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Review

How robust is the evidence of an emerging or increasing female excess in physical morbidity between childhood and adolescence? Results of a systematic literature review and meta-analyses

Alice MacLean [a,*], Helen Sweeting [a], Matt Egan [a], Geoff Der [a], Joy Adamson [b], Kate Hunt [a]

[a] MRC/CSO Social and Public Health Sciences Unit, Glasgow, UK
[b] University of York, UK

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ABSTRACT

For asthma and psychological morbidity, it is well established that higher prevalence among *males* in childhood is replaced by higher prevalence among *females* by adolescence. This review investigates whether there is evidence for a similar emerging female 'excess' in relation to a broad range of physical morbidity measures. Establishing whether this pattern is generalised or health outcome-specific will further understandings of the aetiology of gender differences in health. Databases (Medline; Embase; CINAHL; PsycINFO; ERIC) were searched for English language studies (published 1992–2010) presenting physical morbidity prevalence data for males and females, for at least two age-bands within the age-range 4–17 years. A three-stage screening process (initial sifting; detailed inspection; extraction of full papers), was followed by study quality appraisals. Of 11 245 identified studies, 41 met the inclusion criteria. Most ($n = 31$) presented self-report survey data (five longitudinal, 26 cross-sectional); 10 presented routinely collected data (GP/hospital statistics). Extracted data, supplemented by additional data obtained from authors of the included studies, were used to calculate odds ratios of a female excess, or female:male incident rate ratios as appropriate. To test whether these changed with age, the values were logged and regressed on age in random effects meta-regressions. These showed strongest evidence of an emerging/increasing female excess for self-reported measures of headache, abdominal pain, tiredness, migraine and self-assessed health. Type 1 diabetes and epilepsy, based on routinely collected data, did not show a significant emerging/increasing female excess. For most physical morbidity measures reviewed, the evidence broadly points towards an emerging/increasing female excess during the transition to adolescence, although results varied by morbidity measure and study design, and suggest that this may occur at a younger age than previously thought.

Introduction

It is well established that higher rates of psychological morbidity among males in childhood are replaced by higher female rates in adolescence and adulthood (Bennett, Ambrosini, Kudes, Metz, & Rabinovich, 2005; Cohen et al., 1993; Cyranowski, Frank, Young, & Shear, 2000; Ge, Conger, & Elder, 2001; Hankin & Abramson, 1999; Marcotte, Fortin, Potvin, & Papillon, 2002; Nolen-Hoeksema & Girgus, 1994; Petersen, Sarigiani, & Kennedy, 1991; Schraedley, Gotlib, & Hayward, 1999; Shibley Hyde, Mezulis, & Abramson, 2008). This pattern has also been reported for asthma prevalence (Almqvist, Worm, & Leynaert, 2008; Nicolai, Pereszlenyiova-Bliznakova, Illi, Reinhardt, & von Mutius, 2003; Postma, 2007; Sears et al., 2003; Venn, Lewis, Cooper, Hill, & Britton, 1998; Zannolli & Morgese, 1997). This paper examines whether there is evidence of an emerging or increasing female 'excess' in relation to other forms of physical morbidity. Identifying and appraising evidence for this pattern, particularly assessing whether it is general or specific to certain symptoms or conditions, is important, since it may enhance understanding of the apparent deterioration in some aspects of female health which begins in adolescence and continues into adulthood, and hence indicate potential ways to ameliorate gender differentials.

In the early 1990s, Sweeting (1995) conducted a narrative review of research on physical health (longstanding illness and the specific conditions asthma, diabetes mellitus, migraine and other headaches), psychological well-being and health service utilisation

* Corresponding author. Tel.: +44 (0)1413577524; fax: +44 (0)1413372389.
E-mail address: alice@sphsu.mrc.ac.uk (A. MacLean).

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of children and adolescents, highlighting a 'gender reversal' in the distribution of ill-health during the transition from childhood to adolescence. Since then, this pattern has been widely reported, particularly in respect of psychological morbidity, and has even been described as a central feature of adolescent health in 'a large proportion of the world's industrialised countries' (Torsheim et al., 2006, p. 823). Attempts to explain these patterns have concentrated on psychological morbidity (Cyranowski et al., 2000; Nolen-Hoeksema & Girgus, 1994; Rutter, Caspi, & Moffitt, 2003) and have advanced similar explanations to those put forward for gender differences in adult health, such as different roles, stresses, expectations, reporting behaviours, lifestyles, as well as genetic and biological differences.

Examples of factors which might explain the 'gender reversal' in health beginning in early adolescence include puberty, which is associated with hormonal changes and alterations in body shape generally regarded as more positive for males (Eme, 1979; Polce-Lynch, Myers, Kilmartin, Forsmann-Falck, & Kliewer, 1998) and also with physical symptoms or conditions such as menstrual cramps (Harlow & Park, 1996), headaches and migraine (Deubner, 1977) in females. Another possible explanation is societal gender expectations (for females to be academically successful, hard-working and attractive, for males to be strong and stoic), which become more differentiated during this life stage (MacLean, Sweeting, & Hunt, 2010; West & Sweeting, 2003), potentially leading to differences in the experience of psychosocial stressors and impacting on illness behaviours such as symptom reporting. Gender differences in lifestyle, for example higher levels of physical activity in adolescent males (Coleman & Schofield, 2001), might also contribute to gender differences in adolescent health. The relatively few studies which have specifically examined, or attempted to account for the gender reversal in relation to physical morbidity (Angold, Costello, Erkanli, & Worthman, 1999; Eminson, Benjamin, Shortall, Woods, & Faragher, 1996; Haugland, Wold, Stevenson, Aaroe, & Woynarowska, 2001; MacLean et al., 2010; Sweeting, West, & Der, 2007) have considered such explanations, but fully accounting for these patterns has proved difficult. In addition, a cross-national study of 11–15-year olds from a range of European and North American countries found that the size of gender differences in adolescent health varied between-countries and was associated with each country's male:female life expectancy ratio, suggesting that macro-social contextual factors might also impact on gender differences in adolescent health (Torsheim et al., 2006).

Contrasting with the research focus on an emerging or increasing female excess in psychological distress, no reviews have, to our knowledge, been conducted with the aim of systematically investigating the extent to which there is evidence of an emerging or increasing female excess in relation to a range of *physical* morbidity measures. There are a number of reasons for conducting such a review. Firstly, it should enable the synthesis and appraisal of evidence in relation to changing gender differences in health between childhood and adolescence in physical morbidity and, in turn, allow a judgement about the robustness of evidence for an emerging/increasing female excess. Secondly, it should shed light on whether this pattern is found for physical morbidity generally or is specific to certain symptoms or conditions. Thirdly, it could highlight new areas for investigation to further understandings of the aetiology of gender differences in health. Fourthly, it should ensure that future primary research in this area avoids replication and is informed by the 'best available evidence' (Bambra, 2011) of the gender-by-age patterning of physical morbidity during childhood and adolescence. Finally, it may inform strategies and interventions that aim to prevent or reduce gender inequalities in health.

The identification of 'reversals of fortune' within Sweeting's (1995) earlier review might suggest a simple switch from excess male morbidity in childhood to excess female morbidity by mid adolescence. In attempting to conceptualise patterns of gender-by-age differences in morbidity more critically and comprehensively for this review, we represented diagrammatically a series of plausible patterns. These are described below and shown in Fig. 1. Diagrams in the left-hand column schematically represent possible male and female morbidity rates from mid-late childhood to mid adolescence, whilst those in the right-hand column represent the associated odds of female excess morbidity over the same life stage.

'Type 1 reversals' represent variations on an emerging or increasing female excess. They can originate from: a) a male excess reversing to a female excess (via increasing female rates with age accompanied by decreasing male rates, stable male rates or male rates which increase with age, but less steeply than those of females); b) decreasing male rates with age while female rates remain stable or decrease less steeply; c) an emerging female excess from a point of no gender difference; d) an existing small female excess at younger ages which increases with age. In respect of these patterns the odds of morbidity among females compared to males would start from below ('Types 1a' and '1b'), at ('Type 1c') or above unity ('Type 1d') and increase with age. It should be noted that the specific ages examined will, at least to some extent, determine the pattern observed. For example, a male excess reversing to female excess pattern might appear as an emerging or increasing female excess if initial health measures were obtained at older ages.

'Type 2' patterns represent either no gender difference or no change in the gender difference with age. 'Type 3' represents variations on an emerging *male* excess; the patterns are the reverse of those in Type 1. Finally, 'Type 4' represents any mixed or unclassifiable patterns, for example an increasing then decreasing male rate combined with a stable female rate. Due to their potential complexity and reduced relevance from the point of this review, 'Type 4' patterns are not shown diagrammatically.

Aims

The current review uses systematic methods to investigate the gender-by-age patterning of a range of physical morbidity measures across childhood and adolescence to identify the extent to which there is evidence of an emerging or increasing female excess in physical morbidity over this life stage. We focus on more general measures of physical health (self-assessed health) together with a number of common symptoms (abdominal pain, back pain, dizziness, sleeping problems/tiredness and headache) and conditions (migraine, diabetes mellitus and epilepsy). We are aware that distinguishing certain symptoms as 'physical' rather than 'psychological' or 'malaise' is necessarily somewhat arbitrary (Hunt & Annandale, 1993). All the symptoms included in this review could reflect organic (physical) disease and/or a substantial psychological component (Pennebaker, 1982).

Our objectives, in terms of the PICOS statement (Moher, Liberati, Tetzlaff, & Altman, 2009), were to identify, appraise and review studies with the following characteristics:

Population: males and females aged 4–17 years;
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).