
WILLIAM BOYCE, TORBJORN TORSHEIM, CANDACE CURRIE
and ALESSIO ZAMBON

THE FAMILY AFFLUENCE SCALE AS A MEASURE OF NATIONAL WEALTH: VALIDATION OF AN ADOLESCENT SELF-REPORT MEASURE

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ABSTRACT. One explanation for a lack of consistency in SES-health associations in youth is that parent-based income and occupation measures are inadequate. The Family Affluence Scale (FAS), a four-item measure of family wealth, has been developed in the WHO Health Behaviour in School-aged Children Study as an alternative measure. The aim of this paper is to examine the criterion and construct validity of the FAS as a measure of national absolute wealth in 35 countries. A general measure of national wealth, Gross Domestic Product (GDP) for the year 2001, corrected for Purchasing Power Parity, was used as a gold standard. For the composite FAS index, there was a similar strength in country rank order correlation (0.87) as with GDP, and a Kappa agreement coefficient of 0.57, indicating good criterion validity. FAS index associations with national health indicators were systematically higher than the values obtained with GDP. These features suggest that FAS can be used with confidence in aggregate analyses of HBSC data that focus on relationships between SES and adolescent health.

KEY WORDS: adolescents, health behaviour, socioeconomic measures, validation study

INTRODUCTION

Socio-economic inequalities have been shown to be of key importance to adult health on a wide range of indicators including mortality, morbidity, psychosomatic and somatic illness, and perceived health (Mackenbach and Kunst, 1997; Kennedy et al., 1998). However, the evidence for social inequalities in adolescent health is much less clear. Some authors find strong relationships between SES and health among young people (Goodman, 1999; Halldorsson et al., 2000; Barrerra et al., 2002), while others find weak or non-existent

associations (MacIntyre and West, 1991; West, 1997; West and Sweeting, 2004). In explanation, the latter authors view adolescence as a period when young people look for and earn independence from their parents. Specifically, during this period, social equalization may occur such that peers become the strongest influence on students, outweighing any other family characteristic, including SES. An alternate explanation for a lack of SES–health association is that our measures of adolescent SES are inadequate.

Attention to adolescent health–wealth relationships is needed at a national and cross-national level to develop a common research base for comparative policy development. However, the relationship of macro-economic indicators to adolescent health outcomes, in contrast to child and adult outcomes, has not been widely explored. Importantly, macro indicators of wealth that have relevance to youth are not readily available in all countries. A crucial first step to redress this need is the development of standardised indicators of social inequality in adolescence that can be used cross-nationally. This paper presents the results of validation testing for such an index.

The Family Affluence Scale

Over the years, the WHO-Health Behaviour in School-aged Children (HBSC) survey (<http://www.hbsc.org>) has used a number of measures of adolescent SES that focus on objective and subjective measures of family wealth. Although children and adolescents are aware of socio-economic inequalities and inequitable opportunities (Duncan et al., 1994; Jensen and Jensen, 2002; Backett-Milburn et al., 2003), many adolescents cannot accurately report their parents' occupations or educational levels, much less their incomes (Currie et al., 1997). Nonetheless, objective measures of social position and subjective measures of relative wealth are useful for within-country analyses and help to explain variations in certain health outcomes and behaviours (Currie, 2001).

Because of the difficulties that youth have in reporting family income, an alternate objective measure of family wealth, the Family Affluence Scale (FAS), has been used in the HBSC (Currie et al., 1997).¹ The FAS II is conceptually related to common consumption indices of material deprivation (Carstairs and Morris, 1991) and home affluence (Wardle et al., 2002). FAS II items ask students about

things they are likely to know about in their family (car, bedrooms, vacations, computers). In 2001–2002 the scale was composed of four items:

- *Does your family own a car, van or truck?* (No [0]; Yes, one [1]; Yes, two or more [2]) This item is a component of the Scottish deprivation index developed by Carstairs and Morris (1991), which is used widely in health inequalities research.
- *Do you have your own bedroom for yourself?* (No [0]; Yes [1]) This item is a simple proxy for overcrowding, classified by Townsend (1987) as housing deprivation, and is also a component of the Scottish deprivation index.
- *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]) This item is a measure of ‘deprivation of home facilities’ (Townsend, 1987).
- *How many computers does your family own?* (None [0]; One [1]; Two [2]; More than two [3]) This new item has been used to identify higher SES families in affluent countries.

It is acknowledged that certain biases and limitations may apply to these questions, especially in cross-national contexts: for example, car ownership may vary according to urban or rural area of residence; bedroom sharing may be related to culture and family size, as well as to age and gender of other children; having a holiday might mean different lengths of time or distances according to various cultures. Nonetheless, aggregation of the individual items into a summary score (as will be seen in the results) creates a consistent measure.

A composite FAS score is calculated for each student based on his or her responses to these four items. For most analysis, we use a three point ordinal scale, where FAS low (score = 0,1,2) indicates low affluence, FAS medium (score = 3,4,5) indicates middle affluence, and FAS high (score = 6,7,8,9) indicates high affluence.

Most validation work on FAS has focused at the individual student level, in single country and multi-country analyses. Using an earlier construction of FAS with one different component item (telephone ownership instead of family holidays) in the 1993/94 international HBSC survey, gradients were demonstrated between FAS scores and a range of health and behavioural outcomes in the Scottish data (Currie et al., 1997). Several other publications have

examined Scottish data from different HBSC surveys and found FAS gradients in injury related behaviour (Williams et al., 1997), food habits (Inchley et al., 2001) and physical activity (Inchley et al., in press).

Multi-country analysis of the 1997/98 international HBSC dataset that included data from 11 countries (Mullan and Currie, 2000; Currie, 2001), found individual level FAS I gradients that varied according to health behaviours, health outcomes and to country. Such relationships have been found again in the most recent 2001/02 cross-national HBSC data (Holstein et al., 2004). In this case, data from 35 countries were inspected individually and associations between FAS II and four variables (self-rated health, subjective health complaints, smoking and physical activity) were observed. A very consistent pattern was found between countries in terms of FAS II gradients in self-rated health and physical activity for both boys and girls. Greater variations in FAS II gradients were found by gender and country for health complaints and smoking (Holstein et al., 2004).

At the country level of analysis, the FAS II has statistical and distributional properties that are of interest to the study of social inequalities (Boyce and Dallago, 2004). First, the scale demonstrates strong between-country variation in mean FAS II levels. Second, the FAS II shows varying dispersion patterns (standard deviations) across countries, as well as different levels of skewness and kurtosis, suggesting that family affluence is distributed differently across countries. These properties are essential in any indicator of national wealth to be used for cross-national policy purposes.

Multi-level analyses using FAS I as a country level variable have also been conducted. Torsheim et al. (2004) found a consistent FAS I gradient in self-reported health in 22 countries using the 1997/98 international HBSC survey data. Adolescents in countries with a high mean level of FAS I were less likely to report poor health, as compared to adolescents from countries with a low mean FAS I. This relationship was also present after adjustment for individual level of FAS I, indicating an independent ecological effect of FAS I at the country level. Work has also been conducted to examine the scaling properties of FAS in different countries (Batista-Foguet, 2004) and has indicated that a refinement of the scale construction may result in better comparability in its use between countries.

The aim of this paper is to examine the validity of the FAS as a measure of national absolute wealth. Achievement of this goal would have an important benefit. Aggregated FAS scores at the country level could be used as proxies for national wealth indicators in policy studies that are directly related to adolescent health. Use of such aggregate FAS scores in comparative studies of adolescent health may be more valid than use of standard macro-economic indicators that focus on the formal economy but disregard the informal family economy. Country-aggregated FAS scores should, theoretically, be comparable to other country-level measures of wealth. By comparing associations found between traditional macro-economic indicators and population health measures with associations found between FAS and the same population health measures, we can determine the value of the FAS for international adolescent health inequality studies.

Economic Indicators

In aggregate level studies of wealth, there are various indicators of absolute wealth available at a national or regional level. The most common among them is the Gross National Product (GNP) – describing the total value of products/services per person exchanged globally, or the Gross Domestic Product (GDP) – describing the national situation. Other indicators are used to overcome disadvantages in using GDP or GNP for cross-national comparisons. For example, the Purchasing Power Parity (PPP) indicator takes into account the differences in prices of products/services in different countries and thus their affordability in those countries with the same average GDP. In addition, the Gini coefficient measures the standard deviation of income levels, or the relative distribution of wealth, within a country.

By examining aggregate national-level FAS measures and their relationships to both macro-economic and population health indicators in this study, we explore whether the FAS scale is a valid proxy for other, more traditional, indicators of national economic well-being. Three key tests are necessary for this demonstration: (1) internal consistency and stability of national FAS over time, which would suggest a robust measure of wealth unaffected by availability of products or fashions of expenditure; (2) criterion validity of national

FAS against other accepted indicators such as GDP, which would suggest a more readily available measure of adolescent SES; and (3) construct validity demonstrated by strong associations between national FAS and population health outcomes, which would suggest a more sensitive measure for adolescent health–wealth studies.

METHODS

Sample

Data were obtained from the large, cross-national WHO collaborative study ‘Health Behaviour in School-aged Children 2001/02’ (Currie et al., 2004). From the HBSC 2001/02 survey, this analysis examined the files from 162,305 students (11, 13, and 15 years) in 35 countries. As shown in Table I, the sample consisted of adolescents from a culturally and economically diverse collection of European and North American countries and regions. Data were obtained through a complex multistage sampling procedure. The primary sampling unit was the school class, with participation of students who had parental consent. However, due to differences in the school systems across countries, national adaptations in sampling had to be made. For the majority of countries, the age of school entry was consistent, resulting in a homogeneous age composition of school classes. The strategy followed in these countries was to select one school class per school within each age group to be covered. In a small number of samples (Flemish-speaking Belgium, French-speaking Belgium, England, Republic of Ireland, Switzerland, and the USA), the age composition of school classes was more heterogeneous, due to either students repeating grades or to variable ages of school entry. In this group of countries, a larger sample of school classes had to be sampled, and students matching the desired age-range within these classes were selected. More detailed information about the sample and the sampling frame can be obtained elsewhere (Currie et al., 2004). Given the multistage sampling procedure, non-response could occur at several levels, including school, school classes, and student. The available documentation provides detailed information on non-response at the level of school and student. The response rate at the level of school was in general high, with a majority of countries above 80%.

TABLE I

Mean student level of affluence indicators and index of family affluence by country (n = 35)

Country	Indicator				Index
	Cars	Bedrooms	Holidays	Computers	FAS II
Norway	1.5	0.9	2.2	1.7	6.3
Sweden	1.5	0.9	1.7	1.7	5.8
Canada	1.7	0.9	1.7	1.5	5.7
Netherlands	1.3	0.9	1.7	1.8	5.7
USA	1.8	0.8	1.6	1.5	5.7
Denmark	1.3	0.9	1.5	1.8	5.5
Switzerland	1.4	0.9	1.7	1.6	5.5
France	1.7	0.8	1.7	1.2	5.4
Germany	1.4	0.8	1.5	1.6	5.4
Wales	1.5	0.8	1.4	1.6	5.3
England	1.5	0.8	1.5	1.5	5.3
Austria	1.4	0.8	1.5	1.4	5.2
Belgium-Flemish	1.5	0.9	1.4	1.5	5.2
Finland	1.4	0.9	1.6	1.3	5.2
Slovenia	1.5	0.7	1.9	1.1	5.1
Scotland	1.4	0.8	1.4	1.5	5.1
Ireland	1.6	0.7	1.5	1.2	5.0
Belgium-French	1.4	0.8	1.4	1.4	5.0
Spain	1.4	0.7	1.8	1.1	5.0
Israel	1.3	0.6	1.8	1.3	4.9
Greece	1.3	0.7	2.0	0.8	4.8
Italy	1.6	0.6	1.6	1.0	4.8
Portugal	1.5	0.7	1.7	0.8	4.7
Estonia	1.0	0.7	1.9	0.7	4.3
Hungary	1.0	0.7	1.7	1.0	4.3
Poland	0.9	0.6	1.9	0.8	4.2
Croatia	1.1	0.6	1.7	0.7	4.1
Czech Republic	1.1	0.6	1.5	0.9	4.1
Macedonia	0.9	0.9	1.7	0.6	4.1
Malta	1.6	0.6	0.6	1.1	3.9
Lithuania	0.9	0.6	1.9	0.4	3.8
Greenland	0.3	0.7	1.5	1.1	3.7
Latvia	0.9	0.6	1.4	0.6	3.5
Russia	0.7	0.6	1.5	0.6	3.4
Ukraine	0.5	0.6	1.7	0.2	3.0
Average	1.3	0.8	1.6	1.2	4.8

Survey Procedure

Data were collected in accordance with a standardised protocol. Teachers received instructions on how to administer the survey without influencing student responses. Questionnaires were distributed during ordinary class hours. Students were informed that participation was voluntary, and that responses would be treated as anonymous. Each student had 45 minutes to complete the survey.

*Measurement**Aggregate measures of FAS II*

Wealth or consumption was measured through the FAS II and aggregated across all students in each country or region.

Macro-level indicators of wealth and health

National macrolevel indicators were obtained from the United Nations Development Program Database (United Nations Development Program, 2004). To represent a general measure of national wealth, GDP for the year 2001, corrected for PPP, was included. To represent measures of national health, male/female life expectancy, infant mortality and population survival data were included for the same year. ²

RESULTS

Table I shows the countries' mean family affluence level by individual FAS indicator and by composite FAS II index. There was a notable variation across countries for all of the indicators. For example in the United States, students reported an average value of 1.8 for the cars per household indicator. In contrast, students from Ukraine reported an average value of 0.5. For computer ownership, there was also a strong variation across countries. In the Netherlands and Denmark, students reported an average value of 1.8 for the computers per family indicator. The corresponding average value for students from Ukraine was 0.2. The same varied pattern was evident for the FAS II composite index with Norway having the highest score.

Internal Consistency and Stability

Although internal consistency is not a prerequisite for formative indexes such as the FAS, inspection of the correlation structure is still informative. It can be seen from Table II that most individual indicators of family affluence were highly correlated. Countries with a high mean level of cars were also likely to have a high level of bedrooms and computers. The average number of holidays deviated from this pattern by showing almost zero-order correlation with other indices.

The stability of FAS scores across a four-year interval is demonstrated in Table III. Car ownership, having one's own bedroom and total FAS I scores are quite stable, while number of holidays in 1997/98 and 2001/02 has a weaker correlation.

TABLE II

Spearman rank correlation between country indicators of family affluence (n = 32)

	1	2	3	4
1. Bedrooms				
2. Cars	0.41*			
3. Holidays	-0.08 ns	0.06 ns		
4. Computers	0.61**	0.78**	-0.13 ns	
5. FAS II	0.70**	0.82**	0.17 ns	0.89**

* $p < 0.05$; ** $p < 0.01$; ns, non-significant at the 0.05 level of significance.

TABLE III

Spearman rank correlation between country aggregate FAS indicators measured in 1997 and 2001 (n = 22)

HBSC 1997/98	HBSC 2001/02			
	Cars 2001	Own bedroom 2001	Holidays 2001	Mean FAS I 2001
Cars 1997	0.94**	0.63**	-0.09 ns	0.86**
Own bedroom 1997	0.62**	0.95**	-0.10 ns	0.71**
Holidays 1997	0.23 ns	0.06 ns	0.54*	0.42 ns
Mean FAS I 1997	0.90**	0.76**	0.45*	0.95**

* $p < 0.05$; ** $p < 0.01$; ns, non-significant at the 0.05 level of significance.

Family Affluence and National Wealth Measures

As a test of criterion validity, we compared various aspects of FAS II at the aggregated level to specific national macro-economic indicators. These measures should be highly associated if FAS II is actually a valid measure for national wealth. Initially, we computed Spearman rank correlations between aggregate FAS II indicators/index levels and GDP adjusted for PPP. To examine the absolute agreement between these measures, we computed Kappa coefficients for the association between quartile groups of FAS II measures and GDP. It can be seen from Table IV that FAS II indicators and composite indices were strongly associated with country GDP. Among the individual FAS II indicators, the average number of computers had a correlation of 0.89 with GDP, and a Kappa of 0.53. This indicates a high level of both rank order consistency and absolute agreement between computer ownership and GDP. For the composite FAS II index, there was a similar strength in rank order correlation (0.87) with GDP, and a Kappa agreement coefficient of 0.57, indicating good criterion validity of FAS II.

Family Affluence and Population Health Measures

As previous research has revealed strong associations between variation in macroeconomic indicators and variation in population

TABLE IV

Spearman rank correlation and absolute agreement between FAS indicators and GDP 2001 (n = 31)

	Gross Domestic Product 2001 ^a	
	Spearman rank	Kappa ^c
Family car	0.71**	0.48**
Own bedroom	0.67**	0.53**
Vacation	-0.15 ns	-0.08 ns
No. of computers	0.89**	0.53**
FAS II ^b	0.87**	0.57**

* $p < 0.05$; ** $p < 0.01$; ns, non-significant at the 0.05 level of significance.

^aSource: UNDP.

^bFAS II: Country aggregate of composite index from algorithm: Family car + own bedroom + vacations + number of computers.

^cKappa based on quartiles of distribution.

health, an important marker of FAS II construct validity would be to replicate these associations with the FAS II index. Specifically, we hypothesized that country FAS II levels would be highly associated with standard national health indicators of mortality and morbidity. Table V shows the Spearman rank correlation between FAS II indicators (and also GDP) and selected indicators of population health, including life expectancy for males and females, infant mortality, and proportion of the population not expected to reach 60 years of age.

In general, the correlations were very strong and consistent between FAS II and national health indicators. Notably, the FAS II associations were systematically higher than the values obtained between GDP and national health indicators, although the power of the analysis did not allow for strong conclusions to be drawn from these differences.

DISCUSSION

Overall, this analysis shows that: (a) country FAS II levels reflect highly stable and internally consistent economic attributes of the countries involved; (b) country FAS II indicators and indices are strongly correlated with macroeconomic indicators; and (c) country FAS II indices are strongly correlated with population health indicators. These features suggest that FAS II can be used with confidence in aggregate analyses of HBSC data that focus on relationships between SES and adolescent health. Further work is necessary to

TABLE V

Spearman rank correlation between FAS II and indicators of population health (n = 31)

	Life expectancy Females ^a	Life expectancy Males ^a	Infant mortality ^a	Population not expected to survive 60 ^a
FAS II	0.72**	0.73**	-0.62**	-0.63**
GDP ^a	0.68**	0.67**	-0.57**	-0.61**

**Correlation is significant at the 0.01 level (2-tailed).

^aSource: UNDP.

demonstrate that country level FAS II is associated with other meaningful national indicators of adolescent health, for example, adolescent suicide attempts/successes, adolescent injuries, or adolescent deaths.

The FAS II belongs to the group of material deprivation indices. In previous research, material deprivation indices have been studied in the context of local area variations in health in smaller geographical units, including postcodes and electoral wards (Pickett and Pearl, 2001). The present study shows that the FAS II index can be used as a marker of deprivation in the context of health variation in larger geopolitical units, including at the national level.

This study supports the continued use of material deprivation indices in the study of macro-level health inequalities. However, the meaning of material deprivation in relation to adolescent health needs further examination. For example, the value of including holidays in the FAS II suggests further analysis is needed since number of bedrooms seems unrelated to other elements of the scale. In this context, the work of Oakes and Rossi (2003), who conceptualise and operationalise SES as a function of three types of capital (material, human and social capital) is informative. Individual FAS II indicators may actually represent various forms of capital: material-financial capital (cars), human-cultural capital (vacations, computers), and social capital (bedrooms). These forms of capital may be more relevant to adolescent health than existing measures of adult income and social position. If material deprivation indices measure culturally specific opportunities to access health-producing resources, substitution of other more culturally appropriate items in particular countries, for example use of taxis in urban areas instead of car ownership, or availability of books instead of computers in areas without Internet access, might improve the validity of the FAS II index.

This conceptualisation of SES resource opportunities is related to a recent development in SES measurement. In Sen's (1992) approach that emphasizes the freedom to develop wealth and health, individuals are believed to differ not only in their access to desired resources, but also in their capabilities to transform such resources into goods and activities that have a value for their health. From our perspective, such capabilities and skills are being developed in adolescents themselves through school and work experiences, while opportunities

for access to resources occurs through adolescents' positions in favourable social networks, membership in which may be facilitated by family ownership of various resources.

In conclusion, the FAS II represents a valuable tool for adolescent health studies in a number of ways. At the individual level of analysis, FAS II appears to be a valuable indicator of family wealth that can be reported easily by youth. It is strongly associated with a number of individual level health behaviours and outcomes. At a cross-national level of analysis, this study demonstrates the value of FAS II for international comparisons to assist in the policy development process. The FAS II may be more ecologically valid than parental income data since it is based on the family context of consumption. FAS II may also be available sooner than macroeconomic data if national youth surveys are conducted annually. Finally, FAS II is potentially available in all countries. The availability of a valid, and easy to answer, SES measure such as the FAS may assist in resolving inconsistent evidence for social inequalities in adolescent health.

NOTES

¹ In an earlier version of HBSC (1997/98), only the first three items (car, bedroom, holiday) were used to create a FAS I index. In 2001/02, the computer item was added, thus creating a FAS II index (Boyce and Dallago, 2004).

² When integrating data from HBSC and UNDP sources, FAS II data for (a) Belgium (Flemish) and Belgium (French), and (b) Scotland, Wales and England were combined for comparison with national indicators from Belgium and the United Kingdom.

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Social Program Evaluation Group
Queen's University
McArthur Hall
511 Union Street
Kingston, Ontario
Canada K7L 3N6
E-mail: boycew@post.queensu.ca

William Boyce