CHILDHOOD CONDITIONS, SENSE OF COHERENCE, SOCIAL CLASS AND ADULT ILL HEALTH: EXPLORING THEIR THEORETICAL AND EMPIRICAL RELATIONS

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Abstract—In order to expand our knowledge of how health inequalities are generated, a broader range of possible mechanisms has to be studied. Two mechanisms of potential importance here are childhood conditions and sense of coherence. Drawing on theoretical arguments and empirical findings in these two research fields, a conceptual model of the relationships between childhood conditions, sense of coherence, adult social class and adult health is presented. On the basis of this model, this paper sets out to analyse (1) the degree to which a low sense of coherence is based in childhood experiences, (2) the degree to which the impact of childhood conditions on adult health is mediated through sense of coherence, and (3) the importance of sense of coherence for class differences in ill health. The analyses are carried out on both cross-sectional data (n = 4390) and panel data (n = 3773) from the Swedish Level of Living Surveys in 1981 and 1991. The analyses indicate that childhood family size and the experience of a broken home are unrelated to sense of coherence later in life, while economic hardship has a small and indirect effect, mediated via class position in adulthood. Only dissension in the childhood family was found to have a direct, although fairly modest, effect on sense of coherence. Furthermore, it is demonstrated that sense of coherence does not mediate the effect of childhood factors on adult health. Rather, childhood conditions and adult sense of coherence appear to be complementary and additive risk factors for illness in adulthood. The results presented here also suggest that sense of coherence may be a factor involved in the shaping of class inequalities in health. © 1997 Elsevier Science Ltd. All rights reserved

Key words—childhood conditions, sense of coherence, social class, health inequalities

INTRODUCTION

Health inequalities emerge as the result of a number of predominantly social factors shaping differences in life chances, literally speaking, between groups of people. Persons raised in working class homes, as well as those belonging to the working classes in adult life, generally have poorer chances of survival to a great age, and higher illness risks throughout their lives. This holds true also in fairly prosperous countries. Simple explanations based on poverty are therefore unlikely to be sufficient to understand the mechanisms which are continuously generating class inequalities in health, illness and mortality in affluent societies also [1, 2]. A more thorough exploration of these mechanisms is essential for a better understanding of health inequalities in modern societies and beyond.

One way to expand our knowledge on how health inequalities are generated is to look at other research fields related to public health. Two areas where research and debate have been lively during the past ten years or so, and which are also of interest from a health inequalities point of view, are (1) the importance of childhood conditions for adult health, and (2) the importance of sense of coherence for health throughout life. Below, I will try to outline the interrelationships between these two fields, and how they in turn are related to health inequalities.

A conceptual model

In order to present the different bodies of literature that connect childhood conditions, sense of coherence, adult social class, and health, a conceptual model that roughly orders these relationships will be followed. Although the model (Fig. 1) is mainly intended as a heuristic tool, it summarises the main causal pathways suggested, theoretically or empirically, by the literature.

The starting point for the model is childhood conditions. These consist primarily of the social position of the childhood family, i.e. the class of origin, usually measured as the class position of the father. Life chances in general as well as more concrete living conditions during childhood will differ systematically between children in different social classes. However, life circumstances will differ also between families within each social class. Therefore, it is important to include more specific childhood
living conditions also, such as the presence or absence of economic hardship and social tensions.

Following the model, arrow $a$ illustrates that childhood conditions will affect the class position of the child as an adult, in other words the class of destination. This is not a relationship of primary interest in this article. However, the relationship between class of origin and class of destination is well known, and is also a much studied phenomenon [3–5]. Over and above the effect of class of origin on class of destination, it has been shown that more specific conditions during childhood also play a part in determining which class people will end up in. Lundberg [6] was able to demonstrate that economic hardship during childhood increases the likelihood of ending up in unskilled manual positions, all other things being equal. Also, by means of more indirect measures of childhood conditions, such as height, it has been shown that those who are among the better off in their social class have a better chance of being upwardly mobile [7–9].

Arrow $b$ represents a relationship central to the argument in this study, namely that conditions during infancy and childhood are of importance for health in adulthood. An early suggestion that this is the case was made by Forsdahl [10, 11], who found that the variation in the incidence of arteriosclerotic heart disease among middle-aged men between different areas in Norway was related to variation in infant mortality at the time they were born. The interpretation of this finding was that poor conditions during the early years increase vulnerability to known risk factors for heart disease, especially through raised cholesterol levels [10, 11]. Since then, several studies have found relationships between childhood environment and adult illness and mortality, using both ecological and individual data. Although the hypothesis concerning increased cholesterol levels has been called in question [12], a large and growing number of studies have presented evidence of a relationship between childhood conditions and illness and mortality in adulthood [13–17].

Two types of criticism have been raised in connection with this research, namely (1) that several analyses have not taken adult social circumstances into account [18], which is likely to spuriously increase the effect of childhood conditions, and (2) that the causal pathways are unclear [16]. Both of these topics are of relevance here. As several studies have shown [6, 19, 20], factors in childhood as well as conditions during adult life affect adult health and mortality. This is also clearly reflected in the analytical framework presented here, where both types of factor are included. The causal mechanisms which are suggested as linking childhood conditions with adult health can basically be of two types [16], namely adverse prenatal or early childhood conditions which affect the human organism in a way that increases vulnerability to disease (the biological programming or biological imprint hypothesis) [13], or adverse childhood conditions which affect educational chances, job opportunities and life chances in general, and thereby result in unhealthy life careers [16]. Where the latter of these two explanatory models is concerned, sense of coherence should, in theory, be one of the factors transmitting poor childhood conditions into illness in adulthood.

Turning to sense of coherence, then, the three relationships $c$, $d$, and $f$ will be discussed in relation with each other. The central concept constituting these three relationships is Antonovsky's [21, 22] sense of coherence (SOC). SOC is presented by Antonovsky as

...a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable, and explicable [comprehensibility]; (2) the resources are available to one to meet the demands posed by these stimuli [manageability]; and (3) these demands are challenges, worthy of investment and engagement [meaningfulness] [22] (p. 19).
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The basic rationale behind the concept is that life is complex in the extreme, and every human being is confronted with a flood of confusing and sometimes contradictory stimuli in his or her everyday life, which in turn might invoke tensions within and between persons, as well as between persons and social structures. In order to avoid chaos and negative stress and thereby stay healthy, Antonovsky argues, these tensions or conflicts have to be resolved and dealt with [23].

In order to accomplish this and deal successfully with the stressors confronted in daily life, all three parts of SOC (comprehensibility, manageability and meaningfulness) are needed. To put it bluntly, one needs to know not only what to do about a certain source of stress and that one is able to do something about it, but also why one should do it. Arrows c and d represent important sources of such an ability, while arrow f represents the health effects of having or not having a high SOC.

Curiously little empirical research seems to have been carried out into the sources of a high (or low) SOC. On the other hand, Antonovsky has been quite clear on where to seek the origins of a strong SOC over the course of the life cycle [22] (Ch. 5, 24, 25). The basis for the SOC construct lies in Antonovsky’s interest in “generalized resistance resources” as means used to stay healthy. The next question was

...why such resources—wealth, ego strength, cultural stability, social support—promoted health. Or, to put it in other words, what did they have in common? I came to the answer to this question... SOC. Resources were seen as leading to life experiences which promoted the development of a strong SOC, a way of seeing the world which facilitated successful coping with the innumerable, complex stressors confronting us in the course of living [25] (p. 725).

As early as in infancy and childhood, Antonovsky argues, the human being is trying to achieve stability and predictability, as well as some meaning that can motivate further action. The sense of manageability also starts to develop during the early years, as a result of parental response to the child’s actions [22]. In short, parents with a strong SOC are more likely to raise children who accumulate life experiences which will form the basis for a strong SOC. The SOC will continue to develop during adolescence and mature during early adulthood, not least through entry into working life, which is argued to be “the most decisive setting in shaping life experiences” [24] (p. 96). For this reason it seems reasonable here to assume that the relationship d is mainly that of social class affecting SOC. This implies that SOC can change over the life-course, since adult social class otherwise would not be able to add much to the effect of childhood class. Although it is a widespread belief that Antonovsky himself claimed SOC to be largely stable in adulthood, this is not in line with his later writings. Rather, he explicitly argues that those with a strong SOC will at best be able to maintain this strong SOC, whereas others are most likely to experience decreasing levels of SOC throughout life [22] (pp. 120–123). Although interesting, an analysis of whether social mobility chances are dependent on SOC or not falls outside the scope of the present paper, especially since intra-generational class mobility is not linked to health in Sweden [6].

From the theoretical arguments developed by Antonovsky, then, it appears that childhood conditions, both in terms of the social position of the family, the economic conditions and the social relations in the family, as well as the class position held in adulthood, should be of importance for the formation of a strong (or weak) SOC. There are very few empirical studies in these fields and the results are inconclusive. For example, an analysis of a sample of 742 Israeli adolescents [26] found only a partial effect of family climate on SOC, whereas large differences in SOC according to adult socioeconomic position could be demonstrated in a recent Swedish study [27]. Therefore, it seems of interest to study childhood as well as adult sources of SOC, i.e. the relationships c and d in the model above.

Where arrow f is concerned, many more results have been published. In a review from 1993, Antonovsky [25] lists 10 studies that have reported correlations of the expected direction between SOC and various health outcomes. However, most of these studies are based on less than 250 subjects, and none of them are based on samples of the general population. In a recent study of a population sample of 25–75 year old Swedes, strong relationships between low SOC and illness were reported, even when a number of possible confounders were controlled for [27].

Although not explicitly included in the model, these confounders ought to be considered here also, since any analysis of the relationship between SOC and health should take into account and adjust for spurious relationships that might occur owing to selective processes and biased reporting. This is especially important when SOC and health outcome are measured simultaneously, which is the case here.

A selective process is at hand if, for example, health at time 1 (HT) affects both health at time 2 (HT2) and sense of coherence at time 2 (SOCt2). Since it has been shown that HT is actually related to both HT2 and SOCt2 [27], such a control seems to be important.

There may also be reporting bias causing spurious relationships between health and sense of coherence, for example owing to a general tendency to report all kinds of conditions in negative terms, so called negative affectivity (NA) [28, 29]. That would mean that NA is a common factor behind SOC. Hf
and LCt2. With no direct measure of NA, self-assessed living conditions may be used as a control variable when studying the relationship between SO Ct2 and Ht2 [27], since such assessments also are likely to be sensitive to NA.

A problem arising when introducing prior health and self-assessments of living conditions as control variables is that the operation is only valid under certain assumptions regarding the causal mechanisms involved. If, for example, prior illness is not a determinant of Ht2 and SO Ct2, but rather SO Ct0 determines health at time 1 as well as health and sense of coherence at time 2, it would be erroneous to include health at time 1 as a control variable. By undertaking such a control, one would in fact run the risk of reducing or even eradicating a “true” relationship rather than eliminating the spurious part of it. In the absence of detailed data on the timing of events, the choice appears to be between controlling for possible confounders, and maybe controlling too much, or not controlling for these possible confounders, and then running the risk of reporting relationships that might be heavily influenced by spurious relationships. The strategy used here is to include these control variables in separate steps, and to discuss the changes in the illness odds ratios obtained thereby for sense of coherence.

The final relationship in the model is denoted e, which represents a causal effect of adult class position on adult health. Much of the empirical evidence on social class differences in health published during the past decade points to the existence of such a relationship [30, 31], although few studies have tried to estimate the relative importance of various possible mediating factors. In an earlier work [20] it could be concluded, however, that physical working conditions, childhood environment and health-related behaviour were most important. Factors like restricted economic resources and weak social networks did not turn out to be important for class differences in illness. This study did not include psychosocial factors of the type represented by, for example, SOC, and hence not very much is known about the relative importance of such factors for the production of class inequalities in health.

Aim of the study

From the literature reviewed above it appears that the way people react and respond to health-threatening social situations has consequences for their health status. In order to deal successfully with these situations, a strong sense of coherence may be an important resource, as indeed are good childhood conditions and certain class positions in adulthood. Although it can be argued quite strongly that childhood conditions, adult social class, sense of coherence and adult health are related to each other, some of the relationships presented in the model in Fig. 1 are less well-known than others. Here, I will analyse two of these relationships in more detail, namely (1) to what degree adult sense of coherence is determined by childhood social class and childhood experiences of economic hardship and intra-familial conflicts respectively (relationship c), and (2) to what degree the relationship between childhood conditions and adult health (arrow h) is mediated via sense of coherence (arrows c + f). In addition, I will briefly address the issue of whether sense of coherence is also a factor that can partly explain class differences in health in adulthood (arrows d + f).

DATA AND METHODS

The empirical analyses are based on data from the Swedish Level of Living Survey (SLLS) 1991, and, to some extent, on panel data from the SLLSs from 1981 and 1991. The SLLS is an interview survey that has been carried out in 1968, 1974, 1981 and 1991, and is based on a random sample of the Swedish population aged 15–75 (18–75 in 1991). The sample includes both a panel core and new samples of younger cohorts and immigrants in order also to achieve cross-sectional representation.

The main analyses will be carried out on those aged 25–75 in 1991. The response rate in this part of the sample was 78.1%, or 4390 respondents. Owing to internal non-response, the actual number of observations in the analyses varies between 4310 and 4363. In order to control for confounding owing to health selection, health status as reported in 1981 is used. To do this, only those belonging to the panel 1981–1991 and responding on both occasions may be included in the analysis. In total, 3949 persons fulfil these requirements, which corresponds to an overall response rate of 71.7%. Here too, internal non-response reduces the actual number of observations, and therefore the panel analysis is based on 3773 persons.

Socio-demographic variables

Age and sex are used as control variables in all analyses, where age (in 1991) has been divided into five classes (25–34, 35–44, 45–54, 55–64 and 65–75). The class position of the father is used as an indicator of childhood social class. The father’s class position is based on the main occupation held by the father until the respondent reached 16 years of age. The occupations are coded into seven social classes, namely upper non-manual, middle non-manual, lower non-manual, self-employed, farmers, skilled workers and unskilled workers. Own social class is based on the occupation held by the respondent and coded into the same seven categories.

Indicators of childhood conditions

Four indicators of actual childhood conditions are included, namely (1) economic hardship during childhood (i.e. up to the age of 16), (2) a large family as indicated by a large number of siblings...
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(four or more), (3) a broken home as indicated by the loss of one or both biological parents owing to e.g. divorce or death, and (4) dissension in the childhood family. The first two of these measure economic conditions, whereas the last two measure social conditions in the childhood family (for more detailed descriptions see [16, 32]). As can be seen from Table 1, almost a fifth of this sample report that they suffered from economic hardship during childhood, a quarter were raised in a large family, nearly 14% lost at least one parent early in life (through divorce or death), and just under 12% report that they experienced serious dissension in their family during their upbringing.

It should be noted that questions about childhood conditions only were posed the first time a respondent participated in the SLLS interviews. With a lower age limit of 25, this means that the subjects included in the analyses answered questions about childhood no later than in 1981, while most of them answered these questions as far back as 1968. This, in turn, means that health status or sense of coherence in 1991 cannot affect the reporting of childhood conditions.

Indicator of sense of coherence

Here, SOC is measured in a simplified way described in detail elsewhere [33]. An index is created on the basis of three questions, which are intended to measure each of the three dimensions: comprehensibility, manageability and meaningfulness. These questions are:

Do you usually feel that the things that happen to you in your daily life are hard to understand? (comprehensibility),

Do you usually see a solution to problems and difficulties that other people find hopeless? (manageability), and

Do you usually feel that your daily life is a source of personal satisfaction? (meaningfulness).

The response alternatives were "Yes, most often", "Yes, sometimes", and "No". The summed index, ranging from 0 (excellent SOC) to 6 (very poor SOC), is dichotomised into low and high SOC, where low SOC is indicated by a score of 3 or more. This resulted in 19% being classified as having a low SOC in this sample. There are two reasons for dichotomising the scale like this, namely (1) that very few people are found to have very poor SOC [33] and (2) that the health status is found to be worse among those with poor SOC, but not better among those with an excellent SOC as compared with those with intermediate SOC [34].

Illness indicators

Three different illness indicators are used here, namely psychological distress, circulatory illness and aches and pains in back, hips, joints etc. The indicators are constructed from items following a general question which reads "Have you in the last 12 months had any of the following illnesses or ailments?" For each item in the list the respondent is asked to answer "no", "yes, mild" or "yes, severe". The response alternatives are scored 0, 1 and 3 respectively, thereby giving severe problems a greater weight. Summed indices are formed, and those with 3 points or more are classified as being ill. The health indicators are constructed identically for 1981 and 1991.

The items included in the indicator of psychological distress are: "general tiredness", "insomnia", "nervous problems (anxiety, uneasiness, anguish)", "depression, deep dejection" and "overexertion". In addition, those who have reported at least mild "mental illness" are classified as ill irrespective of their score on the index. On the basis of these requirements almost 12% of this sample are categorised as being psychologically distressed in 1991.

The items included in the indicator of circulatory illness are: "chest pain", "weak heart", "high blood pressure" and "giddiness". Those who have 3 points or more on the index, or who have reported a heart attack, are classified as being ill (in total 7% in 1991).

Three items are used to form the indicator of aches and pains, namely: "aches in shoulders and shoulder blades", "backache, pain in back or hips, sciatica" and "aches/pain in hands, elbows, legs or knees". A good quarter of the sample have aches and pains according to these criteria.
Reporting bias

Self-assessments of living conditions in general and changes in general living conditions during the last decade are used as proxy indicators of reporting bias. The first of these indicators is based on a question reading “We have now been through a lot of questions about your living conditions in different areas. How do you yourself view your own conditions? By and large, do you think that your situation is very good, rather good, rather bad or very bad?” Those who responded “rather bad” or “very bad” are classified as having self-assessed poor living conditions. The second indicator is based on the question “If you look back over the last ten years, do you think that your living conditions during this time have deteriorated, improved, or remained more or less the same?”. The indicator is dichotomised into those who think that their living conditions have deteriorated and others.

Statistical method

The analyses are performed with logit regressions, introducing variables in a theoretically determined order. In logit regression, the illness odds in different categories can be compared with each other simultaneously. Odds ratios, as well as 95% confidence intervals are presented, using one category (typically those who are “unexposed”) as a reference category. The CATMOD procedure in the SAS® Software Package is used. When analysing class differences in health and changes in these differences, standard deviations are calculated from the logged (ln) coefficients for class produced by the regression model. As a measure of the impact of a variable of interest, here sense of coherence, the change in standard deviations for class between a model not including SOC and a model where it is included is used.

RESULTS

Childhood conditions and sense of coherence

The first issue to address relates to arrow c in Fig. 1, namely whether childhood conditions as indicated by childhood social class, economic hardship and social relations determine the level of sense of coherence in adulthood. In Table 2, bivariate analyses are presented of economic and social conditions in childhood, as well as childhood social class, controlling for age and sex. Of the two indicators of economic conditions during childhood, it appears that only economic hardship is related to low sense of coherence in adulthood, and even this is not really statistically significant. Of the two social indicators, only dissension in the childhood family is of some importance for the risk of having low sense of coherence as an adult. Those who have experienced conflicts in their family during childhood have a 30% increase in the risk of having low SOC.

Although family conflicts accordingly seem to have a clear bearing on the process of developing a sense of coherence, the increased risk of having low SOC is nevertheless modest.

Childhood social class, as indicated by the class position of the father, is on the whole not important for sense of coherence in adulthood (P value for the variable is 0.157). Although the point estimate for those raised in a family where the father was a skilled worker is significantly higher than that of the reference category, the confidence interval of this estimate is quite wide. All point estimates except that for middle white collar is higher than that of the reference category, which underscores the impression of similarity between people from different social origins concerning the risk of having low sense of coherence as an adult.

| Table 2. Risk of having low SOC (odds ratios) by childhood factors (entered one at a time) controlling for age and sex, 25–75 year olds 1991, n = 4355 |
|-----------------|-----------------|-----------------|
| Childhood factor | OR 95% CI        | OR 95% CI        |
| Economic hardship| 1.21 0.99–1.47   | 1.04 0.84–1.27   |
| Large family     | 1.03 0.86–1.23   | 1.28 1.01–1.61   |
| Broken home      | 1.10 0.89–1.37   | 1.35 1.04–1.64   |
| Dissension in family | 1.31 1.04–1.64 | 1.44 1.01–2.06   |
| Father’s social class |       | 1.34 0.95–1.88   |
| Upper white collar|              |                 |
| Middle white collar|              |                 |
| Lower white collar|              |                 |
| Self-employed    |              |                 |
| Farmers          |              |                 |
| Skilled workers  |              |                 |
| Unskilled workers|              |                 |

Table 3. Risk of having low SOC (odds ratios) by economic hardship and dissension in the family during childhood (entered simultaneously) controlling for age and sex (Model 1), and age, sex and social class (Model 2), 25–75 year olds 1991, n = 4328

| Table 3. Risk of having low SOC (odds ratios) by economic hardship and dissension in the family during childhood (entered simultaneously) controlling for age and sex (Model 1), and age, sex and social class (Model 2), 25–75 year olds 1991, n = 4328 |
|-----------------|-----------------|-----------------|
| Model 1         | Model 2         |                 |
| Economic hardship| 1.16 0.96–1.42 | 1.04 0.84–1.27 |
| Dissension in family | 1.26 1.00–1.59 | 1.28 1.01–1.61 |
| Social class     |                 |                 |
| Upper white collar| 1              |                 |
| Middle white collar| 1.70 1.17–2.48 |                 |
| Lower white collar| 2.06 1.42–3.00 |                 |
| Self-employed    | 1.48 0.94–2.32 |                 |
| Farmers          | 3.01 1.74–5.21 |                 |
| Skilled workers  | 3.04 2.14–4.32 |                 |
| Unskilled workers| 3.93 2.80–5.52 |                 |
From Table 2 it might be concluded that adult sense of coherence is only partially determined by childhood conditions, at least of the kind included here. Only economic hardship and dissension in the family appear to have some impact on sense of coherence later on in life. If one enters these two factors simultaneously, the effect of both is reduced, leaving economic hardship clearly insignificant (Table 3, Model 1). If one adds adult social class to the model, controlling for the a + d pathway from childhood conditions to SOC, the effect of economic hardship is erased totally (Model 2). This means that there is no independent effect of economic hardship on adult sense of coherence, but that the experience of hardship affects the likelihood of ending up as an unskilled worker [6], a category where low sense of coherence is common. In contrast, the increased risk of low SOC associated with dissension in the childhood family is not affected when adult social class is controlled for.

In general, adult class position is a powerful predictor of low sense of coherence. The variable is on the whole highly significant (P = 0.000), and all categories except the self-employed are significantly different from the reference category. It is clearly the case that workers, together with farmers, are considerably more likely to have low sense of coherence than persons in white-collar categories, although there is a clear gradient also within the white-collar group as a whole.

The conclusion from Tables 2 and 3 is that childhood conditions in general, at least those aspects included here, are of less significance for sense of coherence in adulthood than one might expect from the literature. However, dissension in the childhood family does increase the risk of having low sense of coherence by some 30%, and this appears to be a direct effect. In addition, economic hardship in childhood increases the likelihood of having low SOC to some extent, but this effect is entirely mediated through adult class position.

Childhood conditions, sense of coherence and adult health

Turning, then, to the second aim of the paper, the arrows b, c and f will be analysed, using psychological distress, circulatory illness and aches and pains as outcome measures (Table 4).

In the first column, the excess risks of being ill for those who have experienced economic hardship and dissension in their childhood family are reported. The association between childhood conditions and adult health is strongest for psychological distress, where the excess risk is nearly 90%. However, clearly increased illness risks are associated with both types of childhood factor for circulatory illness as well as aches and pains, although the associations are somewhat weaker for the latter illness type.

As one would expect from the analyses presented in Tables 2 and 3, the illness risks associated with childhood conditions are largely unaltered when low sense of coherence is included in the model (column 2). A low sense of coherence is in itself strongly related to ill health. If one controls for age, sex, and childhood conditions, factors that are all strongly

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<td>4425</td>
<td>4528</td>
<td>4328</td>
<td>4310</td>
<td>3773</td>
</tr>
</tbody>
</table>

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Table 4. Risks (odds ratios) of having psychological distress, circulatory illness and aches and pains, by economic hardship and dissension in the family in childhood and SOC, controlling for age and sex (Models 1 + 2), for age, sex and social class (Model 3), for age, sex, social class, poor living conditions and deteriorating living conditions (Model 4), and for age, sex social class, poor living conditions and deteriorating living conditions, and the corresponding health problem in 1981 (Model 5), 25–75 year olds in 1991, Model 5 panel data 1981–1991.
related to ill health, a low sense of coherence is associated with a risk of being psychologically distressed that is 3.5 times larger than the risk among those with medium and high SOC. For circulatory illness the risk increase is almost two-fold, whereas an increased risk of having aches and pains of 65% is found.

When adult social class is included as a control variable (Model 3), the illness odds ratios for dissension in the childhood family are unchanged, whereas the effects of economic hardship and sense of coherence are reduced to some extent. In the case of economic hardship this means that part of its effect on health in adulthood is mediated through class position in adulthood by means of social mobility, i.e. those who experience economic hardship early in life are more likely to occupy positions in the class structure that are more hazardous to their health. The stable estimates found for dissension in the childhood family indicate that the illness risks associated with this factor are transmitted directly, or via factors not included in these models. As for the reduction in the illness odds ratios found for sense of coherence, the interpretation is less clear. The most plausible interpretation would, however, be that part of the relationship between SOC and illness is spuriously caused by social class, in that persons in some classes are more likely to have both a low sense of coherence and ill health.

A similar pattern of changes in odds ratios is obtained when one also includes poor and deteriorating living conditions in the model (column 4), i.e. stable estimates for dissension in the childhood family and further reduced odds ratios especially for sense of coherence. The latter effect is likely to indicate a certain tendency generally to describe the situation in negative terms. Therefore, the illness odds ratios for sense of coherence reported in column 4 should, at least in some ways, be more accurate than those reported in columns 2–3. It should be noted, however, that also after controlling for self-assessed living conditions childhood conditions as well as adult sense of coherence are strongly and significantly related to poor health.

From the results presented in Table 4 it could thus far be concluded that childhood conditions and sense of coherence are two types of factor that both influence adult health, and that the effect of the former is not mediated through the latter. Rather, they seem to be independent and complementary risk factors of more or less equal strength, except that sense of coherence is more strongly related to psychological distress. Whether this relationship is causal or not is, however, not clear. In order further to test the nature of these relationships, prior ill health should also be included as a control variable (Model 5).

As for the relationships between childhood conditions and illness in 1991, controlling for illness in 1981 will reveal whether or not factors in childhood also continue to affect health after 1981. This is apparently the case for the first of the two indicators employed. The effect on all illness types of economic hardship in childhood is quite stable between Models 4 and 5, suggesting that economic hardship early in life is a health disadvantage throughout life. In contrast, the effect of dissension in the childhood family is clearly reduced when health in 1981 is controlled for, which indicates that most of the illness risk associated with childhood conflicts had already had its effect on health by 1981.

As for sense of coherence, controlling for illness in 1981 is primarily undertaken in order to reduce the risk of health selection, i.e. ill people reporting lower sense of coherence. Here too, the odds ratios are somewhat reduced by controlling for illness in 1981, or at least this is the case for psychological distress. As a result, the risk of being psychologically distressed among those with a low SOC is more than doubled, as indicated by an odds ratio of 2.62 and a confidence interval starting at 2.04, even after age, sex, social class, economic hardship and family dissension in childhood, reporting behaviour, and psychological distress in 1981 are controlled for. Substantial excess risks for circulatory illness and aches and pains also remain after carrying out the controls in Model 5, although these risks are clearly lower than those found when only socio-demographic and childhood variables are controlled for (Model 2).

**Sense of coherence and class inequalities in health**

Turning, finally, to the issue of sense of coherence as a possible factor behind class inequalities in health, it must be stressed that a complete analysis of this issue is beyond the scope of this paper. If, however, the class differences found in Model 2 above are compared with class differences as they are returned from a model including the same variables as in Model 2 except for SOC, a rough estimate of the importance of SOC for class inequalities in health will be obtained (Table 5).

Social class differences in illness, as measured by the standard deviations of the parameters for class, decrease when sense of coherence is controlled for. This is true for all three types of illness, although the size of the effect is quite modest for circulatory illness and aches and pains. On the contrary, an earlier analysis [20] indicated that several possible factors behind class inequalities in health accounted for even smaller reductions in class differences. Except for aches and pains, the P values are also reduced, and in the case of psychological distress become clearly insignificant.

In sum, therefore, the results in Table 5 suggest that a more thorough analysis of the contribution of sense of coherence to class inequalities in health would be worthwhile. In such an analysis the central issue would be to calculate the net effect of
Table 5. Standard deviations (SD) calculated on (In) parameters for social class when (1) controlling for age, sex, economic hardship and dissension in the family in childhood, and (2) when adding SOC to Model 1, differences in SD between Models 1 and 2, and P values for social class, 25–75 year olds in 1991

<table>
<thead>
<tr>
<th></th>
<th>Class</th>
<th>Class + SOC</th>
<th>̄d1–2</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychological distress</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD for social class parameters</td>
<td>0.2268</td>
<td>0.1845</td>
<td>0.0423</td>
<td>-18.6</td>
</tr>
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<td>P value for social class</td>
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<td>0.157</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Circulatory illness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD for social class parameters</td>
<td>0.2966</td>
<td>0.2724</td>
<td>0.0242</td>
<td>-8.2</td>
</tr>
<tr>
<td>P value for social class</td>
<td>0.004</td>
<td>0.029</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Aches and pains</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD for social class parameters</td>
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<td>0.3703</td>
<td>0.0216</td>
<td>-5.5</td>
</tr>
<tr>
<td>P value for social class</td>
<td>0.000</td>
<td>0.000</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

SOC, taking into account the effect not only of childhood conditions, but of physical working conditions and health-related behaviours as well, since all of these factors have previously been shown to be important for the production of class inequalities in health [20].

DISCUSSION

From the literature reviewed on the relationships between childhood conditions, adult social class, sense of coherence and health in adulthood (Fig. 1), three issues that have largely been overlooked in empirical studies were highlighted. These are (1) the nature and strength of the links supposed to exist between childhood conditions and sense of coherence in adulthood, (2) the extent to which the effect of childhood conditions on adult health is mediated through sense of coherence, and (3) the effect of sense of coherence on class inequality in health. From the analyses conducted, some preliminary conclusions at least can be drawn.

Firstly, it appears that, in Sweden at least, childhood family size and the experience of a broken home are unrelated to sense of coherence later in life. As for the other two indicators of childhood conditions, economic hardship has only a small and indirect effect, mediated via class position in adulthood. The only childhood factor that was found to have an independent effect was dissension in the childhood family, and even this effect was fairly modest. These findings may be interpreted in both methodological and substantial terms.

From a methodological point of view, the lack of strong relationships between childhood conditions and sense of coherence is that such relationships do not necessarily exist. If, for example, sense of coherence is shaped and reshaped constantly in accordance with people's interaction with their environment, sense of coherence at a given time might be related more to recent experiences than to experiences during the first 16 years of life. As pointed out above, such a view is well in line with Antonovsky's claim that SOC is likely to be stable only among those with a strong SOC, while those with a modest or weak SOC are likely to move to lower SOC-levels over time [22].

A more substantial interpretation of the lack of strong relationships between childhood conditions and sense of coherence is that the effect of the factors studied should be over-estimated rather than under-estimated owing to omitted variable bias, provided that "truly" important factor/s were not included. It could also be argued that the simplified measure of sense of coherence is a reliable and valid measure [33] that should also produce relationships with other variables similar to those one would find using the original instrument (the correlation with the original 29-item SOC-scale being -0.66 [34]).

As for the second issue addressed in this paper, it must be concluded that sense of coherence does not mediate the effect of childhood factors on adult health. Although this is a logical consequence of the weak relationships found between childhood conditions and sense of coherence, it is interesting to note that childhood conditions and adult sense of coherence appear to be complementary and additive risk factors for illness in adulthood. However, the analyses also indicate that there are different mechanisms linking these factors to ill health in adulthood. Conflicts or dissension in the childhood family appears to have a direct impact on health, or at least one that is not mediated via class position or living conditions, whereas the effect of economic hardship is to some extent mediated in this way. On the other hand, the effect on health of economic hardship seems to be more continuous, in that the control for illness in 1981 affects these estimates to a lesser degree.
As for mechanisms actually linking childhood conditions with disease, the analyses presented here only suggest that these mechanisms are not psychosocial processes, at least not as far as the latter are indicated by sense of coherence. As for the debate over biological programming or biological imprint [13] versus unhealthy life careers or accumulated life experience, no definite conclusions can be drawn. The fact that both economic hardship and dissenion in the family during the first 16 years of life are significantly related to illness in 1991, even after controlling for illness in 1981 (the only exception being the relationship between dissenion and aches and pains), can be taken as support for the life career hypothesis, since continuous disadvantages is also likely continuously to produce illness. However, illness induced by biological programming may also occur continuously, and since data on prenatal problems are not available in this data-set, the relative importance of the two hypotheses cannot be tested. On the other hand, it might be argued that the sheer nature of the childhood conditions analysed here, covering economic and social conditions up to the age of 16, implies that biological programming is not very plausible as an explanation for the relationships found.

The mechanisms behind the relationship found between sense of coherence and illness are also far from clear. Although the controls carried out for age, sex, social class, childhood conditions, poor and deteriorating living conditions as judged by the respondent, and prior health seem to be extensive, there is still the possibility that the strong association between SOC and illness is spuriously generated. Two main possible problems may be at hand, namely inappropriate control for reporting behaviour and conceptual overlap. Both of these problems are difficult to avoid. If the attempt to control for negative affectivity is inefficient, the estimates for SOC will be biased upwards. However, although one can believe that the indicators of self-rated living conditions may at least partly reflect negative reporting—evident in the clear reduction of odds ratios for SOC obtained when these variables are controlled for—it may also be the case that the relationship between SOC and self-assessed living conditions is entirely substantial. In other words, it is not unlikely that poor and deteriorating living conditions per se will actually have a negative impact on sense of coherence. If this is true, the estimates reported are actually biased downwards owing to the controls undertaken.

Conceptual overlap between sense of coherence and illness is a potential problem, but may be less of a problem where aches and pains and circulatory illness are concerned. Especially the latter of these two indicators is constructed from items less likely to be influenced by mood or spirit. Even with these indicators, however, a substantial excess risk is found for those with low sense of coherence, which would lend support to a causal interpretation of the relationship between sense of coherence and illness. The actual mechanisms producing such a (causal) relationship are, however, still largely unknown.

Although the issue of sense of coherence as an additional factor contributing to class inequalities in health cannot be dealt with in great detail here, the results presented suggest that further analyses would be worthwhile. It should be noted that the possible confounding from negative affectivity and prior illness was not taken into account when assessing the size of the contribution of SOC to class differences in illness. The reason for not doing this were the complicated inter-relations between social class, prior illness and self-assessed living conditions, which call for quite extensive discussion and modelling if undertaken. Consequently, the estimates of the contribution of SOC to class differences in ill health, ranging from 5 to 18%, might well be over-estimations. This risk seems to be most obvious in the case of psychological distress, since the illness odds ratio for sense of coherence was most affected by the controls for possible confounders in the case of this illness indicator. From Table 4 it appears that among those with low sense of coherence the risk of being psychologically distressed was reduced by some 20% when self-assessed living conditions and prior health were controlled for (2.62/3.34). Assuming that the contribution of sense of coherence to class differences in illness is spuriously increased by the same factor, SOC would still account for a good 14% of class differences in psychological distress. The corresponding figure for circulatory illness is almost 7%, and for aches and pains 5%. However, more detailed analyses which include working conditions as well as health-related behaviours will have to be undertaken in order to obtain more conclusive results concerning the contribution of sense of coherence to class inequalities in health.

In conclusion, the analyses reported here add to earlier findings about the importance of childhood factors and sense of coherence in adulthood for health and illness in adult life. In contrast, the association between childhood conditions and sense of coherence which could in theory be assumed to exist, could not in fact be demonstrated very clearly. Instead of being a mediator, which partly explains the relationship between childhood experiences and adult ill health, sense of coherence appears to be an additional psychosocial factor linked to health in adulthood. Whereas the time sequence of childhood conditions and adult health provides a basis for conclusions about the causal nature of this relationship, the association between sense of coherence and illness cannot as readily be interpreted in causal terms. However, given the strength of this relationship even after extensive controls for possible confounders, the association is, in my view, more likely to be the result of a causal relation than of selection
processes or reporting bias, even if part of the remaining relationship may also be attributed to such factors. If a causal relationship does actually exist, sense of coherence, together with childhood conditions, working conditions and health-related behaviours, should be high on the research agenda for future analyses of class inequalities in health.

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REFERENCES