

# Systematic Review Protocol

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**How robust is the evidence of an emerging or increasing female excess in morbidity rates between childhood and adolescence?**

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## Background

This protocol is an updated version of the original, which was written in March 2010 and set out our plans for conducting the review. Any significant changes made to the review process, between the writing of the first protocol and this updated version, are highlighted using footnotes.

In 1995, *Social Science & Medicine* published a narrative review of research findings on sex differences in health among children and adolescents (Sweeting 1995). By examining and summarising the findings from a broad range of research on the physical health, psychological well-being and health service utilisation of children and adolescents, with a focus on the 7 to 15 age-range, Sweeting's review provides evidence of a 'gender reversal' in the distribution of ill-health across the transition from childhood to adolescence. Gender and age differences in rates of asthma are referred to in the review as one example of this reversal in physical health. It documents that in children less than 10 years old, rates of asthma are highest among boys but by adolescence boys' and girls' rates converge and after this time higher rates of asthma are often found among girls. A similar picture is presented in relation to psychological well-being; overall rates of psychiatric disorders are more prevalent amongst boys until early adolescence, however the referral rates for girls with psychiatric disorders have been found to rise after 12 years of age and exceed those of boys by age 15-16. As well as demonstrating an overall emergence of excess morbidity in females over early-mid adolescence, Sweeting's review highlighted a need for longitudinal studies to chart sex differences in physical and psychological health, as well as illness behaviours and beliefs, across the transition from childhood to adolescence.

Since the publication of Sweeting's (1995) narrative review, substantial research evidence has been found to suggest that higher rates of psychological morbidity found among males in childhood are replaced by an emergence of higher rates in females during the transition to adolescence (Petersen, Sarigiani et al. 1991; Cohen, Cohen et al. 1993; Schraedley, Gotlib et al. 1999; Ge, Conger et al. 2001; Marcotte, Fortin et al. 2002; Bennett, Ambrosini et al. 2005). This pattern has also been reported for asthma prevalence (Venn, Lewis et al. 1998; Nicolai, Pereszlenyiova-Bliznakova et al. 2003; Sears, Greene et al. 2003). Indeed, a number of reviews have synthesised and documented this evidence and have contributed to an established recognition of an emerging/increasing female excess in rates of psychological disorders (Nolen-Hoeksema and Girgus 1994; Hankin and Abramson 1999; Cyranowski, Frank et al. 2000; Shibley Hyde, Mezulis et al. 2008) and asthma<sup>1</sup> (Zannolli and Morgese 1997; Postma 2007; Almqvist, Worm et al. 2008).

However, there are no reviews, to our knowledge, which have been conducted with the aim of investigating the extent to which there is evidence of an emerging/increasing female excess in relation to other, or a range of, physical morbidity outcomes. This is surprising given that in recent decades several large-scale European and North American surveys of children and adolescents aged between 11 and 16 have reported comparable patterns of an overall emerging or increasing excess in girls' rates of reporting both psychological and physical symptoms (Eiser, Havermans et al. 1995; Eminson, Benjamin et al. 1996; Klepp, Aas et al. 1996; Haugland, Wold et al. 2001; Hetland, Torsheim et al. 2002; Sweeting and West 2003; Torsheim, Ravens-Sieberer et al. 2006). Indeed, the emergence of female excess morbidity during adolescence has been described as a central feature of adolescent health in 'a large proportion of the world's industrialised countries'

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<sup>1</sup> Originally we had planned to include asthma and psychological symptoms and conditions in this review. However, after identifying recent reviews which had explored the gender patterning of prevalence rates by age in relation to these health outcomes, we subsequently excluded studies which only presented data on asthma and psychological health outcomes.

(Torsheim, Ravens-Sieberer et al. 2006, p.823). Therefore, assessing the amount and quality of evidence suggesting that morbidity rates for a range of outcomes vary by gender according to age, may take us closer to explaining the emergence of higher reported morbidity in females.

### **Review Aims**

This review aimed to investigate the extent to which research has found evidence of an emerging/increasing female excess in relation to physical morbidity rates across childhood and adolescence.

Our objectives, in terms of the PICOS statement, were as follows:

**Population:** males and females between the ages of 4 and 17

**Intervention:** none

**Comparator:** gender and age (at least two age-groups)

**Outcome:** gender patterning, by age, in measures of physical morbidity

**Study design:** longitudinal, cross-sectional and repeat cross-sectional studies (including analysis of study-specific data or routinely collected data).

### **Methods**

#### **Searching**

The following bibliographic databases were searched: Medline; Embase; CINAHL (Cumulative Index to Nursing & Allied Health Literature); PsycINFO; and ERIC (Education from U.S. Department of Education, & Institute of Education Sciences). Academic research was targeted and no grey literature was included in the review. Searches were limited to articles published in English

between 1992 and the date of search (April 2010). As it was our intention to update Sweeting's 1995 narrative review (written in 1994), we predicted that searching for articles published in the three years leading up to its publication would enable us to retrieve any relevant studies which may have been in the publication process at the same time as, and therefore not included in, the 1995 review.

The precise search strategy differed slightly between databases if different search facilities and search engines made it necessary to adapt our approach (see Appendix 1 and 2 for the full search strategies used in each database). Our searches included three groups of terms:

*1) Terms to identify the target group*

Adolescent; adolescence; adolesc\*; child; child, preschool; children; early adolescents; late adolescents; preschool child; minor\*; pupil\*; school child\*; teenage\*; young children; young pers\*.

*2) Terms to identify the comparator*

Gender; gender differences; human sex difference; sex; sex distribution; sex factors.

*3) Terms to identify health measures*

We searched each database twice; once using *general* health subject headings and keywords and once using *specific* subject headings and keywords relating to physical symptoms and conditions common in childhood<sup>2</sup>.

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<sup>2</sup> Through the general search we aimed to retrieve studies which explored general measures of physical health (e.g. self-rated health) or a mixture of physical morbidity outcomes (e.g. symptom prevalence rates). The specific search was intended to identify studies that reported on the prevalence of particular health conditions that are common in childhood. In conducting both searches, we hoped to achieve a wide coverage of the research conducted in relation to physical morbidity during childhood and adolescence.

- a) General search terms: adolescent health; attitude to health; child health; general health questionnaire; health; health attitudes; health complaints; health status; health status indicators; health survey; morbidity; self-report; symptoms; well-being; wellness.
- b) Specific search terms: diabetes mellitus; epilepsy; headache; headache disorders, primary; migraine; primary headache.

### **Data Management**

A 'search diary' was kept, which detailed the names of the databases searched, the search terms used and the search results (see Appendix 1 and 2). The results of each search were exported to an Endnote database, along with details of which database they were imported from and whether they were the results of the general or specific search. Titles and abstracts were screened by one reviewer and inclusion/exclusion decisions recorded on the Endnote database. To check for consistency in screening, a random sample of abstracts was screened by two other reviewers and their decision to include or exclude was checked against the main reviewer's decision. Retrieved studies were filed according to inclusion/exclusion decisions.

### **Inclusion and exclusion criteria**

The following inclusion and exclusion criteria were applied to all studies to determine their relevance to the review:

#### *1) Age of participants*

As the review focussed on child and adolescent health, studies which included participants between 4 and 17 years old were included. Studies of babies and toddlers (aged 0-3 years) were excluded on the grounds that they are not able to communicate their symptoms verbally in the same way as older children. Studies of those aged 18 years and over were classed as adult studies and therefore

not included. As we aimed to look at change in prevalence rates according to age, studies were required to present prevalence data for at least two age-groups within the 4-17 range. Studies which only presented data for one age-group were excluded. Studies were included if they presented data in age-bands of no wider than five years (e.g. 11-14). Studies using age-bands wider than five years were excluded on the grounds that this would prevent us from looking at change in prevalence rates according to age. Studies which used age-bands that included some participants within the 4-17 age-range, such as 0-4 or 15-19, were included. However, if half or more of an individual age-band was not within our age-range, that age-band was excluded from our analyses. For example, 0-4 age-bands were excluded from analysis on the assumption that the majority of participants within that sample would be under four years of age. Often this did not result in the exclusion of studies as they presented prevalence data for at least a further two age-groups.

## *2) Sex of participants*

The aim of the review was to assess the evidence for an emerging/increasing female excess in morbidity rates, so studies which presented data in relation to both males and females were included. Studies which presented data only in relation to either males or females were excluded.

## *3) Study design*

Empirical studies which used quantitative data collection and analysis methods were included. Longitudinal, cross-sectional, repeat cross-sectional and studies which have analysed routine data (e.g. hospital records) were included. Studies which employed qualitative data collection and analysis methods were not included. Studies which presented only parent-report data were also excluded.

#### 4) *Health measures*

Studies which presented prevalence data on health measures (e.g. symptom and morbidity rates; health status; incidence of chronic illnesses in childhood etc.) were included in the review. Studies reporting only lifetime prevalence rates were not included because we were interested in current or recent (i.e. within last year) measures of physical morbidity. Studies about injuries or accidents were not included. Studies about health behaviours and symptoms resulting from health behaviours (e.g. impact of alcohol use on depressive symptoms) were also excluded. Studies focussing on dental health were excluded, as were studies which focussed on obesity rates and those which explored rates of symptoms which are the result of traumatic events (e.g. abuse).

#### 5) *Countries*

Studies from current EU countries as well as the USA, Canada, Australia and New Zealand were included on the basis that their contextual similarity would aid comparison. Studies from all other countries were excluded.

The above criteria were applied to the titles and abstracts of the articles identified by the literature searches. Hard copies were obtained of all articles which met the inclusion criteria. In cases where inclusion or exclusion could not be determined from titles and abstracts, full papers were retrieved and checked. Each article was labelled in Endnote as to whether it was included or excluded and the number of articles included and excluded at the various stages of the review was recorded systematically.

### **Data extraction**

Data were extracted by one reviewer and three reviewers each independently extracted a sample of studies. Extraction forms were compared across reviewers. The following data were extracted:

- 1) **Publication details:** author; title; journal; date; primary focus; stated aims.
- 2) **Focus on emerging/increasing female excess:** mention or not of sex differences/similarities/'gender reversal' in introduction, results or discussion; explanations offered for changes in sex differences with age.
- 3) **Study details:** methods; sample (source, size, age range and age-groups; representativeness; response rate/completeness); primary outcomes; questions/instruments.
- 4) **Key data:** any figures for outcomes by sex and age (e.g. prevalence rate/incidence rate, both adjusted and unadjusted, figures extracted as reported in paper (means, OR, RR etc.) with as much detail as possible (95% confidence intervals, chi-square etc.)).

### **Assessment of methodological quality**

Studies were critically appraised by one reviewer using the criteria below which were agreed by all reviewers. A quality index was developed for each criterion which ranged from 2 (lower potential for bias) to 0 (higher potential for bias). Studies were each given an indicative score for quality. Repeat cross-sectional/cross-sectional and routine data studies were scored out of a maximum of 12 and, due to the extra criterion for attrition rate, longitudinal studies were scored out of 14.

#### *Sample size*

- 2 - Every age and gender sub-group is comprised of at least 100 participants.
- 1 - Every age and gender sub-group is comprised of at least 50 participants.
- 0 - <50 in any age and gender sub-group, or data not given.

*Large/multi-site population*

2 - International, national or statewide (e.g. as in a USA state) study, including multi-site studies in which the sites are spread across international, national or statewide areas.

1 - Local multi-site studies (e.g. same city, town/district, or villages within the same region).

0 – Single-site study (e.g. one school).

*Age-ranges covered*

2 - Three or more age points that include under 12 years of age and 12 years or older.

1 - Two age points that include under 12 years of age and 12 years or older.

0 - Age points do not compare those under 12 years of age with those aged 12 years or older.

*Selection bias*

2 - 80-100% response at baseline *or* routine data that covers at least 80% of population.

1 - 60-79% response at baseline (or routine data coverage) and non-response confounding explored and found not to have a substantial gender or age bias *or* routine data covers 60-79% and no reason to assume age/gender bias in coverage.

0 - Response (or routine data coverage) less than 60%; or less than 80% with evidence of a substantial gender or age bias in attrition; or if non-response is not explored.

*Outcome*

2 - Physical examination by trained professional.

1 - Self-complete questionnaire using an established/validated questionnaire.

0 - Unvalidated questionnaire or questionnaire designed for study and there is no comment on validation.

### *Analysis and data reporting*

2 - Use odds ratios/incidence rate ratio and 95% confidence intervals to determine whether there is a significant gender-by-age interaction associated with morbidity rates (or sufficient data to calculate ORs, IRRs and CIs).

1 - Use of alternative (to those above) methods of determining gender-by-age interactions associated with morbidity rates (e.g. continuous data or visual data without confidence intervals).

0 - Data on age, gender or morbidity compromised by unclear reporting or missing data.

### *Attrition (longitudinal studies only)*

2 - Final response is 80%-100% of baseline response.

1 - Final response is 60%-79% of baseline response and attrition confounding explored and found not to have a significant gender or age bias or a bias related to baseline health outcomes.

0 - Final response is <60% of baseline response.

### **Synthesis**

As a meta-analysis was not possible, owing to the heterogeneity of studies, a narrative synthesis method was employed. The studies were grouped by symptoms and conditions as follows: self-assessed health; symptoms (abdominal pain; back pain; dizziness; headache; sleeping difficulties/tiredness); conditions (migraine; diabetes mellitus; epilepsy). Where data were available, odds ratios were calculated (with males serving as the reference group) and studies were tabulated to aid comparison.

### **Dissemination**

The findings from the review were written up and submitted for publication to an international public health journal. We have so far presented the findings at two national conferences.

## Appendix I – General search diary

### Medline (Ovid interface)

16/04/2010

(child, preschool or child or adolescent).sh. and (sex factors or sex distribution).sh. and (health status or attitude to health or health surveys or mental health).sh.

limit to (english language and humans and yr="1992 -Current")

(.sh. = MeSH subject headings)

Results – 3587

### Embase (Ovid interface)

19/04/2010

(child or school child or adolescent or preschool child).sh. and (sex difference or gender).sh. and (adolescent health or health survey or health status).sh.

limit to (human and English language and yr="1992 -Current")

(.sh.= subject headings)

Results – 2652

### CINAHL (Cumulative Index to Nursing and Allied Health) (EBSCO Host interface)

19/04/2010

(adolescence or child or child, preschool).sh. and (sex factors).sh. and (health status or health status indicators or attitude to health or symptoms or morbidity or child health or adolescent health).sh.

limit to (english language and yr="1992 -Current")

(.sh.= word in subject heading)

Results – 1467

**PsycINFO (EBSCO Host interface)**

19/04/2010

(child\* or adolesc\* or young pers\* or teenage\* or pupil\* or school child\* or minor\*).kw. and (human sex differences or sex).sh. and (health or health attitudes or health complaints or general health questionnaire or well being or self report or morbidity or symptoms).sh.

limit to (english language and yr="1992 -Current")

(.kw. – keywords, .sh.= subjects)

Results – 1136

**ERIC (Education from US Department of Education, and Institute of Education Sciences) (Ovid interface)**

(19/04/2010)

((children or young children or adolescents or early adolescents or late adolescents).sh. or (pupil\* or school child\* or minor\*).ab.) and ((sex or gender differences).sh. or (sex or gender).ab.) and ((health or child health or adolescent health or well being or wellness).sh. or (morbidity or symptom\*).ab.)

limit to (english language and yr="1992 -Current")

(.sh.= ERIC subject headings, .ab. = abstract)

Results – 593

**General search total hits – 9435**

**Unique hits – 8623**

## Appendix 2 – Specific search diary

### Medline (Ovid interface)

06/05/2010

(child, preschool or child or adolescent).sh. and (sex factors or sex distribution).sh. and (asthma or epilepsy or headache disorders, primary or diabetes mellitus).sh.

limit to (english language and humans and yr="1992 -Current")

(.sh. = MeSH subject headings)

Results – 1426

### Embase (Ovid interface)

06/05/2010

(child or school child or adolescent or preschool child).sh. and (sex difference or gender).sh. and (asthma or primary headache or migraine or diabetes mellitus or epilepsy).sh.

limit to (human and English language and yr="1992 -Current")

(.sh.= subject headings)

Results – 1526

### CINAHL (Cumulative Index to Nursing and Allied Health) (EBSCO Host interface)

07/05/2010

(adolescence or child or child, preschool).sh. and (sex factors).sh. and (asthma or diabetes mellitus or headache or epilepsy).sh.

limit to (english language and yr="1992 -Current")

(.sh.= word in subject heading)

Results – 498

**PsycINFO (EBSCO Host interface)**

07/05/2010

(child\* or adolesc\* or young pers\* or teenage\* or pupil\* or school child\* or minor\*).kw. and  
(human sex differences or sex).sh. and (asthma or diabetes mellitus or headache or epilepsy).sh.

limit to (english language and yr="1992 -Current")

(.kw. – keywords, .sh.= exact subjects)

Results – 38

**ERIC (Education from US Department of Education, and Institute of Education Sciences) (Ovid interface)**

07/05/2010

((children or young children or adolescents or early adolescents or late adolescents).sh. or (pupil\*  
or school child\* or minor\*).ab.) and ((sex or gender differences).sh. or (sex or gender).ab.) and  
((asthma or headache or migraine).ab. or (diabetes or epilepsy).sh.)

limit to (english language and yr="1992 -Current")

(.sh.= ERIC subject headings, .ab. = abstract)

Results – 22

**Specific search total hits – 3510**

**Unique hits - 2622**

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