	Unspecified mood [affective] disorder	12
	F251	Schizoaffective disorder, depressive type	12
	F309	Manic episode, unspecified	11
	F318	Other bipolar affective disorders	10
	F252	Schizoaffective disorder, mixed type	10
	F314	Bipolar affect disord cur epi sev depres without psyc symp	9
	F201	Hebephrenic schizophrenia	8
	F302	Mania with psychotic symptoms	7
	F232	Acute schizophrenia-like psychotic disorder	7
	F317	Bipolar affective disorder, currently in remission	6
	F301	Mania without psychotic symptoms	6
	F230	Acute polymorphic psychot disord without symp of schizoph a	5
	F380	Other single mood [affective] disorders	4
	F531	Severe mental and behav disorder ass with puerperium NEC	3
		Others <3 each	13
Depression	F329	Depressive episode, unspecified	904
	F321	Moderate depressive episode	92
	F320	Mild depressive episode	56
	F339	Recurrent depressive disorder, unspecified	52
	F331	Recurrent depressive disorder, current episode moderate	50
	F322	Severe depressive episode without psychotic symptoms	45
	F332	Recurrent depress disorder cur epi severe without psyc symp	37
	F328	Other depressive episodes	27
	F330	Recurrent depressive disorder, current episode mild	3
		Others <3 each	<3
Drug related	F112	Mental & behav dis due to use of opiods; dependence syndrome	199
	F191	Men & behav dis multiple/psychoact drug: harmful use	87
	F111	Mental & behav dis due to use of opiods; harmful use	76
	F192	Men & behav dis multiple/psychoact drug: dependence syndrome	47
	F151	Men & behav dis due use oth stims inc caffeine: harmful use	15
	F121	Mental & behav dis due use cannabinoids; harmful use	13
	F195	Men & behav dis multiple/psychoact drug: psychotic disorder	12
	F113	Mental & behav dis due to use of opiods; withdrawal state	8
	F161	Men & behav dis due use hallucinogens: harmful use	8
	F162	Men & behav dis due use hallucinogens: dependence syndrome	8
	F115	Mental & behav dis due to use of opiods; psychotic disorder	6

Group	Code	Label	
	F125	Mental & behav dis due use cannabinoids; psychotic disorder	6
	F132	Men & behav dis due use seds/hypnotics: dependence syndrome	6
	F150	Men & behav dis due oth stims inc cafein: acute intoxication	6
	F199	Men & behav dis multiple/psychoact drug: unsp men & behav di	6
	F133	Men & behav dis due use seds/hypnotics: withdrawal state	5
	F155	Men & behav dis due oth stims inc caffeine: psychotic dis	5
	F163	Men & behav dis due use hallucinogens: withdrawal state	5
	F141	Mental & behav dis due use cocaine: harmful use	4
	F110	Mental & behav dis due to use of opiods; acute intoxication	3
	F130	Men & behav dis due use seds/hypnotics: acute intoxication	3
	F131	Men & behav dis due use seds/hypnotics: harmful use	3
	F193	Men & behav dis multiple/psychoact drug: withdrawl state	3
	F196	Men & behav dis multiple/psychoact drug: amnesic syndrome	3
		Others <3 each	10
Other	F603	Emotionally unstable personality disorder	231
	F419	Anxiety disorder, unspecified	152
	F430	Acute stress reaction	107
	F432	Adjustment disorders	103
	F609	Personality disorder, unspecified	94
	F500	Anorexia nervosa	87
	F171	Men & behav dis due use tobacco: harmful use	80
	F412	Mixed anxiety and depressive disorder	55
	F410	Panic disorder [episodic paroxysmal anxiety]	37
	F172	Men & behav dis due use tobacco: dependence syndrome	31
	F502	Bulimia nervosa	23
	F341	Dysthymia	20
	F411	Generalized anxiety disorder	15
	F431	Post-traumatic stress disorder	15
	F458	Other somatoform disorders	15
	F509	Eating disorder, unspecified	14
	F400	Agoraphobia	13
	F402	Specific (isolated) phobias	11
	F429	Obsessive-compulsive disorder, unspecified	9
	F408	Other phobic anxiety disorders	8
	F418	Other specified anxiety disorders	8
	F69X	Unspecified disorder of adult personality and behaviour	8
	F99X	Mental disorder, not otherwise specified	8
	F439	Reaction to severe stress, unspecified	7
	F621	Enduring personality change after psychiatric illness	7
	F449	Dissociative [conversion] disorder, unspecified	6
	F608	Other specific personality disorders	6
	F919	Conduct disorder, unspecified	6
	F059	Delirium, unspecified	5
	F068	Oth sp mental disord brain damag and dysfunction/physical d	5
	F069	Unsp mental disord brain damag and dysfunction/physical d	5
	F409	Phobic anxiety disorder, unspecified	5
	F420	Predominantly obsessional thoughts or ruminations	5
	F602	Dissocial personality disorder	5
	F952	Combined vocal multip motor tic disorder [de la Tourette]	5
	F03X	Unspecified dementia	4
	F072	Postconcussional syndrome	4
	F450	Somatization disorder	4
	F681	Intent product/feign of symptom/disab eith physical/psychol	4
	F501	Atypical anorexia nervosa	3
	F508	Other eating disorders	3
	F067	Mild cognitive disorder	3
	F401	Social phobias	3
	F444	Dissociative motor disorders	3
	F454	Persistent somatoform pain disorder	3

Group	Code	Label	
	F604	Histrionic personality disorder	3
	F607	Dependent personality disorder	3
		Others <3 each	48