

ORIGINAL ARTICLE

Health effects of family size: cross sectional survey in Chinese adolescents

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Aims: To determine whether only children differ in terms of morbidity, nutritional status, risk behaviours, and utilisation of health services from children with siblings, in China.

Methods: A cross sectional survey was carried out using self completion questionnaires, anthropometry, and haemoglobin measurement in middle schools (predominant age 12–16 years) in three distinct socioeconomic areas of Zhejiang province, eastern China.

Results: Data were obtained for 4197 participants. No significant differences were found between only children and those with siblings for some key indicators: underweight 19% v 18%, suicide ideation 14% v 14%, and ever smoking 17% v 15%. Only children were more likely to be overweight (4.8% v 1.5%), and to have attended a doctor (71% v 63%) or dentist (17% v 10%) in the past year. Sibling children are significantly more likely to be anaemic (42% v 32%) and to admit to depression (41% v 21%) or anxiety (45% v 37%). However, after adjusting for area, sex, and parental education levels only two differences remained: sibling children are more likely to be bullied (OR 1.5, 1.1–2.0; $p = 0.006$) and are less likely to confide in parents (OR 0.6, 0.3–0.8, $p = 0.009$). There were no significant differences in the key parameters between first and second born children.

Conclusions: We found no detrimental effects of being an only child using the indicators measured. Being an only child may confer some benefits, particularly in terms of socialisation.

The total fertility rate has fallen in many countries, with the proportion of one child families rising.¹ There are concerns about this trend, because only children have variously been depicted as egocentric, maladjusted,^{2–3} prone to obesity,^{4–5} deficient in social skills, and prone to aggression, with a tendency to later violent criminal behaviour.⁶

When the One Child Family Policy was introduced in China in the late 1970s there were concerns about such potential effects. At the time the Policy was seen as a necessity to control China's burgeoning population and to facilitate economic growth. Currently the policy consists of a number of measures, including easy access to contraception and abortion, late marriage and childbearing, and a range of penalties for non-compliance from fines to dismissal from work. The one child rule applies mainly to urban residents and government workers. In rural areas, where around 70% of the population live, a second child is generally allowed after five years, especially if the first is a girl. Enforcement is the responsibility of local officials, and hence varies widely.⁷

In China anecdotal evidence about only children as over indulged, overweight "Little Emperors" abounds.^{8–10} In the current climate of fierce academic competition there are particular concerns that with parental expectations and aspirations focused on just one child, these pressures are leading to the high rates of anxiety and depression documented in Chinese adolescents.¹¹ But hard evidence that only children feel more pressure than sibling children is hard to find. The literature has concentrated largely on issues of psychological adjustment and development focusing mostly on younger children, and the conclusions about the effects of being an only child are equivocal, and have often failed to take sufficient account of socioeconomic confounders.^{8–10 12–15} There have been few studies of older children and adolescents. We carried out this study in Zhejiang Province, Eastern China, to determine whether only adolescents differed in terms of morbidity, nutritional status, risk behaviours, and health service utilisation from those with siblings.

SUBJECTS AND METHODS

We carried out a cross sectional survey in schools in three distinct socioeconomic and geographical areas of Zhejiang Province. Zhejiang has a population of 45 million, has a total fertility rate of 1.5,¹⁶ and is typical of wealthier eastern coastal provinces, where there has been rapid economic development in the past two decades. The study locations were the capital Hangzhou, one of the boom cities of the east, Xiaoshan, a wealthy rural area adjacent to Hangzhou, and Chunan, a poor mountainous area 150 km to the southwest.

In each of the three areas six middle schools (predominant age range 12–16 years) were invited to participate. We selected schools to be representative of schools in urban and rural Zhejiang on the basis of an "academic score" or the percentage of students in the school who go on to mainstream higher education. The academic scores of the schools ranged from 20% to 85%, representative of the range for Zhejiang. No school refused to participate. Two randomly selected classes in each year of each school were included. We developed a questionnaire specifically for this study. The pilot study, carried out among 100 students, contained a number of open questions which informed the choices for the closed questions in the study proper. Questions on mental health were drawn from Chinese tools, which have been specifically validated for this age group.^{17 18} Anthropometry and haemoglobin measurements were carried out by especially trained school nurses. Anthropometry was carried out with a stadiometer with measurements to 0.5 cm and a beam balance scale with measurement to 0.1 kg (subjects lightly clothed in bare feet). Haemoglobin measurements were carried out by Hemocue with blood taken by fingerprick. Haemoglobin results were fed back immediately. All with recordings below 100 g/l were advised to consult a doctor.

Local ethical approval was obtained from the provincial and local education authorities. Additional ethical approval was obtained from the Institute of Child Health (London) Ethics Committee. Parents and children were informed (parents by letter hand-carried by the child) one week in advance, that the

Table 1 Sociodemographic indicators for the samples in the three areas

	All	Hangzhou Urban	Xiaoshan Rich rural	Chunan Poor rural
n (%)	4197	1577 (38)	1388 (33)	1232 (29)
Male	2153 (51.2)	791 (50)	720 (52)	642 (52)
Female	2044 (48.8)	786 (49.8)	668 (48)	590 (48)
Mean age (SD)	14.2 (1.69)	14.2 (1.5)	14.3 (1.7)	14.1 (1.9)
Parents' education (%)				
Neither completed middle school	29	2.4	35	54
One completed middle school	27	11	44	31
Both completed middle school	44	86	22	14
Household income* (%)				
<\$150/month	39	21	38	59
>\$150/month	42	63	41	22
Family size (%)				
One child family	56	91	54	11
Two children	41	17.9	43	81
Three children	2.3	0.4	1.3	5.8
Four or more children	0.8	0.3	0.4	2.1
% Boys only children	64	90	75	16
% Girls only children	47	92	35	4.9
Household composition (%)				
Natural parents only	77	75	80	77
Parents + other relatives	15	12	14	17
One parent/relatives: parent(s) working away	2.2	1.5	1.9	3.4
One parent/relatives: parents separated/divorced	2.4	6.0	1.2	0.08
One parent/relatives: death of parent	1.9	1.8	1.4	2.5

*Data for household income was available for only 81% of the sample.

survey would take place. Both parents and children were told that there was the option to refuse participation, though none did refuse, and attendance rates on the days of the survey were similar to a normal school day. The survey was carried out in November and December 1999. The questionnaires were administered in the classroom by a researcher (QJD) and an assistant, and were completed under exam conditions. Students were assured of the confidentiality of the questionnaire information. Because of the sensitive nature of some of the questions, students were offered access to a counsellor should they require it. Three students did avail themselves of this service.

Analysis

Body mass index (BMI = weight/height²) was calculated for each individual. Anthropometric status was assessed for underweight and overweight using WHO standards for adolescents.¹⁹ We defined anaemia using the WHO standard of less than 120 g/l. The questions on anxiety, depression, and self esteem produced a score, which was then dichotomised

for analysis purposes into severe/moderate symptoms or mild/no symptoms and high/low for self esteem. Pearson's χ^2 was used to evaluate the association between family size and both the sociodemographic variables and the health indicators. For those health indicators which were significant in the univariate analysis we controlled for residence, sex, and parental education using logistic regression to compute adjusted odds ratios and 95% confidence intervals. Because of the strong confounding effect of area of residence we further tested the hypothesis by analysing data for Xiaoshan alone where 55% of the children were only children. For the Xiaoshan students we were also able to analyse sibling children by position in family.

RESULTS

Table 1 presents the characteristics of the study sample. There were 4197 completed questionnaires together with anthropometric and haemoglobin data across the three areas. Eighty nine were excluded from the analysis, because of incomplete responses across key variables. The age range was 12–16 years

Table 2 Sociodemographic differences between one child and sibling families, n (%)

	One child families	Sibling families	p value
Total, n=4197	2341 (56)	1856 (44)	<0.0001
Area			
Hangzhou (urban), n=1577	1440 (61)	137 (7)	<0.0001
Xiaoshan (rich rural), n=1388	765 (33)	623 (33)	
Chunan (poor rural), n=1232	136 (6)	1096 (59)	
Sex			
Male, n=2153	1346 (57)	807 (43)	<0.0001
Female, n=2044	995 (42)	1049 (57)	
Parents' education			
Neither completed middle school, n=1217	454 (19)	763 (41)	<0.0001
One completed middle school, n=1133	432 (18)	701 (38)	
Both completed middle school, n=1846	1454 (62)	392 (19)	
Household income			
<\$150/month, n=1594	685 (29)	909 (49)	<0.0001
>\$150/month, n=1784	1170 (50)	614 (33)	

Table 3 Selected indicators by family size; percentages, crude and adjusted odds ratios

	1 child	2+ children	Crude OR (95% CI)	p value	Adjusted OR* (95% CI)	p value
Nutritional indicators						
Overweight	4.8	1.5	0.3 (0.1 to 0.6)	<0.001	2.2 (0.8 to 5.7)	0.12
Underweight	19	18	0.9 (0.7 to 1.2)	0.85		
Anaemic	32	42	1.4 (1.2 to 2.0)	<0.001	0.9 (0.8 to 1.2)	0.79
Health care seeking behaviour						
Visit to doctor in past year	71	64	0.8 (0.7 to 0.9)	0.009	0.9 (0.7 to 1.1)	0.2
Visit to dentist in past year	17	10	0.6 (0.5 to 0.7)	<0.001	0.8 (0.6 to 1.0)	0.1
Risk behaviours						
Ever smoking	17	15	0.8 (0.7 to 1.0)	0.15		
Ever drinking alcohol	34	27	0.7 (0.6 to 0.9)	0.001	1.0 (0.8 to 1.2)	0.09
Ever been drunk	14	10	0.8 (0.7 to 0.9)	0.05	1.3 (1.1 to 1.7)	0.03
Psychological indicators						
Self esteem: high	31	26	0.8 (0.6 to 0.9)	0.05	0.8 (0.6 to 1.0)	0.1
Anxiety: severe/moderate	37	45	1.4 (1.1 to 1.7)	0.002	1.4 (0.9 to 1.7)	0.4
Depression: severe/moderate	24	41	2.0 (1.6 to 2.5)	0.001	1.0 (0.8 to 1.9)	0.65
Have contemplated suicide	14	14	1.0 (0.8 to 1.2)	0.9		
Have tried to commit suicide	10	11	1.0 (0.6 to 1.2)	0.7		
Social						
Bullied sometimes/often	29	44	2.0 (1.6 to 2.4)	<0.001	1.5 (1.1 to 2.0)	0.006
Generally liked by peers	77	70	0.7 (0.6 to 0.8)	0.005	0.8 (0.7 to 0.9)	0.04
Readily confide in friends	70	62	0.5 (0.4 to 0.6)	<0.001	0.6 (0.5 to 0.9)	0.03
Readily confide in parents/other relatives	64	41	0.4 (0.3 to 0.7)	<0.001	0.5 (0.4 to 0.6)	0.009
Self reported academic record: excellent/good	57	51	0.7 (0.6 to 0.8)	0.006	0.9 (0.8 to 1.0)	0.06

*Adjusted for residence, sex, parental education.

with a slight preponderance of boys (51.2%). Most children (92%) lived with both their natural parents. There were differences in family size, parental education background, and household income across the three areas. The number of larger families with over three children was 3.1% overall, and rose to 7.9% in Chunan. In Xiaoshan data on position in family was available for 615 of the 629 sibling children: 287 were firstborns, 313 were second born, nine were third born, and six were twins. Of the firstborn children, 77% were girls. Table 2 shows that there are significant sociodemographic differences between one child and sibling families. Overall only children are more likely to be city dwellers, male, have better educated parents, and higher household income.

In terms of self reported morbidity over the past year there are no significant differences across a range of major and minor health problems between only and sibling children. These include colds and flu, headaches, toothache, menstrual problems, acne, asthma, epilepsy, and diabetes.

Table 3 shows the association between family size and selected health indicators, first unadjusted and then adjusted for residence, parental education, and sex. There are no crude differences between only and sibling children across a number of key indicators: underweight, ever smoking, suicide ideation, and attempted suicide. Only children are more likely to be overweight, and less likely to be anaemic. They are more likely to have attended a doctor or dentist in the past year, and are

Table 4 Selected indicators for Xiaoshan only by family size and by family position in sibling families; percentages, adjusted odds ratios

	1 child n=759	2+ children n=629	Adjusted OR*	p value	Sibling family 1st child n=358	Sibling family 2nd child n=257	Adjusted OR*	p value
Nutritional indicators								
Overweight	0.26	0.19	0.6 (0.2 to 1.2)	0.2	0.17	0.22	0.9 (0.5 to 1.7)	0.8
Underweight	15	17	0.9 (0.6 to 1.4)	0.5	16	18	0.8 (0.4 to 1.4)	0.7
Anaemic	36	38	0.9 (0.7 to 1.3)	0.5	40	37	1.2 (0.6 to 1.7)	0.3
Health care seeking behaviour								
Visit to doctor in past year	62	58	0.8 (0.6 to 1.1)	0.08	57	60	0.8 (0.5 to 1.3)	0.4
Visit to dentist in past year	12	6	0.7 (0.3 to 1)	0.06	8	5	1.2 (1 to 1.4)	0.05
Risk behaviours								
Ever smoking	20	12	0.6 (0.3 to 1.3)	0.5	7	21	0.8 (0.5 to 1.4)	0.1
Ever drinking alcohol	38	30	0.7 (0.6 to 1)	0.04	26	34	0.7 (0.4 to 1)	0.06
Ever been drunk	16	11	0.7 (0.5 to 1)	0.04	8	17	0.8 (0.6 to 0.9)	0.05
Mental health								
Self esteem: high	30	28	0.9 (0.6 to 1.2)	0.7	27	29	0.9 (0.6 to 1.2)	0.7
Anxiety: severe/moderate	35	40	1.2 (0.9 to 1.4)	0.06	46	34	1.2 (0.8 to 1.5)	0.2
Depression: severe/moderate	26	39	1.4 (1.1 to 1.8)	0.03	45	33	1.4 (0.7 to 1.4)	0.3
Have contemplated suicide	14	15	1.1 (0.5 to 1.4)	0.9	17	12	1.1 (0.8 to 1.3)	0.5
Have tried to commit suicide	10	9	0.9 (0.7 to 1.3)	0.9	9	8	1.1 (0.8 to 1.3)	0.6
Social								
Bullied sometimes/often	33	48	0.7 (0.5 to 0.8)	0.001	47	50	0.9 (0.7 to 1.2)	0.6
Generally liked by peers	74	65	0.6 (0.5 to 0.8)	0.005	66	64	1.1 (0.8 to 1.3)	0.5
Readily confide in friends	68	64	0.8 (0.6 to 1.0)	0.07	65	62	1.2 (0.8 to 1.4)	0.6
Readily confide in parents/other relatives	66	38	0.3 (0.2 to 0.6)	0.006	34	43	0.7 (0.5 to 0.9)	0.003
Self reported academic record: excellent/good	50	39	0.5 (0.3 to 0.7)	0.002	45	32	1.3 (1.2 to 1.5)	0.004

*Adjusted for sex, parental education.

more likely to have drunk alcohol and been drunk. They are less likely to have suffered anxiety or depression. Socially they seem to be advantaged: they are more likely to say they are liked by peers and confide more readily in friends and parents. They are also less likely to report being bullied. However, after adjusting for area, parental education, and sex, only the social factors continue to be significant.

The results for Xiaoshan alone comparing only and sibling children (table 4) after adjustment for sex and parental education conform broadly with those of the whole sample. The major exception is that depression remains significantly higher in sibling children in Xiaoshan, and only children report significantly better academic performance than those with siblings.

For the further analysis of the Xiaoshan sibling family children by position in family, twins and third children were excluded. Table 4 shows the results. Using the crude figures there are notable differences, especially in risk behaviours and psychological indicators, but after adjusting for sex and parental education the differences cease to be significant, except in the case of academic record and willingness to confide in relatives.

DISCUSSION

The study has a number of limitations. It was carried out in just 18 schools in one province and extrapolation to other areas should of course be made with caution. Cluster sampling across a larger number of schools and areas would have been preferable, but the number of participating schools was limited by the local education authorities. We failed to ask a number of questions which may have been useful; for example, proximity of extended family (it is quite common for adult siblings to choose to live close by, so that cousins are brought up like siblings). The questions were all closed, and in dichotomising the outcomes the psychological and morbidity indicators are inevitably oversimplified and cannot hope to explore the complexity of the psychological processes and coping mechanisms of these adolescents. Qualitative work to explore these issues would of course have been desirable, but was not permitted by the education authorities at the time of this study. Our group is now planning such a study.

However, despite the limitations the study has highlighted some important issues. Firstly, these data illustrate the socio-demographic patterns which are emerging in China, largely as a result of the One Child Policy. Cities have a predominance of one child families, while poorer rural areas have few. Middle income rural areas, like Xiaoshan, have fairly even numbers of only and sibling children. In Xiaoshan the gender imbalance of only children (75% of the boys and 35% of the girls) is largely accounted for by a local policy which allows couples to have another child only if the first is a girl. It is also of note that larger (three or more children) families are not as rare as might be expected, and loopholes in the regulations seem to be found.

Secondly, the crude differences (unadjusted odds ratios) between only children and those with siblings are non-significant for some important indicators: underweight, suicide ideation and suicide attempts, and ever smoking. These negative findings are important, because they suggest considerable homogeneity across this age group, irrespective of sex, residence, or family size.

Thirdly, where there are significant differences observed between only and sibling children the actual differences in percentage terms are not great and the differences almost all disappear after adjustment. This shows that it is the factors which influence family size, residence, parental education, and sex, which are the key determinants. Family size itself is not. Thus, although only children are three times as likely as sibling children to be overweight, there is no difference after controlling for area and gender. It is a problem primarily of

urban males in this population. Anxiety and depression is more common in sibling children before adjustment. A study carried out in Beijing and Tianjin also found higher levels of anxiety and depression in sibling children.¹⁵ The authors suggested that this was a result of children from larger families being viewed with disapproval, when there is saturation propaganda about having only one child. But this seems an inadequate explanation for our Xiaoshan respondents, since around half the children there are only children. Utilisation of health care is also not associated with family size. The cost of medical and dental care, which is almost all out-of-pocket for children, who rarely have their own health insurance,²⁰ is a deterrent to utilisation for poor families, irrespective of family size. (In Chunan 34% of the respondents said that "health care was hard to afford", with no significant difference between only children and sibling families.)

Fourth, in sibling families there seem to be few differences between first and second children in terms of these indicators. Although there are significant crude differences in a number of parameters, especially risk behaviours and psychological indicators, the differences are highly confounded by gender. There are a number of possibilities why there seems to be little difference between first and second siblings; for example, the compulsory spacing of at least five years between siblings means that siblings do not compete for parental attention and resources at an early age, or second siblings may benefit from the presence of a much older sibling, thus balancing any first child advantage. Further analysis of the second children by gender was prevented because of the small numbers involved, but this is an area of future planned research. It has been suggested that second girls may be disadvantaged.²

If anything, being an only child seems to confer a marginal protective effect: only children were found to be consistently better off in terms of social adjustment, popularity, willingness to confide in others, and are less likely to be the victims of bullying. This suggests that in the absence of siblings they rely more on friends for social interaction and support. The self reported academic record of only children ceases to be significantly better after adjustment. A number of studies in younger children have shown that academic achievement is higher in only children, a finding also of studies in the West.^{2 12 21 22} Maybe this difference disappears by middle school, or the use of self report is inadequate to detect a difference.

Conclusion

This study shows that there are significant crude differences between one child and sibling families across a range of health, nutritional, and psychological and social indicators. However, after adjusting for sociodemographic variables there are minimal differences, with only children appearing to have marginal psychological and social advantages over those with siblings. In this population we could find no consistent detrimental effects of being an only child using the indicators measured. This is perhaps a reassuring message when the proportion of only children worldwide is increasing.

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IMAGES IN PAEDIATRICS.....

Neurocysticercosis in West London

Neurocysticercosis is a major cause of epilepsy and neurological morbidity in endemic areas of the world. It is rare in non-endemic areas, so a high degree of awareness is necessary for diagnosis. It is often benign and lesions can resolve within months. We report two children who presented in West London recently.

A 9 year old male, born in Afghanistan and resident in the UK for two years, presented with a focal seizure. He had a two month history of episodes of stiffness and weakness affecting his right arm and leg followed by right temporal headache and drowsiness. Neurological examination was normal. Computed tomography brain scan showed a 1 cm ring enhancing lesion in the left frontoparietal lobe with surrounding oedema (fig 1). Neurocysticercosis was diagnosed from the radiological findings and a positive serological test.



Figure 1

A 12 year old girl, also born in Afghanistan and a UK resident for six years, presented with paraesthesia of her right arm. Associated symptoms included headache, vomiting, and episodes of expressive dysphasia. Neurological examination was also normal. Magnetic resonance imaging brain scan showed a ring enhancing lesion in the left parietal lobe with surrounding oedema (fig 2).

Both children have remained well and seizure free without treatment.

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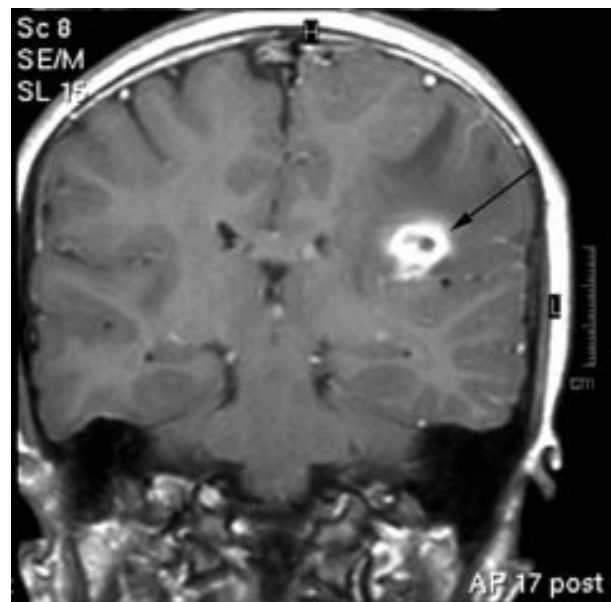


Figure 2