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Short report

# Researching health inequalities in adolescents: The development of the Health Behaviour in School-Aged Children (HBSC) Family Affluence Scale

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## Abstract

Socioeconomic inequalities in adolescent health have been little studied until recently, partly due to the lack of appropriate and agreed upon measures for this age group. The difficulties of measuring adolescent socioeconomic status (SES) are both conceptual and methodological. Conceptually, it is unclear whether parental SES should be used as a proxy, and if so, which aspect of SES is most relevant. Methodologically, parental SES information is difficult to obtain from adolescents resulting in high levels of missing data. These issues led to the development of a new measure, the Family Affluence Scale (FAS), in the context of an international study on adolescent health, the Health Behaviour in School-Aged Children (HBSC) Study. The paper reviews the evolution of the measure over the past 10 years and its utility in examining and explaining health related inequalities at national and cross-national levels in over 30 countries in Europe and North America. We present an overview of HBSC papers published to date that examine FAS-related socioeconomic inequalities in health and health behaviour, using data from the HBSC study. Findings suggest consistent inequalities in self-reported health, psychosomatic symptoms, physical activity and aspects of eating habits at both the individual and country level. FAS has recently been adopted, and in some cases adapted, by other research and policy related studies and this work is also reviewed. Finally, ongoing FAS validation work is described together with ideas for future development of the measure.

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## Introduction

Health inequalities stemming from the unequal distribution of social and economic resources pervade many societies. Until the last decade or so, inequalities in adolescent health received little attention compared to health inequalities in adults and young children (DiLiberti, 2000; Macintyre & West, 1991; Marmot, 2005; West, 1997). Existing adolescent studies, including those at a cross-national level, have used a variety of different measures of both socioeconomic status (SES) and health outcomes, as well as different age groups, making it difficult to draw general conclusions about health inequalities among adolescents (Case, Paxson, & Vogl, 2007; Chen, Martin, & Matthews, 2006, 2007; Starfield, Riley, Witt, & Robertson, 2002).

In adults, SES is usually measured by income, education or occupation. Adolescents themselves have little economic power; are still in schooling and lack occupational social status, as normally they do not participate in the labour market. Most often, the SES of the father, mother or head of the household is the proxy applied to adolescents. However, data on family SES can be difficult to collect from young people because they do not know or are not willing to reveal such information resulting in non-response on parental occupation varying from 20% to 45% reported by various studies (Currie, Elton, Todd, & Platt, 1997; Molcho, Nic Gabhainn, & Kelleher, 2007; Wardle, Robb, & Johnson, 2002). Additionally, bias has been reported with greater non-response in low socioeconomic groups (Lien, Friestad, & Klepp, 2001; Wardle et al., 2004).

One study that has addressed the issue of the adolescent SES measurement problem is the HBSC study (Currie et al., 1997). HBSC is the Health Behaviour in School-Aged Children: WHO Collaborative Cross-National Study, which conducts a self-report questionnaire based survey of schoolchildren every four years with nationally representative samples of children in member countries. This study has been monitoring the health and well-being of young people aged 11, 13 and 15 years since 1982 in a growing number of countries in Europe and North America (Currie et al., 2004). The issue of a low response on parental occupations was first addressed in the HBSC study in Scotland through the development of a supplementary measure of SES, the Family Affluence Scale (FAS) (Currie et al., 1997).

Currie et al. (1997) used the concept of material conditions in the family to base the selection of items for the Family Affluence Scale. In particular the work of Carstairs and Morris (1991) and Townsend (1987) was drawn upon. Townsend's concept of material

deprivation was based on the notion of lacking material standards ordinarily available in the society but in FAS both ends of the scale are considered — the more affluent as well as the deprived. Items selected for FAS met the following criteria:

- items should be simple to answer, non-intrusive and non-sensitive;
- multiple rather than single component items should be used;
- items should be relevant to contemporary economic circumstances;
- there should be the potential to create a common set of indicators for future cross-national HBSC surveys.

The criteria used were in agreement with the ideas presented by other authors, including Abrahamson, Gofin, Habib, Pridan, and Gofin (1982) and Liberatos, Link, and Kelsey (1988), who were concerned with practical considerations as well as conceptual issues when developing socioeconomic indicators.

This paper aims to review the use of FAS as a measure of adolescent socioeconomic circumstances in the context of HBSC and other studies. It presents the key findings and methodological approaches to analysis as well as validation work and ideas for future development of FAS.

## The development of the Family Affluence Scale

When formulating the Family Affluence Scale, Currie et al. (1997) chose a set of items which reflected family expenditure and consumption that were relevant to family circumstances in the early 1990s in Scotland. Possessing these items was considered to reflect affluence and their lack, on the other hand, material deprivation. In its initial format as used in the 1990 Scottish HBSC survey (Currie et al., 1997), FAS was comprised of three easily answered, non-sensitive component items: number of telephones in the household, family car ownership, and the child having their own bedroom, following the work of Townsend (1987). Telephone ownership was known to vary according to social class in Scotland with under-representation in lower SES groups (Robertson & Uitenbroek, 1992). Car ownership and overcrowding (in FAS measured through bedroom occupancy) were components of the Carstairs deprivation index (Carstairs & Morris, 1991). All three items (phone, car and bedroom) were combined to provide a summary 'wealth' variable that was termed the Family Affluence Scale (FAS).

While initially FAS was used in the Scottish context, it was soon adopted by the international HBSC study for cross-national use. This necessitated a review of the component items to assess their relevance to the economic circumstances of families in the other study countries across Europe and North America. Following a systematic process of consultation with national Principal Investigators in preparation for the 1993/1994 HBSC survey, the telephone item was omitted since it did not discriminate affluent/deprived families in some countries. For example, in Canada there were very high levels of telephone ownership in the population and in others, such as Hungary, phone ownership depended on which part of the country the respondent lived in, not on the wealth of the family (Wold, Aarø, & Smith, 1994). However, number of cars and bedroom occupancy was found suitable. The idea of a consumer goods checklist was also considered but was not taken up due to lack of international agreement over appropriate items (Wold et al., 1994). Following a similar process, in the 1997/1998 HBSC survey a new item, number of family holidays, was added to the scale (Mullan & Currie, 2000); and in the 2001/2002 HBSC survey an item on the number of family computers was added (Boyce & Dallago, 2004). The 1997/1998 version of FAS is hereafter referred to as FASI (including car(s), bedroom and holiday(s)) and the 2001/2002 version as FASII (FASI items plus computer ownership) (Currie et al., 2004). Response keys and codes for FASI and FASII are presented in Table 1.

Over the years FAS items proved to be easily answered, thus achieving one of the aims of the scale. In

contrast to parental occupation, proportion of missing data on FAS items is low. Currie et al. (1997) report 2% or less missing data on telephone, car and bedroom items. Molcho et al. (2007) report 3% or less on car, bedroom, holiday and computers items. In another (non-HBSC) study, Wardle et al. (2002) report 2% missing on car and computer items. These high response rates on FAS items provide a scale that is easily completed in a self-report situation and enables the researchers to address the issue of material affluence in children's surveys.

### Use of FAS in HBSC

FAS has been used to examine and explain socioeconomic inequalities in a wide range of health indicators in the HBSC study over the last 10 years. In the main these analyses are cross-national although a few are based on national data. Low affluence is associated with a decreased risk for medically attended injuries and specifically for sport related injuries (Pickett et al., 2005), but with an increased risk for fighting injuries (Simpson, Janssen, Craig, & Pickett, 2005); children with lower FAS scores are found to consume more soft drinks and high-sugar foods compared with children with higher FAS score (Inchley, Tood, Bryce, & Currie, 2001; Mullan & Currie, 2000). High FAS is a predictor of frequent tooth brushing (more than once a day) (Maes, Vereecken, Vanobbergen, & Honkala, 2006) and of participation in moderate (Holstein, Parry-Langdon, Zambon, Currie, & Roberts, 2004) or vigorous physical activity (Inchley, Currie, Todd, Akhtar, & Currie, 2005; Mullan & Currie, 2000).

Poor self-reported health (Holstein et al., 2004; Torsheim et al., 2004; Torsheim, Currie, Boyce, & Samdal, 2006) and poor mental well-being (not feeling happy, not feeling confident and feeling helpless) (Mullan & Currie, 2000) are more prevalent among less affluent adolescents across countries. However, no consistent cross-national picture is found in the relationship between FAS and smoking (Griesbach, Amos, & Currie, 2003; Holstein et al., 2004; Mullan & Currie, 2000; Richter & Leppin, 2007), and the picture for alcohol use is varied. Among boys, low FAS is associated with more frequent drinking, but high FAS with more frequent drunkenness. Girls' drinking is not associated with FAS (Richter, Lepping, & Gabhainn, 2006).

More recently, FAS has been used to examine aggregate inequalities in reported health and eating habits at the country level. Children living in less affluent countries and countries with greater socioeconomic

Table 1  
The Family Affluence Scale: items, response keys and codes for FASI<sup>a</sup> and FASII<sup>b</sup>

Item: question	Response key	Codes
<i>Car</i> <sup>a</sup> : does your family own a car, van or truck?	No	0
	Yes, one	1
	Yes, two or more	2
<i>Own bedroom</i> <sup>a</sup> : do you have your own bedroom for yourself?	No	0
	Yes	1
<i>Holidays</i> <sup>a</sup> : during the past 12 months, how many times did you travel away on holiday with your family?	Not at all	0
	Once	1
	Twice	2
	More than twice	3
<i>Computers</i> <sup>b</sup> : how many computers does your family own?	None	0
	One	1
	Two	2
	More than two	3

<sup>a</sup> Items included in FASI and FASII.

<sup>b</sup> Item also included in FASII only.

inequalities have poorer self-reported health (Torsheim et al., 2004, 2006). Higher consumption of fruits is found in more affluent countries (Vereecken, Inchley, Subramanian, Hublet, & Maes, 2005).

FAS has been utilised in different ways for different analyses. The full composite scale has been used as a continuous variable in a number of analyses focussing on health gradients (for example: Currie et al., 1997; Elgar, Roberts, Parry-Langdon, & Boyce, 2005; Pickett, James, & Wilkinson, 2006; Torsheim et al., 2004, 2006). However, more frequently FAS has been recoded to create low, middle and high affluence groups, and in some cases the sample splits into tertiles, in order to examine the effect of relative or approximate SES position that more easily corresponds with classical SES groupings (for example: Boyce, Torsheim, Currie, & Zambon, 2006; Due et al., 2005; Griesbach et al., 2003; Holstein et al., 2004; Inchley et al., 2005; Maes et al., 2006; Richter & Leppin, 2007; Richter et al., 2006; Vereecken et al., 2005).

In cross-national analyses several approaches have been used to examine country level health inequalities and their consistency. Individual country level analyses and the extent of agreement between them have been used to look at inequalities in a wide range of health outcomes (Batista-Foguet, Fortiana, Currie, & Villalbi, 2004; Holstein et al., 2004; Maes et al., 2006; Mullan & Currie, 2000; Pickett et al., 2006; Richter et al., 2006). The power of this approach is to visualise the similarities and differences between countries and see global patterns that can be further interpreted (Vereecken et al., 2005). Multilevel approaches have been used to examine the relationship between FAS and self-reported health, both within and between countries (Torsheim et al., 2004, 2006), enabling the investigation of the importance of relative and absolute FAS differences in health. Using aggregated data from 33 countries, Zambon et al. (2006) demonstrated the moderating influence of welfare systems on FAS-related health inequalities (Zambon et al., 2006).

### **Use of FAS and similar measures in non-HBSC studies**

FAS has informed research outside the context of the HBSC study (e.g. Koivusilta, Rimpela, & Kautiainen, 2006; Sleskova et al., 2006; Von Rueden et al., 2006; Wardle et al., 2002, 2004; West & Sweeting, 2004; Williams, Currie, Wright, Elton, & Beattie, 1997). Williams et al. (1997) devised a measure based on FAS but using only the car and bedroom items and producing a four point scale. This modified FAS was

associated with injury risk behaviour among a Scottish sample of adolescents. In a study in the North of England, Wardle et al. (2002) devised a Home Affluence Scale (HASC) which is based on FAS comprising car ownership, computer ownership, house tenure and free school meals. The authors validated HASC against children's reports of parental occupation. Wardle et al. (2004) found an association between HASC and girls' reports of body shape perception, dieting behaviour and height. West and Sweeting (2004) in a study in the West of Scotland altered FAS including the car and bedroom items and with the addition of the family having their 'own garden'. These authors found a strong relationship between affluence and height and, to a lesser extent, self-rated health. Koivusilta et al. (2006) in a study in Finland added weekly spending money to their version of FAS. Using the component items separately, they found associations with overweight and self-rated health. Sleskova et al. (2006), in a study of one region in Slovakia, used individual components, car, phone and computers from the different versions of FAS. Von Rueden et al. (2006) used FASII in its unmodified form in a study of health related quality of life in childhood and adolescence in seven European countries. The authors report strong associations between FAS and all facets of health related quality of life among adolescents but not younger children. Each of these authors had their own rationale for the adaptations they made to FAS, however, such adaptations would not have been appropriate for HBSC for a variety of reasons. For example, in some studies data were obtained from other sources than young people themselves (e.g. schools), and some items were not applicable cross-nationally, such as having a garden (Wold et al., 1994).

Recently FAS has been adopted as an indicator of child well-being in an international policy related context. UNICEF includes the percentage of children reporting low family affluence as an indicator of material deprivation (UNICEF, 2007). Its inclusion as an indicator of material well-being has also been reported in a recent paper presenting an index of child well-being in the European Union (Bradshaw, Hoelscher, & Richardson, 2006).

### **Validation of FAS in the HBSC study**

From its early development, there have been efforts to validate FAS at both national and international levels. When the first FAS paper was published (Currie et al., 1997), it included the validation of the measure against self-reported parental occupation, finding moderate correlation between the two measures and broadly

similar patterns of association with health indicators and health behaviours. In a Welsh study children's reports on the FAS items validated against their parents' report showed strong agreement (Parry-Langdon et al., 2006). A variety of cross-national studies have set out to explicitly validate different aspects of the measure. A six-country study (Krolner, Andersen, Holstein, & Due, 2005) of child-parent agreement on FASII items reported high agreement levels on the whole scale and on individual items except for the holiday item. Using data from 25 countries, Boyce et al. (2006) examined the FAS aggregated at the country level against the national wealth indicator, Gross Domestic Product, indicating good criterion validity. Similarly, they demonstrated country FAS to be an improvement over GDP in predictions of various national health indicators. Test–retest reliability of young people's reports on FAS items has not been assessed but disagreement is likely to be low due to the objectivity of the measures. In addition, country level correlations between 1997 and 2001 for both individual FAS items and summary scores were very high indicating good stability (Boyce et al., 2006).

### The development of FAS

The evidence presented above on FAS shows its usefulness as an indicator of child material affluence both in research and policy contexts and as a predictor of health outcomes in young people. Yet there is a need to continue to critically review the component items and consider future developments.

The FAS was developed in the early 1990s reflecting family material affluence/deprivation at the time. Since then, as described above, some additional items have been included in FAS to reflect changes in leisure patterns (family holidays) and technological developments (personal computers) across countries. Car ownership, bedroom occupancy, computer ownership and holidays are among the items currently used by a wide range of contemporary household surveys recently reviewed in Boarini and Mira d'Ercole's (2006) report 'Measures of Material Deprivation in OECD Countries'.

Despite the widespread use of the items in FAS and these other surveys, they may not be bias-free. It is known that car ownership varies according to availability of public transport and urban/rural location (Farmer, Baird, & Iverson, 2001); having one's own room reflects the size of one's house, the demography of the household and urban/rural living (Pacione, 1994); and computer ownership and family holidays may vary according to family demography.

One way of dealing with these potential biases is through statistical approaches that address differential item functioning. The FAS as described so far has been conceptualised as a formative scale where the sum of material possessions equates to an overall measure of material wealth. Another way of conceptualising FAS is as a measure of an underlying trait, or latent construct, of wealth, i.e. as a reflexive index. The distinction between formative and reflexive measurement models has been discussed in the literature (Bollen & Lennox, 1991; Edwards & Bagozzi, 2000; Fayers & Hand, 2002). To consider FAS as a reflexive index correction for differential item functioning should be used. This approach was first introduced in HBSC by Batista-Foguet et al. (2004) who suggested that different weights should be applied to component items in different countries based on their relative importance to the overall measurement of family affluence in each country. This methodological approach has not yet been widely adopted in cross-national analyses but some national HBSC papers have utilised the method (e.g. Richter & Leppin, 2007).

While statistical techniques can overcome some degree of bias posed by items, over the longer term some items may become redundant. Deciding when this has occurred will require rules of thumb, such as reduced variability in the item within and between countries that affects an agreed number of countries. Another way to approach these biases is to reduce the impact of single items through increasing the number of component items in the FAS. This model has been used by some of the (adult) surveys reviewed by Boarini and Mira d'Ercole (2006).

Changes in component items such as the addition of items or omission of obsolete items over time mean that the use of FAS over time must be carried out with some caution. As the scale adapts so too does the range of FAS values. However, the latent construct of wealth remains. It can therefore be argued that for example the least affluent tertile calculated in 1990 on the basis of phone(s), car(s) and bedroom is equivalent and therefore comparable with the least affluent tertile calculated in 2006 on the basis of car(s), bedroom, holiday(s) and computer(s).

### Discussion

Health inequalities in young children and adults are well-established but there has been debate about health inequalities in adolescents (West & Sweeting, 2004). The difficulty of assigning SES to adolescents has been a problem in the study of health inequalities in

this age group and has been especially challenging in the cross-national context. This paper has reviewed the development of the Family Affluence Scale, originally designed to be a supplementary measure to the traditional socioeconomic indicators of parental occupation (Currie et al., 1997). The paper has given an overview of published research looking into the association between FAS and health outcomes of adolescents across Europe and North America. Lastly, the paper examines the validity of the scale and discusses possible developments.

When investigating adolescent health outcomes in relation to FAS, inequalities have been revealed in a wide range of different health measures although not in all. Diet, physical activity, reported health and mental well-being all showed consistent patterns between countries and across studies in the expected direction. However, little consistency was found for a relationship between FAS and drunkenness or daily smoking. FAS associations are strong for health outcomes that are related to family culture and behaviour, but less so for some behaviours where peer norms are a potentially powerful influence. This evidence fits with some of the arguments around health equalisation in youth (West & Sweeting, 2004).

FAS is found to be reliable in that students can report accurately on the component items in agreement with their parents' reports. FAS is sensitive in differentiating levels of affluence as evidenced by its validation against other measures of SES such as parental occupation and macro-economic indicators at a country level. There is strong consistency in the associations found between FAS and health outcomes across countries and between survey cycles. Nevertheless, FAS has limitations some of which have been addressed and others which require future development.

One such development stems from the need to address changing patterns of consumption and lifestyles of families with adolescents. This paper has already highlighted that the lifespan of certain FAS items may be limited in the long term. Rapid changes in technology influence products, prices and consumption patterns. Future development of FAS will need to be sensitive to changes in consumption patterns so that items comprising the scale can be updated to continue to reflect material affluence of the family across countries (Lien et al., 2001). There is also the suggestion that including a larger number of items in the FAS will be beneficial in reducing its sensitivity to such changes.

This paper provides a comprehensive overview of published work on the development and use of the HBSC Family Affluence Scale and is therefore a useful

resource and key reference for research in the area. It records the efforts invested by the HBSC study in developing FAS to date and work planned for the future. It also reports the use of FAS, and adapted versions of the indicator, in research and policy contexts outside the HBSC study; providing evidence that FAS is making a contribution to our understanding of social inequalities among adolescents.

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