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Review Article

A bio-ecological framing of evidence on the determinants of adolescent mental health - A scoping review of the international Health Behaviour in School-Aged Children (HBSC) study 1983–2020

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ABSTRACT

This paper extracts, organises and summarises findings on adolescent mental health from a major international population study of young people using a scoping review methodology and applying a bio-ecological framework. Population data has been collected from more than 1.5 million adolescents over 37 years by the Health Behaviour in School-Aged Children: WHO Cross-National (HBSC) Study. The paper reviews the contribution that this long standing study has made to our understanding of the individual, developmental, social, economic, cultural determinants of adolescent mental health by organising the findings of 104 empirical papers that met inclusion criteria, into individual, microsystem, mesosystem and macrosystem levels of the framework. Of these selected papers, 68 were based on national data and the other 36 were based on international data, from varying numbers of countries. Each paper was allocated to a system level in the bio-ecological framework according to the level of its primary focus. The majority (51 papers) investigate individual level determinants. A further 28 concentrate primarily on the microsystem level, 6 on the mesosystem level, and 29 on the macrosystem level. The paper identifies where there is evidence on the determinants of mental health, summarises what we have learned, and highlights research gaps. Implications for the future development of this population health study are discussed in terms of how it may continue to illuminate our understanding of adolescent mental health in a changing world and where new directions are required.

Introduction

It is well known that establishing good health for adolescents is essential for their growth and development and doing so can help to secure a range of positive health related outcomes in the future (Sawyer et al., 2012). Mental health is an intrinsic part of health and is fundamental to a good quality of life. Defining it is notoriously complex and varies according to disciplinary perspectives (Dodge et al., 2012). Consequently, it is considered to be multi-dimensional and could include physical, psychological, cognitive, social, and economic aspects (Pollard & Lee, 2003). Many of these aspects have been deemed to have implications for young people’s self-esteem, behaviour, attendance at school, educational achievement, social cohesion and future health and life chances (Gómez-Lopez, Viejo, & Ortega-Ruiz, 2019; Mathieson & Koller, 2008; Olweus, 1997). Young people with positive mental health are more likely to possess good problem-solving skills, social competence and a sense of purpose. These are often seen as health assets that can help them rebound from setbacks, thrive in the face of poor circumstances, avoid risk-taking behaviour and generally continue a productive life (Morgan, 2011; Scales, 1999).

In the context of a social determinants approach there is a lot we know about the supportive environments which can help young people to thrive (Viner et al., 2012). As a minimum these would include making improvements to structural factors, as well as optimising access to protective factors over risk factors (Viner et al., 2012). Despite this knowledge, there is still an incomplete understanding of the full range of relevant factors and more importantly how they interact to either impinge or support mental health in the various contexts and environments within which young people live. This lack of a complete picture is illustrated by the fact that there is no simple answer to why some young people thrive under circumstances of considerable adversity while others suffer even though their contexts appear secure and supportive. That said, work stemming from Antonovsky’s (1987) theory of salutogenesis has supported insights and further pursuance of this question.
One longstanding, large scale, cross-national study, Health Behaviour in School-Aged Children, hereon referred to as HBSC (www.hbsc.org), has, over the past 37 years, been researching the determinants of adolescent mental health, albeit expressed in a range of different ways. It has produced a wealth of knowledge that contributes to our ability to improve the lives of young people. However, the collective understanding arising from it has not been methodically assessed, nor has its contribution to our comprehension of adolescent mental health been determined. The aim of this paper is to organise and summarise the body of work produced by HBSC in journal articles on the determinants of adolescent mental health by applying a bio-ecological conceptual framework as a tool to evaluate its contribution. We use a scoping review methodology to map and synthesise peer reviewed empirical papers arising from the study to determine what we have learned about adolescent mental health and its social determinants, since the study began in 1983.

Specific research questions we pose include: How has HBSC conceptualised mental health in adolescents across time and across countries? What are the developmental, social, economic, cultural and temporal determinants of adolescent mental health according to HBSC? How can a bio-ecological systems’ approach help to organise the evidence accumulated so far and to highlight gaps?

The HBSC study

History aim and links with WHO

HBSC is a unique cross-national research study of the health behaviours and health of adolescents in Europe and North America. HBSC was initiated in 1982, by researchers from three countries - Finland, Norway and England and shortly after, the project was adopted by the WHO-Euro region office as a WHO collaborative study. The first HBSC Survey was conducted in 1983/4 in 5 countries (the original three plus Austria and Denmark) using a common research protocol and survey instrument (Aaro et al., 1986). Since 1985/6, HBSC surveys have been conducted every four years in an increasing number of member countries, with the latest survey (2017/2018) carried out in 50 countries in the European Region, and Canada (www.hbsc.org). The HBSC Protocol includes a survey instrument comprising three types of question: mandatory HBSC items - that all countries must include, optional HBSC items - which are available for all countries to include if they choose, and national - which are not part of the HBSC protocol and are selected for inclusion by the national team.

The main aim of HBSC has been to study adolescent health and health behaviours in their social context and understand the various determinants that may influence how these are patterned and change over this developmental stage of the life course. Its approach has been to develop a broad understanding of how young people live; recognising that both the wider society and the social domains that adolescents inhabit are important influences. Health has been conceptualised by HBSC not so much as absence of illness or disease, but rather as both somatic and psychological aspects of subjective health (Haugland et al., 2001; Haugland & Wold, 2001; Hetland et al., 2002). Garripy et al. (2016a) have evaluated the validity and reliability of the checklist as a measure of mental health which they also term psychological health.

A measure of life satisfaction, the ‘Cantril Ladder’, was included for the first time in the 2005/6 survey instrument and included in all surveys thereafter as mandatory. Respondents are asked to rate their life on the rungs (0-10) of a diagrammatic ladder (Larvin & Currie, 2014). Other measures of mental health have been added over time as optional packages of questions. These extend core topics as packages of items that countries can choose to include in their surveys and expand the range of questions that can be asked of the data. Individual countries have also used their own choice of mental health measures at national level.

The determinants of mental health we examine are presented in the Results section, 1.3.

HBSC concepts and measures

The conceptual framework adopted by the HBSC founders was an ecological one, similar to Bronfenbrenner’s (1992) systems’ theory, in which adolescent health and health related behaviours are considered as embedded within the context of the social micro-systems of family, peers, and school (Aaro et al., 1986), which are themselves embedded in meso- and macro-systems. There was an implicit interest in understanding how behaviour related to health. Health related behaviours and psychosocial aspects of health were considered to be key criterion (outcome) variables, with personal and environmental factors in lifestyle as predictors. The importance of demographics and the macrosocial context as influences were also explicitly acknowledged. The conceptual approach is discussed in more detail in Currie et al. (2009a).

The term mental health was not initially used in HBSC but the study’s conceptual approach included subjective aspects of health which we now understand to be a component of mental health (Aaro et al., 1986; Antaramian et al., 2010). These were measured with a checklist of subjective health complaints or symptoms. The checklist scores comprise a single scale or two separate factors/sub-scales representing somatic and psychological aspects of subjective health (Haugland et al., 2001; Haugland & Wold, 2001; Hetland et al., 2002). Garripy et al. (2016a) have evaluated the validity and reliability of the checklist as a measure of mental health which they also term psychological health.

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The determinants of mental health we examine are presented in the Results section, 1.3.

Methods

Scoping review approach

The principles of scoping review methodology were used to guide the process of this study (Arksey & O’Malley, 2005). Specifically, their 5 step approach was used to identify, select, map and synthesise the data included in the HBSC database of publications. Scoping reviews are used to provide an overview of research carried out in complex areas. This study was interested in the mental health of adolescents and specifically its determinants, both complex areas in their own right. This study also aligns with several of the purposes of scoping reviews put forward by Munn et al. (2018), namely clarifying key concepts and definitions, identifying key characteristics and highlighting knowledge gaps.

The research questions described in section 1. Introduction, represent the first step in the process. The identification of relevant studies is an important step (step 2) and normally involves a broad search of electronic databases, reference lists and grey literature. However, given the purpose of this study was to explore what has been learned from HBSC, the sole database of relevance was the HBSC database of national and international journal articles arising from the survey since it began in 1983 (http://www.hbsc.org/publications/journal/). These papers are generated from nine cross-national HBSC surveys conducted since the first in 1985/86 with the most recent survey in 2017/2018. They are the source of data for consideration in step 3.

International reports are published following each survey cycle and present descriptive findings on the prevalence of health, social and behavioural measures by age, gender and family affluence in each country (King et al., 1996; Currie et al., 2000, 2004, 2008a, 2012a; Inchley et al., 2016, 2020). They are not included in the scoping review conducted for the purposes of this paper.

As with all reviews following a systematic process, step 3 involves selecting studies most relevant for answering the research questions of interest. This was done by making explicit a set of inclusion and exclusion criteria. Straightforwardly, the inclusion criteria were: peer reviewed empirical papers; published between 1986 (when the first papers were published from HBSC) and August 2020 (when the review was completed) and in English; topic area of focus was mental health.

All terms that have been used by the HBSC Study to measure mental health were used as inclusion criteria. The terms were gathered from HBSC Research Protocols (accessible via www.hbsc.org) and from
papers on mental health. They include: mental health, mental well-being/wellbeing, perceived well-being, emotional well-being, spiritual well-being, social well-being, subjective well-being, subjective health, subjective health complaints, psychological complaints, psychological symptoms, psychosomatic complaints, psychosomatic symptoms, life satisfaction, anxiety, depression.

Exclusion criteria were: published reports, peer reviewed papers with a conceptual or methodological focus; peer reviewed HBSC empirical papers published in languages other than English. We also excluded papers which focused on externalising aspects of mental health such as conduct disorders and self-harm. Our focus in this review was on internalising aspects of mental health. We do however consider papers which consider risk behaviours, such as smoking and alcohol use, as determinants of mental health.

Using the HBSC publications database of journal articles, titles were used to identify papers by searching on the mental health terms listed above. Abstracts were reviewed for key findings on associations between determinants and mental health outcomes and also to identify the levels of the bio-ecological framework which were referenced (see below for details). If insufficient detail was found in the abstract, then the paper itself was retrieved and reviewed. Charting and organising the data in this way comprised step 4.

In adopting a bio-ecological framework, the mental health of the individual, developing adolescent is contextualised within different system levels – individual, microsystem, mesosystem and macrosystem. Taking into account the different levels of analysis from individual/developmental up to societal, and across countries and over time, Bronfenbrenner’s adapted ecological model is used as a framework for organising the information on determinants of adolescent mental health (Bronfenbrenner & Ceci, 1994). The adapted model includes the maturation stage of the individual which acknowledges the importance of puberty to the health of adolescence. This recognised determinant in adolescent mental health has recently been discussed in an editorial by Currie (2019). The adapted model that Bronfenbrenner developed is known as the ‘process person context time’ model (Bronfenbrenner & Ceci, 1994). Critically it acknowledges the relevance of biological and genetic aspects of the person and the personal characteristics that individuals bring with them into any social situation. It is presented in Fig. 1. The framework is used to collate, summarise, and report the themes arising from the included studies (step 5).

Results

Once hundred and four papers out of a total of 1047 papers in the HBSC database were found to meet the inclusion criteria for this study, that is they had a primary focus on the determinants of adolescent mental health. Table 1 provides a summary of these papers by geographical context, bio-ecological level and year of publication. The majority of these papers were published from 2010 onwards (88%); 65% of total papers were national; and in general all regions represented within HBSC saw a growth of papers over time. The predominant bio-ecological level was the individual level (49%) followed by the micro level (27%) but macro level publications have grown over time.

Table 2 (web supplement) provides details of all 104 papers included in the scoping review providing the following information: Level in Bio-ecological model; 1st Author; Year; National (country)/International paper (N of countries); Title; Aim; Mental health measures included; Determinants included. It lists the papers according to the primary level in the bio-ecological that applies: individual, microsystem, mesosystem and macrosystem.

As Table 2 shows, the scale and sub-scales have also been given other names by different authors - so while the underlying concepts have been the same, the terminology used has varied. As well as subjective health/subjective health complaints, other terms used include multiple health complaints, psychosomatic symptoms, psychosomatic health complaints, subjective health complaints, subjective health.
Determinants of mental health introduced as optional areas in HBSC and are included in our review. From Scotland finds that between 1994 and 2008, younger adolescents have a tendency to psychological health complaints. In addition to mandatory items, some papers include findings on optional package measures including: psychological symptoms, psychological health complaints. Only the 4 psychological complaints are used and various terms are applied – psychological symptoms, psychological health complaints. The table (Table 3) provides a chronology of mental health terms used in paper titles. In addition to mandatory items, some papers include findings on optional package measures including from: Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997); KIDSCREEN (Erhart et al., 2009; Ravens-Sieberer et al., 2014); the Center for Epidemiologic Studies’ Short Depression Scale (CES-D-R 10) (Bradley et al., 2010), the Cohen Perceived Stress Scale (Cohen et al., 1994) and the WHO (Five) Well-Being Index (Topp et al., 2015). Additionally, aspects of social and psychological health and well-being including loneliness, sense of coherence and spirituality have been introduced as optional areas in HBSC and are included in our review.

Table 3 (web supplement) provides a chronology of mental health terms used in paper titles. In addition to mandatory items, some papers include findings on optional package measures including from: Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997); KIDSCREEN (Erhart et al., 2009; Ravens-Sieberer et al., 2014); the Center for Epidemiologic Studies’ Short Depression Scale (CES-D-R 10) (Bradley et al., 2010), the Cohen Perceived Stress Scale (Cohen et al., 1994) and the WHO (Five) Well-Being Index (Topp et al., 2015). Additionally, aspects of social and psychological health and well-being including loneliness, sense of coherence and spirituality have been introduced as optional areas in HBSC and are included in our review.

**Determinants of mental health**

In this section, each paper is allocated to a system level, according to the focus of the paper, i.e. whether it primarily examines associations between determinants and mental health at the individual, microsystem, mesosystem or macrosystem level. In some papers, multiple levels are examined, for example, macro and individual level. These are identified in **Table 2** (web supplement), under the highest level in the biocological framework. Key findings of each paper are briefly presented; however, the evidence is not critiqued or evaluated as this is beyond the scope of the scoping review.

**Individual level**

**Individual characteristics**

Age. While this has been a topic for the HBSC International Reports previously mentioned, there are very few academic papers that directly address the issue of age differences in mental health. One using data from Scotland finds that between 1994 and 2008, younger adolescents scored more favourably on measures of confidence, happiness, helplessness and feeling left out than older adolescents (Levin et al., 2009). **Pubertal status.** Age at menarche is included in most HBSC surveys as a mandatory item and international papers have been produced on timing of menarche in relation to family structure (Steppan et al., 2019) and overweight/obesity (Currie, Ahluwalia, et al., 2012). However, to date there are no papers on the association between pubertal timing and mental health.

**Sex/gender.** In selected papers comparing the mental health of girls and boys, both sex differences and gender differences are referred to, with the terms often used interchangeably. Levin et al. (2009) compare mental health of girls and boys in Scotland between 1994 and 2006. They report that, boys score more favourably on measures of confidence, happiness, helplessness and feeling left out than girls; and multiple health complaints are more prevalent among girls than boys.

A Belgian study explored gender differences in psychological health complaints (feeling low, irritability/bad temper, nervousness, and sleeping difficulties) and the mediating role of well-being factors - life satisfaction, self-confidence, helplessness, and body image. These four well-being factors together explained more than half of the female excess in feeling low. After full adjustment, only gender differences in sleeping difficulties among 13-15-year-olds remained significant (Savoye et al., 2015). **Native/migrant status.** Questions about country of birth and country of parents’ birth are used for the identification of migrant adolescents and comparisons to be made between migrant groups and between migrant and native adolescents.

**Comparison of non-migrant v migrant.** In an Israeli study, mental well-being of native Israeli youth is associated with the quality of their relationships with parents, teachers and peers. However, for immigrant adolescents, a positive school environment (parental support at school, teacher support and peer relationships) predicted better mental health (Walsh et al., 2010).

Another Israeli study compares first- and second-generation immigrant adolescents from the Former Soviet Union (FSU) and Ethiopia, examining psychosomatic symptoms, and host/heritage identities as mediators of the relationship between discrimination and aggressive behaviour/substance use. Discrimination leads to a weaker host identity and increased psychosomatic symptoms, associated with substance use and aggressive behaviour (Walsh et al., 2018).

A cross-national study of 10 countries compared the well-being of migrant compared to native adolescents. Once differences in gender, age and family affluence are taken into account, immigrant children do not significantly differ from their peers in their life satisfaction in most countries (Molcho et al., 2010). In contrast, a Swedish study comparing subjective health complaints (SHC) of native versus adolescents of ‘foreign extraction’ find an increased risk of SHC among girls with a foreign background compared with girls with a Swedish background. No such differences were seen among boys (Carlerby et al., 2011).

**Differences between migrant categories.** Adolescent immigrants to Italy from western Europe have lower levels of health complaints and higher life satisfaction than those from Eastern European and non-Western/non-European countries (Borraccino et al., 2018). Comparing the psychological well-being of Polish and Asian immigrant youth in Iceland, compared to their native peers, less life-satisfaction and more distress was reported in all non-native groups compared with natives with outcomes more negative for youth of mixed ethnic origin (Runarsdottir et al., 2015).

**Sexual orientation.** Some countries included questions about sexual orientation in their national surveys. In a Dutch study, same-sex attracted (SSA) adolescents reported lower levels of life satisfaction, higher levels of psychosomatic complaints and emotional problems than heterosexual adolescents. Not yet attracted (NYA) adolescents reported equal levels of life satisfaction and psychosomatic complaints as heterosexual adolescents, but higher levels of emotional problems (Kuyper et al., 2016).

In Iceland, lesbian, gay and bisexual (LGB) adolescents were worse off across most of the psychosocial measures across the three surveys.
Table 2
Publication details of selected papers.

| Level in Bio-ecological model | 1st Author | Year | National (country)/International paper (N of countries) | Title | Aim | Mental health measures included | Determinants included |
|-------------------------------|------------|------|--------------------------------------------------------|-------|-----|--------------------------------|----------------------|
| Individual                   | Levin      | 2009 | National (Scotland)                                    | Mental well-being and subjective health of 11–15 year old boys and girls in Scotland, 1994–2006 | To examine trends and inequalities in mental health | Confidence, happiness, helplessness and feeling left out, multiple health complaints (MHC) | Age, sex/gender, socioeconomic status |
| Individual                   | Savoye     | 2015 | National (Belgium)                                     | Well-being, gender, and psychological health in school-aged children | To test factors related to well-being as explanatory factors of gender differences in psychological complaints | Psychological complaints, life satisfaction, self-confidence, helplessness, and body image | Sex/gender |
| Individual                   | Walsh      | 2010 | National (Israel)                                     | Parents, teachers and peer relations as predictors of risk behaviors and mental well-being among immigrant and Israeli-born adolescents. | To examine roles of parents, teachers and peers in predicting risk behaviors and mental well-being among Israeli-born and immigrant adolescents | Multiple health complaints | Migrant status |
| Individual                   | Walsh      | 2018 | National (Israel)                                     | The role of identity and psychosomatic symptoms as mediating the relationship between discrimination and risk behaviors among first and second generation immigrant adolescents | To examine psychosomatic symptoms, and host and heritage identities | Multiple health complaints | Migrant status |
| Individual                   | Molcho     | 2010 | International (12 countries)                          | Health and well-being among child immigrants in Europe | To examine health, well being and involvement in risk behaviours of immigrant children across twelve European countries | Life satisfaction, subjective health complaints | Migrant status |
| Individual                   | Carlerby   | 2011 | National (Sweden)                                     | Subjective health complaints among boys and girls in the Swedish HBSC study: Focussing on parental foreign background | To explore the associations between foreign extraction and subjective health complaints (SHC) among school-aged children in Sweden | Subjective health complaints | Migrant status |
| Individual                   | Borraccino | 2018 | National (Italy)                                     | Perceived well-being in adolescent immigrants: it matters where they come from. | To explore whether adolescent immigrants have worse or better perceived well-being | Life satisfaction | Migrant status |
| Individual                   | Runarsdottir | 2015 | National (Iceland)                                  | Ethnic differences in youth well-being: The role of sociodemographic background and social support. | To explore the psychological well-being of Polish and Asian immigrant youth in Iceland in comparison with their native peers | Life satisfaction, distress | Migrant status |
| Individual                   | Kuyper     | 2016 | National (Netherlands)                                | Growing Up With the Right to Marry: Sexual Attraction, Substance Use, and Well-Being of Dutch Adolescents | To assess the well-being and substance use of sexual minority adolescents | Psychosomatic complaints and emotional problems | Sexual orientation |
| Individual                   | Thorsteinsson | 2017 | National (Iceland)                                     | Sexual orientation among Icelandic year 10 adolescents: Changes in health and life satisfaction from 2006 to 2014. | To investigate sexual orientation in relation to mental health and wellbeing | Life satisfaction | Sexual orientation |
| Individual                   | Paniagua   | 2020 | National (Spain)                                     | Under the Same Label: Adopted Adolescents’ Heterogeneity in Well-Being and Perception of Social Contexts. | To compare wellbeing of non-adopted and adopted adolescents | Life satisfaction | Adoption status |
| Individual                   | Pickett    | 2020 | National (Canada)                                     | A Contemporary Profile of the Mental Health of Girls from Farm and Non-Farm Environments | To develop a contemporary profile of the mental health of Canadian adolescent girls from farms and determine whether they differed from girls with non-farm backgrounds | Life satisfaction, psychological problems | Farm-living v non-farm living |
| Individual                   | Whitehead  | 2017 | International (33 countries)                         | Trends in Adolescent Overweight Perception and its Association with Psychosomatic Health 2002–2014: Evidence From 33 Countries. | To examine trends (2002–2014) in the prevalence of adolescent overweight perceptions and their association with psychosomatic complaints. | Psychosomatic health complaints | Overweight |
| Individual                   | Baile      | 2020 | National (Spain)                                     | The Relationship between Weight Status, Health-Related Quality of Life, and Life Satisfaction in a Sample of Spanish Adolescents. | To analyse the relationship between weight status, which is evaluated by means of the body mass index (BMI), and the health-related quality of life (HRQoL) and life satisfaction (LS) variables in Spanish adolescents | Life satisfaction and KIDSCREEN Health related quality of life | Weight status (Body mass index) |
| Individual                   | Gobina     | 2011 |                                                       | Multiple health complaints | Medicine use | (continued on next page)
| Level in Biological Model | 1st Author | Year | National (country)/International paper (N of countries) | Title | Aim | Mental Health Measures Included | Determinants Included |
|---------------------------|------------|------|---------------------------------------------------------|-------|-----|--------------------------------|----------------------|
| Individual | Canha | 2016 | National (Portugal) | Determinants included in Bio-ecological model | To investigate adolescents' medicine use and association with corresponding health complaints in Europe and USA. | Life satisfaction, psychosomatic symptoms | Disabilities |
| Individual | Santos | 2015 | National (Portugal) | The medicine use and corresponding subjective health complaints among adolescents, a cross-national survey | To investigate similarities and differences between students with and without disabilities regarding their self-ratings of life satisfaction, and psychological and physical symptoms | Life satisfaction, psychosomatic symptoms | Disabilities |
| Individual | Sentenac | 2011 | International (11 countries) | Psychological well-being and chronic condition in Portuguese adolescents | To examine the differences in the psychological well-being of Portuguese adolescents living with and without a chronic condition | Psychological symptoms | Chronic condition |
| Individual | Lyyra | 2018 | National (Finland) | Loneliness and subjective health complaints among school-aged children. | To examine the association between loneliness and subjective health complaints | Life satisfaction, Multiple Health Complaints | Disability/chronic condition |
| Individual | Evans | 2019 | National (Ireland) | Comparison of the health and wellbeing of smoking and non-smoking school-aged children in Ireland. | To determine the association between smoking and health and well-being indicators among Irish school-aged children. | Life satisfaction, Multiple health complaints | Smoking |
| Individual | Braverman | 2016 | National (Norway) | Daily Smoking and Subjective Health Complaints in Adolescence | To examine associations between daily smoking, gender, and self-reported health complaints in five cohorts of adolescents over a 16-year period. | Multiple health complaints | Smoking |
| Individual | Kuntsche | 2004 | National (Switzerland) | Emotional well-being and violence among social and solitary risky single occasion drinkers in adolescence. | To test whether risky drinker groups differ in terms of emotional well-being and violence-related variables. | Life satisfaction, depressive mood | Alcohol use |
| Individual | Monshouwer | 2006 | National (Netherlands) | Cannabis use and mental health in secondary school children: Findings from a Dutch survey. | To examine the association between cannabis use and mental health | Somatic health complaints, depression | Cannabis use |
| Individual | Madkour | 2010 | International (5 countries) | Early adolescent sexual initiation and physical/psychological symptoms: a comparative analysis of five nations | To examine psychosocial correlates of early sexual initiation | Psychological symptoms | Sexual initiation |
| Individual | Arnasson | 2020 | International (6 countries) | Cyberbullying and traditional bullying among Nordic adolescents and their impact on life satisfaction | To examine potential associations between life satisfaction, on the one hand, and traditional bullying and cyberbullying on the other. | Life satisfaction | Bullying |
| Individual | Wang | 2011 | National (US) | Cyber bullying and traditional bullying: Different association with anxiety | To compare levels of depression among bullies, victims, and bully-victims of traditional and cyber bullying | Depression | Bullying |
| Individual | Garcia-Moya | 2014 | National (Spain) | Cyberbullying victimization prevalence and its effects on psychosomatic complaints: can sense of coherence make a difference? Trends in bullying victimization in Scottish adolescents 1994–2014, changing associations with mental well-being | To examine the prevalence of bullying victimization and its impact on physical and psychological complaints | Psychological complaints | Bullying |
| Individual | Cosma | 2017 | National (Scotland) | Trends in bullying victimization in Scottish adolescents 1994–2014, changing associations with mental well-being | To analyse the changing associations over two decades between bullying victimization and mental well-being in a representative Scottish schoolchildren sample. | Confidence, happiness, psychological health complaints | Bullying |
| Individual | Hong | 2020 | National (US) | Exploring whether talking with parents, siblings, and friends moderates the association between peer victimization and adverse psychosocial outcomes | To explore whether talking with parents, siblings, and friends will moderate the association between peer victimization and internalising problems | Feel low, feel nervous (2 items from psychosomatic symptoms scale) | Bullying |
| Individual | Carvalho | 2018 | National (Portugal) | Emotional Symptoms and Risk Behaviors in Adolescents: Relationships With Cyberbullying and Implications on Well-Being. | To analyse the relationships between emotional symptoms and cyberbullying | Emotional symptoms | Cyberbullying |
| Level in Biological ecological model | 1st Author | Year | National (country)/ International paper (N of countries) | Title | Aim | Mental health measures included | Determinants included |
|-------------------------------------|------------|------|----------------------------------------------------------|-------|-----|-------------------------------|---------------------|
| Individual                          | Vieno      | 2015 | National (Italy)                                         | Cybervictimization and somatic and psychological symptoms among Italian middle school students. | To verify the association between cybervictimization and both psychological and somatic symptoms on a representative sample of Italian early adolescents. | Psychological and somatic symptoms | Cyberbulling        |
| Individual                          | Dutkova    | 2017 | National (Slovakia)                                      | Is spiritual well-being among adolescents associated with a lower level of bullying behaviour? The mediating effect of perceived bullying behaviour of peers. Bullying and subjective health among adolescents at schools in Latvia and Lithuania. | To explore the association between spiritual well-being and bullying among Slovak adolescents. | Life satisfaction, health complaints | Spiritual well-being Bullying |
| Individual                          | Gobina     | 2008 | International (2 countries)                              | To investigate the prevalence of bullying among adolescents in Latvia and Lithuania and to study its association with self-rated health, health complaints, and life satisfaction. | To assess the relationship of victimization with depression symptoms was assessed. | Depressive symptoms | Bullying |
| Individual                          | Du         | 2018 | National (US)                                            | Peer Support as a Mediator between Bullying Victimization and Depression. | To examine the association of clusters of risk behaviours with adolescent mental well-being | Life satisfaction, psychosomatic complaints | Clusters of risk behaviours |
| Individual                          | Walsh      | 2020 | International (37 countries)                             | The Association Between Physical Activity and General Life Satisfaction in Lower Secondary School Students: The Role of Individual and Family Factors. | To investigate the association between physical activity and general life satisfaction in adolescents. | Life satisfaction | Physical activity |
| Individual                          | Mazur      | 2016 | National (Poland)                                        | The mirror’s curse: Weight perceptions mediate the link between physical activity and life satisfaction among 15-16 year olds. | The objective of the study was to determine whether physical activity influences the variability of selected indices of mental health. | Social dysfunction (GHQ), anxiety and depression | Physical activity |
| Individual                          | Brooks     | 2014 | National (England)                                       | Associations between physical activity in adolescence and health behaviours, well-being, family and social relations. | To examine the association between physical activity and wellbeing | Life satisfaction | Physical activity |
| Individual                          | Meyer      | 2020 | International (44 countries)                             | Outdoor play and nature connectedness as potential correlates of internalized mental health symptoms among Canadian adolescents, | To explore the link between physical activity (PA) and life satisfaction in a large international study of adolescents. | Psychosomatic symptoms | Being in nature/the outdoors |
| Individual                          | Piccininni | 2018 | National (Canada)                                        | Exposure to public natural space as a protective factor for emotional well-being among young people in Canada. | To examine the relationship between exposure to public natural space and positive emotional well-being among young adolescent Canadians. | Emotional well-being (life satisfaction) | Being in nature |
| Individual                          | Huyhn      | 2013 | National (Canada)                                        | To explore the associations of spirituality with self-rated health, health complaints, and life satisfaction of adolescents with the moderating role of religiosity. | Spirituality | Life satisfaction | Spirituality |
| Individual                          | Veselska   | 2018 | National (Slovakia)                                      | To investigate the association between chronotype and mental health and subjective health among adolescents. | To investigate the association between sleep duration, sleep initiation difficulties and psychological and somatic complaints. | Psychosomatic symptoms | Sleep |
| Individual                          | Norell-Clarke | 2018 | National (Sweden)                                        | Child and adolescent sleep duration recommendations in relation to psychological and somatic complaints based on data between 1985 and 2013 from 11 to 15 year-olds. | To investigate the association between sleep duration, sleep initiation difficulties and psychological and somatic complaints. | Psychosomatic symptoms | Sleep |
| Individual                          | Kosticova  | 2020 | National (Slovakia)                                      | Difficulties in getting to sleep and their association with emotional and behavioural problems in adolescents: | To investigate the association between difficulties in getting to sleep/sleep duration and emotional problems. | Psychosomatic symptoms | Sleep |

(continued on next page)
| Level in Biological Model | 1st Author Year | National (country)/International paper (N of countries) | Title | Aim | Mental health measures included | Determinants included |
|-------------------------|-----------------|------------------------------------------------------|-------|-----|-------------------------------|----------------------|
| Individual              | Marino 2016     | National (Italy) | Computer Use, Sleep Difficulties, and Psychological Symptoms Among School-Aged Children: The Mediating Role of Sleep Difficulties | To examine the association between computer use and psychological symptoms among Italian adolescents, taking into account the mediating role of difficulty in getting to sleep. | Psychological symptoms | Computer use and sleep |
| Individual              | Vandendriessche 2019 | International (12 countries) | Does Sleep Mediate the Association between School Pressure, Physical Activity, Screen Time, and Psychological Symptoms in Early Adolescents? A 12-Country Study. | To examine the mediating role of sleep duration and sleep difficulties in the association of school pressure, physical activity, and screen time with psychological symptoms in early adolescents. | Psychological symptoms | Sleep, school pressure, physical activity, screen time |
| Individual              | Bonniel-Nissim 2015 | International (9 countries) | Supportive communication with parents moderates the negative effects of electronic media use on life satisfaction during adolescence | To examine the impact of electronic media (EM) use on teenagers’ life satisfaction (LS) and to assess the potential moderating effect of supportive communication with parents | Life satisfaction | Electronic media use |
| Individual              | Keane 2017      | National (Ireland) | Physical activity, screen time and the risk of subjective health complaints in school-aged children. | To explore if meeting physical activity and total screen time (TST) recommendations are associated with the risk of reporting health complaints weekly or more. | Psychosomatic health complaints | Computer use and physical activity |
| Individual              | Lew 2019        | National (USA) | Examining the relationships between life satisfaction and alcohol, tobacco and marijuana use among school-aged children. | To examine association between life satisfaction and substance use. | Life satisfaction | Tobacco, alcohol and marijuana use |
| Individual              | Bontiel-Nissim 2015 | International (9 countries) | Supportive communication with parents moderates the negative effects of electronic media use on life satisfaction during adolescence. | To examine the impact of electronic media use on teenagers’ life satisfaction and to assess the potential moderating effect of supportive communication with parents. | Life satisfaction | Electronic media use |
| Microsystem             | MacIntyre 2016  | National (Denmark) | High and low levels of positive mental health: are there socioeconomic differences among adolescents? | To examine the socioeconomic patterning of aspects of low and high positive mental health among adolescents. | Self-esteem, social competence and self-efficacy | Parents’ occupational status |
| Microsystem             | Moreno-Maldonado 2020 | International (2 countries) | Factors associated with life satisfaction of adolescents living with employed and unemployed parents in Spain and Portugal: A person focused approach. | To analyse the association of life satisfaction according to their parents’ employment status. | Life satisfaction | Parental employment status |
| Microsystem             | Frasquilho 2016 | National (Portugal) | Parental Unemployment and Youth Life Satisfaction: The Moderating Roles of Satisfaction with Family Life. | To explore the links between parental unemployment and youth life satisfaction by considering the potential moderating roles played by satisfaction with family life and perceived family wealth. | Life satisfaction | Parental employment status |
| Microsystem             | Elgar 2013      | International (8 countries) | Absolute and relative family affluence and psychosomatic symptoms in adolescents. | To examine whether self-reported psychosomatic symptoms in adolescents relate more closely to relative affluence (i.e., relative deprivation or rank affluence within regions or schools) than to absolute affluence. | Psychosomatic symptoms | Family affluence (FAS) |
| Microsystem             | Duinhof 2020    | National (Netherlands) | Immigration background and adolescent mental health problems: the role of family affluence, adolescent educational level and gender. | To examine to what extent differences in the mental health problems of non-western immigrant and native Dutch adolescents were explained by adolescents’ family affluence and educational level and differed with the adolescents’ family affluence, educational level, and gender. | Strengths and Difficulties Questionnaire (SDQ) | Family affluence |
| Microsystem             | Morgan 2019     | National (Wales) | Socio-Economic Inequalities in Adolescent Summer Holiday Experiences, and Mental Wellbeing on Return to School: Analysis of the School | To examine the role of summer holiday experiences in explaining socioeconomic inequalities in wellbeing. | Psychological symptoms | Family affluence (FAS); summer holiday time spent |

(continued on next page)
| Level in Bio-ecological model | 1st Author | Year | National (country)/International paper (N of countries) | Title | Aim | Mental health measures included | Determinants included |
|-----------------------------|------------|------|------------------------------------------------------|-------|-----|-------------------------------|---------------------|
| Microsystems (Microsystem) (Family) | Elgar | 2017 | International (40 countries) | Health Research Network/Health Behaviour in School-Aged Children Study in Wales | Early-life income inequality and adolescent health and well-being. To examine lagged, cumulative, and trajectory associations between early-life income inequality and adolescent health and well-being. | Psychosomatic symptoms and life satisfaction | Family affluence |
| Microsystems (Microsystem) (Family) | Buiks | 2016 | National (Czech Republic) | The role of community social capital in the relationship between socioeconomic status and adolescent life satisfaction: mediating or moderating? Evidence from Czech data. | To explain the relationship between socioeconomic status (SES) and adolescent health and well-being. | Life satisfaction | Family affluence and perceived family wealth |
| Microsystems (Microsystem) (Family) | Levin | 2010 | National (Scotland) | Family structure, mother-child communication, father-child communication, and adolescent life satisfaction: A cross-sectional multilevel analysis | To investigate the association between mother-child and father-child communication and children's life satisfaction. | Life satisfaction | Family structure, parental communication |
| Microsystems (Microsystem) (Family) | Elgar | 2013 | National (Canada) | Family dinners, communication, and mental health in Canadian adolescents | To examine the association between frequency of family dinners and positive and negative dimensions of mental health in adolescents, and mediating role of communication between adolescents and parents. | Life satisfaction, psychosomatic symptoms, emotional well-being | Parental communication, family meals |
| Microsystems (Microsystem) (Family) | Levin | 2012 | National (Scotland) | The association between adolescent life satisfaction, family structure, family affluence and gender differences in parent-child communication | To examine young people's life satisfaction in the context of the family environment | Life satisfaction | Family structure, family affluence and parental communication |
| Microsystems (Microsystem) (Family) | Dujeu | 2018 | National (Belgium) | Living arrangements after family split-up, well-being and health of adolescents in French-speaking Belgium. | To identify the most favourable living arrangement to adolescent health and well-being in French-speaking Belgium. | Life satisfaction, multiple health complaints | Family structure |
| Microsystems (Microsystem) (Family) | Bjarnason | 2012 | International (36 countries) | Life satisfaction among children in different family structures: A comparative study of 36 western societies. | To examine differences in life satisfaction among children in different family structures in 36 western, industrialised countries | Life satisfaction | Family structure |
| Microsystems (Microsystem) (Family) | Steinbach | 2020 | International (37 countries) | Joint Physical Custody and Adolescents' Life Satisfaction in 37 North American and European Countries | To examine the association between physical custody arrangements and adolescent life satisfaction | Life satisfaction | Family structure/living arrangements |
| Microsystems (Microsystem) (Intersectional) | Zaborski | 2018 | International (41 countries) | Gender and age differences in social inequality on adolescent life satisfaction: a comparative analysis of health behaviour data from 41 countries | To examine the gender and age differences in social inequality on life satisfaction among adolescents in 41 countries | Life satisfaction | Age, sex, family affluence |
| Microsystems (Microsystem) (Peers) | Matos | 2003 | National (Portugal) | Anxiety, depression, and peer relationships during adolescence | To examine correlates of depression and anxiety in a large, representative sample of adolescents. | Depression, anxiety | Peer relations |
| Microsystems (Microsystem) (School) | Freeman | 2012 | International (3 countries) | The relationship between school perceptions and psychosomatic complaints: cross-country differences across Canada, Norway, and Romania. | To examine the predictive value of school climate and peer support for psychosomatic complaints, perceived academic achievement, and school satisfaction in Canada, Norway, and Romania. | Psychosomatic complaints | Peer support, school climate |
| Microsystems (Microsystem) (School) | Torsheim | 2001 | National (Norway) | School-related stress, support, and subjective health complaints among early adolescents: a multilevel approach | To investigate the relationship between shared psychosocial school environment and subjective health complaints | Subjective health complaints | School stress and support |
| Microsystems (Microsystem) (School) | Danielsen | 2009 | National | School-related social support and students' perceived life satisfaction. | To examine the effect of school related social support from teachers, classmates, and parents on students' life satisfaction | Life satisfaction | School support |
| Microsystems (Microsystem) (School) | Moor | 2014 | National (Germany) | Explaining educational inequalities in adolescent life satisfaction: do health behaviour and gender matter? | To investigate educational inequalities and life satisfaction of boys and girls. | Life satisfaction | Educational track |

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| Level in Bio-ecological model | 1st Author | Year | National (country)/ International paper (N of countries) | Title | Aim | Mental health measures included | Determinants included |
|-------------------------------|------------|------|----------------------------------------------------------|-------|-----|---------------------------------|----------------------|
| Microsystem (school)          | Diseth     | 2014 | National (Norway) | Autonomy support and achievement goals as predictors of perceived school performance and life satisfaction in the transition between lower and upper secondary school. | To investigate students’ perceptions of their teachers’ autonomy support, the students’ personal achievement goals, perceived school performance, and life satisfaction | Life satisfaction | School support |
| Microsystem (school)          | Sonmark    | 2016 | International (2 countries) | Individual and Contextual Experiences of School Demands and their Relation to Psychosomatic Health a Comparative Study of Students in France and Sweden. | To investigate the association between school pressure and demands and mental health in 2 different school systems | Psychosomatic health complaints | School pressure |
| Microsystem (school)          | Rathman    | 2018 | National (Germany) | Is being a “small fish in a big pond” bad for students’ psychosomatic health? A multilevel study on the role of class-level school performance. | To investigate whether level of high-performing students in classroom is negatively associated with psychosomatic complaints of students who perceive themselves as poor performers. | Psychosomatic complaints | School classmate performance effects |
| Microsystem (school)          | Nielsen    | 2017 | International (2 countries) | School transition and mental health among adolescents: A comparative study of school systems in Denmark and Australia | To explore the influence of transition from primary to secondary schools in Australia versus no transition in Denmark by comparing age trends in students’ school connectedness, emotional symptoms | Emotional symptoms from SDQ | School connectedness |
| Microsystem (school)          | Volk       | 2006 | National (Canada) | Perceptions of parents, mental health and school among Canadian adolescents from the provinces and the northern territories | To examine association between mental health and school achievement and enjoyment | Subjective health complaints | School achievement and enjoyment |
| Microsystem (school)          | Saab       | 2010 | National (Canada) | School differences in adolescent health and wellbeing: Findings from the Canadian Health Behaviour in School-aged Children Study | To assess the relationship between student- and school-level factors and student health and wellbeing outcomes | Emotional Wellbeing, and Subjective Health Complaints | School environment |
| Microsystem (school)          | Garcia-Moya| 2015 | International (England and Spain) | Subjective well-being in adolescence and teacher connectedness: A health asset analysis | To examine teacher connectedness in detail and its potential association with emotional wellbeing | Emotional wellbeing (KIDSCREEN) | Teacher – pupil relationship (connectedness) |
| Microsystem (school)          | Levin      | 2012 | National (Scotland) | Subjective health and mental well-being of adolescents and the health promoting school: A cross-sectional multilevel analysis | To examine the impact of the health promoting school (HPS) on adolescent well-being | Life satisfaction, multiple health complaints | Health promoting school status |
| Mesosystem (family and school) | Matos      | 2006 | National (Portugal) | Family-school issues and the mental health of adolescents: post hoc analysis from the Portuguese National Health Behaviour in School aged children survey | To investigate the role of family and school in adolescent mental health | Anxiety/depression | Family communication |
| Mesosystem (school and family) | Moore      | 2020 | National | Socioeconomic status, mental wellbeing and transition to secondary school: Analysis of the School Health Research Network/Health Behaviour in School aged Children survey in Wales | To examine mental health of students experiencing transition to secondary according to family affluence and school affluence | Short Warwick and Edinburgh Mental Wellbeing scale | School transition, family affluence |
| Mesosystem (school and family) | Nielsen    | 2016 | National (Denmark) | Does school social capital modify socioeconomic inequality in mental health? A multi-level analysis in Danish schools | To examine if the association between socioeconomic position and emotional symptoms among adolescents is modified by school social capital | Emotional symptoms | Social school capital, family socioeconomic status |
| Mesosystem (family and peers)  | Moreno     | 2009 | International (36 countries) | Cross-national associations between parent and peer communication and psychological complaints. | To assess whether or not communication with parents and with peers is related to experiencing psychological complaints in an attempt to explore the hypotheses of continuity and compensation or moderation between contexts | Psychological complaints | Parental and peer communication |

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| Level in Biocultural model | 1st Author | Year | National (country)/ International paper (N of countries) | Title | Aim | Mental health measures included | Determinants included |
|---------------------------|------------|------|--------------------------------------------------------|-------|-----|-------------------------------|----------------------|
| Mesosystem (family, school and peers) | Calmeiro  | 2018 | National (Portugal) | Life Satisfaction in Adolescents: The Role of Individual and Social Health Assets | To explore the relationship between adolescents’ life satisfaction and individual and social health assets. | Life satisfaction | Family and peer support, school connectedness |
| Mesosystem (family, school and peers) | Moore  | 2018 | National (Wales) | School, Peer and Family Relationships and Adolescent Substance Use, Subjective Wellbeing and Mental Health Symptoms in Wales: a Cross Sectional Study | To test the independent and interacting roles of family, peer and school relationships in predicting subjective wellbeing and mental health symptoms among 11–16 year olds in Wales | Life satisfaction, mental health symptoms | Family relationships, support from friends, school connectedness |
| Macrosystem (trends) | Haggquist | 2010 | National (Sweden) | Discrepant trends in mental health complaints among younger and older adolescents in Sweden: An analysis of WHO data 1985–2005. Journal of Adolescent Health | To elucidate the time trends in self-reported mental health complaints (internalising problems) among school children in Sweden during a time characterized by economic downturns and upturns, with a focus on possible differences across grades and genders | Psychological health complaints | Secular trends |
| Macrosystem (trends) | Gariepy | 2016 | National (Canada) | Trends in psychological symptoms among Canadian adolescents from 2002 to 2014: Gender and socioeconomic differences | To describe trends in psychological health symptoms in Canadian youth from 2002 to 2014 and examine gender and socioeconomic differences in these trends. | Psychological symptoms | Secular trends |
| Macrosystem (trends) | Hodacova  | 2017 | National (Czech Republic) | Trends in life satisfaction and self-rated health in Czech school-aged children: HBSC study. | To describe trends in life satisfaction from 2002 to 2014 | Life satisfaction | Secular trends |
| Macrosystem (trends) | Potreby  | 2019 | National (Norway) | Health complaints among adolescents in Norway: A twenty-year perspective on trends | To examine time trends in health complaints among adolescents in Norway between 1994 and 2014 | Health complaints | Secular trends |
| Macrosystem (trends) | Hogberg  | 2020 | National (Sweden) | Gender and secular trends in adolescent mental health over 24 years - The role of school-related stress | To investigate whether trends in mental health are due to increasing amount of stressors in the school environment. | Psychosomatic symptoms | Secular trends |
| Macrosystem (trends) | Cavallo  | 2015 | International (31 countries) | Trends in life satisfaction in European and North-American adolescents from 2002 to 2010 in over 30 countries. | To examine trends in life satisfaction according to age and gender | Life satisfaction | Secular trends |
| Macrosystem (cross-cultural differences) | Ravens-Sieberer  | 2009 | International (38 countries) | Subjective health, symptom load and quality of life of children and adolescents in Europe | To examine cross-cultural differences in the prevalence of school children’s subjective health types and the pattern of socio-demographic and socio-economic differences. | Life satisfaction, psychosomatic symptoms | Secular trends and country effects |
| Macrosystem (socioeconomic) | Rathman  | 2015 | International (27 countries) | Macro-level determinants of young people’s subjective health and health inequalities: A multilevel analysis in 27 welfare states | To investigate whether macro-level determinants are associated with health and socioeconomic inequalities in young people’s health | Psychosomatic health complaints | Macro socioeconomic indicators |
| Macrosystem (socioeconomic) | Zaborskis  | 2019 | International (41 countries) | Social Inequality in Adolescent Life Satisfaction: Comparison of Measure Approaches and Correlation with Macro-level Indices in 41 Countries | To investigate socioeconomic differences in wellbeing at macro-level | Life satisfaction | Macro socioeconomic indicators |
| Macrosystem (socioeconomic) | Levin  | 2011 | International (35 countries) | National income and income inequality, family affluence and life satisfaction among 13 year old boys and girls | To investigate cross-national variation in the relationship between family affluence and adolescent life satisfaction, and the impact of national income and income inequality on this relationship | Life satisfaction | Macro socioeconomic indicators |
| Macrosystem (gender) | Torsheim  | 2006 | International (29 countries) | Cross-national variation of gender differences in adolescent subjective health in Europe and North America. | To investigate cross-national consistency and variation of gender differences in subjective health complaints | Subjective health complaints | Macro gender equality index |
| Macrosystem (gender) | De Looze  | 2018 | International (34 countries) | The happiest kids on earth. Gender equality and adolescent life satisfaction in Europe and North America. | To examine whether societal gender equality can explain the observed cross-national variability in adolescent life satisfaction | Life satisfaction | Macro gender equality index |
| Macrosystem (policy) | Minguez  | 2017 | International (10 countries) | The role of family policy in explaining the international variation in child subjective well-being. | To examine to what extend family policies can explain the variability of subjective child well-being components in different European countries | Life satisfaction | Macro family policies |

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Table 2 (continued)

| Level in Bio-ecological model | 1st Author   | Year | National (country)/International paper (N of countries) | Title                                                                 | Aim                                                                                                                                                                                                 | Mental health measures included                                                                                                                                                                                                 | Determinants included                                                                                       |
|-------------------------------|--------------|------|----------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Macrosystem and Individual    | Boer         | 2020 | International (29 countries)                            | Adolescents’ Intense and Problematic Social Media Use and Their Well-Being in 29 Countries | To examine whether intense and problematic social media use (SMU) is independently associated with adolescent well-being; and whether these association varied by the country-level prevalence of intense and problematic SMU. | Life satisfaction, psychological complaints                                                                                                                      | Country level SMU, individual level SMU                                                              |
| Macrosystem and microsystem   | Ottova       | 2012 | International (34 countries)                            | The Role of Individual-and Macro-Level Social Determinants on Young Adolescents’ Psychosomatic Complaints | To examine the social determinants of psychosomatic complaints in young adolescents                                                   | Psychosomatic health complaints                                                                                                                                  | Family-, peer- and school-related factors as well as country level determinants (Human Development Index [HDI]) |
| Macrosystem and microsystem   | Dierckens    | 2020 | International (17 countries)                            | National-Level Wealth Inequality and Socioeconomic Inequality in Adolescent Mental Well-Being: A Time Series Analysis of 17 Countries | To examine the association between national wealth inequality and income inequality and socioeconomic inequality in adolescents’ mental well-being at the aggregated level. | Life satisfaction, psychological and somatic symptoms                                                                                                           | Country income and wealth inequality; family affluence                                                  |
| Macrosystem and microsystem; intersectional | Kern         | 2020 | International (33 countries)                            | Intersectionality and Adolescent Mental Well-being: A Cross-Nationally Comparative Analysis of the Interplay Between Immigration Background, Socioeconomic Status and Gender | To investigate mental well-being from an intersectional perspective – ie consequences of membership in combinations of multiple social groups and in relation to national context (immigration and integration policies, national-level income, and gender equality). | Life satisfaction, psychosomatic health complaints                                                                                                           | Family affluence, gender; migrant status; country indices of income, gender equality and migrant integration |
| Macrosystem (trends) and microsystem (school) | Cosma        | 2020 | International (36 countries)                            | Cross-National Time Trends in Adolescent Mental Well-Being From 2002 to 2018 and the Explanatory Role of Schoolwork Pressure | To investigate cross-national time trends in adolescent mental well-being and the extent to which time trends in schoolwork pressure explain these trends                                                    | Life satisfaction, psychosomatic health complaints                                                                                                           | Secular trends, schoolwork pressure                                                                           |
| Macrosystem (trends) and microsystem (family) | Elgar        | 2015 | International (34 countries)                            | Socioeconomic inequalities in adolescent health 2002–2010: a time-series analysis of 34 countries participating in the Health Behaviour in School-aged Children study. | To examine trends in health and socioeconomic inequalities in health.                                                                                                                                   | Life satisfaction, physical (somatic) and psychological symptoms                                                                 | Macroeconomic indicators (mean income and mean income inequality), family affluence                         |

NOTE: Different authors use a variety of different terms for the same mental health survey measures in the case of Multiple Health Complaints comprising 4 psychological and 4 somatic complaints. In different papers the following alternative terms have been used: psychosomatic symptoms, psychosomatic health complaints, subjective health complaints, subjective health. In some papers only the 4 psychological complaints are used and various terms applied including: psychological symptoms, psychological health complaints.
(2006, 2010 and 2014) as compared with adolescents of unknown sexual orientation (USO). However, the gap between LGB and USO adolescents appears to be closing, at least for the 2010 to 2014 change, suggesting that outcomes for LGB adolescents have improved compared to four years earlier (Thorsteinsson et al., 2017).

Adopted and non-adopted. Complex differences and similarities are found in a Spanish study of non-adopted and adopted (native and non-native, and country of birth among non-native adoptees) and generalities do not apply (Paniagua et al., 2020).

Farm-living and non-farm-living. In a study of adolescent girls in Canada it was found that those from farms in the most rural schools reported more positive mental health than non-farm girls (Pickett et al., 2020).

Intersectional influences. The intersectional effects of being a member of several demographic groups have been explored in a few papers. Within our bio-ecological framework papers on intersectional effects are mainly considered at the individual level but can also be considered at the individual/microsystem level, where family socioeconomic status is a determinant.

One paper examined gender and age differences in socioeconomic inequality (SEI) in life satisfaction (LS) among adolescents in 41 countries. Family affluence was significantly positively associated with higher adolescent LS in nearly all countries, among girls and boys and across ages. However, the gender and age differences in this association were inconsistent across countries (Zaborskis & Grincaitė, 2018).

Kern et al. (2020) examined intersectional effects on mental health and also examined macro-level effects - this paper is discussed in a later section (Macro and micro level interactions).

Other aspects of health

Body weight. One study examined the relationship between perceptions of being overweight and mental health and how this has changed over time across HBSC surveys in different countries. Between 2002 and 2014, perceived overweight became more strongly associated with psychosomatic complaints in 4 countries among boys and in 12 countries among girls (Whitehead et al., 2017).

A recent study of Spanish adolescents, Baile et al. (2020) reported that those classified as obese, according to their Body Mass Index, have lower life satisfaction and health related quality of life as measured by the KIDSCREEN instrument.

Medicine use. One international study explored medicine use and mental health in 19 countries. It reported that medicine use was strongly positively associated with the frequency of health complaints; and the prevalence of both medicine use and health complaints was higher among girls than boys (Gobina et al., 2011).

Chronic conditions/disabilities. Two national papers from Portugal and one cross-national paper were found in the database that examined the relationship between chronic conditions and mental health.

One Portuguese study found that adolescents with disabilities had more psychosomatic symptoms than their non-disabled peers. Furthermore, disabled students who report better health were happier and more satisfied with their lives (Canha et al., 2016). Another compared Portuguese adolescents living without and with a chronic condition (CC), the latter reporting more psychosomatic symptoms/health complaints than their peers without a CC (Santos et al., 2015).

The cross-national study examined bullying and mental health among adolescents who have a disability or chronic illness (D/CI) compared to those who have not. A higher level of victimization was found among those with a D/CI and victims of bullying were more likely to report lower life satisfaction and multiple health complaints. However, there were no differences in the associations between peer victimization and subjective health indicators according to the D/CI status (Sentenac et al., 2013).

Loneliness. Lyyra et al. (2018) in a Finnish study reported that loneliness was associated with psychological symptoms among girls and among 15-year-old students (Jyyra et al., 2018).

Spirituality. Spirituality, has a broad definition and relates to wisdom, compassion, the experience of joy in life, moral sensitivities and “connectedness” (Michaelson et al., 2016). A Slovak study found associations between spirituality and both health complaints and life satisfaction (Dankulinova Veselska et al., 2018).

Sense of coherence. Sense of coherence (SoC) is considered to be part of the concept of resilience, reflecting an individual’s resistance in the face of stress (Nielsen & Hansson, 2007). One paper, using Norwegian data, and finds SoC had stress-preventive, stress-modernating and health-enhancing effects (Torsheim et al., 2001).

Risk and health behaviours

Smoking. Two studies explored smoking and mental health, both national, one from Ireland and the other from Norway. The Irish study found smokers were more likely to report lower life satisfaction and higher rates of health complaints than non-smokers (Evans et al., 2019). The Norwegian study examined the association between smoking and health complaints in surveys between 1994 and 2010 and across all surveys, health complaint scores were significantly higher for smokers. Females had higher prevalence of health complaints and this association was stronger among smokers compared with non-smokers (Braverman et al., 2016).

Alcohol use. In a Swiss study, ‘risky single occasion drinkers’ (RSoDs) had lower life satisfaction and more depressive moods, with solitary RSoDs being even less satisfied and more likely to have depression than social RSoDs (Kuntsche & Gmel, 2004).

Cannabis use. In a study using data from the Netherlands, after adjusting for confounding factors, cannabis use was not found to be linked to internalising problems such as somatic health complaints and depression (Monshouwer et al., 2006).

Sexual behaviour. One paper examined the links between sexual behaviour and mental health using data from 5 countries, and found that early age at sexual initiation was not related to psychological/somatic symptoms among boys in any nation. However, girls from Poland and the US who had early age of sexual initiation were more likely to report symptoms (Madkour et al., 2010).

Bullying and violence. Six national papers and one cross-national paper emerged from the interrogation of the database that had a focus on mental health in relation to bullying/violence.

A recent US study found that peer victimization is associated with higher risk of feeling low and feeling nervous, although this risk is decreased by support from friends (Hong et al., 2020).

In a Spanish study, the moderating role of Sense of Coherence (SOC) in the association between bullying and mental health was examined. Adolescents with weak SOC were significantly more likely to suffer from bullying victimization and to suffer physical and psychological symptoms than adolescents with a strong SOC (Garcia-Moya et al., 2014).

Bully victimization rates in Scotland increased between 1994 and 2014 for most age-gender groups and over this time, female (but not male) victims reported less confidence and happiness and more psychological complaints than their non-bullied counterparts (Cosma et al., 2017). In a Portuguese study, the effect of cyberbullying on girls was found to be different to boys, with girls more likely to report emotional symptoms, especially fear and sadness (Carvalho et al., 2018).

An Italian study found that being a victim of cyberbullying was positively associated with psychological and somatic symptoms, after controlling for traditional bullying victimization and computer use. Cyber victimization has similar psychological and somatic consequences for boys and girls (Vieno et al., 2015).

A Slovak study found that adolescents who reported a higher level of spiritual well-being had lower risk of bullying, either as perpetrators or victims (Dukkova et al., 2017). A Latvian found that pure victims were more likely to report weekly health complaints, and low life satisfaction. Being a bully was not associated with life satisfaction but was associated
with weekly nervousness, irritability or bad temper, difficulties in getting to sleep and dizziness, in pure bullies. Those who were bully_victims were significantly more likely to report all of the weekly health complaints, and report low life satisfaction (Gobina et al., 2008). In a US study of bullying, being a victim was positively associated with depression symptoms, with a dose-response relationship (Du et al., 2018).

A study of six Nordic countries found being a victim of cyberbullying was associated with lower life satisfaction (Arnarsson et al., 2020). A US study compared levels of depression among bullies, victims, and bully-victims of traditional (physical, verbal, and relational) and cyber bullying. Depression was associated with each of the four forms of bullying. Cyber victims reported higher depression than cyber bullies or cyber bully-victims. For physical, verbal, and relational bullies, higher levels of depression were found in the more frequently-involved group of victims and bully victims (Wang et al., 2011).

Multiple risk behaviours. One paper examined the association between clusters of a range of traditional risk behaviours (such as substance use) and newer risk behaviours (such as high social media use), and mental health (Walsh et al., 2020). High social media use was one of the strongest predictors of low life satisfaction and high psychosomatic complaints.

Physical activity. Several published studies were found that linked physical and mental health. Physical activity was associated with better mental health (life satisfaction and in particular self-esteem), especially among adolescents from lower affluence families in a Polish study (Kleszczewska et al., 2018), Mazur et al. (2016) also reports that physical activity is an important predictor of mental health in Polish adolescents, even when the impact of sociodemographic and environmental factors as well as the respondents’ school achievements are considered. A study of English adolescents finds physical activity (even below the recommended levels) is associated with higher levels of life satisfaction (Brooks et al., 2014); and a recent study of 44 countries finds a positive association between physical activity and life satisfaction (Meyer, Weidmann, & Grob, 2020).

Being outdoors/in nature. A Canadian study found more time outdoors was associated with lower prevalence of high psychosomatic symptoms in girls (Piccininni et al., 2018). Another study of Canadian adolescents found associations between measures of natural space and positive emotional well-being were weak and lacked consistency overall, but modest protective effects were observed in small cities (Huynh et al., 2013).

Eating/dieting. No papers were identified from titles that explored the association between mental health and eating or dieting.

Sleep. Several papers assessed the association between sleep and mental health.

A recent paper from Slovakia found that difficulties in getting to sleep at least once a week, as well as insufficient sleep (less than 8 h), increased the probability of psychosomatic symptoms (Kosticova et al., 2020). Among Canadian adolescents, a later chronotype, i.e. going to bed late getting up late, was associated with poorer mental health, independent of sleep duration and school start time (Garipey et al., 2019). A study which used data from three consecutive HBSC surveys in Sweden found that sleeping less than recommended and sleep initiation difficulties were associated with increased odds of specific complaints and with having the greatest complaint load (Norell-Clarke & Hagquist, 2018).

Among Italian adolescents, more frequent computer use was associated with a higher frequency of psychological symptoms, with difficulty in getting to sleep partly mediating this association (Marino et al., 2016). In a study of 12 countries, it was found that school pressure and screen time were positively associated with psychological symptoms, whereas physical activity was negatively associated. Almost all associations were significantly mediated by sleep duration and sleep onset difficulties (Vandendriessche et al., 2019).

Electronic media use. A nine country study found that higher computer use was related to lower life satisfaction. However, supportive communication with parents seems to buffer this relationship (Boniel-Nissim et al., 2015). See also Marino et al. (2016) under Sleep section above.

Multiple/interacting risk behaviours. An Irish study of recommended levels of physical activity and screen time found that there was a greater risk from overuse of screen than taking too little physical activity. Adolescents who did not meet either recommendations had a significantly increased risk for six of the health complaints when compared to those who met both recommendations (Keane et al., 2017).

A US study found individuals reporting low life satisfaction (LS) were significantly more likely to have ever used tobacco, alcohol and marijuana. Additionally, students with low LS were significantly more likely to use two substances and three substances concurrently (Lew et al., 2019).

Microsystems: family, peer and school social environments

Family socio-economic status

Parental occupation. A Danish study found a graded relationship of increasing odds for low positive mental health (PMH) with decreasing socioeconomic position (MacIntyre et al., 2016). In a study of Spanish and Portuguese adolescents, those with unemployed fathers who had lower life satisfaction, compared to adolescents with both parents employed or only mothers unemployed (Mor-Maldonado et al., 2020). A Portuguese study found that the negative effects of parental unemployment on youth life satisfaction were moderated by youth perceived satisfaction with family life but not by perceived wealth (Frasquilho et al., 2016).

Family affluence. A Family Affluence Scale (FAS) has been developed and widely used in the HBSC Study to examine the association between family socioeconomic (material) circumstances and adolescent health outcomes (Currie, Molcho, et al., 2008; Torsheim et al., 2016). All papers described here use FAS for their analyses. The HBSC International Reports previously mentioned have consistently reported, for the majority of countries, worse mental health associated with lower FAS (Currie et al., 2004, 2008b, 2012; Inchley et al., 2016, 2020).

In terms of papers: one multi-country study finds that relative deprivation to be more closely to symptoms than absolute affluence. Nevertheless, differences in family material assets, whether they are measured in absolute or relative terms, account for a significant variation in adolescent psychosomatic symptoms (Elgar, De Clercq, et al., 2013). A recent Dutch study of family affluence and mental health among native and migrant adolescents finds that non-western immigrant adolescents had poorer mental health than native Dutch adolescents, but family affluence explains only a very small proportion of these differences (Duinhoef et al., 2020).

A Welsh study looked at measures of family affluence and experiences during the summer holidays (hunger, loneliness, time with friends and physical activity) in relation to mental health on return to school after the holidays. Although family affluence retained a direct inverse association with student mental well-being 65.2% of its association with mental well-being was mediated by the experiences over the summer holidays, the strongest mediational pathway being loneliness (Morgan et al., 2019). One paper explores the effect of earlier hardship in life and finds that exposure to income inequality from 0 to 4 years predicted psychosomatic symptoms and lower life satisfaction in females after controlling lifetime mean income inequality, national per capita income, family affluence, age, and cohort and period effects (Elgar et al., 2017).

Family subjective wealth. One paper examined the association between subjective family economic status (‘how well off is your family’ variable) and any mental health measures (Buijs et al., 2016) finding positive associations with life satisfaction.

Experience of hunger is used as a measure of poverty in HBSC BUT bu No papers were found on hunger (from lack of food) and mental
health.

Social capital. In a Czech study it was found that social capital moderates the association between socioeconomic status and life satisfaction such that social gradient in life satisfaction was flattened when pupils reported high levels of perceived community social capital (Buiks et al., 2016).

Family relationships. In a Scottish study, a positive association was found between both mother-child and father-child communication and adolescent life satisfaction, the relationship with their mother being particularly important, especially among girls. Among boys even when communication with one or more parents was easy, not living in a two parent family was a predictor of low life satisfaction, (Levin & Currie, 2010). A Canadian paper reports that having frequent family dinners is negatively related to internalising symptoms and positively related to emotional well-being and life satisfaction (Elgar, Craig, & Trtes, 2013). In an analysis of Portuguese data, it was found that parental encouragement for school has a specific positive effect on adolescent mental health, beyond the effect of school environment and family communication addressed individually (Matos et al., 2006).

Family structure. A Scottish study found for boys and girls aged 13 and 15 years, that those from two parent families had highest life satisfaction. However, for boys and girls at all ages, life satisfaction was more strongly associated with parent–child communication than with family structure or family affluence (Levin, Dallago, & Currie, 2012). In a Belgian study, adolescents living with separated parents showed few differences in mental health according to post-separation living arrangements (Dujes et al., 2018). However, a study of 36 countries found adolescents living with both biological parents had higher levels of life satisfaction than those living with a single parent or parent–step-parent. Adolescents in joint physical custody reported significantly higher levels of life satisfaction than their counterparts in other types of non-intact families. Nevertheless, when controlling for perceived family affluence, there was no difference between joint physical custody families and single mother or mother–stepfather families (Bjarnason et al., 2012).

A similar paper using more recent data by Steinbach et al. (2020) found that adolescents experiencing joint physical custody after their parents’ separation reported higher levels of life satisfaction than adolescents from asymmetric care arrangements. However, after controlling for family characteristics (family affluence, the existence of stepparents, and difficulties regarding the communication with both mother and father), the differences between adolescents’ life satisfaction in asymmetric JPC and asymmetric care arrangements lost significance.

Peer and classmate relationships. In a Portuguese study females and adolescents in grades 8 and 10 were more likely to report high anxiety and/or depressive symptoms and these were associated with poor peer relationships (Matos et al., 2003). Positive peer support and school climate had beneficial effects on psychosomatic complaints, in a comparative study in 3 countries - Canada, Norway and Romania (Freeman et al., 2012). Torsheim and Wold (2001) found that classmate support is associated with lower levels of subjective health complaints and may moderate the negative effects of academic stress.

School environment, school performance and teacher relationships. In a Norwegian study, teacher support was strongly related to school satisfaction. School satisfaction was more strongly related to girls’ life satisfaction than to boys (Danielsen et al., 2009). Moor et al. (2014) found that adolescents’ life satisfaction was lower among adolescents, especially boys, from lower educational tracks.

A study of teacher support for autonomy found that both perceived academic achievement and life satisfaction are related to the students’ positive perception of teachers’ autonomy support as well as the students’ own motivation for learning (Diseth & Samdal, 2014).

A comparative study of France and Sweden found that feeling under pressure from schoolwork is less prevalent in Sweden than in France at ages 11 and 13, but reverses to be almost twice as common in Sweden at age 15. There is a positive correlation between pressure and psychosomatic complaints; and this at age 15 this is stronger in France than Sweden. Feeling tired by schoolwork is a stronger predictor of psychosomatic complaints in Sweden than in France across all age-groups, as is the association between perceiving schoolwork as difficult and psychosomatic complaints (Sommark et al., 2016).

In a German study, pupils with average/low perceived school performance (PSP) showed higher likelihoods of psychosomatic complaints compared to counterparts with very good/good PSP. However, students with average/below average PSP, who attend classes with a higher percentage of students who report very good/good PSP, had higher likelihoods of psychosomatic complaints compared to classmates with very good/good PSP (Rathman et al., 2018).

A comparative study explored the influence of the transition from primary to secondary schools in Australia versus no transition in Denmark. by comparing age trends in students’ school connectedness and emotional symptoms. In Australia, no age differences in emotional symptoms or school connectedness were observed whereas in Denmark, low school connectedness and emotional symptoms increased with age (Nielsen et al., 2017).

In Denmark, school social capital may reduce mental health problems and diminish socioeconomic inequality in mental health among adolescents - classes with high trust had less socioeconomic inequality in emotional symptoms (Nielsen et al., 2015). School climate and peer support had beneficial effects on psychosomatic complaints, in a comparative study in 3 countries, Canada, Norway and Romania (Freeman et al., 2012). A Portuguese study found that parental encouragement for school has a specific positive effect on adolescent mental health (Matos et al., 2006).

A Canadian study reported a positive association between adolescent perceptions of school and mental health (Volk et al., 2006). Another study investigated individual and school level predictors of well-being and found that student problem behaviours at the school were significant predictors of subjective health complaints, while student aggression and the school’s average socioeconomic standing were significant school-level predictors of emotional well-being (Saab & Klinger, 2010).

In a study of adolescents in England and Spain, a consistent positive association was found between teacher connectedness and emotional well-being of adolescents regardless of demographic factors, country and perceptions of school performance. Older adolescents and low achievers reported a lower level of connectedness to their teachers, but the association between teacher connectedness and emotional well-being operated irrespective of adolescents’ age and perceived performance at school (Garcia-Moya et al., 2015).

Examining happiness, confidence, life satisfaction, feeling left out, helplessness, and multiple health complaints (MHC), for the majority of these outcomes, mean proportions of young people reporting positive well-being were greater for schools in Scotland that had, or were working towards, ‘Health Promoting School’ status compared with those that were not (Levin, Inchley, et al., 2012).

Mesosystem: interactions between family, peer and school environments

Family and school. In a Spanish study, school connectedness and family support were the strongest predictors of adolescents’ life satisfaction followed by individual social competence, academic achievement and self-regulation (Calmeiro et al., 2018).

Moore et al. (2020) examined the transition to secondary school in relation to mental health and socioeconomic factors. Mental well-being was significantly predicted by the relative affluence of a child’s primary and secondary school, with movement to a secondary school with higher socioeconomic status associated with lowered well-being; these associations being independent of family affluence.
Peers and parents. In a Spanish study of adolescents’ experience of psychological health complaints in relation to how good communication with parents and peers is, those with better communication in both social contexts were the ones showing least psychological complaints. However, good communication with peers does not reduce psychological complaints if the communication with parents is not good (Moreno et al., 2009).

Peers, parents and school. A Welsh study looked at how family, peer and school micro-systems interact to influence adolescent health. Positive relationships with family and school staff were consistently associated with better outcomes. Support from friends was associated with better subjective well-being and mental health. Better relationships with school staff were most strongly associated with positive subjective well-being, and fewer mental health symptoms where pupils reported less family support. Support from friends was associated with worse mental health among pupils with lower family support (Moore et al., 2018).

Macro-system influences on mental health

Secular trends. Hagquist (2010) reported decreasing mental well-being amongst Swedish adolescent across time with significantly higher rates of mental health complaints especially among older adolescents, particularly girls. Trends over time between 2002 and 2014 in mental health among Canadian adolescents found that psychological symptoms increased in girls across all affluence groups while they remained stable in boys from low and middle affluence and decreased in boys from high affluence. Feeling anxious and having sleep problems increased in girls from all affluence groups, while the probability of feeling depressed and irritable decreased among high affluence boys (Gariyup & Elgar, 2016b).

In Norway between 1994 and 2014, there were increasing trends in health complaints among adolescents, especially among older adolescent girls. For psychological health complaints older adolescent girls had a greater increase over time relative to younger adolescents and boys (Potreby et al., 2019). In the Czech Republic there were found to be no significant trends over time (2002–2014) in life satisfaction. Boys consistently had high LS than girls and 11 year olds higher LS than 15 year olds across time (Hodaćová et al., 2017). Hogberg et al. (2020) investigated whether increasing trends in mental health problems, as measured by psychosomatic symptoms in Sweden could be accounted for by school related pressures. They found that school stress accounts for a substantial portion of the increase in symptoms for girls, but only a minor share of the increase for boys.

Increasing rates of adolescent mental health problems are reported in the Nordic countries between 1994 and 2014, and furthermore it is observed that Finland is joining Sweden in having the sharpest increase among older adolescents, in particular among girls (Hagquist et al., 2019). Cavallo et al. (2015) studied trends in life satisfaction (LS) in 30 countries in Europe and North America. These show a quite variable picture: 12 countries show increasing LS, 7 show decreasing LS and 12 show no change (Cavallo et al., 2015).

Cross-cultural differences. In one study cross-cultural differences in the prevalence of school children’s subjective health types and the pattern of socio-demographic and socio-economic differences were examined. Almost half the sample population (44%) reported multiple recurrent health complaints, only poor to fair general health, low life satisfaction or a combination of these. Older adolescents and girls reported more health problems, the gender difference increased with age. Low socioeconomic status was also associated with health problems (OR: 1.4–2.3) Ravens-Sieberer et al. (2009).

Country level socioeconomic indicators. In a study of 27 countries, those with higher income inequality and a liberal welfare tradition report that adolescents had higher rates of health complaints (Rathman et al., 2015). Another study of 41 countries found that inequalities in life satisfaction according to family affluence were greater in those countries that had a more unequal income distribution (Zaborskis et al., 2019).

One study of 35 countries investigated cross-national variation in the relationship between family affluence and adolescent life satisfaction, and the impact of national income and income inequality on this relationship. National income and income inequality were associated with aggregated life satisfaction score and prevalence of high life satisfaction (Levin et al., 2011).

Country gender equality index. In a study of cross-national consistency and variation of gender differences in subjective health complaints in 29 countries results indicated a very robust pattern of increasing gender differences across age, with 15-year-old girls as a group at particular risk for health complaints across all countries. The magnitude of gender differences varied across countries and were stronger in countries with a higher gender development index score (i.e. countries where women have less opportunities and rights than men) (Torsheim et al., 2006).

In an analysis of data from 34 countries, de Looze, Torsheim, and Vollebergh (2018) found that adolescents in countries with relatively high levels of gender equality report higher life satisfaction than their peers in countries with lower levels of gender equality.

Policies on child welfare. One study investigated to what extent family policies can explain the variability of subjective child well-being components in different European countries. It was found that the index of child subjective well-being is comparatively higher in those countries where family policies are more generous in the areas of preschool education, family services, family spending and duration of paid parental leave (Míguez, 2017).

Macro and individual level interactions. Boer et al. (2020) examined the relationship between intense social media use (SMU) and mental health at individual and country levels. Intense users reported lower levels of life satisfaction and more psychological complaints than non-intense users. In contrast, in countries with a higher prevalence of intense SMU, intense users reported higher levels of life satisfaction than non-intense users, and similar levels of psychological complaints.

Macro and micro level interactions. Ottova et al. (2012) examined the social determinants of psychosomatic complaints in young adolescents looking at both micro-level and macro-level determinants, with data from 34 European countries. Results revealed the negative effects of poor friendships, negative class climate, school pressure, and high media use were more pronounced for girls. After controlling for these factors, a higher country level Human Development Index was related to a lower risk for psychosomatic complaints.

A recent paper (Kern et al., 2020) examined intersectional effects within countries and macro-level effects of national level indices socioeconomic equality, gender equality and migrant integration on life satisfaction and psychosomatic complaints. There were no within country intersectional effects. However, there were macro - micro interactions; high national-level gender equality disproportionately benefited groups of socioeconomically disadvantaged boys, whereas advantaged girls were doing worse than expected, and reversed effects were found for countries with low gender equality.

Dierckens et al. (2020) examined country level and family level socioeconomic influences on life satisfaction and both psychological and somatic symptoms. They found that higher levels of national wealth inequality were associated with fewer average psychological and somatic symptoms, while higher levels of national income inequality were associated with more psychological and somatic symptoms. No associations between either national wealth inequality or income inequality and life satisfaction were found.

In one international paper, macro level secular trends in mental
### Table 3
Chronics of mental health terms used in selected papers.

| Year | Mental health measures included |
|------|----------------------------------|
| 2001 | Subjective health complaints     |
| 2003 | Depression, anxiety              |
| 2004 | Life satisfaction, depressive mood|
| 2006 | Subjective health complaints     |
| 2006 | Anxiety/depression               |
| 2006 | Subjective health complaints     |
| 2006 | Somatic health complaints, depression|
| 2008 | Life satisfaction, health complaints|
| 2009 | Life satisfaction, psychosomatic symptoms|
| 2009 | Confidence, happiness, helplessness and feeling left out, multiple health complaints (MIC) |
| 2009 | Psychological complaints         |
| 2010 | Life satisfaction                |
| 2010 | Psychological symptoms           |
| 2010 | Life satisfaction, subjective health complaints|
| 2010 | Multiple health complaints       |
| 2011 | Life satisfaction                |
| 2011 | Life satisfaction                |
| 2011 | Depression                       |
| 2011 | Life satisfaction, Multiple Health Complaints|
| 2011 | Multiple health complaints       |
| 2011 | Subjective health complaints     |
| 2011 | Life satisfaction                |
| 2012 | Psychosomatic health complaints  |
| 2012 | Life satisfaction, multiple health complaints|
| 2012 | Psychosomatic complaints         |
| 2012 | Life satisfaction                |
| 2012 | Life satisfaction                |
| 2013 | Life satisfaction, psychosomatic symptoms, emotional well-being|
| 2013 | Psychosomatic symptoms           |
| 2013 | Emotional well-being (life satisfaction) |
| 2014 | Life satisfaction                |
| 2014 | Life satisfaction                |
| 2014 | Life satisfaction                |
| 2014 | Psychological complaints         |
| 2015 | Psychological complaints, life satisfaction, self-confidence, helplessness, and body image|
| 2015 | Life satisfaction, physical (somatic) and psychological symptoms|
| 2015 | Life satisfaction                |
| 2015 | Psychosomatic health complaints  |
| 2015 | Emotional wellbeing (KIDSCREEN)  |
| 2015 | Life satisfaction                |
| 2015 | Life satisfaction                |
| 2015 | Psychological and somatic symptoms|
| 2015 | Psychological symptoms           |
| 2015 | Life satisfaction, distress      |
| 2016 | Psychological symptoms           |
| 2016 | Emotional symptoms               |
| 2016 | Psychosomatic health complaints  |
| 2016 | Life satisfaction                |
| 2016 | Life satisfaction                |
| 2016 | Self-esteem, social competence and self-efficacy|
| 2016 | Psychological symptoms           |
| 2016 | Social dysfunction (GHQ), anxiety and depression|
| 2016 | Multiple health complaints       |
| 2016 | Life satisfaction, psychosomatic symptoms|
| 2016 | Psychosomatic complaints and emotional problems|
| 2017 | Life satisfaction                |
| 2017 | Life satisfaction                |
| 2017 | Emotional symptoms from SDQ      |
| 2017 | Psychosomatic symptoms and life satisfaction|
| 2017 | Psychosomatic health complaints  |
| 2017 | Spiritual well-being             |
| 2017 | Psychosomatic health complaints  |
| 2017 | Life satisfaction                |
| 2017 | Confidence, happiness, psychological health complaints|
| 2018 | Life satisfaction                |
| 2018 | Multiple health complaints       |
| 2018 | Life satisfaction                |
| 2018 | Psychosomatic complaints         |
| 2018 | Psychosomatic health complaints  |

**NOTE:** Different authors use a variety of different terms for the same mental health survey measures in the case of Multiple Health Complaints comprising 4 psychological and 4 somatic complaints. In different papers the following alternative terms have been used: psychosomatic symptoms, psychosomatic health complaints, subjective health complaints, subjective health. In some papers only the 4 psychological complaints are used and various terms applied including: psychological symptoms, psychological health complaints.

The overall aim of this paper was to map and summarise the contribution that HBSC has made to the field of adolescent mental health and its determinants. Notwithstanding the substantive impact of HBSC’s international reports on raising awareness and influencing policy on adolescent health (including mental health) (Evans, 2017), this paper focused on the additive contribution of analytic peer reviewed publications.

Given the complexities of adolescent development and the original ecological conceptual framework adopted by the HBSC, Bronfenbrenner’s bio-ecological theory (Bronfenbrenner, 1992; Bronfenbrenner...
& Ceci, 1994) was used to benchmark the work accumulated to date. Applying this bio-ecological framework enabled the identification of determinants of adolescent mental health operating at different, multiple, and interacting, system levels. Through this process we were able to ascertain where there is evidence and where there are gaps in knowledge produced by the HBSC Study. It is suggested that such an approach could help to guide future HBSC data analysis and production of papers; reduce redundancy in the production of papers on the same topics; and focus on producing papers that add knowledge where it is currently lacking.

A number of issues arise from the 104 empirical papers finally selected for inclusion in this review. Firstly, in terms of coverage, it is interesting to note that even though items that could be denoted as indicators of mental health existed from the outset, publications only started to appear in the 2000s. This might be explained by the capacity or interest of the research network to pursue mental health. Additionally, up until around the mid-2000s the focus of international policy was predominantly on health behaviours (Shatkin et al., 2008, WHO, 2012). The review has shown that, whilst there might be some duplication of research questions being answered across geographical contexts, HBSC has the unique opportunity to examine the consistency of findings in different countries in the early exploration of hypothesis testing. Furthermore, in the last 10 years the production of papers in English by non-English speaking HBSC member countries has increased (see Table 1).

The second issue worthy of note is that of changing concepts and terminology. Like all on-going surveys HBSC has always been faced with the tension of maintaining a consistency in the measures it uses over time and the need to have ongoing conceptual development to ensure contemporary relevance of its survey instrument. It is clear from the review that terms related to mental health have not been used systematically in HBSC, in part, it could be argued, for good conceptual, methodological or disciplinary reasons. The inspection of the research conducted on the broad area of mental health within the HBSC Study over the past 37 years indicates that terminology has changed and broadened. This may be because of policy trends or developments in individual disciplinary areas. Also it is apparent that multiple understandings exist, and that analyses have been conducted using the same survey measures but from quite different theoretical and empirical stances and disciplinary perspectives. However, whilst not an objective of this study, such variations of terms causes high degrees of heterogeneity which make collective synthesis of findings difficult. At the very least, papers (and some papers do) should make their rationale for use of terms and their definition explicit.

Despite this potential weakness we illustrate insights from included papers here to demonstrate HBSC’s contribution to the field at each bio-ecological level. At the individual level the following characteristics were found to be associated with having positive mental health/not having negative mental health, with varying strengths of association: being male, younger age, physically active, spending time in nature, having sufficient sleep, not smoking or drinking alcohol, not having a chronic condition/disability, or to frequently be taking medication. A large number of papers have focussed on the microsystem social context of school from different perspectives including relationships with classmates and teachers as well as the school climate. School, as family, clearly has a very important role to play in the mental health of adolescents who spend between 6 and 9 waking hours there per day on school days. Positive school perceptions and experiences are consistently associated with better mental health. Regarding the family microsystem, a topic on which there is also a relatively large number of papers, positive communication and support are found to be important determinants of mental health, with evidence that these factors override negative impacts of non-two parent family arrangements. The family socioeconomic context is also a significant factor in adolescent mental health with better conditions associated with better mental health.

As well as the individual and microsystem levels, we found a few papers on mesosystem determinants. Here the combined or interacting effects of various combinations of family, school and peers are examined. Positive experiences in these different Microsystems tend to have additive effects (Moore et al., 2018); however compensatory effects are not necessarily found. For example, negative relationships with parents are not compensated by positive relationships with peers (Moreno et al., 2009). At the macro-system level, we found that greater levels of inequality at the country level, whether socioeconomic or gender tend to be associated with poorer mental health in the adolescent population (for example, Zaborskis et al., 2019; de Looze et al., 2018). There were papers that looked at macro and micro/mesosystem level effects together and reported various combined effects on mental health (for example, Ottova et al., 2012; Dierckens et al., 2020; Kern et al., 2020).

The third issue is one of scope and breadth of investigation. This review used the bio-ecological framework to map what had been done and what work was still to done. All included papers could be allocated to it. As has been shown in Tables 1 and 2 there have been a concentration of papers on certain topics and types of analyses while others have been neglected, despite data being available within the study to broaden the scope of the work. This review provides an opportunity for a refocussing of attention to potential determinants that have to date been overlooked in analyses and papers. Some examples appear below.

Associations with age have been described but no papers have examined pubertal effects on mental health. While several health behaviours have been examined in relation to mental health no titles were found of papers which have looked at the relationship between eating behaviour patterns and mental health. The role of parents has been analysed in many papers but there is a lack of exploration of the role of family members whom adolescents live with other than parents and parent figures, for example siblings and grandparents. While there is a large focus on bullying, in contrast there is a lack of papers on prosocial behaviour and so a gap in understanding of what friendship, and friendly actions, may play in supporting positive mental health and well-being.

A fourth issue lies within the growing number of international studies over time. One of the unique values of the HBSC is its ability to compare and contrast its findings across different country contexts. It now has 50 participating countries and therefore its ability to do so has strengthened. Out of the 36 international papers included in the review, the number of countries included in papers varies from 2 to over 40. Obviously in part this is due to the number of countries available for inclusion growing over time. However, it was not always clear in included papers, why certain countries or the number of countries included was relevant to the study questions. HBSC has done much to contribute to policy development particularly at the international level and its work with WHO provide good examples of this (Koller et al., 2009; Mathieson & Koller, 2008). International papers and trend papers (10 included in this review) present an opportunity to further HBSC’s impact on policy and practice supported by good policy related questions and extended use of data external to HBSC.

The paper has a number of limitations. Included articles were selected on title, other relevant studies may have been missed due to the naming of the paper. In addition, the database utilised for this review was assumed to be inclusive all HBSC published papers, no external databases were searched to test this. Different authors have used different mental health terms to explore its determinants, resulting in a set of papers that have a high level of heterogeneity. While it is beyond the scope of this paper to evaluate findings, it could strengthen evidence and identifying the gaps is a challenge. Mental health is notoriously difficult to define but in the context of a single study, it is perhaps timely to consider making explicit a multi-disciplinary framework of terms to demonstrate how individual studies contribute to a collective body of knowledge.

While national papers were included, those not written in English were not. These do not appear in the HBSC Publications Database of journal articles and so could not be identified with this review approach.
A substantial body of relevant knowledge may have been missed as result. One possibility of rectifying this would be to include at least an English abstract in the database for those papers published in other languages.

The final limitation is that the evidence on determinants of adolescent mental health and well-being has been restricted (intentionally) to that produced by one study and no effort made to situate that within the broader context of the literature from other research. This would be a different enterprise and a worthy one, but was beyond the aim of this paper.

Despite these limitations, the application of a bio-ecological model has helped to organise knowledge produced by HBSC to provide a picture of what this longstanding multi-country study has achieved over almost 4 decades, and where gaps exist. The scoping review points the way to papers that are needed in areas where data has not been used to produce knowledge on a topic. While the main effort in analyses has been directed at individual and microsystem determinants, there is much scope for more papers that focus on meso and macrolevel. Analysing higher level determinants, at the macro level, and interactions between microsystems at the meso level, should contribute to more sophisticated understandings of determinants of health (in this case mental health) currently being called for in the literature (e.g. Varbanova & Beutels, 2020). Furthermore, HBSC provides the opportunity, by way of its geographical scope, for a deeper understanding of cultural influences at the exosystem level, which to date have not been explored in papers in relation to mental health determinants.

The bio-ecological framework could also be used to review the HBSC survey instrument in future years and identify where additional indicators of determinants and outcomes are needed. These could provide a deeper understanding of adolescent mental health. For example, other aspects of adolescent mental health, known to be important, could be included, such as anxiety; and aspects of the social environment such as cultural capital. After each survey round, the international protocol and survey instrument is reviewed providing opportunities for such developments.

The review concludes that HBSC has clearly made a significant contribution to the field of adolescent mental health, and identifies opportunities for it to capitalise upon, to add to existing knowledge and understanding in future.

Ethical statement

This paper is a review and no ethical processes are needed. The papers reviewed are from a study where ethical procedures were followed in each country and these are reported in individual papers.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.spmh.2020.100697.

References

Aaro, L. E., Wold, B., Kannas, L., & Rimpela, M. (1986). Health behaviour in schoolchildren A WHO cross-national survey: A presentation of philosophy, methods and selected results of the first survey. Health Promotion International, 1(1), 17–33. Antaramian, S. P., Huebner, E. S., Hills, K. J., & Valois, R. F. (2010). A dual-factor model of mental health: Toward a more comprehensive understanding of youth functioning. American Journal of Orthopsychiatry, 80(4), 462.

Antonovsky, A. (1987). The salutogenic perspective: Toward a new view of health and illness. Advances, 4(1), 47–55.

Arkesy, H., & O'Malley, L. (2002). Scoping studies: Towards a methodological framework. International Journal of Social Research Methodology, 8(1), 19–32.

Arnarsson, A., Nygren, J., Nyholm, M., Torsheim, T., Augustine, L., Bjørk, Y., … Nielsen, L. (2020). Cyberbullying and traditional bullying among Nordic adolescents and their impact on life satisfaction. Scandinavian Journal of Public Health, 48(5), 502–510.

Baile, J. J., Guevara, R. M., Gonzalez-Caldern, M. J., & Urcbacha, J. D. (2020). The relationship between weight status, health-related quality of life, and life satisfaction in a sample of Spanish adolescents. International Journal of Environmental Research and Public Health, 17(9), 3106.

Bjarnason, T., Bendtsen, P., Arnarsson, A. M., Borup, L., Iannotti, R. J., Lohstedt, P., … Niclasen, B. (2012). Life satisfaction among children in different family structures: A comparative study of 36 western societies. Children & Society, 26(1), 51–62.

Boer, M., van den Eijnden, J., Reiss, J., Bonieli-Nissim, M., Wong, S., Inselby, J. C., Badura, F., … Kielitke, H. (2020). Interpersonal and psychosocial factors associated with their well-being in 29 countries. Journal of Adolescent Health, 66(6), S89–S99.

Bonieli-Nissim, M., Tabak, I., Mazur, J., Boraccino, A., Brooks, F., Gommas, R., … Harrel-Fisch, Y. (2015). Supportive communication with parents moderates the negative effects of electronic media use on life satisfaction during adolescence. International Journal of Public Health, 60(2), 189–198.

Braverman, M. T., Stawski, R. S., Sanford, O., & Aarz, L. E. (2016). Daily smoking and subjective health complaints in adolescents. Nicotine & Tobacco Research, 19(1), 102–116.

Brofenbrenner, U. (1992). Ecological systems theory. Jessica Kingsley Publishers.

Brofenbrenner, U., & Ceci, S. J. (1994). Nature-nurture recenterized in developmental perspective: A bioecological model. Psychological Review, 101(4), 666.

Brooks, F. M., Sneett, N. C., Chester, K., Spencer, N., & Klemena, E. (2014). Associations between physical activity in adolescence and health behaviours, wellbeing, family and social relations. International Journal of Health Promotion and Education, 52(5), 271–282.

Bujis, T., Maes, L., Salonna, F., Van Damme, J., Hublet, A., Kehwa, V., … De Clercq, B. (2016). The role of community social capital in the relationship between socioeconomic status and adolescent life satisfaction: Mediating or moderating? Evidence from Czech data. International Journal for Equity in Health, 15(1), 203.

Calin-Radulescu, M., Camacho, L., & de Matos, M. G. (2018). Life satisfaction in adolescents: The role of individual and social health assets. Spanish Journal of Psychology, 21. https://doi.org/10.1017/sjp.2018.24.

Canha, L., Simoes, C., Matos, M. G., & Owens, L. (2016). Well-being and health in adolescents with disabilities. PsicoLOGIA Reflexão & Critica, 29.

Carleyer, H., Viiatsara, E., Knutsou, A., & Glid, K. G. (2011). Subjective health complaints among boys and girls in the Swedish HBSC study: Focussing on parental background. International Journal of Public Health, 56(5), 457–464.

Carvalho, M., Branquinho, C., & de Matos, M. G. (2018). Emotional symptoms and risk behaviors in adolescents: Relationships with cyberbullying and implications on well-being. Violence & Victims, 33(5), 871–885.

Cavillo, F., Dalmaso, P., Ottova-Jordan, V., Brooks, F., Mazur, J., Valinas, R., … Positive Health Focus Group. (2015). Trends in life satisfaction in European and North-American adolescents from 2002 to 2010 in over 30 countries. The European Journal of Public Health, 25(supp 2), 80–82.

Cohen, S., Kamarck, T., & Mermelstein, R. (1994). Perceived stress scale. Measuring Stress: A Guide for Health and Social Scientists, 10, 1–2.

Cosma, A., Stevens, G., Martin, G., Duinhof, E. L., Walsh, S. D., Garcia-Moya, I., … Catunda, C. (2020). Cross-national time trends in adolescent mental well-being from 2002 to 2018 and the explanatory role of schoolwork pressure. Journal of Adolescent Health, 66(6), S50–S58.

Cosma, A., Whitehead, R., Neville, F., Currie, D., & Inselby, J. (2017). Trends in bullying victimization in scottish adolescents 1994–2014: Changing associations with mental health. International Journal of Public Health, 63(3), 281–289.

Currie, C. (2019). Development is not the same as ageing: The relevance of puberty to health of adolescents. International Journal of Public Health, 64, 149–150. https://doi.org/10.1007/s00038-019-01212-5.

Currie, C., Ahluwalia, N., Gabbasinn, S. N., Due, P., & Currie, D. (2012). Is obesity at individual and national level associated with lower age at menarche? Evidence from 34 countries in the health behaviour in school-aged children study. Journal of Adolescent Health, 50(6), 621–626.

Currie, C., Hurlemeim, K., Setterbuttle, W., Smith, R., & Todd, J. (2000). Health and health behaviour among young people: International report. Copenhagen: WHO Regional Office for Europe.

Currie, C., Molcho, M., Boyce, W., Holstein, B., Torshenm, T., & Richter, M. (2008). Researching health inequalities in adolescents: The development of the health behaviour in school-aged children (HBSC) family affluence scale. Social Science & Medicine, 66(6), 1429–1436.

Currie, C., Nic Gabhaisin, S., & Godeau, E. (2009a). International HBSC network coordinating committees. The health behaviour in school-aged children WHO collaborative cross-national (HBSC) study: Origins, concept, history and development 1982–2008. International Journal of Public Health, 54(Suppl 2), S58–S59.

Currie, C., Nic Gabhaisin, S., Godeau, E., Roberts, C., Smith, R., Currie, D., … Barnekov, V. (2008a). Inequalities in young people’s health. health behaviour in school-aged children (HBSC) study: International report from the 2005/06 survey (health policy and children and adolescents, no. 5). Copenhagen: WHO Regional Office for Europe.

Currie, C., Roberts, C., Satterthwaite, W., Morgan, A., Smith, R., Sanford, C., … World Health Organization. (2004). Young people’s health in context: Health behaviour in school-aged children (HBSC) study: International report from the 2001/2002 survey. Copenhagen: WHO Regional Office for Europe.

Currie, C., Zanotti, C., Morgan, A., Currie, D., De Looze, M., Roberts, C., … Barnekov, V. (2012a). Social determinants of health and well-being among young people: Behaviour in
School-Aged Children (HBSC) study: International report from the 2009/2010 survey. Copenhagen: WHO Regional Office for Europe.

Danielsen, G., Sandahl, L., & Wold, B. (2009). School-related social support and students’ perceived life satisfaction. The Journal of Educational, 102(4), 303–320.

Dankulinova Veselka, Z., Jirasek, I., Veselky, P., Jirakova, M., Plevova, I., Tavel, P., et al. (2018). Spirituality is not religion but is associated with health and higher life satisfaction among adolescents. International Journal of Environmental Research and Public Health, 15(12), 2781.

Dierckens, M., Weinberg, D., Huang, Y., Elgar, F., Moor, I., Augustine, L., & Currie, C. (2020). National-level wealth inequality and socioeconomic inequality in adolescent mental well-being: A time series analysis of 17 countries. Journal of Adolescent Health, 66(6), S21–S28.

Diyaban, H. Samadi, M., & E., (2015). Autonomy support and achievement goals as predictors of perceived school performance and life satisfaction in the transition between lower and upper secondary school. Social Psychology of Education, 17(2), 269–291.

Dodge, R., Daly, A. P., Hayton, J., & Sanders, L. D. (2012). The challenge of defining well-being. International Journal of Wellbeing, 2(1). 20

Du, C., DeGuito, K., Albright, J., & Arehault, S. (2018). Peer support as a mediator between bullying victimisation and depression.

Duinhof, E., Smid, S. C., Vollebergh, W., & Stevens, G. (2020). Immigration background and its effects on psychosomatic complaints: Can sense of coherence make a difference? The Journal of Educational Research, 9(5), 611–624.

Dumoulin, J., & Leblanc, S. L. (2021). Well being of older adolescents in Sweden: An analysis of WHO data 1985–2005. Journal of Adolescent Health, 46(3), 258–264.

Hagquist, C., Dure, P., Torshen, T., & Valimaa, R. (2019). Cross-country comparisons of trends in adolescent psychosomatic symptoms—a rasch analysis of HBSC data from four Nordic countries. Health and Quality of Life Outcomes, 17(1), 27.

Haukland, S., & Wold, B. (2001). Subjective health complaints in adolescence—reliability and validity of survey methods. Journal of Adolescent, 24 (4), 611–624.

Haugland, S., Wold, B., Stevenson, J., Aaroe, L. E., & Woynarowska, B. (2001). Subjective health complaints in adolescence: A cross-national comparison of prevalence and dimensionality. The European Journal of Public Health, 11(1), 4–10.

Hetland, J., Torshen, T., & Aas, I. E. (2002). Subjective health complaints in adolescents: Dimensional structure and variation across gender and age. Scandinavian Journal of Public Health, 30(3), 223–230.

Hodacova, L., Hlaváčková, E., Sigmundová, D., Kalman, M., & Kopáčková, J. (2017). Subjective well-being in Czech school-aged children: HBSC study. Central European Journal of Public Health, 25(Supplement 1).

Hogberg, B., Strandh, M., & Hagquist, C. (2020). Gender and secular trends in adolescent mental well-being over 24 years–The role of school-related stress. Social Science & Medicine, 123890.

Hong, J. S., Zhang, S., González-Premadas, A. A., & Albudour, M. (2020). Exploring whether talking with parents, siblings, and friends moderates the association between peer victimization and adverse psychosocial outcomes. Journal of Interpersonal Violence, Article 0886260519898432.

Huyyn, Q., Craig, W., Janssen, I., & Pickett, W. (2013). Exposure to public natural space as a protective factor for emotional well-being among young people in Canada. BMC Public Health, 13(1), 407.

Inchley, J., & Currie, D. (2016). Growing up unequal: Gender and socioeconomic differences in young people’s health and well-being. health behaviour in school-aged children (HBSC) study: International report from the 2013/2014 survey. Copenhagen: WHO Regional Office for Europe.

Spotlights on adolescent health and well-being. Findings from the 2017/2018 health behaviour in school-aged children (HBSC) survey in europe and canada.

International report. In Inchley, J., Currie, D., Budisavljevic, S., Torshen, T., Jštad, A., Cosma, A., et al. (Eds.), Key findings (Vol. 1). (2020). Copenhagen: WHO Regional Office for Europe.

Keane, E., Kelly, C., Molcho, M., & Gabbahin, S. N. (2017). Physical activity, screen time and the risk of subjective health complaints in school-aged children. Preventive Medicine, 96, 21–27.

Kern, M. R., Duinhof, E. L., Walsh, S. D., Cosma, A. Moreno-Maldonado, C., Molcho, M., ... Stevens, G. W. (2020). Intersectionality and adolescent mental well-being: A cross-nationally comparative analysis of the interplay between immigration background, socioeconomic status and gender. Journal of Adolescent Health, 66(6), S20–S28.

King, et al. (1996). The health of youth: A cross-national survey. WHO regional publications. European series no. 69. ERIC.

Klesczaewksa, D., Dzielek, A., Solonana, F., & Mazur, J. (2018). The association between physical activity and general life satisfaction in lower secondary school students: The role of individual and family factors. Community Mental Health Journal, 54(8), 1245–1252.

Koller, S., Morgan, A., Guerreiro, A., Currie, C., Ziglio, E., & International HBSC Study Group. (2009). Addressing the socioeconomic determinants of adolescent health: Experiences from the WHO/HBSC forum 2007. International Journal of Public Health, 54(2), 278–284.

Kosticova, M., Husarova, D., & Dankulincova, Z. (2020). Difficulties in getting to sleep and their association with emotional and behavioural problems in adolescents: Does the sleeping duration influence this association? International Journal of Environmental Research and Public Health, 17(5), 1691.

Kosticova, M., E., (2020). National income and income inequality, family affluence and life satisfaction among 13 year old boys and girls: A multilevel study in 35 countries. The Journal of Educational Research, 109(2), 1047–1063.

Kyper, L., de Roos, S., Iedema, J., & Stevens, G. (2016). Growing up with the right to marry: Sexual attraction, substance use, and well-being of Dutch adolescents. Journal of Adolescent Health, 59(3).

Lamsnies, H., Pietila, A., Hietasalo-Husu, S., & Kansangimi, M. (2017). A systematic review of adolescents’ sources of coherence and health. Scandinavian Journal of Caring Sciences, 31(4), 651–661, 276–282.

Levin, K. A., & Currie, C. (2010). Family structure, mother-child communication, father-child communication, and adolescent life satisfaction: A cross-sectional multilevel analysis. Health Education, 110(3), 152–158. https://doi.org/10.1177/0046156609338332.

Levin, K. A. & Currie, C. (2014). Reliability and validity of an adapted version of the carilf ladder for use with adolescent samples. Social Indicators Research, 119(2), 1047–1063.

Levin, K. A., Currie, C., & Muldoun, J. (2009). Mental well-being and subjective health of 11 to 15-year-old boys and girls in scotland, 1994-2006. The European Journal of Public Health, 19(6), 605–610.

Levin, K. A., Dallago, L., & Currie, C. (2012). The association between adolescent life satisfaction, family structure, family affluence and gender differences in parent-child communication. Social Indicators Research, 106(2), 287–305.

Levin, K., Inchley, J., Currie, D., & Currie, C. (2012). Subjective health and mental well-being of adolescents and the health promoting school: A cross-sectional multilevel analysis. Health Education, 112(2), 170–184.

Levin, K. A., Torshen, T., Vollebergh, W., Richter, M., Davies, C. A., Schnoor, C. W., ... et al. (2011). National income and income inequality, family affluence and life satisfaction among 13 year old boys and girls: A multilevel study in 35 countries. Social Indicators Research, 104(2), 179–194. https://doi.org/10.1007/s11205-010-9478-7.
Torsheim, T., Ravens-Sieberer, U., Hetland, J., Valimaa, R., Danielson, M., & Overpeck, M. (2006). Cross-national variation of gender differences in adolescent subjective health in Europe and north America. *Social Science & Medicine, 62*(4), 815–827.

Torsheim, T., & Wold, B. (2001). School-related stress, support, and subjective health complaints among early adolescents: A multilevel approach. *Journal of Adolescence, 24*(6), 701–713.

Vandendriessche, A., Ghokhlieva, A., Van Cauwenberg, J., De Clercq, B., Dhondt, K., Desmet, A., ... Defoerche, B. (2019). Does sleep mediate the association between school pressure, physical activity, screen time, and psychological symptoms in early adolescents? A 12-country study. *International Journal of Environmental Research and Public Health, 16*(6), 1072.

Varbanova, V., & Beutels, P. (2020). Recent quantitative research on determinants of health in high income countries: A scoping review. *PloS One, 15*(9), Article e0239031.

Vieno, A., Gini, G., Lenzi, M., Pozzoli, T., Canale, N., & Santinello, M. (2015). Cybervictimization and somatic and psychological symptoms among Italian middle school students. *The European Journal of Public Health, 25*(3), 433–437.

Viner, R. M., Ozer, E. M., Denny, S., Marmot, M., Fatusi, A., et al. (2012). Adolescence and the social determinants of health. *The Lancet, 379*(9826), 1641–1652.

Volk, A. A., Craig, W., Boyce, W., & King, M. (2006). Perceptions of parents, mental health, and school among Canadian adolescents from the provinces and the northern territories. *Canadian Journal of School Psychology, 21*(1-2), 33–46.

Walsh, S. D., Harel-Fisch, Y., & Fogel-Grinvald, H. (2010). Parents, teachers and peer relations as predictors of risk behaviors and mental well-being among immigrant and Israeli born adolescents. *Social Science & Medicine, 70*(7), 976–984.

Walsh, S. D., Kolobov, T., Raiz, Y., Boniel-Nissim, M., Tesler, R., & Harel-Fisch, Y. (2018). The role of identity and psychosomatic symptoms as mediating the relationship between discrimination and risk behaviors among first and second generation immigrant adolescents. *Journal of Adolescence, 64*, 34–47.

Walsh, S. D., Sela, T., De Looze, M., Craig, W., Cosma, A., Harel-Fisch, Y., ... Ng, K. (2020). Clusters of contemporary risk and their relationship to mental well-being among 15-year-old adolescents across 37 countries. *Journal of Adolescent Health, 66*(6), 540–549.

Wang, J., Nansel, T. R., & Iannotti, R. J. (2011). Cyber and traditional bullying: Differential association with depression. *Journal of Adolescent Health, 48*(4), 415–417.

Whitehead, R., Berg, C., Cosma, A., Gobina, I., Keane, E., Neville, F., ... Kelly, C. (2017). Trends in adolescent overweight perception and its association with psychosomatic health 2002–2014: Evidence from 33 countries. *Journal of Adolescent Health, 60*(2), 204–211.

WHO. (2012). *Health 2020: The European policy for health and wellbeing*. Copenhagen, Denmark: WHO Regional Office for Europe.

Zaborskis, A., & Grincaitė, M. (2018). Gender and age differences in social inequality on adolescent life satisfaction: A comparative analysis of health behaviour data from 41 countries. *International Journal of Environmental Research and Public Health, 15*(7), 1297.

Zaborskis, A., Grincaitė, M., Lenzi, M., Tesler, R., Moreno-Maldonado, C., & Mazur, J. (2019). Social inequality in adolescent life satisfaction: Comparison of measure approaches and correlation with macro-level indices in 41 countries. *Social Indicators Research, 141*(3), 1055–1079.