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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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Highlights

- Summary of determinants of adolescent mental health from an international study
- Application of a novel bio-ecological framework helps to identify gaps in knowledge
- Accumulated knowledge majors on individual and microsystem level determinants
- Complexity of determinants requires increased research on meso and macro levels

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Keywords:

Adolescent; population mental health; social determinants; determinants of mental health; cross-national survey; bio-ecological framework; HBSC

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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.

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1. 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, 2002). 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 (Gomez-Lopez et al., 2019; 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 Antonovosky's (1987) theory of salutogenesis has supported insights and further pursuance into this question (Lansimies, 2017).

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 HBSC 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?

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1.1 The HBSC Study

1.1.1 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 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 psychological and physical well-being. Further information on the history and development of the HBSC study are presented in Currie et al. (2009a).

1.1.2 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 & Wold, 2001; Haugland et al., 2001; Hetland et al., 2002). Gariepy 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 (Levin & 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.

2. Methods

2.1 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

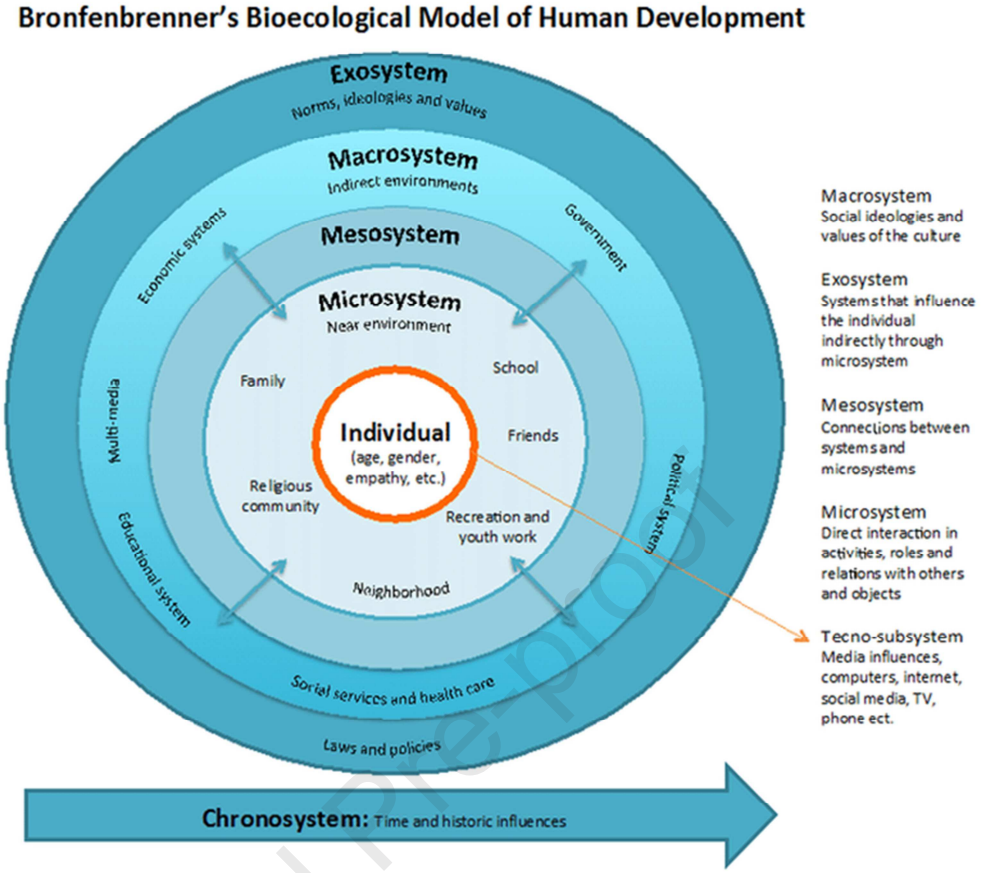
www.hbsc.org) and from papers on mental health. They include: mental health, mental well-being/wellbeing, perceived well-being, emotional well-being, spiritual well-being, social well-being, subjective well-being, subjective health, subjective health complaints, psychological complaints, psychological 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 focussed 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 and Ceci,1994). The adapted model includes the maturational 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 and 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 Figure 1. The framework is used to collate, summarize, and report the themes arising from the included studies (step 5).

Figure 1: Bronfenbrenner's Bio-Ecological Model of Human Development



3. 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 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 has 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. In some papers only the 4 psychological complaints are used and various terms applied including: psychological symptoms, psychological health complaints.

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.

3.2 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 bio-ecological 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.

3.2.1 Individual level

3.2.1.1 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 1994-2008, 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 et al., 2012b). 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 (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 and Grincaite, 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).

3.2.1.2 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).

In a recent study of Spanish adolescents, Baile et al. (2020) report 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 nondisabled 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 victimisation was found among those with a D/CI and victims of bullying were more likely to report low 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 (Lyyra 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 (Dankulincova 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-moderating and health-enhancing effects (Torsheim et al., 2001).

3.2.1.2 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 victimisation 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 of found that adolescents who reported a higher level of spiritual well-being had lower risk of bullying, either as perpetrators or victims (Dutkova 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 et al., 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 (Gariepy 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).

3.2.2 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 had lower life satisfaction, compared to adolescents with both parents employed or only mothers unemployed (Moreno-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 et al., 2008b; 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 et al., 2013b). 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 (Duinhof et al., 2020).

A Welsh study looked at measures of family affluence, 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 (as a measure of poverty):

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 (Buijs 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 et al., 2013a). 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 having 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 et al., 2012a).

In Belgian study, adolescents living with separated parents showed few differences in mental health according to post-separation living arrangements (Dujeu 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 symmetric 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 & 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 (Sonmark 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 and 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 et al., 2012b).

3.2.3 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 higherl 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 looks 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).

3.2.4 Macro-system influences on mental health

Secular trends

Hagquist (2010) reports decreasing mental well-being of 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 (Gariepy & 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 (Potrebny 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 (Hodačová 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 socio-economic 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 et al. (2017) 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 (Mínguez, 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) examine 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.

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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 health were examined in the context of corresponding trends in school pressure (Cosma et al., 2020). A small linear increase over time in psychosomatic complaints and schoolwork pressure was found. No change in life satisfaction emerged. Analysis revealed that across countries, the small increase in schoolwork pressure over time partly explained the increase in psychosomatic health complaints.

Elgar et al. (2015), studying trends and inequalities in 34 countries report that from 2002 to 2010, average levels of physical symptoms and life satisfaction slightly increased. Inequalities between socioeconomic groups increased in psychological and physical symptoms, but reduced for life satisfaction. Internationally, the higher the per person income, the better and more equal health was in terms of psychological symptoms and life satisfaction. However, higher income inequality related to more psychological and physical symptoms and larger inequalities between socioeconomic groups in psychological and physical symptoms, and life satisfaction.

4. Discussion

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 focussed 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,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 test 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 6-9 waking hours there per day on schooldays. 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., 2018; de Looze et al., 2017). There were papers that looked at macro and

811 micro/ mesosystem level effects together and reported various combined effects on mental
812 health (for example, Ottova et al.; 2012; Dierckens et al., 2020; Kern et al., 2020).

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

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

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

843 The paper has a number of limitations. Included articles were selected on title, other relevant
844 studies may have been missed due to the naming of the paper. In addition, the database
845 utilised for this review was assumed to be inclusive all HBSC published papers, no external
846 databases were searched to test this. Different authors have used different mental health
847 terms to explore its determinants, resulting in a set of papers that have a high level of
848 heterogeneity. While it is beyond the scope of this paper to evaluate findings, assessing the
849 collective evidence and identifying the gaps is a challenge. Mental health is notoriously
850 difficult to define but in the context of a single study, it is perhaps timely to consider making
851 explicit a multi-disciplinary framework of terms to demonstrate how individual studies
852 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.

References

Aarø, L. E., Wold, B., Kannas, L., & Rimpelä, 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,

Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. International journal of social research methodology, 8(1), 19-32.

1. Arnarsson, A., Nygren, J., Nyholm, M., Torsheim, T., Augustine, L., Bjereld, 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.
2. Baile, J. I., Guevara, R. M., González-Calderón, M. J., & Urchaga, 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.
3. Bjarnason, T., Bendtsen, P., Arnarsson, A. M., Borup, I., Iannotti, R. J., Löfstedt, 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.
4. Boer, M., van den Eijnden, Regina JJM, Boniel-Nissim, M., Wong, S., Inchley, J. C., Badura, P., . . . Klanšček, H. J. (2020). Adolescents' intense and problematic social media use and their well-being in 29 countries. Journal of Adolescent Health, 66(6), S89-S99.
5. Boniel-Nissim, M., Tabak, I., Mazur, J., Borraccino, A., Brooks, F., Gommans, R., . . . Harel-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.
6. Borraccino, A., Charrier, L., Berchialla, P., Lazzeri, G., Vieno, A., Dalmasso, P., & Lemma, P. (2018). Perceived well-being in adolescent immigrants: It matters where they come from. International Journal of Public Health, 63(9), 1037-1045.

Bradley, K. L., Bagnell, A. L., & Brannen, C. L. (2010). Factorial validity of the center for epidemiological studies depression 10 in adolescents. Issues in Mental Health Nursing, 31(6), 408-412.

7. Braverman, M. T., Stawski, R. S., Samdal, O., & Aarø, L. E. (2016). Daily smoking and subjective health complaints in adolescence. Nicotine & Tobacco Research, 19(1), 102-110.

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

Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nuture reconceptualized in developmental perspective: A bioecological model. Psychological Review, 101(4), 568.

8. Brooks, F. M., Smeeton, N. C., Chester, K., Spencer, N., & Klemera, E. (2014). Associations between physical activity in adolescence and health behaviours, well-being, family and social relations. International Journal of Health Promotion and Education, 52(5), 271-282.
9. Buijs, T., Maes, L., Salonna, F., Van Damme, J., Hublet, A., Kebza, 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.

10. Calmeiro, L., Camacho, I., & de Matos, M. G. (2018). Life Satisfaction in Adolescents: The Role of Individual and Social Health Assets. The Spanish journal of psychology, 21. DOI: 10.1017/sjp.2018.24
11. Canha, L., Simões, C., Matos, M. G., & Owens, L. (2016). Well-being and health in adolescents with disabilities. Psicologia: Reflexão E Crítica, 29
12. Carlerby, H., Viitasara, E., Knutsson, A., & Gådin, K. G. (2011). Subjective health complaints among boys and girls in the swedish HBSC study: Focussing on parental foreign background. International Journal of Public Health, 56(5), 457-464.
13. 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 and Victims, 33(5), 871-885.
14. Cavallo, F., Dalmasso, P., Ottova-Jordan, V., Brooks, F., Mazur, J., Välimaa, 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(suppl_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.

15. Cosma, A., Whitehead, R., Neville, F., Currie, D., & Inchley, J. (2017). Trends in bullying victimization in scottish adolescents 1994–2014: Changing associations with mental well-being. International Journal of Public Health, 62(6), 639-646.
16. 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.

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

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

Currie, C., Roberts, C., Settertobulte, W., Morgan, A., Smith, R., Samdal, O., . . . 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., Nic Gabhainn, S., Godeau, E., Roberts, C., Smith, R., Currie, D., . . . Barnekow, 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 for children and adolescents, no. 5). Copenhagen: WHO Regional Office for Europe

Currie, C., Molcho, M., Boyce, W., Holstein, B., Torsheim, T., & Richter, M. (2008b). 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.

976 Currie, C., Nic Gabhainn, S., & Godeau, E. (2009a). International HBSC Network
977 Coordinating Committee. the Health Behaviour in School-Aged Children: WHO Collaborative
978 Cross-National (HBSC) Study: Origins, concept, history and development 1982-2008. Int J
979 Public Health, 54 (Suppl 2), 131-139.

980 Currie, C., Zanotti, C., Morgan, A., Currie, D., De Looze, M., Roberts, C., . . . Barnekow, V.
981 (2012a).). Social determinants of health and well-being among young people: Behaviour in
982 School-Aged Children (HBSC) study: International report from the 2009/2010 survey.
983 Copenhagen: WHO Regional Office for Europe.

984 Currie, C. Ahluwalia, N., Gabhainn, S. N., Due, P., & Currie, D. B. (2012b2012b). Is obesity
985 at individual and national level associated with lower age at menarche? evidence from 34
986 countries in the health behaviour in school-aged children study. Journal of Adolescent
987 Health, 50(6), 621-626.

988 17. Danielsen, A. G., Samdal, O., Hetland, J., & Wold, B. (2009). School-related social
989 support and students' perceived life satisfaction. The Journal of Educational
990 Research, 102(4), 303-320.
991 18. Dankulincova Veselska, Z., Jirasek, I., Veselsky, P., Jiraskova, M., Plevova, I., Tavel,
992 P., & Madarasova Geckova, A. (2018). Spirituality but not religiosity is associated
993 with better health and higher life satisfaction among adolescents. International
994 Journal of Environmental Research and Public Health, 15(12), 2781.
995 19. .de Looze, Torsheim, T., & Vollebergh, W. A. (2018). The happiest kids on earth.
996 gender equality and adolescent life satisfaction in europe and north america. Journal
997 of Youth and Adolescence, 47(5), 1073-1085.
998 20. Dierckens, M., Weinberg, D., Huang, Y., Elgar, F., Moor, I., Augustine, L., ... &
999 Currie, C. (2020). National-level wealth inequality and socioeconomic inequality in
1000 adolescent mental well-being: a time series analysis of 17 countries. Journal of
1001 Adolescent Health, 66(6), S21-S28.
1002 21. Diseth, Å, & Samdal, O. (2014). Autonomy support and achievement goals as
1003 predictors of perceived school performance and life satisfaction in the transition
1004 between lower and upper secondary school. Social Psychology of Education, 17(2),
1005 269-291.

1006 Dodge, R., Daly, A. P., Huyton, J., & Sanders, L. D. (2012). The challenge of defining
1007 wellbeing. International Journal of Wellbeing, 2(3)

1008 22. Du, C., DeGuisto, K., Albright, J., & Alrehaili, S. (2018). Peer support as a mediator
1009 between bullying victimization and depression.
1010 23. Duinhof, E., Smid, S. C., Vollebergh, W., & Stevens, G. (2020). Immigration
1011 background and adolescent mental health problems: The role of family affluence,
1012 adolescent educational level and gender. Social Psychiatry and Psychiatric
1013 Epidemiology, 1-11.
1014 24. Dujeu, M., Lebacq, T., Moreau, N., Pedroni, C., Castetbon, K., & Godin, I. (2018).
1015 Living arrangements after family split-up, well-being and health of adolescents in
1016 french-speaking belgium. Revue D'Épidémiologie Et De Santé Publique, 66, S372.
1017 25. Dutkova, K., Holubcikova, J., Kravcova, M., Babincak, P., Tavel, P., & Geckova, A.
1018 M. (2017). Is spiritual well-being among adolescents associated with a lower level of

Journal Pre-proof

bullying behaviour? the mediating effect of perceived bullying behaviour of peers. Journal of Religion and Health, 56(6), 2212-2221.

26. Elgar, F. J., Craig, W., & Trites, S. J. (2013a). Family dinners, communication, and mental health in Canadian adolescents. Journal of Adolescent Health, 52(4), 433-438.
27. Elgar, F. J., De Clercq, B., Schnohr, C. W., Bird, P., Pickett, K. E., Torsheim, T., . . . Currie, C. (2013b). Absolute and relative family affluence and psychosomatic symptoms in adolescents. Social Science & Medicine, 91, 25-31.
28. Elgar, F. J. TK Pfortner, I. Moor, B. de Clercq, GW Stevens, et al., (2015) Socioeconomic inequalities in adolescent health 2002-2010: A time-series analysis of 34 countries participating in the health behaviour in school-aged children study. Lancet, 385(9982), 2088-2095.
29. Elgar, F. J., Gariépy, G., Torsheim, T., & Currie, C. (2017). Early-life income inequality and adolescent health and well-being. Social Science & Medicine, 174, 197-208.

Gariépy, G., Torsheim, T., & Currie, C. (2017). Early-life income inequality and adolescent health and well-being. Social Science & Medicine, 174, 197-208.

Erhart, M., Ottova, V., Gaspar, T., Jericek, H., Schnohr, C., & Alikasifoglu, M.& Ravens-sieberer, U. (2009). measuring mental health and well-being of school-children in 15 European countries using the KIDSCREEN-10 index. International Journal of Public Health, 54(2), 160-166.

Evans, D. (2017). Investing in children: The European Child and Adolescent Health Strategy 2015–2020. Copenhagen, WHO Regional Office for Europe.

30. Evans, D. S., O'Farrell, A., Sheridan, A., & Kavanagh, P. (2019). Comparison of the health and well-being of smoking and non-smoking school-aged children in Ireland. Child: Care, Health and Development, 45(5), 694-701.
31. Frasquilho, D., de Matos, M. G., Neville, F., Gaspar, T., & de Almeida, J. C. (2016). Parental unemployment and youth life satisfaction: The moderating roles of satisfaction with family life. Journal of Child and Family Studies, 25(11), 3214-3219.
32. Freeman, J. G., Samdal, O., Băban, A., & Bancila, D. (2012). The relationship between school perceptions and psychosomatic complaints: Cross-country differences across Canada, Norway, and Romania. School Mental Health, 4(2), 95-104.
33. García-Moya, I., Suominen, S., & Moreno, C. (2014). Bullying victimization prevalence and its effects on psychosomatic complaints: Can sense of coherence make a difference? Journal of School Health, 84(10), 646-653.
34. García-Moya, I., Brooks, F., Morgan, A., & Moreno, C. (2015). Subjective well-being in adolescence and teacher connectedness: A health asset analysis. Health Education Journal, 74(6), 641-654.
35. Gariepy, G., McKinnon, B., Sentenac, M., & Elgar, F. J. (2016a). Validity and reliability of a brief symptom checklist to measure psychological health in school-aged children. Child Indicators Research, 9(2), 471-484.
36. Gariépy, G., & Elgar, F. J. (2016b2016b). Trends in psychological symptoms among canadian adolescents from 2002 to 2014: Gender and socioeconomic differences. The Canadian Journal of Psychiatry, 61(12), 797-802.

37. Gariépy, G., Riehm, K. E., Whitehead, R. D., Doré, I., & Elgar, F. J. (2019). Teenage night owls or early birds? chronotype and the mental health of adolescents. Journal of Sleep Research, 28(3), e12723.
38. Gobina, I., Zaborskis, A., Pudule, I., Kalnins, I., & Villerusa, A. (2008). Bullying and subjective health among adolescents at schools in Latvia and Lithuania. International Journal of Public Health, 53(5), 272-276.
39. Gobina, I., Välimaa, R., Tynjälä, J., Villberg, J., Villerusa, A., Iannotti, R. J., . . . Holstein, B. E. (2011). The medicine use and corresponding subjective health complaints among adolescents, a cross-national survey. Pharmacoepidemiology and Drug Safety, 20(4), 424-431.

Gómez-López, M.,., Viejo, C., && Ortega-Ruiz, R. (2019). Psychological Well-Being during adolescence: Stability and association with romantic relationships. Frontiers in psychologypsychology, 10, 1772.

Goodman, R. (1997). The strengths and difficulties questionnaire: A research note. Journal of Child Psychology and Psychiatry, 38(5), 581-586.

40. Hagquist, C. (2010). Discrepant trends in mental health complaints among younger and older adolescents in Sweden: An analysis of WHO data 1985–2005. Journal of Adolescent Health, 46(3), 258-264.

Hagquist, C., Due, P., Torsheim, T., & Välimaa, 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.

Haugland, S., & Wold, B. (2001). Subjective health complaints in adolescence—reliability and validity of survey methods. Journal of Adolescence, 24(5), 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., Torsheim, T., & Aarø, L. E. (2002). Subjective health complaints in adolescence: Dimensional structure and variation across gender and age. Scandinavian Journal of Public Health, 30(3), 223-230.

41. Hodacova, L., Hlaváčková, E., Sigmundová, D., Kalman, M., & Kopcakova, J. (2017). Trends in life satisfaction and self-rated health in Czech school-aged children: HBSC study. Central European Journal of Public Health, Volume 25, Issue: Supplement 1,
42. Högberg, B., Strandh, M., & Hagquist, C. (2020). Gender and secular trends in adolescent mental health over 24 years–The role of school-related stress. Social Science & Medicine, 112890.
43. Hong, J. S., Zhang, S., Gonzalez-Prendes, A. A., & Albdour, M. (2020). Exploring whether talking with parents, siblings, and friends moderates the association between peer victimization and adverse psychosocial outcomes. Journal of Interpersonal Violence, , 0886260519898432.

44. Huynh, 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.

Inchley J, Currie D, Budisavljevic S, Torsheim T, Jåstad A, Cosma A et al., editors. (2020). Spotlight 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. Volume 1. Key findings. Copenhagen: WHO Regional Office for Europe.

45. Keane, E., Kelly, C., Molcho, M., & Gabhainn, S. N. (2017). Physical activity, screen time and the risk of subjective health complaints in school-aged children. Preventive Medicine, 96, 21-27.
46. 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), S12-S20.

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

47. Kleszczewska, D., Dzielska, A., Salonna, 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, T., 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.

48. 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.
49. Kuntsche, E. N., & Gmel, G. (2004). Emotional wellbeing and violence among social and solitary risky single occasion drinkers in adolescence. Addiction, 99(3), 331-339.
50. Kuyper, 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),

Länsimies, H., Pietilä, A. M., Hietasola-Husu, S., & Kangasniemi, M. (2017). A systematic review of adolescents' sense of coherence and health. Scandinavian journal of caring sciences, 31(4), 651-661.276-282.

51. 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. DOI: 10.1108/09654281011038831

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

52. Levin, K. A., Currie, C., & Muldoon, 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.
53. Levin KA, Torsheim T, Vollebergh W, Richter M, Davies CA, Schnohr CW & Currie C. (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. DOI: 10.1007/s11205-010-9747-8
54. Levin, K. A., Dallago, L., & Currie, C. (2012a). The association between adolescent life satisfaction, family structure, family affluence and gender differences in parent–child communication. Social Indicators Research, 106(2), 287-305.
55. Levin, K., Inchley, J., Currie, D., & Currie, C. (2012b). Subjective health and mental well-being of adolescents and the health promoting school: A cross-sectional multilevel analysis. Health Education, 112(2), 170-184.
56. Lew, D., Xian, H., Qian, Z., & Vaughn, M. G. (2019). Examining the relationships between life satisfaction and alcohol, tobacco and marijuana use among school-aged children. Journal of Public Health, 41(2), 346-353.
57. Lyyra, N., Välimaa, R., & Tynjälä, J. (2018). Loneliness and subjective health complaints among school-aged children. Scandinavian Journal of Public Health, 46(20_suppl), 87-93.
58. Macintyre, A., Nielsen, L., Stewart-Brown, S., Vinther-Larsen, M., Meilstrup, C., Holstein, B. E., & Koushede, V. (2016). High and low levels of positive mental health: areare there socioeconomic differences among adolescents?.?. Journal of Public Mental Health..
59. Madkour, A. S., Farhat, T., Halpern, C. T., Godeau, E., & Gabhainn, S. N. (2010). Early adolescent sexual initiation and physical/psychological symptoms: A comparative analysis of five nations. Journal of Youth and Adolescence, 39(10), 1211-1225.
60. Marino, C., Vieno, A., Lenzi, M., Borraccino, A., Lazzeri, G., & Lemma, P. (2016). Computer Use, Sleep Difficulties, and Psychological Symptoms Among School-Aged Children: The Mediating Role of Sleep Difficulties. International Journal of School Health, (In Press). DOI: 10.17795/intjsh-32921

Mathieson, A., & Koller, T. (2008). Social cohesion for mental well-being among adolescents: WHO/HBSC forum 2007 World Health Organization, Europe.

61. Matos, M. G., Barrett, P., Dadds, M., & Shortt, A. (2003). Anxiety, depression, and peer relationships during adolescence: Results from the Portuguese national health behaviour in school-aged children survey. European Journal of Psychology of Education, 18(1), 3-14.

Journal Pre-proof

62. Matos MG, Dadds M & Barrett P (2006) Family-school issues and the mental health of adolescents: post hoc analysis from the Portuguese National Health Behaviour in School aged children survey. Journal of Family Studies, (2), 261-274. Doi.org/10.5172/jfs.327.12.2.261
63. Mazur, J., Nałęcz, H., Kleszczewska, D., Małkowska-Szkutnik, A., & Borraccino, A. (2016). Behavioural factors enhancing mental health—Preliminary results of the study on its association with physial activity in 15 to 16 year olds. Dev.Period Med, 20, 315-324.
64. Meyer, S., Weidmann, R., & Grob, A. (2020). The mirror's curse: Weight perceptions mediate the link between physical activity and life satisfaction among 727,865 teens in 44 countries. Journal of Sport and Health Science,

Michaelson, V., Brooks, F., Jirásek, I., Inchley, J., Whitehead, R., King, N., . . . Pickett, W. (2016). Developmental patterns of adolescent spiritual health in six countries. SSM-Population Health, 2, 294-303.

65. Mínguez, A. M. (2017). The role of family policy in explaining the international variation in child subjective well-being. Social Indicators Research, 134(3), 1173-1194.
66. Molcho, M., Cristini, F., Nic Gabhainn, S., Santinello, M., Moreno, M., Gasper de Matos, M., . . . Due, P. (2010). Health and well-being among child immigrants in Europe. Eurohealth, 16(1), 20.
67. Monshouwer, K., Van Dorsselaer, S., Verdurmen, J., Ter Bogt, T., De Graaf, R., & Vollebergh, W. (2006). Cannabis use and mental health in secondary school children: Findings from a Dutch survey. The British Journal of Psychiatry, 188(2), 148-153.
68. Moor, I., Lampert, T., Rathmann, K., Kuntz, B., Kolip, P., Spallek, J., & Richter, M. (2014). Explaining educational inequalities in adolescent life satisfaction: Do health behaviour and gender matter? International Journal of Public Health, 59(2), 309-317.
69. Moore, G. F., Cox, R., Evans, R. E., Hallingberg, B., Hawkins, J., Littlecott, H. J., . . . Murphy, S. (2018). School, peer and family relationships and adolescent substance use, subjective wellbeing and mental health symptoms in wales: A cross sectional study. Child Indicators Research, 11(6), 1951-1965.
70. Moore, G. F., Anthony, R. E., Hawkins, J., Van Godwin, J., Murphy, S., Hewitt, G., & Melendez-Torres, G. J. (2020). 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. British Educational Research Journal
71. Moreno, C., Sánchez-Queija, I., Muñoz-Tinoco, V., de Matos, M. G., Dallago, L., Ter Bogt, T., . . . Rivera, F. (2009). Cross-national associations between parent and peer communication and psychological complaints. International Journal of Public Health, 54(2), 235-242.
72. Moreno-Maldonado, C., Jiménez-Iglesias, A., Camacho, I., Rivera, F., Moreno, C., & Matos, M. G. (2020). Factors associated with life satisfaction of adolescents living with employed and unemployed parents in spain and portugal: A person focused approach. Children and Youth Services Review, 110, 104740.
73. Morgan, K., Melendez-Torres, G. J., Bond, A., Hawkins, J., Hewitt, G., Murphy, S., & Moore, G. (2019). Socio-economic inequalities in adolescent summer holiday

1233 experiences, and mental wellbeing on return to school: Analysis of the school health
1234 research network/health behaviour in school-aged children survey in wales.
1235 International Journal of Environmental Research and Public Health, 16(7), 1107.

1236 Munn, Z., Peters, M. D., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018).
1237 Systematic review or scoping review? guidance for authors when choosing between a
1238 systematic or scoping review approach. BMC Medical Research Methodology, 18(1), 143.

1239 Nielsen, A. M., & Hansson, K. (2007). Associations between adolescents' health, stress and
1240 sense of coherence. Stress and Health: Journal of the International Society for the
1241 Investigation of Stress, 23(5), 331-341.

1242 74. Nielsen, L., Koushede, V., Vinther-Larsen, M., Bendtsen, P., Ersbøll, A. K., Due, P.,
1243 & Holstein, B. E. (2015). Does school social capital modify socioeconomic inequality
1244 in mental health? A multi-level analysis in Danish schools. Social Science & Medicine,
1245 140, 35-43.
1246 75. Nielsen, L., Shaw, T., Meilstrup, C., Koushede, V., Bendtsen, P., Rasmussen, M., . . .
1247 Cross, D. (2017). School transition and mental health among adolescents: A
1248 comparative study of school systems in Denmark and Australia. International Journal
1249 of Educational Research, 83, 65-74.
1250 76. Norell-Clarke, A., & Hagquist, C. (2018). Child and adolescent sleep duration
1251 recommendations in relation to psychological and somatic complaints based on data
1252 between 1985 and 2013 from 11 to 15 year-olds. Journal of Adolescence, 68, 12-21.

1253 Olweus, D. (1997). Bully/victim problems in school: Facts and intervention. European
1254 Journal of Psychology of Education, 12(4), 495.

1255 77. Ottova, V., Erhart, M., Vollebergh, W., Kökönyei, G., Morgan, A., Gobina, I., . . . de
1256 Matos, M. G. (2012). The role of individual-and macro-level social determinants on
1257 young adolescents' psychosomatic complaints. The Journal of Early Adolescence,
1258 32(1), 126-158.
1259 78. Paniagua, C., Moreno, C., Román, M., Palacios, J., Grotevant, H. D., & Rivera, F.
1260 (2020). Under the same label: Adopted adolescents' heterogeneity in well-being and
1261 perception of social contexts. Youth & Society, 52(8), 1544-1568.
1262 79. Piccininni, C., Michaelson, V., Janssen, I., & Pickett, W. (2018). Outdoor play and
1263 nature connectedness as potential correlates of internalized mental health symptoms
1264 among canadian adolescents. Preventive Medicine, 112, 168-175.
1265 80. Pickett, W., Berg, R. L., Kaprelian, J., & Marlenga, B. (2020). A contemporary profile
1266 of the mental health of girls from farm and non-farm environments. Journal of
1267 Agromedicine, 25(1), 96-105.

1268 Pollard, E. L., & Lee, P. D. (2003). Child well-being: A systematic review of the literature.
1269 Social Indicators Research, 61(1), 59-78.

1270 81. Potrebny, T., Wiium, N., Haugstvedt, A., Sollesnes, R., Torsheim, T., Wold, B., &
1271 Thuen, F. (2019). Health complaints among adolescents in Norway: A twenty-year
1272 perspective on trends. PloS One, 14(1), e0210509.
1273 82. Rathmann, K., Ottova, V., Hurrelmann, K., de Looze, M., Levin, K., Molcho, M., . . .
1274 Richter, M. (2015). Macro-level determinants of young people's subjective health and

health inequalities: A multilevel analysis in 27 welfare states. Maturitas, 80(4), 414-420.

83. Rathmann, K., Bilz, L., Hurrelmann, K., Kiess, W., & Richter, M. (2018). 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. BMC Public Health, 18(1), 1098.
84. Ravens-Sieberer, U., Torsheim, T., Hetland, J., Vollebergh, W., Cavallo, F., Jericek, H., . . . Erhart, M. (2009). Subjective health, symptom load and quality of life of children and adolescents in europe. International Journal of Public Health, 54(2), 151-159.

Ravens-Sieberer, U., Herdman, M., Devine, J., Otto, C., Bullinger, M., Rose, M., & Klasen, F. (2014). The european KIDSCREEN approach to measure quality of life and well-being in children: Development, current application, and future advances. Quality of Life Research, 23(3), 791-803.

85. Runarsdottir, E. M., & Vilhjalmsson, R. (2015). Ethnic differences in youth well-being: The role of sociodemographic background and social support. Scandinavian Journal of Public Health, 43(6), 580-587.
86. Saab, H., & Klinger, D. (2010). School differences in adolescent health and wellbeing: Findings from the canadian health behaviour in school-aged children study. Social Science & Medicine, 70(6), 850-858.
87. Santos, T., de Matos, M. G., Simões, C., & Machado, M. d. C. (2015). Psychological well-being and chronic condition in portuguese adolescents. International Journal of Adolescence and Youth, 20(3), 334-345.
88. Savoye, I., Moreau, N., Brault, M., Levêque, A., & Godin, I. (2015). Well-being, gender, and psychological health in school-aged children. Archives of Public Health, 73(1), 52.

Sawyer, S. M., Afifi, R. A., Bearinger, L. H., Blakemore, S. J., Dick, B., Ezeh, A. C., & Patton, G. C. (2012). Adolescence: a foundation for future health. The lancet, 379(9826), 1630-1640.

Scales, P. C. (1999). Reducing risks and building developmental assets: Essential actions for promoting adolescent health. Journal of School Health, 69(3), 113-119.

89. Sentenac, M., Gavin, A., Gabhainn, S. N., Molcho, M., Due, P., Ravens-Sieberer, U., . . . Vollebergh, W. (2013). Peer victimization and subjective health among students reporting disability or chronic illness in 11 western countries. The European Journal of Public Health, 23(3), 421-426.

Shatkin, J. , Balloge, N. , & Belfer, M. (2008). Child and adolescent mental health policy worldwide. International Psychiatry, 5, 81-84.

90. Sonmark, K., Godeau, E., Augustine, L., Bygren, M., & Modin, B. (2016). Individual and contextual expressions of school demands and their relation to psychosomatic health a comparative study of students in france and sweden. Child Indicators Research, 9(1), 93-109.

91. Steinbach, A., Augustijn, L., & Corkadi, G. (2020). Joint Physical Custody and Adolescents' Life Satisfaction in 37 North American and European Countries. Child Indicators Research, 1-17. DOI: 10.1007/s12187-015-9299-1

Steppan, M., Whitehead, R., McEachran, J., & Currie, C. (2019). Family composition and age at menarche: Findings from the international health behaviour in school-aged children study. Reproductive Health, 16(1), 176.

92. Thorsteinsson, E. B., Loi, N. M., Sveinbjornsdottir, S., & Arnarsson, A. (2017). Sexual orientation among icelandic year 10 adolescents: Changes in health and life satisfaction from 2006 to 2014. Scandinavian Journal of Psychology, 58(6), 530-540.

Topp, C. W., Østergaard, S. D., Søndergaard, S., & Bech, P. (2015). The WHO-5 well-being index: A systematic review of the literature. Psychotherapy and Psychosomatics, 84(3), 167-176.

93. 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.

Torsheim, T., Aaroe, L. E., & Wold, B. (2001). Sense of coherence and school-related stress as predictors of subjective health complaints in early adolescence: Interactive, indirect or direct relationships? Social Science & Medicine, 53(5), 603-614.

94. Torsheim, T., Ravens-Sieberer, U., Hetland, J., Välimaa, 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., Cavallo, F., Levin, K. A., Schnohr, C., Mazur, J., Niclasen, B., . . . FAS Development Study Group. (2016). Psychometric validation of the revised family affluence scale: A latent variable approach. Child Indicators Research, 9(3), 771-784.

95. Vandendriessche, A., Ghekiere, A., Van Cauwenberg, J., De Clercq, B., Dhondt, K., DeSmet, A., . . . Deforche, 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), e0239031.

96. 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., Resnick, M., Fatusi, A., & Currie, C. (2012). Adolescence and the social determinants of health. The lancet, 379(9826), 1641-1652.

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97. 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.
98. 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.
99. 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.
100. 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), S40-S49.
101. 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.
102. 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 (2008) Social cohesion for mental well-being among adolescents. Copenhagen, WHO Regional Office for Europe

WHO (2012) Health 2020: The European Policy for Health and Wellbeing. WHO Regional Office for Europe, Copenhagen, Denmark.

103. Zaborskis, A., & Grincaite, 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.
104. Zaborskis, A., Grincaite, 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.

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Table 1. Characteristics of selected papers

		YEAR OF PUBLICATION		
		2000-09	**2010-15**	**2016-2000**
NO OF PAPERS	104			
National	68	8	18	42
International	36	4	15	17
National by Region	68	8	18	42
Western Europe	21	3	8	10
Eastern Europe	7	0	0	7
Northern Europe	13	1	5	7
Southern Europe	15	1	4	10
North America	12	1	4	7
International Papers by No of Included Countries	36	3	16	17
>10	11	0	7	4
11-19	5	0	3	2
20-29	3	1	1	1
30-39	13	2	5	6
40+	4	0	0	4
By Bio-Ecological Level	104	11	34	59
Individual National	39	3	9	27
International	12	1	6	5
Micro N	19	3	9	7
I	9	0	4	5
Meso N	5	1	0	4
I	1	1	0	0
Macro N	5	0	1	4
I	14	2	5	7
TRENDS (classified within macro level)	13	2	3	8
National	4	1	1	2
International	6	1		3

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Table 2. Publication details of selected papers

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**

Level in Bio-ecological model	1st Author	Year	National (country)/ International paper (N of countries)	Title	Aim	Mental health measures included	Determinants included
Individual	//////////	///////	/////////////////	/////////////////	//////////////////////////////	//////////////////	//////////////////
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	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

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				immigrant and Israeli born adolescents.			
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 examines 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	To explore whether adolescent immigrants have worse or	Life satisfaction	Migrant status

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				adolescent immigrants: it matters where they come from.	better perceived well-being		
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'	To compare wellbeing of non-adopted and adopted adolescents	Life satisfaction	Adoption status

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				Heterogeneity in Well-Being and Perception of Social Contexts.			
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 analyze 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)

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Individual	Gobina	2011	International (19 countries)	The medicine use and corresponding subjective health complaints among adolescents, a cross-national survey	To investigate adolescents' medicine use and association with corresponding health complaints in Europe and USA.	Mulitiple health complaints	Medicine use
Individual	Canha	2016	National (Portugal)	Well-being and health in adolescents with disabilities	To investigated 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	Disablilities
Individual	Santos	2015	National (Portugal)	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	Sentenac	2011	International (11 countries)	Peer victimization and subjective health among students reporting disability or chronic illness in 11 Western countries.	To compare the strength of the association between peer victimization at school and subjective health according to the disability or chronic illness	Life satisfaction, Multiple Health Complaints	Disability/ chronic condition
Individual	Lyyra	2018	National	Loneliness and	To examine the association	Subjective health	Loneliness

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			(Finland)	subjective health complaints among school-aged children.	between loneliness and subjective health complaints	complaints	
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	Early adolescent	To examine psychosocial	Psychological	Sexual initiation

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			countries)	sexual initiation and physical/psychological symptoms: a comparative analysis of five nations.	correlates of early sexual initiation	symptoms	
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: Differential 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)	Bullying victimization prevalence and its effects on psychosomatic complaints: can sense of coherence make a difference? Trends in bullying victimization in Scottish adolescents	To examine the prevalence of bullying victimization and its impact on physical and psychological complaints	Psychological complaints	Bullying

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				1994–2014: changing associations with mental well-being			
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 internalizing 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	To analyse the relationships between emotional symptoms and cyberbullying	Emotional symptoms	Cyberbullying

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				and Implications on Well-Being.			
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.	To explore the association between spiritual well-being and bullying among Slovak adolescents	Spiritual well-being	Bullying
Individual	Gobina	2008	International (2 countries)	Bullying and subjective health among adolescents at schools in Latvia and Lithuania.	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.	Life satisfaction, health complaints	Bullying
Individual	Du	2018	National(US)	Peer Support as a Mediator between Bullying Victimization and Depression.	To assess the relationship of victimization with depression symptoms was assessed,	Depressive symptoms	Bullying
Individual	Walsh	2020	International (37	Clusters of	To examine examined the	Life satisfaction,	Clusters of risk

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			countries)	Contemporary Risk and Their Relationship to Mental Well-Being Among 15-Year-Old Adolescents Across 37 Countries	association of clusters of risk behaviours with adolescent mental well-being	psychosomatic complaints	behaviours
Individual	Kleszczewska	2018	National (Poland)	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)	Behavioural factors enhancing mental health-preliminary results of the study on its association with physical activity in 15 to 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	To examine the association between physical activity and	Life satisfaction	Physical activity

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				physical activity in adolescence and health behaviours, well-being, family and social relations	wellbeing		
Individual	Meyer	2020	International (44 countries)	The mirror's curse: Weight perceptions mediate the link between physical activity and life satisfaction among 727,865 teens in 44 countries.	To examine the link between physical activity (PA) and life satisfaction in a large international study of adolescents.	Life satisfaction	Physical activity
Individual	Piccininni	2018	National (Canada)	Outdoor play and nature connectedness as potential correlates of internalized mental health symptoms among Canadian adolescents.	To explore how exposure to nature/ outdoors is associated with the prevalence of recurrent psychosomatic symptoms.	Psychosomatic symptoms	Being in nature/ the outdoors
Individual	Huynh	2013	National (Canada)	Exposure to public natural space as a protective factor for emotional well-	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

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				being among young people in Canada			
Individual	Dankulincova Veselska	2018	National (Slovakia)	Spirituality but not Religiosity Is Associated with Better Health and Higher Life Satisfaction among Adolescents	To explore the associations of spirituality with self-rated health, health complaints, and life satisfaction of adolescents with the moderating role of religiosity.	Life satisfaction	Spirituality
Individual	Gariépy	2019	National (Canada)	Teenage night owls or early birds? Chronotype and the mental health of adolescents	To investigate the association between chronotype and mental health	Emotional problems and emotional well-being	Sleep chronotype
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 health complaints	Sleep
Individual	Kosticova	2020	National (Slovakia)	Difficulties in getting to sleep and their	To investigate the association between difficulties in getting to sleep/ sleep duration	Psychosomatic symptoms	Sleep

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				association with emotional and behavioural problems in adolescents: does the sleeping duration influence this association?.	and emotional problems		
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 onset 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-	2015	International (9	Supportive	To examine the impact of	Life satisfaction	Electronic media

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	Nissim		countries)	communication with parents moderates the negative effects of electronic media use on life satisfaction during adolescence	electronic media (EM) use on teenagers' life satisfaction (LS) and to assess the potential moderating effect of supportive communication with parents		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	Boniel-Nissim	2015	International (9 countries	Supportive communication with parents moderates the negative effects of electronic media use on	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

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				life satisfaction during adolescence			
Microsystem	//////////	///////	/////////////////	///////////////	//////////////////////////////////	//////////////////	/////////////////
Microsystem (Family)	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 (family)	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 (Family)	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	Absolute and	To explore whether self-	Psychosomatic	Family affluence

(Family)			countries)	relative family affluence and psychosomatic symptoms in adolescents	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.	symptoms	(FAS)
Microsystem (Family)	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 afuence, educational level, and gender	Strengths and Difficulties Questionnaire (SDQ)	Family affluence
Microsystem (Family)	Morgan	2019	National (Wales)	Socio-Economic Inequalities in Adolescent Summer Holiday Experiences, and Mental Wellbeing on Return to School: Analysis of the School Health Research Network/Health Behaviour in School-Aged Children Survey in Wales	To examine the role of summer holiday experiences in explaining socioeconomic inequalities in wellbeing	Psychological symptoms	Family affluence (FAS); summer holiday time spent

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Microsystem (Family)	Elgar	2017	International (40 countries)	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
Microsystem (Family)	Buijs	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
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
Microsystem (Family)	Elgar	2013	National (Canada)	Family dinners, communication, and mental	To examine the association between frequency of family dinners and positive and	Life satisfaction, psychosomatic symptoms,	Parental communication, family meals

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				health in Canadian adolescents	negative dimensions of mental health in adolescents, and mediating role of communication between adolescents and parents	emotional well-being	
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
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
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
Microsystem (family)	Steinbach	2020	International (37 countries)	Joint Physical Custody and	To examine the association between physical custody	Life satisfaction	Family structure/ living

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				Adolescents' Life Satisfaction in 37 North American and European Countries	arrangements and adolescent life satisfaction		arrangements
Microsystem (family) Intersectional	Zaborskis	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
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
Microsystem (school)	Freeman	2012	International (3 countries)	The relationship between school perceptions and psychosomatic complaints: cross-country differences across Canada, Norway, and	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

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				Romania			
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
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
Microsystem (school)	Moor	2014	National (Germany)	Explaining educational inequalities in adolescent life satisfaction: do health behaviour and gender matter? International journal of public health, 59(2), 309-317	To investigate educational inequalities and life satisfaction of boys and girls.	Life satisfaction	Educational track
Microsystem (school)	Diseth	2014	National (Norway)	Autonomy support and achievement goals as predictors of perceived 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

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				performance and life satisfaction in the transition between lower and upper secondary school.			
Microsystem (school)	Sonmark	2016	International (2 countries)	Individual and Contextual Expressions 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	To explore the influence of transition from primary to	Emotional symptoms from	School connectedness

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				mental health among adolescents: A comparative study of school systems in Denmark and Australia	secondary schools in Australia versus no transition in Denmark by comparing age trends in students' school connectedness, emotional symptoms	SDQ	
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	To examine teacher connectedness in detail and its potential association with emotional wellbeing	Emotional wellbeing (KIDSCREEN)	Teacher – pupil relationship (connectedness)

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				analysis			
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	//////////	///////	/////////////////	///////////////	//////////////////////////////////	//////////////////	/////////////////
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	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

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				School-aged Children survey in Wales			
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	School social 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
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	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	Life satisfaction, mental health symptoms	Family relationships, support from friends, school connectedness

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				Wellbeing and Mental Health Symptoms in Wales: a Cross Sectional Study	olds in Wales		
Macrosystem	//////////	///////	/////////////////	/////////////////	//////////////////////////////	//////////////////	//////////////////
Macrosystem (trends)	Hagquist	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 (internalizing 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
Macro (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	To describe trends in life satisfaction from 2002-2014	Life satisfaction	Secular trends

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				school-aged children: HBSC study.			
Macrosystem (Trends)	Potrebny	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	Rathman	2015	International (27	Macro-level	To investigate whether macro-	Psychosomatic	Macro

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(socioeconomic)			countries)	determinants of young people's subjective health and health inequalities: A multilevel analysis in 27 welfare states	level determinants are associated with health and socioeconomic inequalities in young people's health	health complaints	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	To investigate cross-national consistency and variation of gender differences in subjective health complaints	Subjective health complaints	Macro gender equality index

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				health in Europe and North America.			
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
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 associations 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	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]

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				Complaints			
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 intergration
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	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

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				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

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Table 3. Chronology of mental health terms used in selected papers

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**

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,

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	multiple health complaints (MHC)
2009	Psychological complaints
2009	Life satisfaction
2010	Psychological health complaints
2010	Emotional Wellbeing, and Subjective Health 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

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	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

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	(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

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	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
2018	Psychosomatic symptoms
2018	Life satisfaction, multiple health complaints
2018	Life satisfaction

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2018	Subjective health complaints
2018	Life satisfaction
2018	Life satisfaction, mental health symptoms
2018	Life satisfaction
2019	Psychological symptoms
2019	Psychological symptoms
2019	Life satisfaction
2019	Emotional problems and emotional well-being
2019	Life satisfaction, multiple health complaints
2019	Life satisfaction
2019	Health complaints
2020	Life satisfaction
2020	Life satisfaction, psychological problems
2020	Life satisfaction and KIDSCREEN Health related quality of life
2020	Life satisfaction
2020	Feel low, feel nervous (2 items from psychosomatic symptoms scale)

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2020	Life satisfaction, psychosomatic complaints
2020	Life satisfaction
2020	Psychosomatic symptoms
2020	Life satisfaction
2020	Strengths and Difficulties Questionnaire (SDQ)
2020	Life satisfaction
2020	Short Warwick and Edinburgh Mental Wellbeing scale
2020	Psychosomatic symptoms
2020	Life satisfaction, psychological complaints
2020	Life satisfaction, psychological and somatic symptoms
2020	Life satisfaction, psychosomatic health complaints
2020	Life satisfaction, psychosomatic health complaints

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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.

Kind regards

Candace Currie

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