

Temporal trends in psychological distress and healthcare utilization among young people



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Scientific environment

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This project was part of the Norwegian study into HBSC, led by Oddrun Samdal, and using data from the Norwegian “Ungdata” study, led by Anders Bakken.

The supervisors were:

Professor Frode Thuen, Centre for Evidence-Based Practice, HVL.

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Dr Nora Wiium, Department of Psychosocial Science, UiB.

Professor Bente Wold, Department of Health Promotion and Development, UiB.

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Abstract

Background: Young people are generally considered to be healthy, as severe illness and mortality is uncommon during this developmental stage. However, there are increasing concerns that psychological distress may be increasing in recent generations of youth, which will generate greater healthcare needs.

Overall aims: The overall aims of this thesis were to investigate the temporal trends of psychological distress (also referred to as psychosomatic health complaints) among the general youth population and to investigate the association between the utilization of the youth primary healthcare service and psychological distress.

Material and methods: The first paper used the Joanna Briggs Institute framework to conduct a systematic review and meta-analysis of prevalence studies, systematically identifying, selecting and critically appraising all the global evidence on psychosomatic health complaints among young people. The primary databases searched were MEDLINE, Embase and PsycINFO. Studies were included if they were of a repeated cross-sectional design and contained the self-reported data of 10-19-year-olds. Inclusion criteria and study quality were assessed by two independent reviewers. The second paper was a repeated cross-sectional study investigating temporal trends of psychosomatic health complaints among 11-16-year-olds in Norway between 1994 and 2014. The data were drawn from the Norwegian HBSC study ($n = 27,476$). The third paper was a repeated cross-sectional study investigating the temporal trends of psychological distress and its relationship to youth primary healthcare utilization among 13-19-year-olds in Norway, between 2014 and 2018 ($n = 368,579$). The data were drawn from the Norwegian “Ungdata” study.

Results: *Paper I:* The systematic search of the literature yielded 8,338 potentially relevant articles. Twenty-one studies met the inclusion criteria and were included in the study. In total, this study represents over seven million young respondents from 36 countries, mainly in Europe and North America, covering the time period between 1982 and 2013. Overall, the results indicated a minor increasing trend of psychosomatic health complaints among young people. However, the increase was

mainly found in Northern Europe, while other geographical regions had more stable trends. *Paper II*: In Norway, psychosomatic health complaints increased between 1994 and 2014 among young people. There were indications that psychological and somatic health complaints might follow different trajectories. For psychological health complaints, there was a three-way interaction between age, gender and time, indicating that older teenage girls experience a greater increase in psychosomatic health complaints over time relative to boys and younger adolescent girls. In terms of somatic health complaints, older teenage girls also had the greatest increase over time, but this difference was constant and did not diverge from the other groups over time. *Paper III*: Psychological distress and primary healthcare utilization increased between 2014 and 2018 among young people in Norway. Psychological distress was associated with primary healthcare utilization, and young people with high levels of psychological distress used services twice as often as their peers. Psychological distress could account for a substantial amount of the change in utilization of youth primary healthcare. However, the absolute increase in primary healthcare utilization was mainly driven by those with low levels of psychological distress, as opposed to young people with high levels of distress. This suggests that primary healthcare utilization among young people with high and low levels of distress is converging, which could indicate overuse among less distressed youths and underuse among more distressed youth.

Conclusion and implications for practice: The prevalence of psychological distress (psychosomatic health complaints) among young people from 36 different countries in Europe and North America appeared to remain stable in large parts of Europe and North America between 1980 and 2013. However, Northern Europe stood out in terms of displaying an increasing trend of psychological distress among young people, suggesting that increasing psychological distress among this age group is primarily a Northern European phenomenon. In Norway, psychological distress among young people appear to have been systematically increasing between 1994 and 2018, especially among older teenage girls. Furthermore, since psychological distress is associated with primary healthcare utilization, one would expect that part

of the increase could be explained by a growing population of psychologically distressed young people. However, this does not appear to be the case, as the greatest increase identified in the utilization of youth primary healthcare, occurs primarily among the less distressed. This raises questions about the expected need for healthcare and actual healthcare utilization, on the pathways from distress to care and the effectiveness of youth primary healthcare.

School-based interventions tailored to reduce psychological distress symptoms or psychosomatic health complaints should be tailored to address the needs of older teenage girls, who tend to be more distressed. Intervention strategies should also be developed to improve health literacy among young people to enable them to identify and seek help for psychological distress.

List of Publications

- Potrebny, T., Wiium, N. & Lundegård, M. M. I. (2017). Temporal trends in adolescents' self-reported psychosomatic health complaints from 1980-2016: A systematic review and meta-analysis. *PloS One*, *12*(11), e0188374.
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Abbreviations

BM	The Behavioral Model of Health Service Use
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CI	Confidence Interval
GHQ	The General Health Questionnaire
HBSC	The Health Behaviour in School-aged Children study
HBSC-SCL	Health Behaviour in School-aged Children Symptom Checklist
HSCL	Hopkins Symptom Checklist
HVL	Western Norway University of Applied Sciences
JBİ	Joanna Briggs Institute
MHI-5	The five-question Mental Health Inventory
OR	Odds Ratio
PRESS	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RMSEA	Root Mean Square Error of Approximation
SDQ	Strength and Difficulties Questionnaire

SRMR	Standardized Root Mean Square Residual
UiB	University of Bergen
WHO	World Health Organization

1. Introduction

1.1 Background

Youth is a developmental period where young people transition from childhood to adulthood. During this developmental period, young people are generally considered to be healthy, and as such, severe illness and mortality is uncommon. Nevertheless, many young people experience high levels of psychological distress in their daily lives during maturity (Ottova-Jordan et al., 2015a). The World Health Organization (1948) defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. This definition of health emphasizes the importance of the health indicators of population morbidity and mortality but acknowledges that these indicators only provide limited information on health.

Information on subjective well-being and the subjective health of young people is more relevant when investigating health and well-being among young people. Considering this, the greatest burden of disease among young people globally, is related to mental health problems, which is an area of health that has been largely neglected in terms of public health, since young people are perceived as being healthy (Gore et al., 2011). This may have led to less than ideal public health efforts in promoting health and preventing disease among young people (Gore et al., 2011), which is especially worrying, since approximately half of mental health problems affecting people throughout their lifetime are known to start manifesting themselves by the mid-teenage years (Kessler et al., 2007). In terms of health promotion and prevention of mental health problems, the youth developmental period is thus a crucial time in which to gain an insight into the mechanisms of psychological distress, in addition to understanding its determinants and etiology.

Self-reported rates of psychological distress symptoms among young people indicate a long-term increase over the past 30 years in many countries in Northern Europe (Collishaw, 2015; Sigfusdottir, Asgeirsdottir, Sigurdsson, & Gudjonsson, 2008;.

Tick, van der Ende & Verhulst, 2008a; von Soest & Wichstrøm, 2014). The majority of these studies suggest that this increase has been greater among young women than young men. Comparative research has shown that the Nordic countries, especially Norway, are among the countries with the largest increase in psychological distress globally (Ottova-Jordan et al., 2015a; Ottova-Jordan et al., 2015b). The emerging trends of psychological distress are now viewed as a modern public health issue by many and have, therefore, gained substantial interest among policy makers and in research. Another challenge is that the determinants of increasing psychological distress in recent generations of young people, and especially among young women, are mostly unknown, as there are no obvious changes in known determinants of symptoms of mental health problems (Bor, Dean, Najman, & Hayatbakhsh, 2014; Ottova-Jordan et al., 2015a).

The purpose of this thesis is to examine and provide evidence of temporal changes, or trends, as well as psychological distress symptoms in the general youth population from 1980 to the present. This involves investigating observed geographical differences within and between Europe and North America. This thesis also examines socio-structural determinants associated with trends of psychological distress, as previous research has indicated large gender and age differences in psychological distress. It is, however, currently uncertain if there is a gender and age divergence, where subgroups of older teenage girls, in particular, disproportionately experience increasing symptoms of psychological distress over time, and thus more research is needed. Furthermore, earlier research suggests that psychological distress is associated with increased help-seeking behavior. Few studies have, however, investigated the relationship between psychological distress and help-seeking in times of increasing prevalence of psychological distress and thus increased healthcare needs among young people. This current study examines the trends of psychological distress and its association with help-seeking behavior in more detail.

1.2 Operationalization of key concepts

1.2.1 The period of youth and development

The WHO defines young people as being between 10 and 24 years of age and adolescents as being aged 10 to 19. At any given time, around 27% of the world's population are young people. The transition from childhood to adulthood is accompanied by major physical, psychosocial and social developmental changes. In addition to youth maturity and development, several risks to health and well-being emerge during this period. Due to social and biological differences, young women and men face different health risks as they get older. These social and biological differences start to intensify during early adolescence and often continue throughout life (Blum, Mmari, & Moreau, 2017). These differences often result in distinct gender profiles of health and well-being. Following puberty, internalizing problems (e.g., psychological distress) is more common among young women, while externalizing problems (e.g., conduct problems) is more frequent among young men (Bor et al., 2014).

In this thesis, the WHO definition of youth and adolescents is used interchangeably throughout. In Paper I and II, young people aged between 10 and 19 were referred to as adolescents, while in Paper III, 13-19-year-olds were referred to as young people.

1.2.2 Psychological distress

Psychological distress is a widely used indicator of mental health, mental health functioning or non-specific mental health problems of a population within the public health sciences, psychology and epidemiology (Drapeau, Marchand, & Beaulieu-Prévost, 2012). Psychological distress is defined as a state of emotional suffering, typically characterized by recurring psychological anxiety and (psycho)somatic symptoms (Drapeau et al., 2012; Ridner, 2004). Excess symptoms are thought to be linked to high levels of stress, which in turn is associated with stressors and demands that are difficult to cope with in everyday life (Drapeau et al., 2012).

In the scientific literature, the most common way of measuring psychological distress is by means of brief, self-reported symptom checklists, containing combinations of

common anxio-depressive disorders (e.g., sadness, hopelessness, feeling tense, worried and irritability) and (psycho)somatic symptoms (e.g., insomnia, headaches, lack of energy) in either the general or clinical population. Examples of widely used symptom checklists that satisfy the definition of psychological distress adopted here are: the Hopkins Symptom Checklist (HSCL) (Derogatis et al., 1974), Health Behaviour in School-aged Children Symptom Checklist (HBSC-SCL) (Inchley, Currie, Cosma, & Samdal, 2018), Strength and Difficulties Questionnaire (SDQ) (Goodman, Meltzer, & Bailey, 1998), The General Health Questionnaire (GHQ) (Goldberg & Hillier, 1979). Psychological distress is expressed in different terms in research, depending on the study-sample or the research paradigm. There are more clinical or specific terms, such as “depressive symptoms”, “psychosomatic health complaints” and “internalizing symptoms”, and more neutral terms, such as “(subjective) health complaints”. These terms are undifferentiated and rely on a common theoretical stress-distress framework (Drapeau et al., 2012). Symptoms of psychological distress are thought to operate on a continuum, ranging from experiencing few symptoms or no symptoms or health complaints, which indicate the absence of distress, to multiple recurring symptoms or health complaints, indicating distress. There is no clear consensus on a cut-point, discriminating “problematic” psychological distress from “normal” states (high/low levels of distress), as psychological distress is known to vary across different socio-cultural settings (Drapeau et al., 2012). Instead, different instruments use cut-points, set in the course of development and validation of each specific scale.

In this thesis, psychological distress is differentiated from mental disorders, where psychological distress is a state perceived as strenuous but not to the extent that it qualifies as a disorder. Mental disorders on the other hand are diagnoses by clinicians, the most common of which are anxiety and depression. Often, but not always, mental health disorders can cause a greater mental strain on individuals than psychological distress (Reneflot et al., 2018). Previous research has shown a clear association between the level of psychological distress experienced during youth and mental health illness in adulthood, decreased wellbeing and quality of life (Ravens-Sieberer et al., 2009), increased need for primary healthcare services (Perquin et al.,

2001; Vingilis, Wade, & Seeley, 2007), use of medication (Gobina et al., 2011) and school absenteeism (Wood et al., 2012). In the present thesis psychological distress is operationalized using the suggested definition of psychological distress and refers to health complaints or health symptoms (such as in Paper I and II) or psychological distress or depressive symptoms (such as in Paper III).

1.2.3 Help-seeking behavior and utilization of healthcare services

Help-seeking behavior is defined as any action or activity carried out by an individual, who perceive themselves as needing care, healthcare or social services, from either formal services (within the healthcare system) or informal services (such as family or peers) (Barker, 2007). More specifically, within the mental health context, help-seeking is considered as an adaptive coping process by which one attempts to obtain external assistance to deal with a mental health concern (Rickwood & Thomas, 2012). Healthcare utilization is often, but not always, used synonymously with help-seeking behavior. Although the terms both indicate help-seeking, healthcare utilization usually only considers the net use of health services, rather than intentions to seek help outside formal healthcare services (Rickwood & Thomas, 2012). In the present thesis, the terms help-seeking and primary healthcare utilization are used interchangeably to refer to the use of formal primary healthcare services among young people, with high and low levels of psychological distress.

2. Theoretical and empirical framework

2.1 Stress and psychological distress

It has been well documented that stress influences the etiology and maintenance of mental health-related problems in adult and youth populations (Compas, Orosan, & Grant, 1993; Drapeau et al., 2012; Ridner, 2004; Wiklund et al., 2012).

Understanding stress may be key to understanding how young people manage stress in relation to health, as well as in understanding the development of common mental health problems (Compas et al., 2001).

A stress-distress model is often used to conceptualize mechanisms behind the development of psychological distress. Common for all stress-distress models is the pathway from a stressor to a stress response. The stress response may either manifest itself as distress (“bad stress”) or eustress (“good stress”) and, consequently, lead to maladaptation or adaptation responses (Selye, 1976). Folkman and Lazarus’s transactional model of stress and coping (Folkman & Lazarus, 1984) expands on the stress-distress pathway by adding that exposure to events that are perceived as stressful, can lead to ineffective coping and the lack of coping may lead to an emotional turmoil that can lead to psychological distress. Cognitive Activation Theory (Ursin & Eriksen, 2004) suggests that a stress response turns into psychological distress if sensations are sustained over a period of time and coping is not achieved. A working stress-distress model would, therefore, include stressors that lead to a stress response which if sustained and combined with ineffective coping, could manifest as distress, leading to a state of psychological distress (Figure 1).

Figure 1

A working stress-distress model showing the causal pathway from stressor to psychological distress



The transition from childhood to youth is a major life event; young people are exposed to new stressors such as increased academic demands in school, parent-child conflict and peer influence that may foster or strain their psychological development (Byrne, Davenport, & Mazanov, 2007; Moksnes, Moljord, Espnes, & Byrne, 2010). A longitudinal study between the ages of 16 and 25 found that psychological distress reached a peak at the age of 17 for boys and girls, coinciding with the final year of secondary school (Rickwood & d'Espaignet, 1996). Young people may, therefore, be more exposed to stress than other age groups (Byrne et al., 2007), and the stressors that emerge during secondary school, may affect psychological distress. In the school-setting, there have been studies suggesting that being bullied by peers and stress related to academic demands (school-related stress) are significant stressors associated with psychological distress (Banks & Smyth, 2015; Myklestad, Røysamb, & Tambs, 2012; Sweeting, West, Young, & Der, 2010; West & Sweeting, 2003). In the family setting, parent-child conflict during youth has been shown to increase psychological distress (Wilkinson-Lee, Zhang, Nuno, & Wilhelm, 2011; Ystgaard, Tambs, & Dalgard, 1999). Both school-related stress and family conflict appear to increase psychological distress more among young women than young men. Over time, however, the prevalence of young people being bullied appears to have been declining (Rigby & Smith, 2011), while other studies suggest that school-related

stress has been increasing, especially after the introduction of the international PISA assessments in 2000 (Klinger et al., 2015; Sweeting et al., 2010; West & Sweeting, 2003). This may indicate that the relative significance of these well-known stressors associated with psychological distress, may be changing in more recent generations of young people.

2.2 The Behavioral Model of Health Service Use

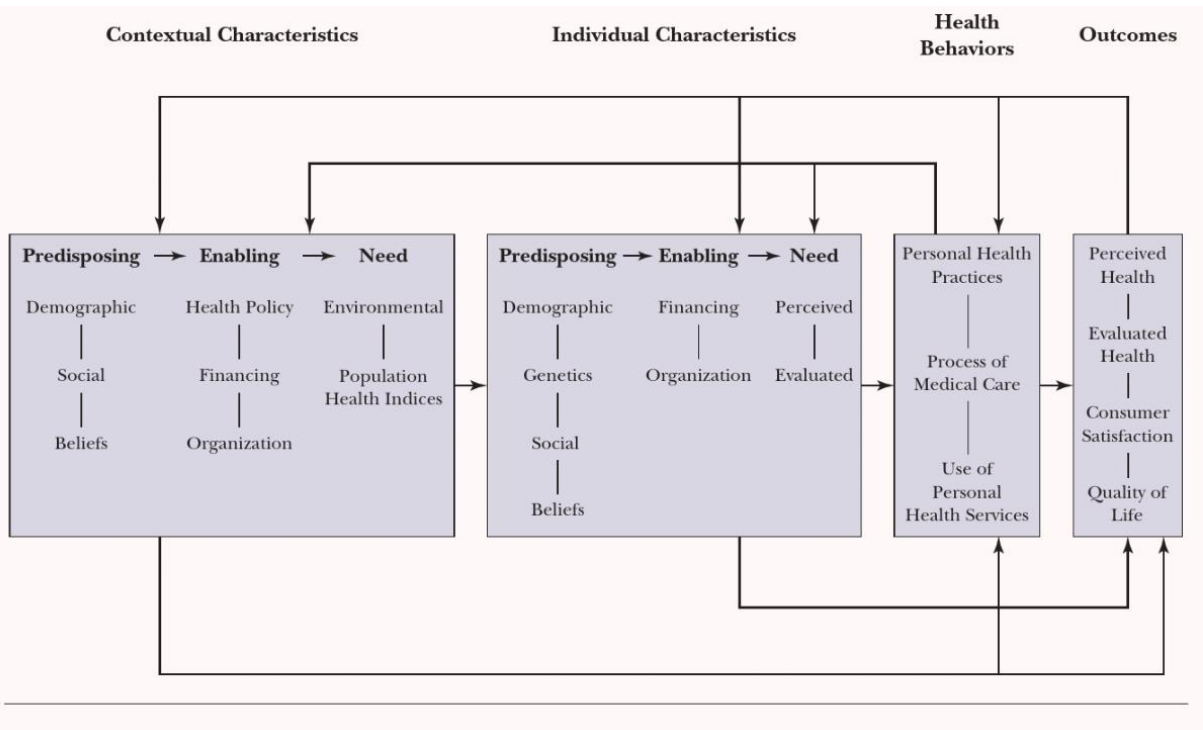
Health service use, or healthcare utilization, describes the use of formal healthcare services by individuals who perceive themselves as needing care (Rickwood & Thomas, 2012). Monitoring healthcare utilization allows us to (1) predict the use of health services, (2) promote equitable use, (3) improve effectiveness and efficiency of health service delivery and (4) indirectly measure the health and well-being of populations (Andersen, Rice, & Kominski, 2011).

One of the most widely used models for understanding health service utilization is the Behavioral Model of Health Service Use (BM), also called “The Andersen Healthcare Utilization Model”, which was developed in 1968 by medical sociologist Ronald M. Andersen. Since its inception, the BM has been through several revisions and the current model is the sixth iteration (Andersen et al., 2011). The BM is a conceptual framework emphasizing contextual and individual determinants of health service use. Improving healthcare utilization can be accomplished by focusing on both contextual and individual determinants (Andersen, 1995; Andersen et al., 2011). The term *individual determinants* represents individual-level factors and preferences influencing healthcare use, while *contextual determinants* represent the circumstances and environment around the individual, which can either facilitate or impede their health service use. This context can include health organization-related factors, as well as community characteristics, and ranges from influences such as national healthcare systems to familial influences. Ultimately, the focus of the BM is on individual health behaviors and individuals’ use of health services leading to improved health outcomes, satisfaction with services and quality of life in the long-term (Andersen et al., 2011). The BM incorporates three major components on an

individual as well as a contextual level: predisposing, enabling and need factors (Figure 2).

Figure 2

The Behavioral Model of Health Service Use – sixth revision



Note. From “Changing the US health care system: Key issues in health services policy and management” by R.M. Andersen, T.H. Rice and G.F. Kominski, 2011. Copyright 2011 John Wiley & Sons.

Individual *predisposing factors* include demographic factors, such as age and gender, social factors, such as education, occupation, ethnicity and social networks, and health beliefs (e.g., attitudes, values and knowledge related to health and health services). Predisposing contextual factors include socio-economic, cultural, social

and environmental factors in communities and society that may influence health service use.

Individual *enabling factors* consist of health services organization and delivery (availability of health services), financial factors (accessibility of health services) and social support. Contextual *enabling factors* include health coverage, healthcare expenditure and health policy.

On an individual level, *need factors* are differentiated into perceived and evaluated needs for health services. Perceived need is how people experience and respond to their own general health and emerging symptoms of illness or distress. Evaluated need represents professional judgment and objective measures of a patient's physical status and need for healthcare. On a contextual level, death rates, traffic- or occupational-related injuries and population health indices, indicate overall community environmental needs and the health status of the population.

If healthcare services are not easily accessed, healthcare utilization might be affected. In addition, patients must perceive a need for care in order to utilize healthcare services; they have to respond to this need and the contextual factors must enable the search for care. Accordingly, in the BM, the decision of an individual to use health services, as a *health behavior*, is determined based on predisposing, enabling and need factors which are influenced by both contextual and individual characteristics. Another central aspect of the BM are feedback loops. The feedback loops are depicted by arrows from outcomes to health behaviors, and individual and contextual characteristics are shown in Figure 1. The identified feedback loops demonstrate the complexity of health service use and its multifaceted determinants.

The BM has frequently been applied in a range of studies exploring health service use and their determinants (Babitsch, Gohl, & von Lengerke, 2012). In their systematic review Babitsch, Gohl and von Lengerke (2012) found that age and gender were predisposing factors associated with healthcare utilization, indicating that older people and women are much more likely to use healthcare services. Enabling factors, such as socio-economic status have been shown to be negatively associated with

health service use, with lower socio-economic status being associated with a lower likelihood of health service access. Furthermore, if health services are readily available and easily accessed, this increased service use would decrease the delay of healthcare delivery. Finally, Babitsch, Gohl and von Lengerke (2012) found that physical or mental health status (such as psychological distress) as a need factor, was a determinant of healthcare utilization. In almost all cases poor physical and mental health was a predictor of health service utilization.

2.2.1 Psychological distress and healthcare utilization among the young

Primary healthcare provides the first line of care for mental health problems and most people who seek help for psychological distress are treated solely at this level of care (Arvidsdotter et al., 2016). However, psychological distress often goes undetected in primary healthcare, since it may be masked by other co-occurring conditions (Agüera et al., 2010; Menchetti et al., 2009). In terms of need factors of healthcare service utilization, only around 20-40% of young people with mental health problems are identified by healthcare services and only 25% receive appropriate treatment (Sanci, Lewis, & Patton, 2010). In addition, age as a predisposing factor, clearly shows that young people have worse healthcare utilization than the general population (Gibb, Fergusson, & Horwood, 2010) and the majority of young people with mental health problems do not seek help from formal healthcare services at all (Ford, Hamilton, Meltzer, & Goodman, 2007; Potter et al., 2012). However, the use of mental health services by young people continues to increase in many high income countries as mental health services become more available (Kosidou et al., 2017; Olfson, Druss, & Marcus, 2015; Tick, van der Ende & Verhulst, 2008b). From the perspective of young people, mental health issues are among the most common need factors, influencing decisions to seek help from primary healthcare services (Bakken, Frøyland, & Sletten, 2016).

Due to the association between mental health problems and healthcare utilization, healthcare service utilization is often used as an indicator of contextual need within epidemiology, as mental health status and subsequently the use of healthcare services

can be used to infer information in relation to population health (Sletten & Bakken, 2016). Therefore, when investigating the prevalence rates of psychological distress among young people, both indicators of psychological distress and healthcare utilization can be viewed as population health indices.

2.3 Prevalence and temporal trends of psychological distress

In Europe and North America, the prevalence of psychological distress among young people is suggested to be as high as 35% in representative samples from 2018 (Inchley et al., 2020). The prevalence of psychological distress among young people, measured by symptom checklists, has not necessarily always been as high as it is today, but has been increasing since the 1950s. In their seminal review on the mental health of young people, Rutters and Smith (1995) found that psychological distress symptoms increased in high-income countries during the post-Second World War era, between the 1950s and the 1990s. Since then other systematic reviews have indicated a further increase in psychological distress among young people in different countries and contexts, through the 1980s until the early 2010s (Bor et al., 2014; Collishaw, 2015), although not all evidence is consistent (Costello, Erkanli, & Angold, 2006; Ottova-Jordan et al., 2015a; Twenge, Nolen-Hoeksema, & Baker, 2002) and the trends seem to vary depending upon country and context.

A large comparative study from 35 countries in Europe, North America and Israel over a period of 16 years, indicated that certain countries showed a clear increasing trend of psychological distress, between 1994 and 2010, and these countries were mostly located in Northern Europe (Ottova-Jordan et al., 2015b). Other studies from parts of Northern Europe, especially the Nordic countries, also support this increase in psychological distress over an even longer time period (Berntsson & Köhler, 2001; Berntsson & Ringsberg, 2014; Ross, Kelly, & Sacker, 2017; van Geelen & Hagquist, 2016; von Soest & Wichstrøm, 2014). The increase in psychological distress observed in the Nordic countries occurred despite these countries' favorable prerequisites for young people's health and their progressive health-promoting

policies (Raphael, 2014). However, it appears that while the prevalence of psychological distress is low in most Northern European countries, compared to other parts of the world, a trend analysis indicates a systematic increase in psychological distress and convergence of these countries. The prevalence of psychological distress among young people in other global regions appears more stable. The cause of such an increase in Northern Europe and the reasons why these specific high-income countries are experiencing convergence are unknown, which constitutes a public health concern (Ottova-Jordan et al., 2015b; van Geelen & Hagquist, 2016).

Norway is one of the Nordic countries that has been highlighted as having one of the largest increases in psychological distress among 15-year-olds between 1994-2010 in a comparative study of 35 countries (Ottova-Jordan et al., 2015b). The proportion of young people with psychological distress in Norway increased from 22% in 1994 to 33% in 2010. Based on the available epidemiological data on young people in Norway between 1984 and 2019, there is evidence to support a systematic increase over the last 35 years – especially among young women (Bakken, 2019; Berntsson & Köhler, 2001; Berntsson & Ringsberg, 2014; Knapstad, Heradstveit, & Sivertsen, 2018; Norwegian Institute of Public Health, 2014; von Soest & Wichstrøm, 2014).

2.4 Determinants of psychological distress trends

There are two important characteristics of psychological distress that are well documented: significant gender and age differences. Accordingly, psychological distress is much more prevalent among young women than young men in almost all countries (Inchley et al., 2020) and greater among older groups of young people (Inchley et al., 2020), when peak prevalence is usually observed (Rickwood & d'Espaignet, 1996). Even though the gender effect is relatively consistent among young people, it is not clear what causes the higher prevalence of psychological distress in young women. Some researchers hypothesize that distress might be attributable to gender-related personality traits or biological determinants, that young women are more exposed or vulnerable to socio-cultural risk factors or differences in emotional expressions of psychological distress (Drapeau et al., 2012). Besides

gender and age, other important determinants of psychological distress include being bullied, school-related stress and engagement in unhealthy behaviors, such as smoking (Ottova-Jordan et al., 2015a).

Disentangling whether the association between risk factors and psychological distress has shifted over time and whether exposure and vulnerability to risk factors has changed, is a complex task. Most researchers argue that many small changes encompassing a myriad of factors, ranging from unhealthy behaviors to socio-cultural factors, rather than one specific cause, are more likely to provide an explanation for emerging trends in psychological distress (Bor et al., 2014; Collishaw, 2015). Indeed, research has shown that most of the main determinants of psychological distress have remained relatively stable in Europe and North America over time (Ottova-Jordan et al., 2015a). Although empirical research is lacking, there are certain causal hypotheses with regard to possible determinants of temporal changes in psychological distress that have been explored for school-related stress, willingness to disclose symptoms of distress, eating problems, cannabis use, body image, electronic media communication, socio-economic differences and family structure (Bor et al., 2014; Collishaw, 2015; Ottova-Jordan et al., 2015a; Sletten & Bakken, 2016; von Soest & Wichstrøm, 2014). The individual impact of most of these factors on trends of psychological distress are often uncertain and evidence is inconclusive (Bor et al., 2014; Collishaw, 2015; Sletten & Bakken, 2016). From a sociological point of view it has been speculated that these factors as a whole, indicate a negative societal development trend that is related to increased individualism and meritocracy, where emphasis on self-realization tends to cause pressure on individuals, with young women being more vulnerable to such pressures (Sletten & Bakken, 2016). However, this hypothesis has not been empirically tested.

2.4.1 School-related stress and psychological distress

An increase in school-related stress has shown the most promise in terms of being able to explain certain of the increasing trends in psychological distress, observed in countries with negative consequences (Sletten & Bakken, 2016; Sweeting et al., 2010). The suggested causal hypothesis is that increased school-related stress during

the formative years may account for part of the increase in psychological distress among young people. This has been attributed to the systematic association between psychological distress and school-related stress (Ottova-Jordan et al., 2015a; Wiklund et al., 2012) and the evidence that several countries with increasing psychological distress have also seen increasing demands in school and in perceived school-related stress (Klinger et al., 2015).

As young people move through the educational system, they may be subjected to greater academic demands and expectations. This exposure to academic demands facilitates learning and development but may also be a source of stress during school years. The “school-stress hypothesis” states that modern societies put such a high value on education that this in itself can create many modern stressors related to the academic performance of young people, through an increase in testing, demand and the associated emotional experiences of being evaluated (West & Sweeting, 2003). Should the school-stress hypothesis be true, it can affect psychological distress in two ways: (1) if school-related stress becomes more prevalent and the effect on psychological distress is stable, it will lead to more psychological distress, all else being equal. This is called the exposure pathway since it indicates increased exposure to academic stressors. (2) secondly, if school-related stress remains stable over time, it can still conceivably contribute to increased distress if individuals become more vulnerable to academic stressors. This is called the vulnerability pathway (Sweeting et al., 2010).

A recent study tested the school-stress hypothesis and found that in Sweden, a country where there is an unexplained increase in psychological distress among young people, an increase in school-related stress could explain a substantial part of the increase in psychological distress between 1993-2017, especially among young women, who have displayed the largest increase in psychological distress by comparison with young men (Högberg, Strandh, & Hagquist, 2020). This may suggest that there is both increased exposure to school-related stress in general, and increased vulnerability among young women in particular. Another large comparative study from European and North American countries, spanning over 15 years, also

found that increased school-related stress explains part of the increase in psychological distress between 2002 and 2018 (Cosma et al., 2020) but that the association is different between young men and young women and varies greatly by country. School-related stress is now emerging as a modern and novel risk factor for psychological distress among young people, and in particular, young women.

2.4.2 Increased willingness to disclose symptoms of psychological distress among young people

There is an ongoing discussion whether a long-term increase in the psychological distress of young people will reflect a greater willingness among recent cohorts of those young people to disclose their symptoms, or whether the increase actually represents a true increase in psychological distress (Collishaw, 2015). A greater willingness to disclose symptoms of psychological distress is hypothesized to be related to greater societal acceptance of psychological distress and less of a stigma relating to mental health, influencing a shift in individual thresholds for symptom reporting (Collishaw, 2015). It is unclear to what extent societal openness has contributed to an increased willingness to disclose symptoms of psychological distress but the possibility cannot be excluded (Bor et al., 2014; Collishaw, 2015).

However, it is seen as unlikely that a willingness to disclose symptoms is the main explanatory factor of increasing psychological distress among young people (Bor et al., 2014). There are several reasons to support the evidence that the trends of psychological distress do in fact reflect true changes in population prevalence. For example, there has not been a *general shift* in willingness to report symptoms over time: young men do not report more symptoms compared to young women; the increase is often found within specific symptoms of psychological distress, although not always, and trends differ across income groups (Bakken et al., 2016; Collishaw, 2015). There are also qualitative studies suggesting the opposite, that young people rather avoid disclosing symptoms of distress and that young women are not necessarily more willing than young men to report symptoms (MacLean, Sweeting, & Hunt, 2010). The most convincing evidence, however, comes from experimental evidence on mental health literacy training, to reduce the stigma of mental health

among young people; Jorm et al. (2020) conducted two randomized controlled trials, where participants received training to identify and recognize symptoms of psychological distress. The researchers concluded that the intervention did lead to a greater *willingness* to disclose symptoms but did not affect psychological distress scores. This provided a strong causal test that increased openness and reduced stigma around psychological distress, did not inflate psychological distress scores. Therefore willingness to disclose symptoms is unlikely to be the main cause of increased prevalence rates of psychological distress observed among young people (Jorm et al., 2020).

3. Overall aims of this thesis

Paper I

The main aim of this study was to systematically review the global evidence on temporal trends in self-reported, psychosomatic health complaints among 10-19-year-olds. The secondary aims were to investigate differences in temporal trends by gender, age, geographical region and time period.

Paper II

The main aim of this study was to examine the temporal trends of self-reported psychosomatic health complaints among 11-16-year-olds in Norway between 1994 and 2014. The secondary aims were to examine the differences between gender, age and time period, as well as their interactions, and to explore the dimensionality of health complaints.

Paper III

The main aim of this study was to investigate the relationship between youth primary healthcare service use and psychological distress, in times of increasing mental health problems and increased service need, among 13-19-year-olds in Norway between 2014 and 2018. The following research questions were addressed: (1) to what extent did psychological distress increase among young people between 2014 and 2018 and (2) to what extent is psychological distress associated with youth primary healthcare service use.

4. Methods

The present study falls within the broad tradition of social epidemiology, both methodologically and thematically. While epidemiology is the study of the distribution of health and illness in populations, social epidemiology is a branch of epidemiology concerned with the way in which social determinants influence states of health (Berkman, Kawachi, & Glymour, 2014). Social epidemiology draws on methodologies and theory from several other research disciplines, notably health psychology, an applied science related to understanding how psychological, behavioral and contextual factors contribute to health, health behaviors and illness. Social epidemiology assumes that the distribution of advantages and disadvantages in a society reflects the underlying distribution of health and illness. Based on this premise, social epidemiology examines how socio-structural factors, such as social class, gender, or social policies, affect the patterns of health and illness distribution within a society and studies its mechanisms (Berkman et al., 2014).

Due to the research focus on the health status of the population, social epidemiological research often relies on observational designs, such as cohort studies and cross-sectional studies. Both cohort studies and repeated cross-sectional studies, also known as longitudinal ecological studies, allow investigation into time trends and changes of population health indicators over time. While a cohort study follows individual change over time prospectively, repeated cross-sectional studies examine patterns of aggregate group-specific changes in the population retrospectively. Within epidemiology, observational studies, such as cohort and ecological studies, are particularly useful in determining patterns of disease and health distribution in a society, in terms of prevalence and incidence rates, and generate a hypothesis around its mechanisms, rather than demonstrating strict causality (Berkman et al., 2014; Honjo, 2004). In this thesis, repeated cross-sectional studies form the basis of the analyses examining the distribution of psychological distress and associated help-seeking behavior among the youth population.

4.1 Design, recruitment and analysis plan

To address the aims of the thesis, three steps were taken: firstly, a knowledge synthesis that summarized all available global evidence on the trends of psychosomatic health complaints among the general adolescent population between 1980 and 2016; secondly, a trend analysis of psychosomatic health complaints between 1994 and 2014, based on trend data from the general Norwegian adolescent population, drawn from the HBSC study; thirdly, a trend analysis of psychological distress and primary healthcare utilization among young people in Norway between 2014 and 2018, using data from the “Ungdata” study. Overall, the thesis covered the trends of psychological distress among young people from 1980 to 2018, measured by symptom checklists and primary healthcare utilization between 2014 and 2018.

4.1.1 Knowledge synthesis of psychosomatic health complaints (Paper I)

A knowledge synthesis summarizes existing research findings of individual studies within a larger body of evidence. A synthesis must be methodological, rigorous, reproducible and transparent. The most common form of knowledge synthesis is a systematic review, which has the hallmarks of being exhaustive and comprehensive in retrieving international evidence and synthesizing the results of a systematic search into evidence to inform practice and policy (Joanna Briggs Institute, 2014).

This thesis used the Joanna Briggs Institute framework to conduct a systematic review and meta-analysis of prevalence studies (Joanna Briggs Institute, 2014), in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009), with the intention of being exhaustive and transparent, when synthesizing the international evidence on temporal trends of psychosomatic health complaints among young people aged 10-19.

The first step was to develop and register a protocol that pre-defined the objectives and methods of the systematic review, prior to conducting the review. This protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO) in advance (registration #CRD42016048300). This step covered

concrete inclusion criteria: studies measuring psychosomatic health complaints in the general youth population aged 10-19 with a repeated cross-sectional design and measuring temporal trends exceeding a period of five years using similar instruments and sampling approaches, ensure that results over time are comparable.

In the second step, a systematic search strategy was developed. The primary databases used to search the literature were MEDLINE, Embase and PsycINFO. Search terms were as follows (including subject headings adapted to the specific database search algorithm): (health complaint* or psychosomatic or psychophysiology*) OR (subjective or self-reported/health or complaints) AND (adolescen* or youth or youths or kid or kids or preteen or teen* or child* or young or juvenile) AND (time or trend or trends or secular or temporal). Several complementary searches were performed to ensure search exhaustion.

Complementary searches were performed in the Web of Science and Google Scholar, SweMed+. In addition, a search of relevant articles, based on the reference list of included studies was performed. The systematic search was peer-reviewed by an independent search specialist (a university librarian) to ensure search quality and reduce the risk of selection and detection bias, as recommended by McGowan et al. (2016).

All identified studies were screened for relevance, based on the predefined inclusion and exclusion criteria, using two levels. At the first level of screening, studies were considered for inclusion, based on title and abstract. At the second level of screening, potentially relevant articles from level-one screening were assessed by reading the full text and assessing inclusion. Subsequently, the methodological quality of the included studies was assessed using the JBI "Checklist for Prevalence Studies" (Joanna Briggs Institute, 2014). Finally, included articles were synthesized and the data on relevant outcomes were extracted and presented in the form of a systematic review and meta-analysis. All stages of the inclusion process and quality assessment were carried out independently by two authors and any disagreements were resolved by discussion.

4.1.2 Health Behavior in School-aged Children study (Paper II)

The HBSC is a WHO collaborative cross-national study. This study has been conducted every four years since 1984 and uses a standardized self-report survey. Currently, 45 countries from Europe and North America participate. The overall aim of the study is to provide up-to-date information on the health, well-being, social environment and health behaviors of schoolchildren (11-, 13- and 15-year-olds) from participating countries (Jo Inchley et al., 2018).

The current thesis used nationally representative data from the Norwegian sample, collected during 1994, 1998, 2002, 2006, 2010 and 2014. To ensure a nationally representative sample, a randomized cluster probability sampling approach was carried out on all Norwegian school classes, with the aim of having 1500 respondents for each age group, thus, forming a sample of around 4500 per survey cycle. The recommended sample size was calculated, based on the expected design effect and to account for the effect of clustering (Inchley et al., 2018). In Paper II, a total sample of 27,476 students was used and 49% of these respondents were women (Table 1).

Table 1

Sample description of the HBSC study

	1994	1998	2002	2006	2010	2014	Total
Participating school classes	141	288	254	277	208	284	1452
Participating students	4,952	5,026	5,023	4,711	4,342	3,422	27,476
Response rate	82%	93%	88%	85%	81%	76%	84%

Surveys were carried out during school hours in the students' familiar classrooms. Questionnaires were answered with pen and paper. Parents were informed in advance

of the study and passive consent was obtained. All students were given the opportunity to decline participation and were informed that their participation was voluntary and anonymous. The main reason for non-response was reported to be absenteeism on the day of data collection (Inchley et al., 2018).

4.1.3 Ungdata study (Paper III)

The Ungdata study (“Youth-data”, in English) is a large, national survey conducted annually in Norway among students attending junior and upper secondary school (aged 13-19) since 2010. The study is carried out at municipal level by means of a standardized self-report survey. The aim of the study is to provide a comprehensive source of information on health and well-being among young people growing up in Norway, to be used in municipal planning. All Norwegian municipalities are recommended to facilitate data collection every three years (Frøyland, 2017). Only 14 out of 422 municipalities have never participated in the study. Norwegian municipal authorities choose when and how they participate in the study; the most common and recommended recruitment approach, is census sampling at school level. There are variations based on the municipal composition each year, however, previous research has shown that Ungdata is nationally representative, and is representative at municipal level, when analyzing a pooled sample over a period exceeding three years (Frøyland, 2017). In order to further increase the analytical precision of Ungdata, one should adjust for the complex structure of the data, in relation to the number of municipalities included and the number of years.

Data are collected by means of online questionnaires in schools during school hours. Ungdata collects data anonymously and the passive consent of parents is obtained. Parents and young people are informed in advance about the study and participation is voluntary.

The current thesis used all available data on youth primary healthcare utilization and psychological distress, producing five waves of data, with a total sample representing 368,579 Norwegian young people (50% women) from 2014 to 2018. The response rate was reported to be greater than 80% (Table 2).

Table 2*Sample description of the Ungdata study*

	2014	2015	2016	2017	2018	Total
Participating municipalities	86	121	138	174	124	416 ^a
Participating students	46,019	73,426	70,577	107,601	70,956	368,579
Response rate	>80%					

^a 416 out of 422 municipalities have participated at least once

4.2 Measurements

4.2.1 Health Behaviour in School-aged Children Symptom Checklist (HBSC-SCL)

The HBSC Symptom Checklist (HBSC-SCL) was designed as a non-clinical measure of psychological distress by measuring the frequency of psychological and somatic symptoms. HBSC-SCL measures eight symptoms: headache, abdominal pain, backache, feeling low, irritability or in a bad mood, feeling nervous, sleeping difficulties and dizziness. Adolescents were asked how often they had experienced these symptoms over the last six months. The five response categories were: “about every day”, “more than once a week”, “about every week”, “about every month” and “rarely or never”. Based on the working theoretical framework for this scale, it was assumed that greater symptom frequency indicated greater psychological distress (Inchley et al., 2018). Previous research supports the validity and reliability of the

scale as unidimensional (Garipey, McKinnon, Sentenac, & Elgar, 2016; Haugland & Wold, 2001; Haugland et al., 2001; Ravens-Sieberer et al., 2008). However, other research has indicated that the scale may consist of two correlated but distinctive factors: psychological symptoms (feeling low, irritability or in a bad mood, feeling nervous, sleeping difficulties) and somatic symptoms (headaches, abdominal pain, backache and dizziness (Dey, Jorm, & Mackinnon, 2015; Hetland, Torsheim, & Aarø, 2002). Although the psychological and somatic dimensions may differ qualitatively, this does not imply a dualistic understanding of the underlying causes (Inchley et al., 2018).

There is no clear threshold or “cut-off point” to differentiate “normal” levels of symptoms from intolerable conditions, however, research has shown that symptoms tend to cluster together and that the prevalence of multiple weekly symptoms is high among young people (Jo Inchley et al., 2018). Therefore, in the analysis of the current thesis, a mean score was calculated by adding the item scores ranging from 0 (“rarely or never”) to 4 (“about every day”) and dividing by the number of items in the dimension; higher scores represent more distress.

4.2.2 Hopkins Symptom Checklist (HSCL)

The short format of the HSCL was designed to be used in clinical and non-clinical samples as a measure of psychological distress, defined by psychological and somatic symptoms (Derogatis et al., 1974). The measure originally consisted of 90 items, however, the shorter format (5-25 items) has since been developed and has demonstrated its ability to perform almost as well as the original format (Strand, Dalgard, Tambs, & Rognerud, 2003). The six item scale measured the following: “felt that everything is a struggle”, “had sleep problems”, “felt unhappy, sad or depressed”, “felt hopelessness about the future”, “felt stiff or tense”, “worried too much about things”. Young people participating were asked if they had been affected by any of the symptoms during the past week. The six questions had four response options: “not been affected at all”, “not been affected much”, “been affected quite a lot” and “been affected a great deal”. A Rasch analysis of the psychometric properties of the six-item HSCL scale used in the current thesis, has shown that this

scale works reasonably well (Kleppang, Hartz, Thurston, & Hagquist, 2018). To capture more severe levels of psychological distress, mean scores were computed, ranging from 1 to 4, where higher scores indicated higher levels of distress. To capture more serious levels of psychological distress, mean scores were dichotomized based on higher levels of distress (threshold 3.0) in the current thesis. Previous studies have shown that young people scoring above this threshold were within the range of depressive disorders, commonly found in the youth samples of the Norwegian community (Sund, Larsson, & Wichstrøm, 2011; Wichstrøm, 1999).

4.2.3 Generic symptom checklists

For the systematic review, other generic symptom checklists measuring psychological and somatic symptoms, were considered for inclusion if they contained a combination of both psychological and somatic symptoms. These included Youth Self-Report (internalizing symptoms scale), Strength and Difficulties Questionnaire (emotional symptoms scale), the Psychosomatic Problems Scale and other similar “generic” symptoms scales.

4.2.4 Health service utilization

The utilization of the youth primary healthcare service was measured by the question “How many times have you used the following healthcare services over the past 12 months?” Young people could choose from the following services: “school nurse or doctor”; “youth health centers”; “family doctor”; “psychologist”; “out-of-hours primary healthcare service”. These services were meant to cover the most commonly used and the most accessible healthcare services, used by young people within primary care in Norway (Frøyland, 2017).

The response options which indicated how often the participant used each service were: “never”; “1-2 times”; “3-5 times”; “6 or more times”. For the purposes of analysis in this thesis, the response categories were averaged to represent interval midpoint estimates of service use (never = 0, 1-2 times = 1.5, 3-5 times = 4, 6 or more times = 6).

4.3 Data analysis

4.3.1 Meta-analysis

In the current thesis, a meta-analysis was performed to synthesize research findings from the systematic review on temporal trends of psychosomatic health complaints among adolescents between 1982 and 2013 (Paper I). The meta-analysis was conducted using Comprehensive Meta-Analysis software (Version 3) by Biostat.

Meta-analysis refers to the statistical synthesis of results from a series of single studies, in order to derive conclusions relating to the main body of evidence. The results will only be meaningful if the single studies have been collected systematically, often through a systematic review. The purpose of a meta-analysis is often to estimate the magnitude of an effect size more precisely than by any of the single studies on their own, or to identify factors associated with variations in the effect size across subgroups of studies (Borenstein, Hedges, Higgins, & Rothstein, 2009).

An odds-ratio (OR) with a 95% confidence interval (CI) was reported as a synthesized effect size of relative change in the prevalence of psychosomatic health complaints. All effect sizes from individual studies were transformed into an OR in the meta-analysis. Provided the continuous or binary measurements are considered to follow a similar underlying distribution (for example, as with depression), it is possible to re-express the outcomes as a common effect; in this case, an OR (Borenstein et al., 2009; Higgins & Green, 2011). When combining metrics, it is recommended to perform a sensitivity analysis to test the robustness of the results (Borenstein et al., 2009). To structure the conversion to a common metric, an individual effect of its native index was first computed for each study (log-OR for binary data and d for continuous data). Secondly, they were all converted to a common index, which was a log-OR. Finally, log-OR was exponentiated to the final OR (Borenstein et al., 2009).

Considerable heterogeneity was expected between studies, as effects are known to vary with age, gender, country and time. A random effects statistical model for

calculating means effects, is recommended when the true effects are expected to differ between studies (Borenstein et al., 2009). Heterogeneity was quantified using the I^2 statistic, indicating heterogeneity in percentages. Higher values indicate higher heterogeneity, with values of 0% indicating no heterogeneity, 50% indicating moderate heterogeneity and 75% indicating high heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003).

Several subgroup analyses were conducted based on gender, age, geographical region, time period and complaint type (psychological or somatic).

To be able to compare trends during specific time periods for studies that contained two or more time points, the first timepoint was compared to the second, the second to the third and so on, so as to be able to group the subgroup analysis in terms of historical time. This gave an effect of relative change in psychosomatic health complaints over time.

4.3.2 Complex survey data analysis

In Papers II and III, regression analysis with complex survey design-weights were used to increase precision and generalizability of all estimates, which is the best-practice approach, as suggested by Schnohr et al. (2015). The R statistical environment and the survey package were used.

Most surveys within the social sciences are not simple random samples of the population, but instead consist of respondents from a complex survey design. Within complex surveys, the population sampling is often stratified, based on some population characteristic, such as belonging to a certain school district, where school classes could be the primary sampling unit of interest (Lumley, 2011). A second feature of complex survey data is that it can account for differential respondent weighting and essentially reweight the sample respondents back to represent the population, by creating sample weights to increase the generalizability of the results (Lumley, 2011).

4.3.3 Time-trend analysis

In Papers II and III, time-trend analysis was used to assess temporal trends in psychological distress and primary healthcare utilization in Norway.

Repeated cross-sectional studies are the optimal design to study social change in societies (Firebaugh, 2010). Repeated cross-sectional studies stand out from cohort studies in that data are collected from different samples for each successive data collection, representing similar populations (over time), while cohort studies follow the same sample prospectively. Both repeated cross-sectional and cohort studies provide an opportunity to analyze changes over time, but the difference is that cohort studies examine changes at the individual level, while repeated cross-sectional studies consider changes at the aggregate population level. Repeated cross-sectional studies are designed for and are well suited to answer research questions regarding population changes over time, investigating the “moderating” effect of time on subgroups (for example based on gender difference) and whether trends are converging/diverging in certain subgroups of the population of interest (Firebaugh, 2010).

4.3.4 Confirmatory factor analysis (CFA)

Confirmatory factor analysis (CFA) is a form of factor analysis that is used to test whether the hypothesized structure of construct, such as psychological distress, is consistent with the current theory on the construct (Kline, 2015). In Paper II, the underlying factor structure of the HBSC-SCL was tested using CFA. A unidimensional psychosomatic factor model was compared to a model comprised of two correlated factors (psychological and somatic), in order to determine which model(s) best fit the data. When considering model fit, it is good practice to assess several goodness-of-fit indices (Kline, 2015). The following fit indices were reported, based on robust maximum likelihood estimators: model chi-square, Comparative Fit Index (CFI), the root mean square error of approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR). Values of chi-square $p > 0.05$, $CFI > 0.95$, $RMSEA < 0.05$ and $SRMR < 0.08$ indicate a good model fit (Kline, 2015).

4.4 Ethical considerations

Paper I was a systematic review and unlike primary research, the systematic review does not directly collect sensitive or personal information about participants, as systematic reviewers use publicly accessible documents. Therefore, systematic reviewers do not normally require specific ethical approval. Nonetheless, great care was taken to present the synthesis of research findings in an appropriate way to accurately represent the evidence relating to psychological distress symptoms.

Participation in the studies, as well as the use of HBSC and Ungdata in the present thesis was voluntary. Parents were given the opportunity to decline permission for their child's participation. Both studies were approved by the NSD - Norwegian Centre for Research Data.

There is no known conflict of interest or involvement from funding bodies in the development of this thesis. The authors are responsible for all analysis and interpretations made, based on the data used.

5. Results

In the current thesis, psychological distress was operationalized as a combination of psychological and somatic health symptoms, or health complaints. Psychological distress was measured by symptom checklists. In Paper I and Paper II, the term psychosomatic health complaints was used and sub-dimensions of psychological and somatic symptoms were explored. In Paper III, the term psychological distress was used.

In this thesis young people were defined as being 10-24-year-olds, in Papers I and II young people aged between 10 and 19 were referred to as adolescents. In Paper III, young people aged between 13 and 19 were referred to as young people.

5.1 Paper I: Temporal trends in adolescents' self-reported psychosomatic health complaints from 1980-2016: A systematic review and meta-analysis.

The main aim of this study was to systematically review the global evidence on temporal trends in psychosomatic health complaints in the general adolescent population (aged 10-19). The primary databases searched were MEDLINE, Embase and PsycINFO. Studies were included if they were of a repeated cross-sectional design and contained self-reported data from adolescents (aged 10-19 years). Inclusion and study quality were assessed by two independent reviewers.

The systematic search of the literature yielded 8,338 potentially relevant articles. Twenty-one studies met the inclusion criteria and were included in the study. In total, this study represents over seven million adolescent respondents from 36 countries, mainly in Europe and North America, covering the time period from 1982 to 2013. Overall, the results indicate a minor, increasing trend of psychosomatic health complaints in the general adolescent population. The increase is conditional to the time period between the 1980s and the 2000s, and is associated with the Northern European region, indicating that the increase of psychosomatic health complaints is not a global phenomenon but may primarily be attributed to changes over time in

Northern Europe. Other geographical regions on the other hand, experienced more stable trends. This indicates that adolescents in Northern Europe, who had low absolute prevalence of psychosomatic health complaints historically, are currently converging toward the higher prevalence rates of psychosomatic health complaints of other global regions. This makes the deteriorating psychological health of adolescents in Northern Europe a public health concern.

Due to the limitations of the data available, conclusions could not be drawn on possible gender and age differences. In addition, the studies included had sound methodological quality, but the conclusions relating to cause and effect could not be established, due to the limitations of the observational design of the studies. Thus, the evidence concerning trends of psychosomatic health complaints, observed between 1982 and 2013 is weak and must, therefore, be interpreted with caution.

Supporting information can be found in Appendix 1-4.

5.2 Paper II: Health complaints among adolescents in Norway: A twenty-year perspective on trends

The main aim of this study was to examine the temporal trends of psychosomatic health complaints in the general adolescent population (aged 11-16 years) in Norway between 1994 and 2014 ($n = 27,476$).

CFA indicated that a two-factor model, consisting of psychological and somatic health complaints better fit the data than a unidimensional model, consisting of psychosomatic health complaints. Psychological and somatic health complaints were therefore analyzed separately, with design-based linear regression analysis accounting for the complex survey design. The results showed that psychological and somatic health complaints both increased between 1994 and 2014, even though the types of health complaints follow different trajectories. In terms of psychological health complaints, there was a three-way interaction between age, gender and time, indicating that the psychological health complaints of older teenage girls have shown a greater increase over time, by comparison with boys and younger adolescent girls,

who displayed a divergent trend when compared with older teenage girls. Regarding somatic health complaints, older teenage girls also showed the greatest increase over time, but this difference was constant and did not diverge from the other groups over time.

5.3 Paper III: Trends in the utilization of youth primary healthcare services for psychological distress

The main aim of this study was to investigate the relationship between primary healthcare service use and psychological distress in times of increasing mental health problems and increased service need, among the general youth population in Norway (aged 13-19) between 2014 and 2018 ($n = 368,579$).

The results from the population-weighted and design-adjusted, generalized, log-linear regression showed that psychological distress among young people increased by five percentage points and primary healthcare service utilization increased by 300 consultations per 1000 young people, between 2014 and 2018. Psychological distress was associated with primary healthcare utilization, and young people with high levels of psychological distress used services twice as often as their peers with low levels of psychological distress. Psychological distress accounted for between 16 and 66% of the change in utilization between 2014 and 2018, depending on service type.

However, and rather unexpectedly, the absolute increase in primary healthcare utilization on the part of young people was mainly driven by those with low levels of psychological distress, as opposed to young people with high levels of distress. This suggests that primary healthcare utilization among young people with high and low levels of distress is converging, which might indicate overuse among less distressed young people and underuse among the more distressed.

6. Discussion

The discussion chapter begins with a summary of the main findings, followed by a discussion of the temporal trends of psychological distress, etiology, youth primary healthcare utilization, young men and psychological distress, dimensionality of psychological distress and finally, a section on the strengths and limitations of the thesis.

6.1 Summary of the main findings

Findings in the current thesis have indicated that there was a minor increase in psychological distress, measured by symptom checklists, between 1982 and 2013 among the general youth population, based on data from 36 countries, primarily in Europe and North America. Psychological distress increased between the 1980s and the 2000s and was stable between the 2000s and early 2010s. Subgroup analysis however, showed that an increasing trend of psychological distress could mostly be attributed to changes within the Northern European region, thus indicating that increases in psychological distress were mostly a Northern European phenomenon. In Norway, findings from this thesis suggested that psychological distress increased among the Norwegian youth between 1994 and 2014. Specifically, in terms of psychological symptoms, the increase was greatest among older teenage girls, by comparison to younger girls and boys. A continued increase in psychological distress was observed thereafter, between 2014 and 2018. In addition, primary healthcare utilization increased between 2014 and 2018.

Findings in this thesis further suggest that young people with high levels of psychological distress used primary healthcare services twice as often as the less distressed. However, the absolute increase observed in primary healthcare utilization was found to be driven mainly by young people with low levels of psychological distress, as opposed to young people with high levels of distress, a finding which is contrary to the assumed needs of the increasing proportion of distressed young people. This suggests that primary healthcare utilization is converging and may

indicate overuse among the less distressed youth and underuse among the more distressed.

6.2 Temporal trends of psychological distress

6.2.1 Global trends of psychological distress

In Paper I, the findings suggested a minor increase in psychological distress among the general youth population between 1982 and 2013 (Potrebny, Wiium, & Lundegård, 2017). This is supported by earlier reviews, indicating that in high income countries, mental health indicators among young people, including psychological distress, may have been worsening ever since the post-war era (Bor et al., 2014; Collishaw, 2015; Rutter & Smith, 1995). Although, the accumulating evidence of a global trend of increasing psychological distress appears to be compelling, there are several nuances to consider. Firstly, not all evidence is consistent. There is contrasting evidence from three meta-analyses indicating a rather stable trend of psychological distress in non-clinical populations between the 1970s and 2010s (Ottova-Jordan et al., 2015a; Twenge et al., 2010; Xin, Niu, & Chi, 2012). Secondly, a recent and large comparative study of 36 countries suggests that although psychological distress symptoms increased slightly between 2002 and 2018, there was no evidence of a global trend due to a great deal of heterogeneity between countries. The increase was mainly found in countries in Northern and Western Europe. The authors suggest that there are country-specific processes and mechanisms which affect mental health that need to be considered (Cosma et al., 2020). This supports our findings that an increasing trend of psychological distress may not be indicative of a global trend, per se, as increasing trends appear to be conditional to countries within Northern Europe between the 1980s and 2018 (Cosma et al., 2020; Potrebny et al., 2017), and perhaps Western Europe (Cosma et al., 2020).

6.2.2 Norwegian trends of psychological distress

In Paper I, a trend of increasing psychological distress among young people was primarily found to be a Northern European phenomenon. All countries studied within Northern Europe had a small, but unison increase of psychological distress between

the 1980s and 2013, when examining the single studies included in the systematic review. One comparative study highlights Norway as the country with the second largest increase in psychological distress among 15-year-olds, after Greenland, with an estimated increase from 22% in 1994 to 33% in 2010 (Ottova-Jordan et al., 2015b). Beyond 2010, the general trend among young people in Norway becomes more uncertain as descriptively the general trend within the population from the HBSC study becomes stable, while a continued increase is observed in the population studies in the Ungdata study (Potrebny et al., 2019; Potrebny et al., 2017). However, findings from Paper II indicated a complicated gender-effect, a three-way interaction between gender, age and time from 1994 to 2014, suggesting that trends of increasing psychological distress are predominantly found among older teenage girls and exponentially more so in recent cohorts of this subpopulation. Other epidemiological data provide further evidence of an increasing trend in psychological distress symptoms among young people in Norway between 1992 and 2018, especially among young women (Bakken, 2019; Knapstad et al., 2018; Norwegian Institute of Public Health, 2014; von Soest & Wichstrøm, 2014).

Data on mental illness, use of medication and healthcare utilization, are often used as contextual measures of population mental health. Examining the available data from Norway, there has been a parallel increase in the diagnosis of mental illness, prescription of antidepressant medication and use of primary healthcare services in the same period as psychological distress, which has also been more pronounced among young women (Bakken, 2019; Furu et al., 2018; Reneflot et al., 2018). Therefore, the contextual measures of population mental health seem to further support a trend of deteriorating psychological health among young women, as was found in this thesis.

Furthermore, a Norwegian grey paper summarizing the evidence on trends of psychological distress among young people in Norway, concluded that psychological distress has indeed increased between the 1990s and 2015 among young women (Sletten & Bakken, 2016). The authors argue that societal acceptance and the reduced

stigma of mental health problems cannot explain this increase, an assertion which has since been supported by experimental evidence (Jorm et al., 2020).

6.3 The etiology of emerging temporal trends of psychological distress

6.3.1 Gender and age divergence in recent cohorts of youth

It has previously been confirmed that the prevalence of psychological distress is more common among young women and older adolescents (Inchley et al., 2020). Although age and gender effects on psychological distress are established, developmental trajectories are often overlooked in research. In Paper I, the evidence of gender and age-specific trends was deemed inconclusive, as studies included in the systematic review did not consistently report age and gender differences. However, results from Paper II indicated that there were substantial age and gender differences, and an interaction effect between age, gender and time. This complicated gender effect suggests that older teenage women had an exponential-like pattern of increase in psychological distress over time.

Ross et al. (2017) identified an increase in the mean score of psychological distress among young women between 1991 and 2008, but not men, after adjusting for age. The authors argue that the small mean increase observed in young women might mask a greater polarization between the proportion of young women with low and high distress scores. This may suggest that a divergence between gender, age and high/low scores may potentially be masked in the systematic review findings and, therefore, potentially underestimate temporal trends in these subgroups of youth, leading to the inconclusive results found in Paper I. Therefore, the findings of Ross et al. (2017) may support the indications of a complicated gender effect in Norway, as much of the increasing trend of distress between 1994 and 2014 was accounted for by older teenage girls in particular, which may otherwise have been masked in a mean score.

6.3.2 Young women, stress and psychological distress

Several researchers have investigated different determinants in countries with increasing psychological distress. Isolating causes of *increasing* psychological distress has proved to be difficult, as the impact of known determinants have remained relatively constant, or small changes may have counteracted one another (Ottova-Jordan et al., 2015a). Based on the findings of this thesis we would argue that it is becoming more and more probable that a true causal factor of increasing distress would also be disproportionately associated with more distress among older teenage women in recent times, such as we found in Norway.

Based on current evidence, one of the most feasible causal hypotheses put forward is the “school-stress hypothesis”, which assumes that psychological distress can be explained by stress associated with educational stressors, such as increasingly greater academic demands, an increase in testing and its associated experiences of being evaluated (Sweeting et al., 2010; West & Sweeting, 2003). Furthermore, the accumulation of educational expectations seems to cause more distress among young women, since young women tend to value schoolwork more, experience more stressors and are more sensitive to stressors in school (Sweeting et al., 2010; West & Sweeting, 2003). There is now accumulating evidence of a stress-distress mechanism, operating between school-related stress and psychological distress. In line with a stress-distress framework, greater exposure to school-related stress among young people in recent generations, may feasibly have contributed to greater strain and consequently, contributed to increased psychological distress, disproportionately affecting older teenage girls. However, no known studies have explored school stress as a cause of increasing psychological distress in Norway. Therefore, it is not possible to directly infer findings from other countries in relation to increased distress among young people.

6.4 Youth primary healthcare utilization for psychological distress in Norway

6.4.1 Determinants of youth primary healthcare utilization

Primary healthcare utilization among young people is considered to be determined by predisposing (e.g., age and gender), enabling (e.g., availability and accessibility of services) and need factors (e.g., ill-health), according to the behavioral model of health service use (Andersen et al., 2011). In Paper 3, we found that predisposing (age and gender), enabling (family affluence and availability of services) and need factors (psychological distress) were all associated with greater primary healthcare utilization by young people in Norway.

6.4.2 Patterns of youth primary healthcare utilization for psychological distress

Based on the findings in Paper III, the utilization of primary healthcare by young people in Norway increased between 2014 and 2018. This increase ranged from 2%-6% annually, depending on service type. The statutory youth primary healthcare services, the school health service and youth health centers, experienced an estimated annual increase of 6% and 4% respectively, while the use of a psychologist increased by 5% and the use of family doctors and out-of-hours primary healthcare increased by 2%. The overall net increase in youth primary healthcare services was around 300 consultations more per 1000 young people in 2018, compared to 2014. Furthermore, a substantial part of the change in youth primary healthcare utilization over time, can be explained by psychological distress among the youth population, in line with earlier research (Tick et al., 2008b).

Although the rates of primary healthcare utilization are increasing, patterns of help-seeking behavior appear to be changing. In the period between 2014 and 2018, the prevalence of psychological distress increased by 5% in this same youth population. Even though the proportion of distressed youth increased in the population, help-seeking behavior for psychological distress developed in the opposite direction, as young people with psychological distress used primary healthcare services less over time, while young people with low levels of distress used services more. It has been

suggested that a lowered threshold for help-seeking may influence healthcare utilization among less distressed young people (Mykletun, Knudsen, & Mathiesen, 2009; Tick et al., 2008b). As the findings suggesting possible overuse among less distressed young people are rather unexpected, based on healthcare utilization theory, this is a topic that has seldomly been explored in research. Subsequently, it is therefore unknown to what extent this may represent a general phenomenon, as suggested by (Tick et al., 2008b). Other researchers, however, claim to have identified a cause of overuse, specific to the Norwegian youth. Bakken et al. (2017) suggest that a school-absence policy, introduced in Norway to reduce truancy is likely to have caused inflated healthcare utilization of family doctors by young people, not related to morbidity. The school-absence policy was meant to reduce truancy in upper secondary school, the main feature of which is that students with more than 10% undocumented absences in a particular subject forfeit their right to a graded semester assessment, unless absence is documented by a medical certificate, issued by a healthcare professional (The Norwegian Directorate for Education and Training, 2016). In line with Bakken et al. (2017) we argued that this might also have influenced overuse of healthcare utilization in other youth primary healthcare services. It therefore seems likely that the school-absence policy, introduced in Norway, may indirectly stimulate overuse of youth primary healthcare services (Bakken et al., 2017).

Furthermore, declining healthcare utilization among the growing proportion of psychological distressed young people in Norway is another concern. In line with the behavior model of health service use, this indicates that these young people may experience more unmet healthcare needs, the implication being that there might be serious barriers between the perceived need for care among young people and primary healthcare service access. This is particularly worrying as young people already show the worst healthcare utilization (Arvidsdotter et al., 2016) and only 20-40% of young people with mental health issues are detected by healthcare services (Sanci et al., 2010). At the moment, it is not clear whether declining, help-seeking behavior among the distressed in primary care may be due to increased help-seeking

elsewhere, such as from specialized care or informal sources or whether these needs remain unmet.

The converging utilization of youth primary healthcare services raises questions on the effectiveness of healthcare provision in Norway. The effectiveness of youth primary healthcare should be a research priority, to ensure that young people with psychological distress receive the care they need. Further investigation is also needed with regard to mechanisms related to under- and overuse of services. Based on healthcare utilization theory, when youth health services are effective, psychological distress and future mental illness can be reduced. Thus, youth primary healthcare can play a key role in promoting young people's health and preventing psychological distress, by identifying those with needs and providing them with services that meet their needs.

6.5 Young men, psychological distress and help-seeking

Although young men generally have less psychological distress symptoms, as supported by the findings of this thesis, young men perform poorly with regard to other indicators of mental health. It is well known that young men tend to have more externalizing symptoms, such as higher rates of conduct disorders, suicide rates and substance abuse (Rice, Purcell, & McGorry, 2018). Therefore, compared to young women, young men should be considered as having distinct health profiles that may not be captured by internalizing symptoms, such as psychological distress. In addition, there is evidence to suggest that young men disconnect from healthcare services. They also need to overcome pervasive attitudes and the stigma from society and peers, that make help-seeking a challenge (Möller-Leimkühler, 2002; Rice et al., 2018). Due to young men having a greater tendency to externalize symptoms, caution must be urged when making assumptions about the mental health status of young men, based solely on indicators of psychological distress.

6.6 Dimensionality of psychological distress

This thesis has explored the underlying dimensions of psychological distress symptoms, a psychological and a somatic dimension, and has found that for HBSC-SCL, two factors better fit the data than a unidimensional model (Potrebny et al., 2019). Psychological distress is usually thought to contain both psychological and somatic symptoms. However, there are some theoretical disagreements revolving around the high correlation between psychological and somatic symptoms, questioning whether the two factors constitute two distinct but correlated sub-dimensions (Dey et al., 2015; Garipey et al., 2016; Hetland et al., 2002), or whether the high correlation between the two factors suggest one underlying higher-order dimension (Haugland & Wold, 2001; Ravens-Sieberer et al., 2008). The current findings suggest that the psychological and somatic symptoms develop somewhat differently among young people over time. However, the findings in this thesis do not give any definitive answers around the dimensional structure of psychological distress symptoms and, subsequently, further research is recommended.

6.7 Strengths and limitations

One major strength of the present thesis is the use of both a systematic review, synthesizing all available studies and large repeated cross-sectional data, allowing investigation into social change and trends of psychological distress among a very large, combined sample of young people, over an extended period of time. One limitation of relying on observational studies is that the design does not allow strict causal inference. Alternatively, the thesis aimed to investigate the impact of population changes on psychological distress among the general youth population. When investigating social, economic or political changes in general populations, repeated cross-sectional design is well suited, as it allows for studying aggregate population changes (Firebaugh, 2010). Repeated cross-sectional studies (i.e., studying aggregate population changes) and panel studies (i.e., studying individual change over time) are both needed for a full understanding of social change, since panel surveys and repeated surveys are designed for different purposes (Firebaugh, 2010).

One possible limitation is reliance on self-reported studies from young people themselves, which focus on symptom ratings, rather than objective measures of health. In contrast, it may be argued that self-reports are an advantage since they reflect young people's own perspective of psychological well-being. Indeed, self-reported health outcomes are valuable in public health research and subjective measures of health have been shown to reliably predict future mental illness (Bor et al., 2014; van Geelen & Hagquist, 2016). Furthermore, the use of self-reports is appropriate when studying health in general populations using survey methods.

School is a suitable setting for conducting surveys on the youth population since the whole population is usually represented. One potential limitation, however, is that pupils who were absent on the day of data collection did not get a chance to participate. Previous research indicates that this may introduce a bias, because young people with high levels of psychological distress are more likely to be absent from school than young people with less distress (Bellini et al., 2013). This may lead to an underestimation of the true prevalence of psychological distress among the youth population and should, therefore, be considered when interpreting the current results.

The instruments used to assess psychological distress in this thesis are based on symptom checklists with a common theoretical stress, namely the distress framework. Individually the instruments are considered to be reliable and valid (Derogatis et al., 1974; Haugland & Wold, 2001; Haugland et al., 2001). Furthermore, there is further evidence supporting the convergent validity between the HBSC-SCL and KIDSCREEN-10 (Ravens-Sieberer et al., 2010), emotional problems and emotional well-being (Garipey et al., 2016) and between HSCL and the Mental Health Inventory (MHI-5) (Strand et al., 2003) indicating that there is a great deal of construct overlap between indicators of psychological health. In addition, the results from a sensitivity analysis in Paper I, showed only minor differences between various symptom checklists when standardized, which may provide further support for convergent validity. However, caution is urged when interpreting the overall findings of this thesis, as no known studies have directly compared the correlation between HBSC-SCL and the HSCL, therefore, the convergent validity of these symptom

checklists cannot be confirmed. This highlights the need for studies that utilize consistent methods and cover both the psychological and somatic aspects of psychological distress over time, which will further increase the validity of findings in relation to trends of psychological distress.

7. Implications for practice

Based on the findings of the thesis, two public health priorities relating to the mental health of young people have been identified: (1) emerging trends of increasing psychological distress in Northern Europe, (2) converging trends of youth primary healthcare utilization for psychological distress in Norway.

7.1 Emerging trends of increasing psychological distress in Northern Europe

Regarding the increasing trends of psychological distress in Northern Europe, further research should examine country-specific determinants of distress, as there are large variations in both prevalence and trends between countries. Based on the current findings, the increasing trend of psychological distress seen in Norway is greatest among older teenage girls and therefore, targeted interventions should be developed for 15-19-year-old women. However, prevention and health promotion efforts should start even sooner, during childhood, before psychological distress begins to manifest.

The school environment is particularly suitable for intervening in psychological distress, as young people spend a substantial amount of time in school. Earlier reviews on the effect of school-based interventions in relation to psychological distress present mixed findings on the effectiveness of such programs (Feiss et al., 2019; Kraag et al., 2006; Rew, Johnson, & Young, 2014). However, these reviews have several methodological limitations, such as the poor quality of included studies, as well as publication and selection biases (van Loon et al., 2020). To overcome the limitations of these reviews, a recent meta-analysis, covering 61 samples with a total of 16,475 young people, reanalyzed the current evidence of school-based interventions relating to psychological distress among young people. The findings of the meta-analysis suggest that school-based interventions had a moderate overall effect on psychological distress, although the interventions appear to be most beneficial for self-selected or screened samples (targeting young people with high levels of psychological distress) (van Loon et al., 2020). The authors also state that

school-based intervention programs may not only prevent psychological distress, but they are also likely to alleviate school-stress, which other researchers have highlighted as a potential cause of increasing psychological distress.

Based on the current evidence, targeted school-based interventions look promising in reducing psychological distress and may subsequently reduce school-related stress among young women. Thus, we recommend developing and feasibility testing school-based interventions, aimed at reducing psychological distress among young women in Norway.

7.2 Converging trends of youth primary healthcare utilization for psychological distress

The findings of the current thesis suggest that youth primary healthcare utilization converged between 2014 and 2018 in Norway, where young people with low levels of psychological distress used primary healthcare services more, while those with high levels of psychological distress used primary healthcare less over time. The absolute increase in youth primary healthcare services masks this convergence, when solely investigating health service use among the general youth population, without considering need factors. The implications of the converging trend indicate unintended “misuse” of youth primary healthcare services, caused by unknown mechanisms. Help-seeking behavior among young people appears to be increasingly misaligned with policy intentions in two concerning ways: the first concern is that young people with psychological distress may progressively be experiencing greater unmet healthcare needs; the second concern is increased primary healthcare utilization among young people with low levels of distress, who have a perceived need for care. This makes interventions promoting a proportionate and equitable use of healthcare, based on perceived need, important for future research. One feasible strategy is to improve health literacy among young people. Interventions to improve youth mental health literacy has been shown to be effective for symptom recognition, without affecting symptom scores of psychological distress (Jorm et al., 2020). In addition, other authors have argued that a public policy to reduce truancy in school

has caused inflated utilization rates of youth primary healthcare in addition to an increased use of medication, without increased morbidity (Bakken et al., 2017). This assertion appears to be supported by the findings of the current thesis. It may, therefore, be the case that the school-absence policy in Norway is doing more harm than good from a public health point of view. In future research, we recommend that the changes in the school-absence policy and its effect on the help-seeking behavior of young people should be evaluated.

Furthermore, youth primary healthcare services are part of the public health effort in preventing psychological distress, therefore, when the proportion of youth with psychological distress continues to increase over time, questions arise in relation to the efficiency of healthcare for young people. The Norwegian healthcare model has been highlighted as providing a good standard of care for young people in general (Baltag & Levi, 2013). However, there is no available evidence in relation to the effectiveness of youth primary healthcare in Norway. A comparative study from countries in Europe suggests that over 12.5% of young people needed mental healthcare, based on school screenings, and less than one third accepted professional help (Wasserman et al., 2010). This indicates that a lack of prevention of psychological distress due to poor detection, and misaligned help-seeking behavior among young people, is an area that warrants further research. The provision of low-threshold and accessible youth primary healthcare services, such as those in place in Norway, have the *potential* to ensure equitable youth primary healthcare, proportionate to those with the greatest need. However, based on the findings of the thesis, youth healthcare delivery in Norway should be evaluated in relation to its effectiveness in preventing psychological distress, as well as mapping potential barriers to care.

8. Conclusions

The present thesis indicates that psychological distress, measured by self-reported symptom checklists, among over seven million young people from 36 different countries in Europe and North America, appeared to remain stable in large parts of Europe and North America between 1980 and 2013. In absolute terms, the health of young people in Northern Europe is considered to be good. However, Northern Europe stood out in terms of having an increasing trend of psychological distress among the general youth population, suggesting that this trend among young people is primarily a Northern European phenomenon. Within the Northern European region, comparative research highlights Norway as one of the countries with the greatest increasing trend of psychological distress in recent times.

Findings of the current thesis indicate that psychological distress among the Norwegian youth appears to have been systematically increasing between 1994 and 2018, especially among older teenage girls. Since psychological distress and youth primary healthcare utilization both appear to be increasing among young people in Norway, and since psychological distress is associated with primary healthcare utilization, one would expect that part of the increase could be explained by a growing population of psychological distressed youth. However, this does not appear to be the case, as the absolute increase seen in youth primary healthcare utilization occurs mostly among the less distressed. This raises questions around the expected need for healthcare and actual healthcare utilization, on the pathways from distress to care and the effectiveness of youth primary healthcare, that warrant further attention.

School-based interventions tailored to reduce psychological distress symptoms or psychosomatic health complaints should be tailored to address the needs of older teenage girls, who tend to be more distressed. Intervention strategies should also be developed to improve health literacy among young people to enable them to identify and seek help for psychological distress.

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9. Papers I – III



RESEARCH ARTICLE

Temporal trends in adolescents' self-reported psychosomatic health complaints from 1980-2016: A systematic review and meta-analysis

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Abstract

Objective

There is increasing concern that mental health may be deteriorating in recent generations of adolescents. It is unclear whether this is the case for self-reported psychosomatic health complaints (PSHC).

Method

We conducted a systematic review and meta-analysis of published primary studies on PSHC in the general adolescent population over time. The primary databases were MEDLINE, Embase and PsycINFO, which were searched from inception to November 2016. Studies were included if they involved an observational design, presented self-reported data from participants aged 10–19 years and included data from at least two time points, five years apart. Inclusion and study quality were assessed by two independent reviewers.

Results

Twenty-one studies were included; 18 reported trends on the prevalence of PSHC in a single country, while three studies reported on multiple countries. In total, over seven million adolescents from 36 countries in Europe, North America, Israel and New Zealand were represented, covering the period 1982–2013. In the descriptive analysis, 10 studies indicated a trend of increasing PSHC, eight showed a stable trend and three showed a decreasing trend at certain points in time. The results from the meta-analysis showed a mean odds ratio (OR) of 1.04 ($K = 139$, 95% CI 1.01–1.08) for PSHC from 1982 to 2013, thus indicating a minor increase in general. In the subgroup analysis, this minor increase was observed mainly between the 1980s and 2000s, while the trend appeared to be more stable between the 2000s and 2010s. Some differences were also found between multinational subregions. Findings from subgroup analysis, however, only supported a significant increasing trend in Northern Europe.

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Conclusion

There may have been a minor increasing trend in adolescent self-rated PSHC between the 1980 and 2000s, but has become more stable since the 2010s, from a multinational perspective. Northern Europe was the only region to show a clearly significant minor increasing trend, without being the region with the highest total prevalence of PSHC at the present time. The discrepant trends regarding PSHC between regions and the reliance on self-reported data may reflect true changes in the occurrence of PSHC in the adolescent population. However, they may also reflect changes in how adolescents perceive and report health complaints.

Other

PROSPERO registration 2016: CRD42016048300.

Introduction

In recent years, there has been a growing focus on adolescent mental health and well-being in developed countries, with mental health problems now considered to be one of the greatest disease burdens among adolescents, according to the World Health Organization (WHO) [1]. In light of this, there has been increasing concern that adolescent mental health may be deteriorating and that today's general adolescent population is more at risk from mental health problems than previous generations. The potential increasing risk of mental health problems is problematic as these health problems are universally recognized as having a detrimental impact on adolescents' well-being, development, academic performance and social capital [2].

Rutter and Smith [3] conducted a comprehensive review on the time trends of psychosocial disorders in young people, showing clear evidence of a substantial increase of psychosocial disorders, including depressive disorders, in developed countries from the 1950s to the 1990s. A systematic review of mental health problems in the general adolescent population from 1983 to 2010 by Bor and colleagues [4] concluded that, while externalizing problems (such as rule-breaking behaviour, drug use and ADHD) appear to be stable, internalizing problems (mental health complaints and symptoms) may be increasing, especially among girls. Further support for the suggested increase in mental health complaints among adolescents between the 1950 and 2010s can be found in several meta-analyses. Twenge and colleagues [5] identified a large generational increase in psychopathological symptoms, including depression, in the course of a meta-analysis among general populations of young people in the US between 1937 and 2007. Xin and colleagues [6] showed that Chinese adolescents' mental health deteriorated across birth cohorts from 1992 to 2005, reflected in increased scores on the negative indicators of mental health (e.g., mental health problems, anxiety and depression). There is now accumulating evidence that there may have been a real secular increase in adolescent symptom prevalence, although not all the evidence is consistent. This apparent increasing trend in mental health complaints is nuanced by three meta-analyses [7–9], which show a rather stable trend of adolescent mental health complaints and depressive symptoms internationally in non-clinical populations between the 1970s and 2010s.

Mental health complaints have also shown to commonly co-occur and highly correlate with somatic health complaints (recurring pains and aches) in adolescent population studies [10–13]. Therefore, the combination of mental health complaints and somatic health complaints

are often considered to be unidimensional based on empirical- and theoretical grounds [12, 14–17]. At present, there is increasing evidence that somatic health complaints in combination with mental health complaints are important components of mental disorders [18, 19]. Parallel to the development of mental health complaints, there are also clear indications that trends in musculoskeletal pains, or other somatic complaints, among adolescents have been on the increase since the early 1970s to the present decade in Europe [20–22]. Dey and colleagues [13] also found that while levels of mental health complaints showed only minor changes over time, somatic complaints increased monotonically between 1994–2006 in Switzerland.

Indications of increasing mental and somatic health complaints create further concern about deteriorating adolescent mental health problems in more recent birth cohorts, with a fear that there may still be an increasing trend in deteriorating psychological and somatic health at present, compared to the post-war era. Consequently, adolescent mental health problems are now commonly viewed as a pressing global public health issue [2, 19]. Therefore, nowadays, it is of primary importance to identify whether the burden of mental health problems, in combination with somatic complaints, among adolescents is still increasing and, if so, to what extent this affects adolescent health and well-being [4, 23].

The aim of this study is to systematically review the published literature and contribute to the understanding of temporal changes in adolescent self-reported psychosomatic health complaints (PSHC) by investigating differences between birth cohorts in the general adolescent population. Empirically and theoretically, PSHC are regarded as a combination of psychological- (also referred to as mental health complaints) and somatic complaints (reoccurring pains and aches), without a known pathology and without any underlying presumptions about aetiology [12, 19], even though reoccurring complaints are recognized as important indicators of mental disorders [19]. Low levels of PSHC are also considered as good indicators of adolescent psychosocial health and well-being [24].

Method

This review was structured in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [25], using the Joanna Briggs Institute (JBI) reviewers' manual for prevalence and incidence data [26]. A study protocol was published in the International Prospective Register of Systematic Reviews (PROSPERO) in advance of the study (registration #CRD42016048300). The quality assessment for the evidence was evaluated in line with the JBI critical appraisal tool, Checklist for Prevalence Studies [26].

Inclusion and exclusion criteria

To explore the time trends of self-reported PSHC among adolescent populations, primary studies utilizing a: (1) repeated cross-sectional design/time series (2) within the same geographical area and (3) with similar sampling approaches, which (4) measured a time frame for change over at least two time periods of five years or more, were included in the review. Studies focusing on the general adolescent population and its everyday functioning and well-being meet the inclusion criteria, while studies only measuring psychopathology, suicide incidence and externalizing problems, or solely focusing on "at-risk" adolescent samples were therefore excluded. The adolescent population covered should ideally be nationally representative, either from a national, community or school sample, and recruited using a random sampling methodology. Studies should cover at least parts of the adolescence age range (10–19 years, based on the WHO's definition of adolescents) and use a broad operationalization of psychosomatic health complaints, i.e., measures of both psychological and somatic complaints and their respective occurrence. In addition, as studies must focus on adolescents' subjective assessment

of their own health using self-reports, measures relying on only parent or teacher reports of adolescent health were excluded in our case. This review was limited to peer-reviewed articles published in English, Norwegian, Swedish or Danish.

Search strategy

An extensive search for published literature without any historical time or other restrictions was conducted during November 2016. The primary databases searched were MEDLINE, Embase and PsycINFO. The levels of search words used in MEDLINE, in addition to all the relevant subject headings, were as follows: (health complaint* or psychosomatic or psychophysiol*) OR (subjective or self-reported/ health or complaints) AND (adolescen* or youth or youths or kid or kids or preteen or teen* or child* or young or juvenile) AND (time or trend or trends or secular or temporal). Several complementary searches were performed to insure a sufficiently broad search strategy using an adjusted syntax. These databases were the Web of Science and Google Scholar; for Scandinavian literature, we used SweMed+ and the Norwegian source Helsebiblioteket. A search of the reference list of included studies was also performed. The systematic searches were peer-reviewed by an independent university librarian to ensure the search quality and reduce the risk of selection and detection bias, as recommended by McGowan and colleagues [27], using the PRESS methodology (Appendix 1). The complete search strategy for all the databases is included in Appendix 2.

All identified articles were considered for their relevance to the review, based on the inclusion and exclusion criteria. All the potential articles were read and screened before relevant articles were selected and retrieved. As a first step, relevant articles were considered on the basis of their title and abstract. In a second step, the full text versions of selected papers were examined. All stages of the inclusion process were performed independently by Thomas Potrebny (TP) and Margrethe Moss-Iversen Lundegård (MMIL) using the Rayyan review tool [28]. Agreement was made by discussion between the two authors, based on the inclusion criteria, with regard to final inclusion. Articles meeting the inclusion criteria were then summarized by country, survey, study duration, age groups, measure instrument/scale, and relevant key findings.

Quality assessment

The assessment of the methodological quality of included primary studies was performed using JBI's recommended critical appraisal tool, Checklist for Prevalence Studies [26] (Table 1). The appraisal was performed independently by TP and MMIL. Any differences in classification and scoring were discussed until agreement was made and then summarized in the final appraisal. The final quality appraisal can be found in Appendix 3. The assessment was at the study level where possible. If a study contained multiple outcomes only the relevant measure of PSHC was appraised. The quality assessment was used to appraise the overall methodological quality of a

Table 1. Critical appraisal checklist.

Was the sample frame appropriate to address the target population?
Were study participants sampled in an appropriate way?
Was the sample size adequate?
Were the study subjects and the setting described in detail?
Was the data analysis conducted with sufficient coverage of the identified sample?
Were valid methods used for the identification of the condition?
Was the condition measured in a standard, reliable way for all participants?
Was there appropriate statistical analysis?
Was the response rate adequate, and if not, was the low response rate managed appropriately?
https://doi.org/10.1371/journal.pone.0188374.t001

primary study and determine the extent to which a study had addressed the possibility of bias in its design, conduct and analysis. If the overall study quality was considered to be low (based on an overall assessment), studies were then excluded from the meta-analysis.

Meta-analytic approach

The meta-analysis was conducted using the Comprehensive Meta-Analysis (version 3) software, as developed by Biostat. An OR with a 95% CI was reported as an overall synthesized measure of effect size, representing a ratio of prevalence of PSHC among adolescent populations between two different points in time. Only studies reporting effect sizes that could be converted into an OR were included in the meta-analysis. This included studies that reported either (1) the mean scores of a continuous variable with standard deviation/standard error or (2) the outcome as a binary/dichotomized variable with rates or counts, combined with sample size. While studies that provide correlational data can also be included in a meta-analysis, this option was not applicable for this review. As long as the underlying continuous or binary measurements are considered to follow a similar logistic distribution (for example, as with depression), it is possible to re-express the outcomes as a common effect; in this case, OR [29, 30]. Even if these assumptions do not hold exactly, Borenstein and colleagues [30] advise against simply omitting certain studies, as this would involve loss of information and possibly a *systematic loss* of information, which could result in a biased sample of studies. Upon making these decisions, performing a sensitivity analysis is recommended [30]. To facilitate conversion to a common metric, each study was first computed to an individual effect size and variance of its native index (log OR for binary data and d for continuous data). Second, they were all converted to a common index, which was a log OR. Finally, using the exponential function, transformation to the final OR was performed and presented [30].

As considerable heterogeneity was expected between studies, pooled mean effect size was calculated using the random effects model. Random effects models are recommended when accumulating data from a series of studies where the effect size is assumed to vary from one study to the next, and where it is unlikely that studies are functionally equivalent [30]. The Q^{within} statistic was used to assess the heterogeneity of studies. A significant Q^{within} value rejects the null hypothesis of homogeneity. An I^2 statistic was computed as an indicator of heterogeneity in percentages. Increasing values show increasing heterogeneity, with values of 0% indicating no heterogeneity, 50% indicating moderate heterogeneity, and 75% indicating high heterogeneity [31].

Subgroups of gender and complaint type (psychological and somatic) were grouped together where applicable for the main analysis. Several additional subgroup analyses were planned by gender, age group, complaint type, country/region and historical time point, where possible. As we hypothesized that differences in macro-level determinants of health between regions, such as social, political and cultural influences, could influence PSHC and contribute to different trends, the study samples were divided into global subregions. Samples from the European continent were pragmatically divided into groups based on EuroVoc, the official thesaurus of Europe [32]. Greenland was added to Northern Europe due to its close political and historical history with Europe. This resulted in a subset of Northern, Eastern, Southern and Western Europe. Definitions of European subregions are illustrated in Fig 1. Samples from North America were also grouped, while the remaining samples from New Zealand and Israel were grouped as "other subregions".

Studies that measured PSHC at more than two time points were grouped in order to compare trends during specific time periods. To make all the studies comparable, and to include all available information about the time trends, the prevalence of PSHC at the first measured

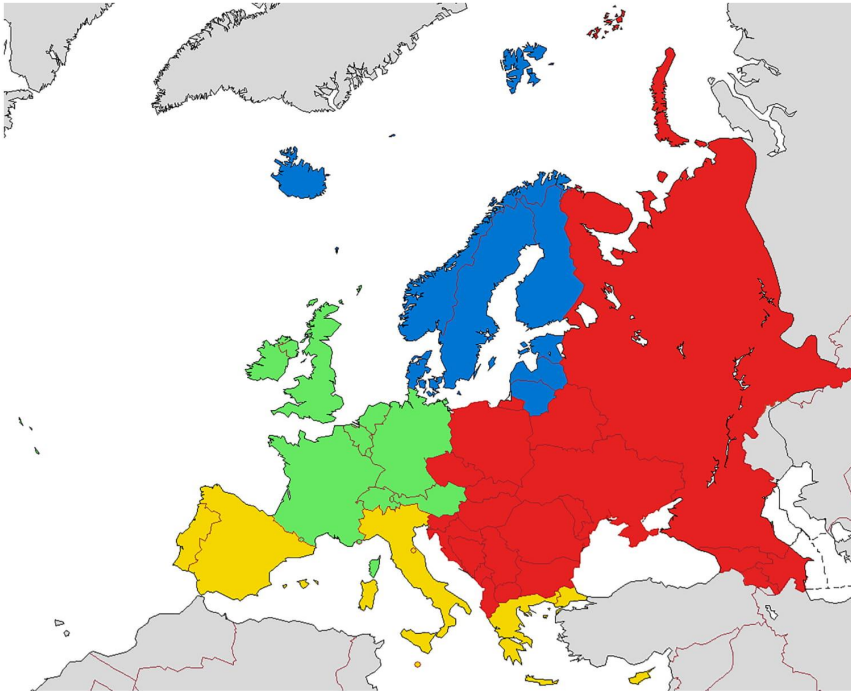


Fig 1. European subregions defined by EuroVoc. Blue—Northern Europe, green—Western Europe, red—Eastern Europe, yellow—Southern Europe, grey—territories not considered part of Europe. By Samotny Wędrowiec, 2014, via Wikimedia Commons. Used under Creative Commons Attribution-ShareAlike 3.0.

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time point was compared to the second, then the second to the third, and so on. This gave an OR that estimated the *relative change* in trends in the prevalence of PSHC within the data for the main meta-analysis.

Results

Descriptive findings

The formal systematic search of the literature yielded 8,338 potentially relevant articles, while complementary searches yielded only seven articles. After duplicates were removed, 7,771 remained for screening. Upon reviewing the title and abstract, 85 articles were considered to be potentially relevant and their full text was assessed for eligibility. Sixty-four out of the 85

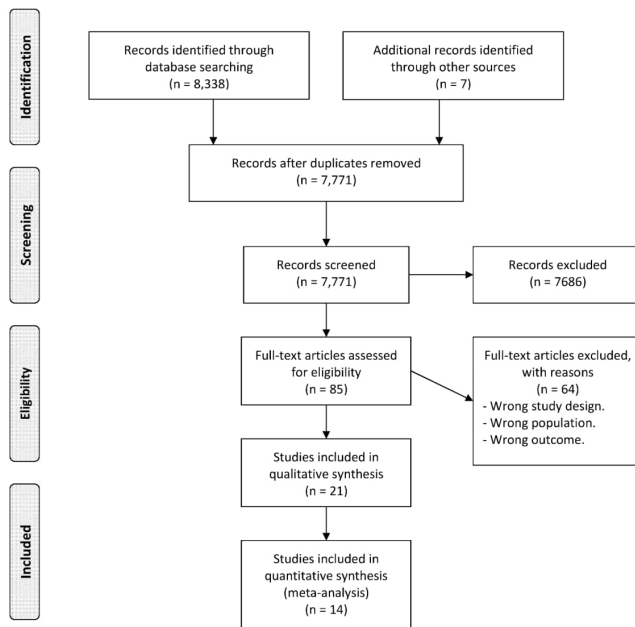


Fig 2. Flow diagram for the study selection process.

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articles were excluded due to (exclusively or in combination) wrong study design, outcome or population. Thus, 21 articles met the inclusion criteria and were included in the final qualitative synthesis. For the meta-analysis, 14 studies provided the necessary outcome needed to be included in the analysis (Fig 2). While all samples within the studies were independent of each other, there was some overlap in the data set between studies within the “HBSC” survey and the “Young in Värmland” survey. Thus, in the meta-analysis, only one measure for each independent sample was used. The sample with the most consistent outcome was included, while the remaining studies were excluded.

Out of the 21 included studies, 18 studies reported on trends in the prevalence of PSHC in the general adolescent population over a period of at least five years in *single countries* [13, 19, 33–48], while three reported on *multiple countries* [8, 24, 49]. Out of the three studies that examined trends in multiple countries, one reported data from five Nordic countries [49], while two reported comprehensive international summaries of the HBSC survey that included data from 35 countries across Europe, North America and Israel [8, 24]. Overall, 36 countries,

mainly in Europe, as well as the USA, Canada, Israel and New Zealand, covering the time period 1982–2013 and representing a sample of over seven million children and adolescents and their experiences of health, were included in the current review (Table 2).

Risk of bias assessment

Overall, the risk of bias was considered to be low for the included studies, with the exception of Henriksen's study [41], which had a lower, albeit adequate, level of methodological quality. All studies were observational and had a repeated cross-sectional design, which is common in the field. Most studies utilized a random sampling method, had a large sample size (of at least 900 adolescents) and were nationally representative. In general, the external validity was therefore considered to be high, but there was a skewness of studies focusing exclusively on age 15, thereby reducing the generalizability to other adolescent age groups. The outcomes, which were typically assessed by questionnaires completed by the adolescents, consisted of a measure of PSHC that reflected both psychological and somatic health complaints and was assessed using the validated scales: Youth Self-Report (internalizing symptoms scale), HBSC Symptom Checklist, Strength and Difficulties Questionnaire (emotional symptoms scale), Psychosomatic Problems Scale and other similar non-validated "generic" PSHC scales. The full quality appraisal with comments can be found in Appendix 3.

Meta-analysis

Overall results, including by decade. Of the 21 included studies, 10 indicated a trend of increasing PSHC, eight showed a stable trend and three showed a decreasing trend over time at certain points in time between 1982 and 2013. In the meta-analysis, a synthesis of 139 independent samples with measurements at two time points between 1982 and 2013 provided an overall OR estimate of 1.04 (95% CI 1.01–1.08). High levels of heterogeneity were established for the effect sizes included in this overall estimate ($Q^{\text{within}} 1156.15$, $p < 0.01$, $I^2 = 88.06$) (Table 3). Due to the hypothesized difference in effect between the historical time points reported in previous studies, a subgroup analysis was performed for the different decades in an attempt to explain some of the high heterogeneity in the main analysis. The analysis showed that differences in PSHC trends between decades were significant ($Q^{\text{between}} 13.80$, $df = 2$, $p < 0.00$), when comparing studies carried out between the 1980s and 1990s ($K = 8$, OR 1.39, 95% CI 1.17–1.66) to studies carried out between the 1990s and 2000s ($K = 57$, OR 1.05, 95% CI 1.01–1.10) and studies carried out between the 2000s and 2010s ($K = 74$, OR 1.01, 95% CI 0.97–1.05) (Fig 3 and Table 3). The findings indicate possibly different trends in PSHC for the different decades. The subset of studies carried out between the 1980s and 1990s had a significantly higher OR than the two following decades. From the 1980s until the 2000s, there appears to have been an overall increasing trend at a multinational level, while the trend between the 2000s and 2010s appears to be more stable. Achenbach and colleagues [33], whose findings were not included in the meta-analysis due to not presenting comparable scale scores, also reported a small, but non-significant, increase among US adolescents from 1989 to 1999.

Multinational subregions

Based on hypothesized differences between countries and subregions, and on the noticeable differences in trends of adolescent PSHC between countries and subregions in findings from descriptive analyses, a subgroup analysis was performed on studies from different multinational subregions. From the analysis, differences in PSHC across subregions were significant ($Q^{\text{between}} 13.83$, $df = 5$, $p < 0.02$) when comparing studies from Eastern Europe ($K = 26$, OR 1.00, 95% CI 0.93–1.07), North America ($K = 13$, OR 0.98, 95% CI 0.91–1.07), Northern

Table 2. Summary of studies included in the review.

Lead author	Country (Survey)	Study duration (years)	Age group (years)	N	Outcome measure/scale	Mean score ^a /Categorical	Trend type ^b	Included in Meta-analysis	Relevant key findings & sampling procedure
Achenbach (2002) [33].	USA (Other)	1989, 1999	11–18	2.737	YSR (internalizing symptoms scale).	M	S	No	<ul style="list-style-type: none"> • No trend of significant change was observed in PSC, and no differences between genders or age, over time. • Mean levels of complaints were reported to be high. • Indicates that complaints may be higher than in other comparative cultures. • - Stratified random sampling procedure (based on 48 states).
Bertsson (2001) [49] & Bertsson (2014) [34].	Nordic countries (NordChild)	1984, 1996, 2001	2–17	21.997	Generic PSC scale.	> 1 complaint every/other week.	I	Yes	<ul style="list-style-type: none"> • An increasing trend of PSC over time. • Higher prevalence among girls than boys. • Children (age 2–6) have lower PSC than adolescents (Age 7–12 and 13–17). • No significant difference between early- and late adolescent age groups. • Stratified random sampling procedure (based on age and gender).
Braverman (2016) [35].	Norway (HBSC)	1994, 1998, 2002, 2006, 2010	15	7.761	HBSC-SCL.	M	I	Yes	<ul style="list-style-type: none"> • An increase trend of PSC over time. • Higher prevalence among girls than boys. • Cluster random sampling procedure (based on school or class).
Dey (2015) [13].	Switzerland (HBSC)	1994, 1998, 2002, 2006	11–15	33.625	HBSC-SCL.	M	S	Yes	<ul style="list-style-type: none"> • A trend of fewer 'psychological' complaints, while there was an increasing trend of 'somatic' complaints. • Different trajectories for the psychological and somatic health complaints. • Higher prevalence of complaints among girls and older adolescents. • Cluster random sampling procedure (based on school or class).
Due (2003) [36].	Denmark (HBSC)	1988, 1991, 1994, 1998	11–15	12.782	HBSC-SCL.	> 4 complaints/week	S	No	<ul style="list-style-type: none"> • No consistent change in trends of PHC. • Cluster random sampling procedure (based on school or class).

(Continued)

Table 2. (Continued)

Lead author	Country (Survey)	Study duration (years)	Age group (years)	N	Outcome measure/scale	Mean score ^a /Categorical	Trend type ^b	Included in Meta-analysis	Relevant key findings & sampling procedure
Duinhof (2014) [37].	Netherlands (HBSC/DSSNU)	2003, 2005, 2007, 2009, 2013	11–16	29.352	SDQ (emotional symptoms scale).	M	S	Yes	<ul style="list-style-type: none"> • No change in the trend of PHC was observed. • Boys have a significant but negligible (according to the authors) different trend of PHC over time than girls. • Higher prevalence among girls than boys, also negligible. • Cluster random sampling procedure (based on school or class).
Fink (2015) [38].	England (Other)	2009, 2014	11–13	3.366	SDQ (emotional symptoms scale)	M	I	Yes	<ul style="list-style-type: none"> • A trend of increasing PHC over time. • Different trend between girls and boys. • Higher prevalence among girls than boys. • Non-probability sampling procedure (based on 200 schools).
Fleming (2014) [39].	New Zealand (NAHS)	2007, 2012	13–18	17.607	SDQ (emotional symptoms scale)	> 7 subscale score	I	Yes	<ul style="list-style-type: none"> • A trend of increasing PHC over time. • Higher prevalence among girls than boys. • Cluster random sampling procedure (based on schools).
Hagquist (2009) [40], Norell-Clarke (2016) [45] & van Geelen (2016) [19].	Sweden (Young in Värmland)	1988, 1991, 1995, 1998, 2002, 2005, 2008, 2011	15–16	20.115	PSP	M and > 90 th percentile	I	Yes	<ul style="list-style-type: none"> • A trend of increasing PHC over time. • Different trend between girls and boys. • Higher prevalence among girls than boys. • Total population sample procedure (Based on all 15–16 year olds in the county).
Henriksen (2012) [41].	Denmark (Other)	1996, 2010	6–16	949	YSR (internalizing symptoms scale)	M	I	Yes	<ul style="list-style-type: none"> • A trend of increasing PHC over time. • Boys have a larger increase of PHC over time than girls. • Higher prevalence among girls than boys. • Non-probability sampling procedure (based on two schools).

(Continued)

Table 2. (Continued)

Lead author	Country (Survey)	Study duration (years)	Age group (years)	N	Outcome measure/scale	Mean score ^a /Categorical	Trend type ^b	Included in Meta-analysis	Relevant key findings & sampling procedure
Levin (2009) [42].	Scotland (HBSC)	1994, 1998, 2002, 2006	11–15	19,393	HBSC-SCL	> 2 complaints/week	D	No	<ul style="list-style-type: none"> • Decreasing trend of PHC over time. • Increasing trend of mental well-being. • Indications of increasing socioeconomic inequalities in health and well-being. • Higher prevalence of PHC among girls than boys. • Cluster random sampling procedure (based on school or class).
Levin (2015) [43].	Scotland (HBSC)	1998, 2002, 2006, 2010	11–15	18,470	HBSC-SCL	Never-daily	D	No	<ul style="list-style-type: none"> • A Likely decreasing trend of PHC over time. • Cluster random sampling procedure (based on school or class).
Maughan (2012) [44].	UK (UK national studies by ONS)	1999, 2004	5–15	18,415	SDQ (emotional symptoms scale)	M	D	Yes	<ul style="list-style-type: none"> • Decreasing trend of PHC over time. • No difference in prevalence between genders. • Stratified random sampling procedure (based on population registries).
Ottová-Jordan (2015a) [8].	International (HBSC)	2002, 2006, 2010	11–15	510,876	HBSC-SCL	M	S	No	<ul style="list-style-type: none"> • Fairly stable international trend of PHC. • Higher prevalence among girls than boys, across all countries and age groups. • Higher prevalence among older adolescents. • Cluster random sampling procedure (based on school or class).
Ottová-Jordan (2015b) [24].	International (HBSC)	1994, 1998, 2002, 2006, 2010	15	237,136	HBSC-SCL	> 2 complaints/week	S	Yes	<ul style="list-style-type: none"> • Rather stable international trend of PHC across countries, but great variation in prevalence rates between countries and survey years. • Cluster random sampling procedure (based on school or class).
Sourander (2012) [46].	Finland (Other)	1998, 2008	13–17	3,027	SDQ (emotional symptoms scale)	M and >90 th percentile	S	Yes	<ul style="list-style-type: none"> • No change in the trend of PHC was observed. • Higher prevalence among girls than boys. • Total population sample procedure (based on all 13–14 year olds in two cities).

(Continued)

Table 2. (Continued)

Lead author	Country (Survey)	Study duration (years)	Age group (years)	N	Outcome measure/scale	Mean score ^a / Categorical	Trend type ^b	Included in Meta-analysis	Relevant key findings & sampling procedure
Tick (2008) [47].	Netherlands (Other)	1993, 2003	11–18	1.905	YSR (internalizing symptoms scale)	M and >84 th percentile	S	Yes	<ul style="list-style-type: none"> • Different trends for boys and girls in PHC. Girls showed an increase over time (mainly for somatic complaints), while boys had a decrease (the decrease was mainly for somatic complaints although boys showed a parallel significant increase of psychological complaints). • Higher prevalence among girls. • Simple random sampling procedure (based on population registries).
Twenge (2015) [48].	USA (Other)	1982–2013 (yearly)	14–18	6.900.000	Generic PSC scale (similar to CES-D)	M	I	Yes	<ul style="list-style-type: none"> • A trend of increasing PHC over time. • Different trend between girls and boys. • Different trajectories for the psychological and somatic health complaints (higher increase of somatic complaints). • Multi-stage random sampling procedure (based on schools).

^a Mean score = M

^b I = increasing-, D = decreasing-, S = stable trend

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Europe (K = 46, OR 1.13, 95% CI 1.06–1.20), Southern Europe (K = 10, OR 0.93, 95% CI 0.83–1.03), Western Europe (K = 39, OR 1.04, 95% CI 0.98–1.10) and other regions (K = 5, OR 1.05, 95% CI 0.87–1.26). In general, only small differences existed between subregions. However, the Northern European region showed a clear, albeit minor, increasing trend with regard to PSHC among adolescents (Table 4 and Fig 4).

Table 3. Meta-analytic findings for studies on adolescents' PSHC (Random effects model).

	K	Mean OR	95% CI	Q	I ²
Overall estimate	139	1.04 ^b	1.01–1.08	1156.15 ^a	88.06
By decade					
1980s–1990s	8	1.39 ^a	1.17–1.66	112.78 ^a	93.79
1990s–2000s	57	1.05 ^b	1.01–1.10	372.91 ^a	84.98
2000s–2010s	74	1.01	0.97–1.05	561.88 ^a	87.01
Total between				13.80 ^a	

^a P<0.001.

^b P<0.05.

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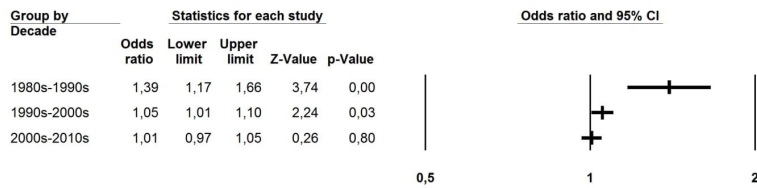


Fig 3. Forest plot for meta-analysed studies on adolescents' PSHC, grouped by decade.

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Gender and complaint type

Nearly all studies reported girls having a higher prevalence of PSHC than boys. While the majority of studies show that the higher prevalence of PSHC among girls was stable over time, there are also several indications of a different trend development between girls and boys. Some studies indicate that increasing PSHC are found in girls, but not to the same extent in boys, over time [37, 38, 40, 47, 48], while Henriksen [41] found the opposite, that is, that boys have an increasing trend of PSHC compared to girls. However, based on a subgroup analysis of these study effects, there was no clear evidence of a significant difference in trends for boys and girls, which is also in line with most of the studies not included in this analysis. That said, we cannot exclude the possibility of different gender trends due to the small number of comparisons available for this analysis ($K = 26$).

In preliminary analysis, two studies also showed that there may be a different trend over time for psychological versus somatic health complaints among adolescents [13, 48], while one study reported no differences between the two dimensions of complaints [35]. A subgroup analysis showed no clear difference in trends of psychological and somatic health complaints ($K = 26$). Although previous research has suggested a two-factor solution [12, 13], PSHC can also be conceived as measuring the unidimensional latent traits of psychological and somatic complaints [14].

Sensitivity analysis, publication bias assessment and other notes

Performing a sensitivity analysis is recommended in order to test the robustness of the findings, when combining continuous and categorical measures in a meta-analysis [30]. Important assumptions to test are the assumption that the effect from continuous measures does not

Table 4. Meta-analytic findings for studies on adolescents' PSHC, by multi-national sub-region (Random effects model).

By sub-region	K	Mean OR	95% CI	Q	I^2
Eastern Europe	26	1.00	0.93–1.07	160.67 ^a	84.44
North America	13	0.98	0.91–1.07	122.74 ^a	90.22
Northern Europe	46	1.13 ^a	1.06–1.20	309.47 ^a	85.46
Other	5	1.05	0.87–1.26	38.97 ^a	89.74
Southern Europe	10	0.93	0.83–1.03	49.41 ^a	81.79
Western Europe	39	1.04	0.98–1.10	395.98 ^a	90.40
Total between				13.83 ^a	

^a $P < 0.001$.

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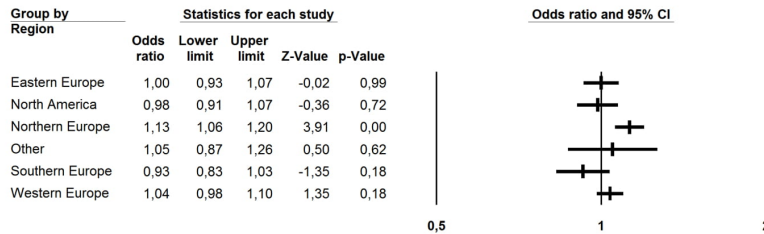


Fig 4. Forest plot for meta-analysed studies on adolescents' PSHC, grouped by multinational subregion.

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differ from the results of the categorical measures, and the assumption that the result of the meta-analysis will not differ with or without the categorical measures. The meta-analysis consisted of 139 samples with categorical measures and 20 samples with continuous measures; there was no significant difference between these samples ($Q^{\text{between}} = 0.24$, $df = 1$, $p = 0.62$). When the samples with continuous measures were removed, the main meta-analysis still showed similar results ($K = 119$, OR 1.04, 95% CI 1.00–1.08, $p < 0.04$). One study had a higher risk of bias, but the results of the main analysis did not change, even when bias was removed from the study [41]. Comparing the results of the different measurements used in the included studies showed no significant differences between measures, except for the “generic” psychosomatic health complaint scales showing a larger effect size compared with other measurements. This applies specifically to only two studies, Berntsson and Köhler [49] and Twenge [48], both examining trends from the 1980s and onwards, a period in which adolescents' mental health may have been deteriorating, as shown also by other researchers [3]. The probable increase of PSHC during this period may explain some of the dissimilarities between the “generic” measures and other measures of PSHC.

Four indicators of publication bias were examined: Rosenthal's fail-safe N , funnel plot, Duval and Tweedie's trim and fill procedure, and Egger's regression intercept [30]. Rosenthal's fail-safe N indicated that 1,815 missing studies were needed to make the overall measure non-significant. Following the recommendations for interpretations by Sterne and colleagues [50], a funnel plot indicated relative symmetry, but with additional horizontal scatter, which was likely attributed to the high heterogeneity resulting from the differences between studies (in terms of different country and time point). When interpreting the funnel plot, Egger's regression test showed that the intercept was not significantly different from zero ($B_0 = -0.15$, 95% CI -1.29–1.00, $p = 0.80$), while Duval and Tweedie's trim and fill method indicated that there were no missing studies to the left or right of the mean. This suggests that the impact of potential publication bias is trivial [30].

Two final comments are worth considering. In one study [49], the raw OR scores of all ages between two and 17 years of age, were reported in the primary study. For the meta-analysis, it would have been preferable to only report on the adolescent age group (10–19 years) in the different countries. However, the OR was not significantly different for the two to 17 years age group and the 13 to 17 years age group. Since children and younger adolescents have been shown to have lower amounts of health complaints than older adolescents [4], the mean OR in the meta-analysis may therefore have had a lower mean OR than the 10 to 17 years age group, as indicated by the descriptive statistics in this primary study. Finally, it should be noted that we were not able to treat adolescent age and historical time points as continuous measures as

this data was not available in the included studies. As such, further analysis could not be performed.

Discussion

Increasing trend of psychosomatic health complaints among adolescents

This review of secular trends among adolescents' self-reported PSHC from 1982 to 2013 examined 21 epidemiological studies with an overall low risk of bias. Out of the 21 included studies, 18 studies reported trends in the prevalence of PSHC in the general adolescent population over a period of at least five years in a single country, while three studies reported on multiple countries. Over seven million adolescents from 36 countries in Europe, North America, Israel and New Zealand were represented. In the descriptive analysis, 10 studies indicated a trend of increasing PSHC, eight showed a stable trend and three showed a decreasing trend at certain points in time between 1982 and 2013. Overall, results from the meta-analysis indicated that trends involving PSHC in adolescence vary between country, multinational subregion and historical points in time from which studies were carried out.

The results from the meta-analysis showed a mean OR of 1.04 for PSHC between 1982 and 2013, thereby indicating a minor increasing trend in general. In subgroup analysis, this minor increasing trend was observed mainly from the 1980s to the 2000s, while the trend appeared to be more stable during the 2000s to the 2010s. Some differences were also found between multinational subregions, where some regions showed an increasing trend regarding PSHC (e.g., Western Europe, Northern Europe and "other regions", that is, New Zealand and Israel), while others showed a more stable or decreasing trend (e.g., Eastern Europe, Southern Europe and North America). However, findings from the subgroup analysis only support a significant increasing trend in Northern Europe.

In the same time frame as this review, there have also been some notable indications of converging trends among general adolescent populations in terms of increasing symptoms of mental health disorders, musculoskeletal pains and the increasing use of health services, for the diagnosis and treatment of both psychosomatic health complaints and mental health disorders, in high-income countries [23, 48, 51], which broadly supports the findings from this review. Not all findings are as consistent however. Several researchers have noted the contrasting evidence between increasing adolescent mental health issues over the last decades, compared with the improvement in favourable prerequisites for adolescents' health and well-being [23, 52]. This has led to an ongoing debate in terms of both the reliability of the present evidence, but also the presumed severity and impact on adolescent physical health, impairment and school absenteeism. At present, it is unclear whether the change in self-reported PSHC represents an actual change in adolescents' everyday functioning, physical health and well-being [23, 53]. It has been argued that the two pathways are not mutually exclusive and that the increasing *risk* of mental health issues may not necessarily exacerbate physical health and well-being [3, 23]. These observations are also in line with the theoretical notion that the concept of illness can be differential to the concept of sickness and disease, while there is an inevitable overlap between these distinct dimensions of health [54]. Regardless, the implication in the case of adolescent mental health is that the increasing prevalence of PSHC or mental health problems may not actually lead to any significant increase in adolescent impairment. One of the recent studies included in this systematic review examined the trend of adolescent PSHC in combination with functional impairment between 1988 and 2011 in Värmland, Sweden [19]. Functional impairment was operationalized as a composite score of the high degree of school absenteeism, difficulty on most or all school courses, and never or rarely experiencing

any social activity with family and peers. The study found that the PSHC not only increased in this time period along with functional impairment, but this increase also contributed to a significantly amplified risk of functional impairment over time. The authors concluded by stating the notion of a time trend of deteriorating adolescent mental health and that the long-term findings in this field "constitute a real and pressing health priority" (p. 55).

A longitudinal study from Norway also indicates that high levels of adolescent PSHC do indeed increase the risk of functional impairment in the transition from adolescence to young adulthood, in the form of sickness absence and the use of medical/welfare benefits [55], which could in turn increase the likelihood of young adults being marginalized from the labour market all together [56]. The failure to complete secondary school education, which is also regarded as a major public health challenge in high-income countries, is also associated with adolescent PSHC and everyday impairment [55, 57]. It is therefore likely that strategies targeting PSHC in adolescence also have the potential to reduce the future receipt of medical/welfare benefits in young adulthood, as well as secondary school incompleteness rates [55, 58].

In light of this, it is quite understandable that there is, in part, a worldwide concern that adolescent mental health could be deteriorating and that today's young people may be more prone to mental health problems than previous generations [2, 19]. There is a need for studies on impairment in adolescents' everyday functioning or other measures of well-being to assess whether adolescent mental health is further deteriorating.

The curious case of Northern Europe

Interestingly, Northern Europe showed a different trend than other multinational subregions. Indeed, it was the only region that showed a clearly significant minor increasing trend in adolescent PSHC between 1982 and 2013 ($K = 46$, $OR = 1.13$, 95% $CI = 1.06-1.20$). This increasing trend is also apparently similar in all nine Northern European countries included in this review across the Nordic countries, including Greenland and the Baltic states. Demographically, countries in Northern Europe are considered to have a very high human development index (HDI) [59], while the Nordic countries are mostly considered to be leaders in promoting health through public policy [60]. It has previously been argued that, while the Nordic countries have excellent prerequisites for adolescent health and well-being, PSHC still appear to be increasing, which is something of a paradox [52]. While the same paradox may seem to be apparent in this review, one nuancing factor is also observed in our data: the increasing relative trend of PSHC in Northern Europe does not necessarily indicate that the prevalence of complaints is highest overall. For instance, there are strong indications of different time trends regarding PSHC when comparing the USA and Norway [8]. This different trend regarding PSHC does not necessarily account for their current prevalence. In 1994, the rate of multiple recurrent PSHC in Norway was 21.8%, while there was a monotonic increase to 32.5% in 2010. In contrast, the USA showed a rather sharp declining trend of PSHC from 45.7% in 1994 to 36.9% in 2010 [24]. This illustrates that, even though these countries have contrasting trends that differ completely, the prevalence of PSHC appears to be higher in the USA compared to Norway. This may suggest that, even though the trend of increasing PSHC in Northern Europe is of considerable public health concern, accounting for differences in multinational prevalence may nuance the findings of this review somewhat.

Social determinants of psychosomatic health complaints

The nature of the studies reviewed does not allow for any causal inference. It is agreed that a myriad of factors will have influenced adolescents' mental health between 1982 and 2013, while the very nature of explaining the temporal trends is a complex task [3, 23]. However,

there are some suggestions with regard to possible determinants of PSHC that are worth noting. In general, when it comes to social determinants of psychosomatic health across time and country, it is difficult to identify any particular meaningful change, as there are many small changes in both proximal factors, such as individual health behaviours and distal factors (changes in country-level factors), such as gross domestic product (GDP) [8]. What is suggested, however, is that variations in PSHC can mostly be explained by individual factors, which have been comparatively stable over time [8, 61]. Thus, rather than changing factors, we should talk about stable factors. The main determinants showing a clear association with PSHC in the data from 2002 to 2010 are: being a girl, having been bullied, smoking, and experiencing school-related pressure [8]. Negative effects relating to poor social networks, peer socialization and high (electronic) media use have been shown to be associated with increased PSHC [34, 61–63]. Increasing screen time use in adolescence may also have changed the way that adolescents relate to physical activity and socialization among peers [61, 64]. The apparent negative effect of high electronic media use may also be more pronounced among adolescent girls, suggesting gender-specific intervention programmes aimed at this population may be appropriate [61].

Nearly all studies in this systematic review reported a higher prevalence of PSHC among adolescent girls than boys. This gender effect appears to be mostly stable over time, although there are several indications of divergent trends in line with the findings of Bor and colleagues [4], who concluded that the burden of internalizing symptoms is increasing among adolescent girls, possibly more than for boys; this may warrant further investigation. In any case, it has been well established that there are gender differences in rates of health complaints among adolescent girls and boys. One reason highlighted for the difference in subjective health between genders is that girls are somewhat predisposed to a higher extent than boys [4]. It also may be, in part, due to increasing school-related pressure, earlier sexualization, earlier onset of puberty and other societal changes, such as media and consumer culture, which is presumed to negatively affect adolescent girls to a higher extent than boys [3, 4, 8, 49, 54].

While PSHC are often considered to negatively affect girls more than boys, one could conversely expect that adolescent boys tend to have more externalizing problems (such as conduct disorders, ADHD and illicit drug use). Bor and colleagues [4] indicated that externalizing problems appear to be relatively stable. Although externalizing problems is outside of the scope of this systematic review, several of the included studies also reported adolescent self-reported externalizing problems. Two of these studies showed no increase in general externalizing problems [33, 41], while one showed a small increase in externalizing problems among boys [47].

Macro-level determinants

As stated earlier, the trends of prevalence of PSHC vary between countries, multinational sub-regions and historical time points. One can only theorize about the direct influence of macro-level determinants on adolescent PSHC in recent history. Although proximal factors seem to have a larger effect than distal factors (such as GDP, country-level income distribution (Gini index), HDI and changing values, which, to a certain extent represent the modernization of society), there are still indications of a macro-level impact on young people's health, despite the presence of discrepant results [8, 61, 65]. Distal macro-factors, such as the change in the orientation of values from the collective to the individual, changing family structures and the overall modernization of society, have evolved, which could also have contributed to changes in adolescent PSHC trends [3, 64, 66]. Bremberg [67, 68], however, argued that part of this modernization, such as changes in family structure and values, cannot explain the variation

between European countries. Bremberg instead hypothesized that increased competition in the labour market increasingly demands higher qualifications by means of extended education. By extension, young people who fall out of the school system at a young age and who are not established in the labour market may have a heightened risk of health complaints.

Other authors have highlighted the importance of healthcare systems and health policy as determinants of adolescent health, as there has been substantial development in child and adolescent mental health services- and policy during the last decades [69]. Patel and colleagues however, critically argue that healthcare system responses to emerging youth mental health issues have been inadequate despite the positive development. Supportive evidence for this argument is found in a review of international adolescent mental health policy that showed that only 7% of WHO member countries (14 of 191) had clearly articulated child and adolescent mental health policy before the year 2004 [70]. Shatkin and Belfer therefore concluded that few healthcare systems and health policies were designed to fully support adolescent mental health issues. However, most of the countries that did have identifiable policies recognising the developmental and mental health needs of youths were in Europe, in line with other studies [60, 71]. The European healthcare systems, for example, have seen quite a dramatic increase of skilled healthcare professionals over the last decades as a result of its health policies, while North American and New Zealand's health policies aimed at young people's mental health have also been given greater priority since the 1980s [70, 71]. The situation within different countries however, remains very heterogeneous with regard to the organization of health services.

The question remains whether the advancement in health policy in developed countries combined with the increase of professional health workers has led to greater utilization of mental health services among the youths in these countries. There are several studies indicating that the majority of young people with higher levels of health complaints or with mental health problems, tend not to seek help from available health services—in Europe and North America [72–77]. Patel and colleagues [69] argue that in the context of developed countries, services tailored to young people remain scarce and are not sufficiently “youth friendly”, that is, encouraging help-seeking behaviour. Furthermore, young people's health problems are often diagnostically confusing, and often need multidisciplinary and intersectoral responses. For these reasons, the authors suggest that a substantial gap exists between efficacy and effectiveness in mental health care for young people. It may therefore be important to advocate healthcare systems that act to continually improve multidisciplinary and intersectoral action through health promoting policy, to be able to counteract potential trends of increasing adolescent health complaints and mental health problems and to support positive youth development.

Whatever the case may be, macro-level factors' influence on PSHC are likely to function indirectly through mediating factors, such as social and public policy [8]. Therefore, an analysis of macro-factors may enrich the understanding of adolescent health trends, which is of critical importance when developing public health policy, especially since Patton and colleagues [2] suggest that adolescent health has not explicitly been prioritized in the effort to secure health equity.

Limitations

There are several limitations in this systematic review that should be noted. One limitation is the reliance of self-reported studies from adolescent themselves, which rely on symptoms and behaviour ratings, rather than more objective measures of health. This, however, has provided the current authors with the opportunity to look at patterns of trends over an extended period

of time, which have otherwise been unavailable for research. Furthermore, the number of studies eligible for inclusion was small, while studies with somewhat different outcome measures were included. Only including studies using the same measure of health complaints limits the overall narrative understanding. This limitation does, however, highlight the need for studies that utilize consistent methods and cover both the psychological and somatic aspect of subjective health across multiple cohorts. Several research studies have noted that self-reported health measures are valuable to public health research [4, 23]. Self-reported health complaints have also been shown to reliably predict future mental illness [19]. The discrepant trends in PSHC between regions and the reliance on self-reported data may reflect true changes in the occurrence of PSHC in society; however, they may also reflect changes in subjectivity over time and how adolescents perceive and report health complaints. Changes in the way of reporting *have* likely been an influencing factor over time, although it is regarded as unlikely that this is the main explanatory factor [4, 68].

Investigating psychometric properties of the PSHC measurements showed some indications of differential item functioning (DIF) for certain PSHC items. DIF was, for example, found over time in a Swiss sample, for the item "sleeping difficulties" [13]. However, no discernible DIF was found for a similar item over time in a Swedish sample [15]. Hagquist [15] states that the PSHC measurement adequately meets measurement criteria and proper categorisation of the items included, and does not recommend removing any items in future trend analysis. In a cross-national analysis however, the item "sleeping difficulties" showed a sizeable DIF when compared across countries within the HBSC-study. Thus, the authors recommend discarding this item in future research comparing PSHC cross-nationally [14]. There were also some indications of DIF in the item, "dizziness", which may be attributed to linguistic differences between socio-demographic subgroups in Switzerland [13]. In sum, these analyses on psychometric properties indicate that even though certain items may have introduced bias, especially in comparisons of complex cross-national data, the impact of this potential bias is currently not known [13]. Future research on DIF over time in population studies on adolescent health is therefore recommended.

Conclusion

This review observed a minor increasing trend regarding adolescent self-rated PSHC between the 1980 and 2000s, before becoming more stable into the 2010s, from a multinational perspective. This observation is in line with those reported in previous reviews, which looked at trends in child and adolescent mental health problems between the 1950s and 2000s [3, 4].

Analysing the time trends in different multinational subregions showed that there are some small differences between the regions over time. Northern Europe was the only region that showed a clearly significant minor increasing trend, while not being the region with the highest total prevalence of PSHC at present. Based on the results of this systematic review and meta-analysis, and accounting for the all the increasing/decreasing trends between all nations within the included data, an overall significant minor increase in the prevalence of PSHC among adolescents can be observed between 1982 and 2013. This is likely to influence adolescent health, functioning and well-being, while the growing evidence of a trend of increasing burdens in the context of adolescent mental health is rightfully a public health concern, as stated by earlier research.

Supporting information

S1 PRISMA checklist.

(DOC)

S1 Appendix. Peer review of electronic search strategies (PRESS).
(DOCX)

S2 Appendix. Complete search strategy 22.11.2016.
(DOCX)

S3 Appendix. Risk of bias assessment.
(DOCX)

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RESEARCH ARTICLE

Health complaints among adolescents in Norway: A twenty-year perspective on trends

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Abstract

Purpose

Examine time trends in health complaints among adolescents in Norway between 1994 and 2014 and among population subgroups, e.g., age and gender, as well as their interactions.

Methods

Norwegian data on 11-16-year-olds were drawn from the Health Behaviour in School-aged Children survey (HBSC) and analyzed for 1994 ($n = 4,952$), 1998 ($n = 5,026$), 2002 ($n = 5,023$), 2006 ($n = 4,711$), 2010 ($n = 4,342$) and 2014 ($n = 3,422$). Design adjusted linear regression that accounts for clustering effects was used to examine mean scores of two subscales of the HBSC-symptom checklist: psychological and somatic health complaints.

Results

Psychological and somatic health complaints among adolescents in Norway followed somewhat different trajectories, but the mean scores of both types of health complaints appeared to increase during the 20-year period. For psychological health complaints, there was a three-way interaction between age, gender and time, indicating that increasing trends in health complaints depended on both age and gender, in which older adolescent girls had a greater increase over time relative to younger adolescents and boys.

Conclusions

Findings from this study, together with earlier findings, suggest that there has been an increasing trend in health complaints among adolescents in Norway from 1994 to 2014, especially among older adolescent girls. Future research should examine if trends in health complaints also depend on gender and age in other contexts. This will help the planning and implementation of tailored and effective interventions.

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Data Availability Statement: The data underlying the results presented in the study are available from the Norwegian Centre for Research Data (<http://www.nsd.uib.no/nsd/english/order.html>). To recreate the used dataset, merge the "HBSC 2013/14 trendfile", containing data from 2002-2014, and the "earlier international files" named "1993" and "1998", and then subset the Norwegian data.

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Introduction

At present, there are increasing concerns about reports of deteriorating mental health in non-clinical youth populations from high-income countries between the 1950s and 2016 [1–4]. One highlighted indicator is recurring health complaints among young people, which is considered to be an important indicator of subjective well-being, as it reflects individual burden and personal experience related to negative life events in the social context of family, school and peers [5]. Health complaints consist of the subjective experience of psychological (mental health complaints) and somatic (recurring pains and aches) symptoms, without any presumption of underlying mental illness [5, 6], even though recurring health complaints are recognized as important indicators of mental health in adolescence [7]. These subjective health complaints are also referred to as “psychosomatic complaints” in the literature.

Northern Europe appears to have had the greatest deteriorating trend in health complaints compared to other regions [2, 8]. In a comparative study involving countries in Europe and North America, adolescents from the Nordic countries seem to particularly stand out with indications of increasing health complaints over recent decades, even though the prevalence of two or more weekly health complaints among 15-year-olds is generally low in most of the Nordic countries compared to other regions [8]. The Nordic increase in health complaints occurred despite these countries ranking very high on the Human Development Index (HDI) [9] and holding a leading position in promoting health through public policy [10] which, in some respects, represents a public health puzzle. Norway is highlighted as the country with the largest increase between 1994 and 2010, at a rate of almost 11% (from 21.8% to 32.5%). In contrast, a decline in health complaints has been observed in North America, for example the United States, where a sharp 9% decrease (from 45.7% to 39.6%) between 1998 and 2010 was observed [8]. This might suggest that even though the rates of recurring health complaints are generally lower in the Nordic countries compared to other regions, the Nordic countries may be converging toward regions that are known to have higher rates of health complaints among adolescents, the cause of which is currently unknown.

To assess the time trends in subjective health complaints in Norway, we performed a literature review of empirical evidence, Norwegian grey literature and ongoing Norwegian projects tracking trends in health complaints among school-aged children. The available empirical findings suggest an increase in health complaints (although small) between 1992 and 2010 among 11–17-year-olds in Norway [8, 11–13]. National population registries on adolescent health, such as “Ungdata” [14], report relatively stable levels of health complaints from 2011 to 2016 among adolescents aged 13–19. However, there are indications of divergent trends, in which boys show rather stable levels of complaints, while girls show a small increase. The Norwegian Institute of Public Health [15] survey on living conditions (“Norhealth”) indicates an increase in psychological complaints between 1998 and 2012 among 16–24-year-olds. Although a rise in health complaints is observed in both genders, the strongest increase is found among young girls, with a high rate of complaints that increased from 13% in 1998 to 23% in 2012, compared to 7% in 1998 to 12% in 2012 for young boys. Thus, while there is clear evidence that girls generally have more health complaints than boys in absolute terms, the evidence of different trends over time for gender is inconclusive [2], although there are some indications of a greater increase among girls over time [16–20]. In other Northern European countries, it has also been found that gender differences in health complaints depend on the age of the adolescents [21]. Nonetheless, there appears to have been a clear rise in health complaints among young people, aged 11–24, living in Norway between 1992 and 2016.

A Norwegian prospective study has associated high levels of health complaints among adolescents with high school dropout [22]. Results from the same cohort of adolescents also

indicate that adolescents who do not finish secondary education have an increased risk of sickness and disability in the transition to young adulthood [23]. Such findings illustrate why both high school dropout and health complaints among adolescents are considered to be pressing public health issues in their own right [7, 22].

Although health complaints among generational cohorts of adolescents in Northern Europe, including Norway, seem to be increasing, the evidence is not conclusive and there are still unanswered questions to be addressed. Thus, there is a highlighted need for high quality research on trends in adolescent health [1].

The present study aims to analyze Norwegian trends in adolescent health complaints over twenty years, between 1994 and 2014. The study will also examine trends among gender, age and time as well as their interactions, while accounting for the complex sampling procedure in our study.

Method

Sample

The data analyzed were drawn from the Health Behaviour in School-Aged Children (HBSC), a World Health Organization collaborative cross-national project tracking health, health behavior, school and social factors among a nationally representative sample of students in primary school, (Norwegian grade 6) consisting of 11–12 year olds and lower secondary school (Norwegian grades 8 and 10) consisting of 13–16 year olds. The HBSC was first carried out in 1983 and included samples from five countries. Since then, the survey has been conducted every four years and now 48 countries in Europe and North America take part. All countries partaking in the project follow a standardized protocol.

This study focused on the full sample of Norwegian adolescents in which health complaint items were comparable. This included six survey waves from the following years: 1993/1994, 1997/1998, 2001/2002, 2005/2006, 2009/2010 and 2013/2014. The number of respondents in each wave was 4,952 (49% girls), 5,026 (49% girls), 5,023 (49% girls), 4,711 (48% girls), 4,342 (50% girls) and 3,422 (51% girls), respectively, resulting in a total sample of 27,476 adolescents. The response rates at the student level for each survey cycle were 82%, 93%, 88%, 85%, 81% and 76%, respectively. The participating students were nested within school classes, thus necessitating adjustments for cluster effects. There were 141, 288, 254, 277, 208 and 284 primary sampling units (school classes), respectively, for the six waves of survey. Design-weights were created using the primary sampling units, stratified by survey year. This design-weight provide valid and robust standard errors in further regression analyses [24–26].

Procedure

The selection process followed a randomized clustered sampling strategy based on national registries of schools and school classes with the aim of having nationally representative samples. Parents, school administrators and teachers were informed of the study in advance. Passive consent was obtained from parents and school staff, who were offered the opportunity to decline participation. All students were informed that their participation in the study was voluntary and assured anonymity of their responses. For the schools that wanted to participate, teachers supervised the students as they completed the questionnaires in their usual classrooms. Students who did not participate in the survey were either absent from school or attending schools for children with special needs [5].

Norwegian data collection was approved by NSD-Norwegian Centre for Research Data. Additional information about the data collection process can be found elsewhere [5].

Measures

The HBSC Symptom Checklist (HBSC-SCL) was used to measure the adolescents' subjective health complaints. The HBSC-SCL is a non-clinical measure consisting of eight health complaint items: headache, abdominal pain, backache, feeling low, irritability or in a bad mood, feeling nervous, sleeping difficulties and dizziness. Adolescents were asked how often they experienced these symptoms over the last six months. The five response categories were: "about every day", "more than once a week", "about every week", "about every month" and "rarely or never". Previous research found that the HBSC-SCL has adequate test-retest reliability and validity properties [27]. Other research has shown support for a two-factor solution for the HBSC-SCL: a dimension of psychological health complaints (feeling low, irritability or in a bad mood, feeling nervous and sleeping difficulties) and a dimension of somatic health complaints (headache, abdominal pain, backache and dizziness) [21, 28]. Before the analysis, the mean score for each of the two dimensions was calculated. The mean scores were obtained by adding the items scores from 0 ("rarely or never") to 4 ("about every day") and dividing by the number of items in the dimension. Of those with valid scores, roughly 97.5% answered all the questions.

Data analysis

Statistical analysis was performed using the "lavaan" [29] and "survey" packages [26] in R [30]. In the first step, the lavaan package was used to perform a confirmatory factor analysis (CFA) in order to test the underlying factor structure of the HBSC-SCL. A unidimensional factor model was compared to a model comprised of two correlated factors (psychological and somatic) in order to determine which model(s) fit the data best. When considering model fit, it is good practice to assess more than one goodness-of-fit indices [31]. The following goodness-of-fit indices are reported: the model chi-square, Comparative Fit Index (CFI), the root mean square error of approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR). Values of chi-square $p > 0.05$ (sensitive to a large sample size), CFI > 0.95 , RMSEA < 0.05 and SRMR < 0.08 indicate a good model fit [31]. Robust maximum likelihood estimators were used.

In the second step, the "survey" package, developed for analyzing complex survey samples, was used to model age, gender and time differences by conducting a linear regression analysis that accounted for the design effect of the HBSC's sampling procedure. Schnohr et al. have recommended accounting for complex sampling in analysis of HBSC data [32]. Age and time were centered at their first values (age 11 and year 1994), making the regression coefficients meaningful and easier to interpret. The time-coefficient represent the annual change of health complaints among adolescents in the study period between 1994–2014. Statistically significant changes over time will be referred to as the "time trend" or "trend".

Trends and trends by subgroup interactions were tested using Wald F-test for complex survey designs. The Wald-F statistic was used for testing the null hypothesis that the regression coefficient of an independent variable in the model is not significantly different from zero. If the test fails to reject the null hypothesis, removing the variable from the model will not substantially reduce the fit of that model. In analysis of complex samples, the Wald test degrees of freedom is corrected to encompass the survey design [24, 25]. Only interactions that significantly improved the model fit were included in the final analysis.

Results

Preliminary analysis

To confirm previous recommendations of a two-factor structure of health complaints, a design-based CFA accounting for complex samples was performed to assess the model fit in

the Norwegian sample. The two-factor model showed a good fit based on several goodness-of-fit indices ($\chi^2 = 602.78$, $df = 19$, $p < 0.001$; CFI = 0.976; RMSEA = 0.041; SRMR = 0.021) and indicated a superior fit to the data in comparison with a unidimensional model ($\chi^2 = 2059.44$, $df = 20$, $p < 0.001$; CFI = 0.929; RMSEA = 0.076; SRMR = 0.036), in line with previous findings [21, 28]. The findings from the CFA supported treating psychological and somatic complaints as two separate scores in the subsequent analysis.

Descriptive statistics

Summarizing the unadjusted raw trends in psychological and somatic health complaints over a period of twenty years (1994–2014), both types of complaints appear to have increased from 1994 to 2010, followed by a slight decrease between 2010 and 2014. Table 1 shows the development of psychological health complaints among adolescents by gender and time. Descriptively, boys had overall lower levels of psychological health complaints compared to girls. Furthermore, boys had an increase in psychological health complaints between 1994 and 2010, followed by a decrease in 2014. Girls had higher levels of psychological health complaints than boys at all time points; their scores increased from 1994 to 2010, then decreased in 2014.

With regard to somatic health complaints, Table 1 shows the development by gender and time. Overall, somatic health complaints scores were lower than psychological health complaint scores. Boys had lower levels of somatic health complaints compared to girls. Like psychological health complaints, somatic health complaints increased for both boys and girls between 1994 and 2010, thereafter decreasing from 2010 to 2014.

Regression analysis

Table 2 shows the results of the design adjusted linear regressions models. When examining the main effect model, the results indicated an increasing trend in somatic health complaints among adolescents between 1994 and 2014. In addition, girls appeared to have more somatic health complaints compared to boys and older adolescents had more somatic health complaints than younger adolescents. The interaction model, however, indicated a significant two-way interaction for gender by age ($F(1, 1436) = 77.10$, $p < 0.001$), suggesting that girls report more somatic health complaints as they get older compared to boys. This gender by age effect did not change significantly over time. Furthermore, there was a significant two-way interaction for age by time ($F(1, 1436) = 4.41$, $p < 0.05$), indicating that older adolescents experienced a greater increase in somatic health complaints than younger adolescents between 1994 and 2014.

Based on the results in Table 2, psychological health complaints appeared to have a somewhat different trend than somatic health complaints. First, like somatic health complaints, results from the main effect model indicated an increasing trend and higher levels of complaints among girls and older adolescents. Second, unlike somatic health complaints, the interaction model indicated a significant three-way interaction between gender, age and time ($F(1, 1435) = 13.77$, $p < 0.001$), suggesting that older adolescent girls had the greatest increase in psychological health complaints over time. This finding on older adolescent girls is relative to

Table 1. Unadjusted psychological and somatic health complaints by gender and time.

	Year	Mean (95% CI)					
		1994	1998	2002	2006	2010	2014
Psychological	Boys	0.88 (0.85, 0.92)	0.86 (0.83, 0.89)	0.96 (0.92, 0.99)	0.99 (0.95, 1.03)	0.99 (0.95, 1.03)	0.87 (0.83, 0.92)
	Girls	1.07 (1.03, 1.11)	1.06 (1.03, 1.10)	1.24 (1.20, 1.28)	1.21 (1.16, 1.26)	1.34 (1.29, 1.38)	1.23 (1.16, 1.29)
Somatic	Boys	0.55 (0.52, 0.57)	0.55 (0.52, 0.58)	0.57 (0.53, 0.60)	0.58 (0.55, 0.62)	0.64 (0.61, 0.68)	0.58 (0.54, 0.62)
	Girls	0.76 (0.72, 0.79)	0.82 (0.78, 0.86)	0.88 (0.84, 0.92)	0.82 (0.78, 0.86)	0.9 (0.87, 0.93)	0.84 (0.79, 0.88)

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Table 2. Linear regression analysis assessing trends in health complaints among adolescents in Norway.

	Psychological health complaints				Somatic health complaints			
	Model 1a		Model 1b		Model 2a		Model 2b	
	B (95% CI)	P-value	B (95% CI)	P-value	B (95% CI)	P-value	B (95% CI)	P-value
Girl	0.260 (0.238, 0.282)	0.001	0.134 (0.067, 0.202)	0.001	0.261 (0.242, 0.280)	0.001	0.126 (0.082, 0.169)	0.001
Age	0.024 (0.017, 0.032)	0.001	-0.017 (-0.031, -0.002)	0.02	0.044 (0.038, 0.050)	0.001	0.010 (-0.001, 0.021)	0.06
Time	0.008 (0.006, 0.010)	0.001	-0.001 (-0.005, 0.004)	0.78	0.004 (0.003, 0.006)	0.001	0.001 (-0.002, 0.004)	0.38
Girl:Age			0.018 (-0.004, 0.040)	0.10			0.050 (0.039, 0.061)	0.001
Girl:Time			-0.001 (-0.006, 0.005)	0.87			0.001 (-0.002, 0.004)	0.46
Age:Time			0.002 (0.001, 0.003)	0.02			0.001 (0.001, 0.002)	0.04
Girl:Age:Time			0.004 (0.002, 0.006)	0.001				
Constant	0.793 (0.762, 0.825)	0.001	0.937 (0.889, 0.985)	0.001	0.424 (0.398, 0.449)	0.001	0.514 (0.479, 0.550)	0.001

Models 1a and 2a are main effect models; Models 1b and 2b are interaction models.

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boys, who had a rather stable trend in psychological health complaints between 1994 and 2014, with only small differences between younger and older adolescent boys (Fig 1).

Discussion

The trends in psychological and somatic dimensions of health complaints differed to some extent in our analyses. On the one hand, somatic health complaints appeared to be rising for boys and even more so for girls; older girls had the greatest increase, while the gender by age effect did not change over time. On the other hand, psychological health complaints appeared to be more prevalent and increasing at a greater rate over time than somatic health complaints. In addition, a three-way interaction between gender, age, and time suggested that psychological complaints increased mainly among older adolescent girls compared to younger girls and boys over the 20-year period, indicating a divergent trend. Other Norwegian studies report similar findings and indicate an increase in psychological health complaints among adolescent girls between 1992 and 2016 [14, 15], thus supporting the present findings.

Earlier studies from Europe and North America have observed an age or a gender effect on health complaints, but few have investigated a possible three-way interaction that includes change over time. A systematic review of gender and age-specific trends in internalizing problems reported an increase mainly among older adolescent girls over time [1]. Furthermore, previous studies on HBSC data that investigated psychological health complaints in Sweden and

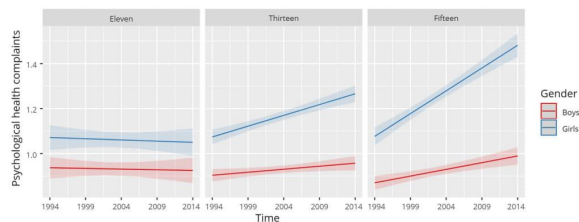


Fig 1. Marginal effects for psychological health complaints by gender and time, grouped by age (mean score, 0–4).

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Switzerland found that in Sweden, there was a clear increase over time for older girls, while the increase was only minor in Switzerland [21, 33]. For somatic health complaints, Dey et al. [21] also found an increasing trend, but the study did not include tests of a three-way interaction between gender, age and time. Moreover, somatic symptoms during adolescence have been shown to predict adult mental illness even when controlling for adolescent depression, suggesting that adolescents with reoccurring somatic symptoms may need early treatment for these specific symptoms [34]. Somatic and psychological symptoms are also associated with adolescent loneliness [35]. Therefore, high levels of somatic complaints at a young age can be an important early indicator of underlying mental health problems among adolescents.

It is a challenge to elucidate the changing trends in health complaints among adolescents, as (1) our data does not allow any causal inference and (2) evidence indicates that several factors associated with health complaints have changed over the last twenty years, while other determinants have remained stable (such as smoking, being bullied and school-related stress) [12]. It is also known that the timing of puberty contributes to acute health complaints in this age group. It has been speculated that an observed decrease in the age at onset of puberty over the last century may be putting early maturing adolescents at risk of adjustment difficulties, including psychopathology [36, 37]. In particular, early puberty in girls may be indicative of future psychological problems, although it is still uncertain whether this effect is transient or sustained [36]. It has been hypothesized that a rise in psychological health complaints may, to some extent, be explained by an increased willingness to report symptoms. However, an increased willingness to report symptoms is not considered to be a key explanatory factor of growing mental health problems [1]. In fact, some qualitative research suggests that adolescents may just as well avoid disclosing symptoms of mental health problems due to stigma from peers, parents and teachers and to avoid being perceived as "weird" [38, 39]. This might be the case for both girls and boys.

In regard to boys, reporting overall lower health complaints might reflect some differences in reacting to symptoms of mental distress in subtle ways; boys may tend to externalize mental distress, e.g., delinquency or self-medication to a greater extent, allowing distress to build before "blowing off steam" [40]. Ridge et al. [40] highlight that little is known about how men experience mental distress. A study of adult twins from the US [41] does indicate that latent differences in the prevalence of common mental disorders such as internalizing and externalizing syndromes may well be accounted for by gender, indicating higher levels of internalizing and lower levels of externalizing syndromes among women, while the opposite appears to be true for males. The authors note that it is currently uncertain if gender differences in internalizing and externalizing syndromes pertains to the adolescent population as well. Another study does however suggest that the trend in externalizing syndromes appears to be stable over time for both boys and girls, whilst internalizing syndromes appears to be increasing among adolescent girls [1].

Some limitations of this study should be noted. First, pupils who were absent on the day of data collection were not represented. Previous research suggests this may introduce a bias, because adolescents with more health complaints are more likely to be absent from school than adolescents with less complaints [42]. Second, using repeated cross-sectional data allows the analysis of time trends, but does not permit drawing strict causal inferences. Third, from a gender perspective, it should be noted that externalizing behaviors were not included in the study, as the HBSC-SCL mainly consists of internalizing mental health symptoms. As a result, no comments about period effects in externalizing symptoms can be made. Fourth, the trend analysis did not control for socio-economic background, SES has been shown to be a predictor of health in previous studies, where families in lower SES households tend to have poorer health [43]. Previous research has however indicated that SES among adolescents in Norway has remain constant between 1994–2010 [44], although other researchers have questioned the

validity and reliability of this specific SES indicator over time [21]. It is therefore unlikely that there have been any substantial changes in health inequalities among adolescents that could confound the trends observed in our findings. Fifth, from a methodological perspective, it appears that the upward trends in health complaints might not be completely linear, which is evidenced by comparing observed values to predicted values in our sample. Observed values indicated a small decrease between 2010 and 2014, making the predicted increase between these two time points more uncertain. However, another Norwegian study does indicate that there has been a yearly increase between 2011 and 2016 among girls, while psychological health complaints among boys remained stable [14], parallel to our main findings and might suggest that the decrease seen in the observed values from 2010 to 2014 could reflect random fluctuations. Any indication of a continued decrease should be followed closely when analyzing future Norwegian data.

Conclusion

Based on the present findings, there has been an increase in psychological and somatic health complaints among adolescents in Norway, especially among older adolescent girls. This is supported by evidence from Norwegian adolescent population health data that indicate an increase in the prevalence of health complaints among cohorts of young people in Norway between 1994 and 2014, which rightfully confirms that increasing health complaints is a public health concern. To further investigate potential determinants of health complaints, longitudinal studies and continued tracking of health trends are needed. In addition, intervention strategies that will assist adolescents in managing psychological and somatic health complaints are vital.

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Trends in the utilization of youth primary healthcare services for psychological distress

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Psychological distress, psychological health complaints, depressive symptoms, young people, youth, primary healthcare, service use, trend

Abstract

Background Psychological distress among young people is increasing in Northern Europe. According to established healthcare utilization theory, this will create a greater need for youth primary healthcare and subsequently lead to more help-seeking behavior by distressed young people. The aim of this study was to investigate the relationship between the use of youth primary healthcare services and psychological distress in times of increasing mental health problems and increased service need.

Methods This study consisted of five waves of repeated annual cross-sectional data collected from young people (aged 13-19) living in Norway between 2014 and 2018 (n = 368,579). Population-weighted and design-adjusted generalized linear regression with a log-link was used to examine the use of youth primary healthcare services over time.

Results We found that a large proportion of young people use primary healthcare services and that young people with high levels of psychological distress use primary healthcare services twice as much as their peers with low levels of psychological distress. In addition, between 2014 and 2018 both psychological distress and primary healthcare service utilization increased: psychological distress increased by 5% and total primary healthcare service use increased by 300 consultations per 1000 young people. Overall, psychological distress had a conditional association with youth primary healthcare service use and could account for between 16-66% of the change in the use of services between 2014 and 2018, depending on the service type. However, the absolute increase seen in the use primary healthcare services was mainly driven by young people with low levels of psychological distress as opposed to young people with high psychological distress. This suggest a converging trend.

Conclusions Our findings suggest that there might be serious barriers between need and help-seeking behavior for young people with high levels of psychological distress and that the pattern of utilization among young people with lower distress may indicate overuse, possibly as an inadvertent consequence of a newly introduced school absence policy. While further research is needed to confirm these findings, our work may inform healthcare providers and policy makers about primary healthcare utilization trends among young people.

Introduction

Indicators of psychological distress among young people, such as psychological and psychosomatic health complaints, appear to be increasing in many developed and Western countries [1-3]. In comparative studies in Europe and North America, young people in the Nordic countries stand out in regard to psychosomatic health complaints where an increasing trend has been reported over the last twenty years [1, 2]. One comparative study highlights Norway as the country with the largest increase in youth reports of two or more weekly psychosomatic complaints, with an increase of almost 11% (from 21.8% to 32.5%) from 1994 to 2010 [2]. Based on the available population health data in Norway, there is further evidence for a trend of increasing psychological distress among young people between 1992 and 2018, especially among females [4-8]. In contrast, the number of health complaints observed in other geographical regions remained stable or declined [1, 2].

Like other countries with an increasing trend of psychological distress among young people, Norway has also seen a parallel increase in the diagnosis of mental illness, prescription of antidepressant medication and primary healthcare service use. These changes appear to correspond with the increase in psychological distress – particularly pronounced among young females [6, 8, 9].

Consequently, deteriorating mental health among young people is recognized as a public health concern both internationally and in Norway [10, 11], and further research to improve our understanding of psychological distress and help-seeking behavior is needed.

Psychological distress is associated with healthcare service use and help-seeking behavior [12, 13].

The use of mental health services by young people is increasing in many developed countries [13-15].

By their own account, mental health problems are among the most common reasons why young people seek help in the primary healthcare service [16]. Alarmingly, young people frequently show the worst service access compared to other age groups [17] even though 75% of all mental disorders emerge before the age of 25 [18]. Another review has shown that only 20-40% of adolescents with mental health problems are detected by primary healthcare services and only about 25% receive appropriate professional treatment [19]. Homlong et al. [20] found that among 15 to 16-year-olds, frequent users of school health services or youth health centers had a greater risk of dropping out of

high school five years later. A Norwegian report found that one in five high school dropouts reported that they quit school because of mental health problems [21].

The Andersen healthcare utilization model [22] is a widely accepted conceptual model for the study of health services utilization. The Andersen healthcare utilization model suggests that help-seeking behavior is a complex interaction between three sets of determinants: predisposing factors (demographic and social), enabling factors (economic) and need for care (health outcomes). Based on this theoretical framework, it could be hypothesized that increasing psychological distress among young people will be associated with an increased need for primary healthcare services, such as youth specific services that promote health (e.g., youth health centers and school health services) and traditional primary healthcare services (e.g., family doctor, psychologist and out-of-hours primary healthcare). Increased need for care should hold true when considering predisposing factors (age, gender) and enabling factors (socioeconomic status, service availability, ease of access).

Norway represents a suitable research setting to further explore the relationship between primary healthcare service utilization and psychological distress among young people, since both psychological distress and service use appear to be increasing. In Norway, youth primary healthcare services are generally free, widespread and easily available to the public.

The aim of this study is to investigate the relationship between youth primary healthcare service use and psychological distress in times of increasing mental health problems and increased service need.

The following research questions will be addressed:

RQ 1: To what extent did psychological distress increase among young people between 2014 and 2018?

RQ 2: To what extent is psychological distress associated with youth primary healthcare service use?

a) Can changes in psychological distress explain changes in service use among young people over time?

b) How much of the trend in primary healthcare service use can be explained by changes in psychological distress?

c) Is the trend similar for those with low levels and high levels of psychological distress, or do the two

groups converge/diverge in relation to primary healthcare service use?

Methods

Study design and participants

The data analyzed are drawn from the Norwegian Ungdata (Youngdata in English) national survey.

Ungdata is an annually repeated cross-sectional data collection scheme, designed to conduct youth surveys at the municipal level in Norway (for more information see <http://www.ungdata.no/English>).

Since its inception in 2010, youth surveys have been conducted repeatedly in nearly all Norwegian municipalities. Ungdata is regarded as the most comprehensive source of data on adolescent health and well-being in Norway. The data are used in municipal planning and developmental work related to public health and preventive measures as part of national efforts to monitor young people's health.

The survey receives funding through the national budget. Norwegian municipalities initiate the survey themselves. The survey consists of approximately 150 mandatory questions with the option of adding additional packages. Surveys are conducted throughout the school year from August to June and involve students attending Grades 8-10 and all three years of upper secondary school (generally aged between 13 and 19 years old).

In the current study, data that included questions about youth primary healthcare service utilization were used. These questions were included in the mandatory questionnaire from 2014 onwards. This produced five waves of data from 2014 to 2018. Response rates are reported to be high at the municipal level (>80%). The sample for this study consisted of 46,019 participants (from 86 municipalities out of 422) in 2014, 73,426 (from 121 municipalities) in 2015, 70,577 (from 138 municipalities) in 2016, 107,601 (from 174 municipalities) in 2017 and 70,956 (from 124 municipalities) in 2018, resulting in a net sample of 368,579 young people growing up in Norway. The gender distribution in our sample is 50% females and 50% males.

Measures

Youth primary healthcare service utilization was measured by the question "How many times have you used the following healthcare services over the past 12 months?" Participants could choose from the following services: "school nurse or doctor"; "youth health centers"; "family doctor";

“psychologist”; “out-of-hours primary healthcare service”. The response options to indicate how often the participant used each service were as follows: “never” (1); “1-2 times” (2); “3-5 times” (3); “6 or more times” (4). For the analysis, these response categories were averaged to represent interval midpoint estimates of service use (never = 0, 1-2 times = 1.5, 3-5 times = 4, 6 or more times = 6). Symptoms of psychological distress, sometimes referred to as psychological health complaints, were measured with a six-item scale derived from the widely used the Hopkins Symptom Checklist (HSCL) [23]. The HSCL is recommended for use in both clinical and epidemiological studies to measure psychological distress among young people. Short formats of the HSCL (5-25 item scales) have been shown to perform almost as well as the full version [24]. Rasch analysis of the psychometric properties of the six-item HSCL scale used in the current study has previously shown that this scale works reasonably well [25]. Participants were asked if they had been affected by any of the following during the past week: “felt that everything is a struggle”, “had sleep problems”, “felt unhappy, sad or depressed”, “felt hopelessness about the future”, “felt stiff or tense”, “worried too much about things”. The six questions had four response options: (1) “not been affected at all”, (2) “not been affected much”, (3) “been affected quite a lot” and (4) “been affected a great deal”. To capture more severe psychological distress, the responses were dichotomized based on average scores greater than 3.0. Previous studies have shown that young people scoring above this cut-off point were within the range of depressive disorders commonly found in Norwegian community youth samples [26, 27].

Background characteristics and demography

The socioeconomic status of young people was measured using the Family Affluence Scale (FAS II) which is a validated, brief, assets-based measure of family wealth that is designed for use in youth surveys [28, 29]. FAS consisted of four questions: “Does your family have a car?”; “Do you have your own bedroom?”; “How many times have you travelled somewhere on holiday with your family over the past year?”; “How many computers does your family have?”. A mean score was created from the participants' responses.

Availability of core primary healthcare services was measured through a municipal centrality index

developed by Statistics Norway, ranking the 422 municipalities in Norway on a scale from 0-1000 based on service availability and available workplaces within a 90-minute drive by car [30]. In addition, grade, gender and survey year (time) were added as covariates in later analysis.

Data analysis

Statistical analysis was performed using the survey package for complex survey samples [31] in R [32]. Regression models were analyzed using a generalized linear model (GLM) with a log-link to account for non-normal distribution of the residuals. The GLM approach with a log-link is preferable to log-linearized models when the distribution of residuals is non-normal as was found in the current study [33, 34]. Complex survey design weights were created using population weights, stratifying for municipality and survey year, in order to maintain national representativeness of the sample. In addition, design weights were used to provide robust standard errors. Interaction terms between psychological distress and survey year were tested using a Rao-Scott log likelihood test for complex survey samples. The log likelihood statistic was used to test if an independent variable shows no association with the outcome (null hypothesis). If the likelihood test fails to reject the null hypothesis, removing the independent variable from the model will not substantially reduce the fit of that model [35].

Results

Descriptive statistics

Increasing trend of psychological distress and primary healthcare service utilization among young people between 2014 and 2018

A summary of the population weighted trends in psychological distress between 2014 and 2018 suggests that psychological distress increased yearly from 13% in 2014 (95% CI = 12%, 13%) to 18% in 2018 (95% CI = 17%, 19%). Overall, there were substantial gender and age differences in those suffering from psychological distress. For males, 7% (95% CI = 7%, 8%) reported psychological distress compared to 22% among females (95% CI = 22%, 23%). With respect to age, the difference

in psychological distress increased from 8% (95% CI = 8%, 9%) for the youngest teens to 22% for the oldest (95% CI = 21%, 23%).

In our sample, 35% (95% CI = 34%, 35%) of the participants used the school health service (the school nurse or doctor), 13% (95% CI = 12%, 13%) used a youth health center, 10% (95% CI = 10%, 10%) used a psychologist, 60% (95% CI = 60%, 60%) used their family doctor and 36% (95% CI = 36%, 36%) used an out-of-hours primary healthcare service during the previous six months. In general, there was a trend of increasing service use in the youth population, increasing from an average of 3.6 consultations in 2014 to 4.1 consultations in 2018 (Table 2).

Young people with high levels of psychological distress tended to consult primary healthcare services more often (M = 6.48, 95% CI = 6.40, 6.55), almost twice as much as their peers with low levels of distress (M = 3.36, 95% CI = 3.28, 3.43).

Table 2. The use of primary healthcare services among young people by year and psychological distress (population weighted).

Health service	Psychological distress	Mean (95% CI)			
		Year 2014	2015	2016	2017
School nurse or doctor	High level	1.41 (1.34, 1.48)	1.38 (1.31, 1.45)	1.47 (1.38, 1.56)	1.48 (1.42, 1.54)
	Low level	0.62 (0.58, 0.67)	0.63 (0.59, 0.67)	0.64 (0.61, 0.67)	0.73 (0.69, 0.77)
Youth health centers	High level	0.72 (0.67, 0.76)	0.64 (0.58, 0.70)	0.63 (0.60, 0.67)	0.65 (0.61, 0.70)
	Low level	0.25 (0.22, 0.27)	0.21 (0.19, 0.23)	0.21 (0.20, 0.23)	0.26 (0.23, 0.28)
Psychologist	High level	1.22 (1.15, 1.28)	1.2 (1.16, 1.24)	1.19 (1.15, 1.24)	1.13 (1.1, 1.17)
	Low level	0.21 (0.20, 0.23)	0.22 (0.20, 0.23)	0.21 (0.20, 0.22)	0.25 (0.24, 0.25)
Family doctor	High level	2.20 (2.12, 2.28)	2.25 (2.20, 2.29)	2.24 (2.18, 2.30)	2.25 (2.15, 2.34)
	Low level	1.48 (1.44, 1.53)	1.51 (1.45, 1.56)	1.45 (1.42, 1.49)	1.53 (1.46, 1.59)
Out-of-hours primary healthcare service	High level	1.06 (0.99, 1.13)	1.12 (1.08, 1.17)	1.01 (0.97, 1.06)	1.02 (0.98, 1.05)
	Low level	0.70 (0.68, 0.72)	0.76 (0.73, 0.78)	0.70 (0.68, 0.73)	0.75 (0.74, 0.77)
Average		3.64 (3.54, 3.74)	3.76 (3.62, 3.90)	3.64 (3.56, 3.72)	3.95 (3.86, 4.05)

Looking more closely at the statutory youth primary healthcare services revealed that the use of the school health service increased from an average of 0.72 consultations per person in 2014 to 0.92 in 2018 (Table 2). Young people tended to consult youth health centers less often than the school health

services. Consultation rates for youth health centers increased slightly from 0.31 per person in 2014 to 0.33 in 2018 (Table 2). Young people with high levels of psychological distress used school health services more than twice as much as their peers with low levels of distress (Table 2). The results were similar for youth health centers where young people with high levels of psychological distress used the service close to three times as much as their peers with low levels of distress (Table 2).

In general, there were gender and age differences in primary healthcare service use. Females and older users accessed the services more than males and younger users. On average, females had 1.5 more consultations during a six-month period ($M = 4.57$, 95% CI = 4.50, 4.64) than males ($M = 3.06$, 95% CI = 2.96, 3.16). As the users got older, they used primary healthcare services more, with an average difference of 1.3 consultations between grade 8 ($M = 3.30$, 95% CI = 3.21, 4.30) and third year of upper secondary school ($M = 4.58$, 95% CI = 4.38, 4.72).

For the statutory youth services specifically, females tended to use both services twice as much as males. For the school health services, females had on average 1.07 consultations (95% CI = 1.04, 1.10) compared to 0.53 (95% CI = 0.51, 0.56) for males. For youth health centers, females had 0.42 consultations (96% CI = 0.40, 0.44) compared to 0.17 (95% CI = 0.17, 0.18) among males. As the young people got older, they generally used the services more. For the school health service, use increased through grades 8 to 10, from 0.82 (95% CI = 0.78, 0.86) in grade 8 to a peak of 0.9 (95% CI = 0.87, 0.93) in grade 10. In the transition to upper secondary education where the availability of this service is reduced, the use of the school health service declined to 0.77 (95% CI = 0.74, 0.79).

However, service use then increased as the young people got older to 0.8 (95% CI = 0.74, 0.86) in the third and final year of upper secondary school. For youth health centers, service use increased linearly from 0.17 (95% CI = 0.16, 0.18) in grade 8 to 0.51 (95% CI = 0.46, 0.56) in the last year of upper secondary school.

Regression analysis

Convergence in primary healthcare service utilization for psychological distress among young people

between 2014 and 2018

Results from the GLM regression analysis suggest a changing pattern in primary healthcare service use among young people between 2014 and 2018. Results indicate a gross change in service use over time. There was a significant yearly increase in all service types in the youth population (see Additional file 1). The statutory youth primary healthcare services, the school health service (school nurse or doctor) and youth health centers had an estimated yearly increase of 6% and 4% respectively, based on the log means of primary healthcare service use over time. For the remaining primary healthcare services, the use of a psychologist increased by 5% while both the use of family doctor and out-of-hours primary healthcare increased by 2% yearly. Adding psychological distress as a covariate indicated the proportion of the effect of the time coefficient that could be explained by psychological distress among young people. This ranged from 16% in the pattern of use for the school health service to 66% for the use of a psychologist. This suggests that psychological distress can explain a substantial part of the change in young people's primary healthcare service use between 2014 and 2018.

The interaction term between psychological distress and time that was added to the model was significant and improved the model fit for the school health service ($X^2(1, 635) = 8.9, p < 0.01$), youth health centers ($X^2(1, 635) = 8.6, p < 0.01$), psychologist ($X^2(1, 635) = 31.9, p < 0.001$) and out-of-hours primary healthcare services ($X^2(1, 635) = 14.5, p < 0.001$), but not for family doctor (see Additional file 2). This indicates that primary healthcare service use follows a different slope for young people depending on whether they have high levels of psychological distress or not. This effect did not change when adjusting for gender, grade, socioeconomic status and service availability. The strongest predictor of primary healthcare service use was psychological distress followed by gender. Exponentiating the adjusted regression coefficients for primary healthcare service use over time at the average of all included covariates indicates that young people with high levels of psychological distress use health services more than their peers with low levels. However, the increase of service use over time was mainly observed among young people with low levels of psychological distress and

not among those with high levels (Figure 1).

--- Insert figure 1 around here ---

Figure 1. Youth primary healthcare service use by psychological distress and year (predicted values).

Based on the total predicted values, the observed increase in primary healthcare service use in 2014 compared to 2018 equated to an increase of 371 consultations per 1000 among young people with low levels of psychological distress, while it decreased by 68 consultations for young people with high levels psychological distress. The only primary healthcare service which saw an actual increase in use by young people with high levels of psychological distress was the school health service (that is an increase of 150 consultations per 1000). This suggests convergence in primary healthcare service use between young people with low levels of psychological distress and those with high levels. If the current trend remains unchanged, young people with low levels of psychological distress will use primary healthcare services more than those with high levels within 20 years and the point of convergence is expected to be reached before the year 2038.

Discussion

The aim of this study was to investigate the relation between youth primary healthcare service use and psychological distress in times of increasing mental health problems. Based on Andersen's healthcare utilization model, we expected an increase in psychological distress, such as the increase seen among the youth of Norway, would lead to an increased need for primary healthcare services and an increase in help-seeking behavior among the distressed. We found that between 2014 and 2018 psychological distress among young people continued to increase alongside increasing rates of primary healthcare service use. A large proportion of young people used available primary healthcare services, ranging from 10% using a psychologist to 60% using their family doctor over a six-month period. Overall, psychological distress has a conditional association with youth primary healthcare service use and can explain between 16-66% of the change in the use of services between 2014 and 2018, depending on the service type. Young people with high levels of psychological distress tended

to seek help from primary healthcare services twice as often as their peers with low levels of distress. Contrary to our hypothesis, the absolute increase in primary healthcare service use observed between 2014 and 2018 appeared to be driven mainly by young people with low levels of psychological distress and not by the increasing proportion of young people with high levels of psychological distress. While young people with low psychological distress use services more over time, young people with high levels of psychological distress use services less and less. This is suggestive of a converging trend. This decrease in service utilization among distressed young people was seen in all the youth primary healthcare services, except in the school health service.

Why do young people with high levels of psychological distress use primary healthcare services less over time despite the increasing prevalence of psychological distress?

In our data, based on self-reports, the proportion of young people with high levels of psychological distress increased from 13% in 2014 to 18% in 2018. An increase in psychological distress in Norway has previously been observed by other researchers in the period between 1992 and 2018 [4-8]. This increasing trend of mental health problems among young people is regarded as a public health concern [4]. Psychological distress is usually considered to be strongly associated with primary healthcare service utilization among young people [12, 13] and according to Andersen's health service utilization model [22], increasing rates of psychological distress should theoretically lead to an increased need for primary healthcare services. For young people this should constitute increased primary healthcare service utilization within the school health service and youth health centers or other primary healthcare services. Superficially, this appeared to be the case as we found that young people with psychological distress tend to use primary healthcare services twice as much as their peers with low levels of distress. However, between 2014 and 2018, youth service utilization of primary healthcare services declined yearly by 68 consultations per 1000 young people among those with high levels of psychological distress.

The cause of the decline in the utilization of primary healthcare services among distressed young people is unknown and was unexpected based on our proposed theoretical framework. The healthcare

utilization model suggests that deteriorating health outcomes would create a greater need for care leading to greater primary healthcare service utilization. It would be expected that deteriorating mental health outcomes should lead to a greater need for care. However, since our study does not support this idea, the implication is that there are serious barriers between perceived need for care by young people and primary healthcare service access. This is in line with previous research that has shown that young people access services less than adults [17]. The inherent barriers between care needs and help-seeking behavior is particularly worrying in times of the increasing prevalence of psychological distress in the youth population.

Great measures are taken in Norway to ensure high quality, easily available youth primary healthcare, but the extent to which the services provided are standardized and evidence-based is still under debate. Several Norwegian systematic reviews suggest that there is still room for improvement in the provision of youth-specific services [36, 37]. Current evidence on the provision of mental healthcare in the general population suggests that there are no obvious changes in the risk factors for psychological distress that could explain an increasing trend in mental health problems. This indicates that the issue is complex [38]. The authors argue that the lack of improved mental health may be related to the quality of the care service provided and that currently these services do not meet the minimum standards of clinical practice guidelines. In addition, the services may fail to adequately provide preventive efforts in the pursuit of health promotion among young people and adults. If the authors' conclusion is correct, it would suggest that the quality of the services provided for young people in Norway does not currently meet the needs of young people with psychological distress and that many distressed young people seek help elsewhere or possibly not at all. It is presently unknown if young people with psychological distress seek help elsewhere within the healthcare system (for example other care services or specialized care), or that they seek help from informal sources of care, such as family and friends [39]. If they do, this could explain the decline observed in most primary healthcare services between 2014 and 2018.

Our finding that young people with high levels of psychological distress used primary healthcare services less between 2014 and 2018 despite deteriorating mental health supports the recommended

quality improvements in healthcare systems suggested by Jorm et al. [38], in order to make primary healthcare services more effective in preventing further deterioration of mental health in the youth population. Policy makers and care providers should be advised that primary healthcare services need to be made more attractive and youth-friendly in order to ensure access for young people with psychological distress.

Why do young people with low levels of psychological distress use services more often over time?

Young people with low levels of psychological distress use primary healthcare services relatively less than those with high levels of psychological distress. However, between 2014 and 2018, service use among young people with low levels of psychological distress increased substantially. Compared to 2014, young people with low levels of psychological distress had 371 more primary healthcare consultations per 1000 young people in 2018. This leads to many questions regarding psychological distress and its effects on primary healthcare utilization. Since young people with low levels of psychological distress use primary healthcare services more often over time, this may suggest a change in the propensity to seek care, such as a lower threshold for seeking care (overuse). A previous study found that the mean level of psychological distress among young people using psychiatric services between 2002 and 2010 decreased suggesting a lower threshold for help-seeking behavior among young people in Sweden. However, this development was not found among adults. The authors therefore argued that a lower threshold of help-seeking behavior among young people may explain the recent increase in psychiatric service use in Sweden and perhaps in other developed countries [13]. Another study involving patient data from 34 countries investigated the propensity to seek healthcare and found that it was weakly associated with greater use of a family doctor [40]. In addition, the authors found that the characteristics of the healthcare system might influence patients' decision to seek help, potentially leading to either overuse or underuse of health services [40]. According to the Norwegian Institute of Public Health [41], underuse of primary healthcare services appears to be more likely in the general population. On the other hand, the Norwegian Institute of

Public Health points out that if help-seeking behavior were to increase among those with low levels of psychological symptoms, as seen in our study and in a study by Kosidou et al. [13], this might instead indicate overuse of health services.

Further evidence to support the notion of overuse among young people with low levels of psychological distress between 2014 and 2018 might be found in the impact of a school absence policy introduced in 2016. From the start of the 2016/17 school year, new rules for absence were introduced in upper secondary schools [42]. The main feature of the new regulations is that students with more than 10% undocumented absence in a school subject lose their right to a graded semester assessment without which they are unable to graduate. In case of illness, only a medical certificate or documentation issued by a qualified healthcare professional will be considered as valid absence documentation following more than 10% absence from upper secondary school. According to Bakken et al. [43], the number of consultations in the general practice services increased by 30% in the age group 16 to 18 years in the year the reform was introduced compared to the previous year. This led the authors to believe that it is very likely that the school absence policy is inadvertently causing young people to overuse primary healthcare services. Bakken et al. [43] only included data on the use of family doctors among young people, but since health personnel other than the family doctor (e.g., physiotherapists, dentists, psychologists) may also document absence for the students [42], a similar increase could conceivably be observed in other primary healthcare services as well. Interestingly, our study partially confirms this. Young people in general (and to a greater extent young people in upper secondary school) with low levels of psychological distress had a general increase of primary healthcare service use after the policy change in 2016 above that of young people with high levels of psychological distress. This might suggest that part of the increase in youth primary healthcare service use is not a sign of increased morbidity, but rather in part due to young people needing a medical certificate to avoid failing subjects, further supporting the notion of overuse among young people with low levels of psychological distress.

Alternatively, the increased use of primary healthcare services among young people with low levels of psychological distress might partly be explained by a change in how young people utilize primary

healthcare services for matters not directly relating to psychological distress and not captured in our study. Young people use primary healthcare services for a wide range of reasons, including sexual health (such as pregnancy, contraception and sexually transmitted infections) which is also one of the most common reasons for contact with youth primary healthcare alongside mental health issues [16]. The propensity for young people to seek care remains understudied and more research is needed in order to determine if increases seen in youth primary healthcare use are due to overuse mechanisms.

Predisposing and enabling factors of service use

The predisposing and enabling factors covered in this study, gender, age, socioeconomic status and psychological distress, are all important indicators of primary healthcare service utilization among young people. In regard to gender and youth primary healthcare service use, it is well known that females use primary healthcare services more than males, a finding that is also observed in the current study. Given that males have the same need for primary healthcare services when they have psychological distress, it is not thoroughly understood why males report less help-seeking behavior. Empirical evidence indicates that low treatment rates among males cannot be explained by better health, but must be attributed to a discrepancy between perception of need and help-seeking behavior [44, 45]. Furthermore, we found that older young people generally used primary healthcare services more often. We also found that overall, socioeconomically disadvantaged young people used primary healthcare services more than the more advantaged. This might suggest equitable services proportionate to those with the greatest need [46].

Strengths and limitations

A major strength of this study is that it is based on a very large sample of young people and has a yearly data collection scheme allowing the investigation of trends in the general youth population in Norway. In addition, data are weighted and adjusted in order to ensure national representativeness of young people growing up in Norway. However, one limitation is that the repeated cross-sectional design used in the current study does not enable strict causal inference. In addition, this study relies

on self-reported data, which provide the overall picture from the young people's own perspective and might be distinct from objective data. Finally, the use of youth primary healthcare services is a general outcome in the survey and therefore the specific reason for the consultations are not known and could be related to health outcomes other than those studied in our paper.

Conclusion

Between 2014 and 2018, there was an increase in the prevalence of psychological distress and primary healthcare service use among young people in Norway. Young people with high levels of psychological distress used primary healthcare services twice as often as their peers. However, despite an increasing proportion of young people with psychological distress between 2014 and 2018, primary healthcare service use among young people with high levels of psychological distress declined. This suggests that the absolute increase seen in primary healthcare utilization among young people is accounted for by increased use among the less distressed. Declining primary healthcare service use among young people with high levels of psychological distress in parallel with increasing use among the less distressed suggests future convergence. A converging trend of primary healthcare service use suggests overuse of primary healthcare services among the less distressed young people and likely underuse among the more distressed. It is currently unknown if young people with high levels of psychological distress seek care elsewhere in the healthcare system, from friends and family or not at all. These issues need to be further investigated in order to map possible overuse and underuse mechanisms and to ensure that young people get excellent care when they need it.

Abbreviations

HSCL: Hopkins Symptom Checklist

FAS: Family Affluence Scale

GLM: Generalized Linear Model

NSD: Norwegian Centre for Research Data

NOVA: Norwegian Social Research - NOVA

Declarations

Ethics approval and consent to participate

The study was approved by the NSD, Norwegian Centre for Research Data (reference number: 42367). The Ungdata survey was administered anonymously online during school hours with a teacher present. The young people were informed that participation was voluntary, and parents were informed prior to the study (a passive consent scheme).

Consent for publication

N/A

Availability of data and materials

The datasets generated during and/or analyzed during the current study are available in the NSD - Norwegian Centre for Research Data repository (<https://nsd.no/nsd/english/orderform.html>).

Competing interests

The authors declare that they have no competing interests.

Funding

The authors declare that they have no competing interests

Authors' contributions

All authors prepared the outline of the first draft and created a data analysis plan. TP prepared the first draft of the paper. TP and NW analyzed the data. All authors reviewed the first- and subsequent drafts of the paper and approved the final manuscript.

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Figures

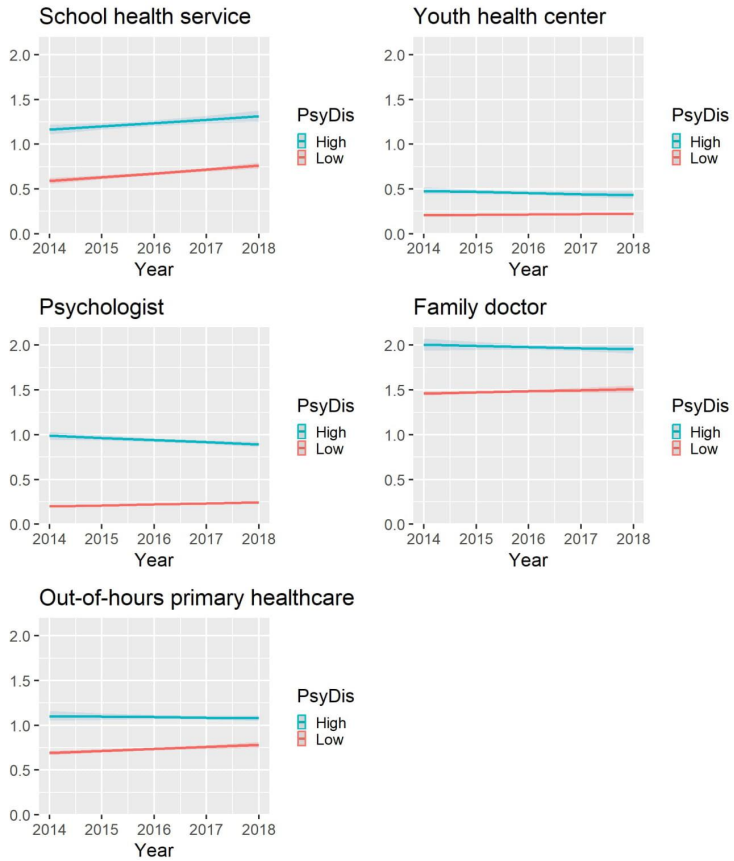


Figure 1

Youth primary healthcare service use by psychological distress and year (predicted values).

Supplementary Files

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10. Appendix

10.1 Appendix 1. PRISMA checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-6
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5-6
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	6
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6-7
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	7-8
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	7-8, S3
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	8
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7-8
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7-8
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	8

Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	9-11
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I ²) for each meta-analysis.	9-11

10.2 Appendix 2. Peer review of electronic search strategies (PRESS)

Peer Review of Electronic Search Strategies (PRESS)			
Review title: Time trends in adolescent subjective health complaints from 1985-2015			
Author: Thomas Potrebny <Thomas.Potrebny@hib.no>		Reviewer: Regina Kűfner Lein	Date completed: 11. Nov. 2016
Database: Medline (Ovid)			
			If "B" or "C," please provide an explanation or example:
1	Translation of the research question	<input checked="" type="checkbox"/> A. No revisions <input type="checkbox"/> B. Revision(s) suggested <input type="checkbox"/> C. Revision(s) required	
2	Boolean and proximity operators	<input checked="" type="checkbox"/> A. No revisions <input type="checkbox"/> B. Revision(s) suggested <input type="checkbox"/> C. Revision(s) required	
3	Subject headings	<input checked="" type="checkbox"/> A. No revisions <input type="checkbox"/> B. Revision(s) suggested <input type="checkbox"/> C. Revision(s) required	
4	Text word searching	<input checked="" type="checkbox"/> A. No revisions <input type="checkbox"/> B. Revision(s) suggested <input type="checkbox"/> C. Revision(s) required	
5	Spelling, syntax, and line numbers	<input checked="" type="checkbox"/> A. No revisions <input type="checkbox"/> B. Revision(s) suggested	

		<input type="checkbox"/> C. Revision(s) required	
6	Limits and filters	<input checked="" type="checkbox"/> A. No revisions <input type="checkbox"/> B. Revision(s) suggested <input type="checkbox"/> C. Revision(s) required	
7	Overall evaluation (if one or more «revision required is noted above, the response must be «revisions required»)	<input checked="" type="checkbox"/> A. No revisions <input type="checkbox"/> B. Revision(s) suggested <input type="checkbox"/> C. Revision(s) required	

10.3 Appendix 3. Complete search strategy

Complete search strategy 22.11.2016.

Database: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) <1946 to Present>

Search Strategy:

-
- 1 Diagnostic Self Evaluation/ or Psychophysiologic Disorders/ or Psychosomatic Medicine/ (25966)
 - 2 ((subjective or self-reported) adj3 (health or complaints)).ti,ab. (12319)
 - 3 (health complaint* or psychosomatic or psychophysiolog*).ti,ab. (22171)
 - 4 adolescent/ or child/ or Young Adult/ (2910380)

5 (adolescen* or youth or youths or kid or kids or preteen or teen* or child* or young or juvenile).ti,ab. (1757265)

6 time/ or time factors/ (1169764)

7 (time or trend or trends or secular or temporal).ti,ab. (3087898)

8 1 or 2 or 3 (51720)

9 4 or 5 (3659872)

10 6 or 7 (3919093)

11 8 and 9 and 10 (2350)

Database: Embase <1974 to 2016 Week 47>

Search Strategy:

1 self evaluation/ (27812)

2 (Diagnostic Self Evaluation or self diagnosis).ti,ab. (397)

3 psychophysiology/ (19571)

4 psychosomatic disorder/ or psychosomatics/ (29139)

5 (health complaint* or psychosomatic or psychophysiolog*).ti,ab. (28977)

- 6 ((subjective or self-reported) adj3 (health or complaints)).ti,ab. (13682)

- 7 adolescent/ (1401923)

- 8 child/ (1630709)

- 9 juvenile/ (60856)

- 10 young adult/ (150665)

- 11 (adolescen* or youth or youths or kid or kids or preteen or teen* or child* or young or juvenile).ti,ab. (1999315)

- 12 time/ or time factor/ (393696)

- 13 trend study/ (18273)

- 14 (time or trend or trends or secular or temporal).ti,ab. (3683026)

- 15 1 or 2 or 3 or 4 or 5 or 6 (101951)

- 16 7 or 8 or 9 or 10 or 11 (3243179)

- 17 12 or 13 or 14 (3954500)

- 18 15 and 16 and 17 (3341)

Search Strategy:

- 1 Health Complaints/ or Self-Report/ or exp Psychophysiology/ (23075)
- 2 psychosomatic medicine/ (1556)
- 3 ((subjective or self-reported) adj3 (health or complaints)).ti,ab. (5507)
- 4 (health complaint* or psychosomatic or psychophysiology*).ti,ab. (20457)
- 5 exp Somatoform Disorders/ (11229)
- 6 ADOLESCENT PSYCHOLOGY/ or Adolescent Characteristics/ (3938)
- 7 child characteristics/ or child psychology/ (4195)
- 8 (adolescen* or youth or youths or kid or kids or preteen or teen* or child* or young or juvenile).ti,ab. (773874)
- 9 TIME/ (11511)
- 10 TRENDS/ (9398)
- 11 (time or trend or trends or secular or temporal).ti,ab. (572556)
- 12 1 or 2 or 3 or 4 or 5 (51394)
- 13 6 or 7 or 8 (774171)
- 14 9 or 10 or 11 (575546)

Braverman et al. (2016)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dey et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Due et al. (2003)	Y	Y	Y	Y	Y	Y	Y	N	Y
Duinhof et al. (2014)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fink et al. (2015)	N	U	Y	Y	N	Y	Y	Y	Y
Fleming et al. (2014)	N	Y	Y	Y	U	Y	Y	Y	Y
Hagquist (2009)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Henriksen et al. (2012)	N	U	U	N	N	Y	U	Y	Y
Levin et al. (2009)	Y	Y	Y	U	Y	Y	Y	Y	Y
Levin et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Maughan et al. (2012)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Norell-Clarke et al. (2016)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ottová - Jordan et al. (2015a)	Y	Y	Y	U	Y	Y	Y	Y	U
Ottová - Jordan et al.	Y	Y	Y	U	Y	Y	Y	Y	U

Doctoral Theses at The Faculty of Psychology,
University of Bergen

1980	Allen, Hugh M., Dr. philos.	Parent-offspring interactions in willow grouse (<i>Lagopus L. Lagopus</i>).
1981	Myhrer, Trond, Dr. philos.	Behavioral Studies after selective disruption of hippocampal inputs in albino rats.
1982	Svebak, Sven, Dr. philos.	The significance of motivation for task-induced tonic physiological changes.
1983	Myhre, Grete, Dr. philos.	The Biopsychology of behavior in captive Willow ptarmigan.
	Eide, Rolf, Dr. philos.	PSYCHOSOCIAL FACTORS AND INDICES OF HEALTH RISKS. The relationship of psychosocial conditions to subjective complaints, arterial blood pressure, serum cholesterol, serum triglycerides and urinary catecholamines in middle aged populations in Western Norway.
	Værnes, Ragnar J., Dr. philos.	Neuropsychological effects of diving.
1984	Kolstad, Arnulf, Dr. philos.	Til diskusjonen om sammenhengen mellom sosiale forhold og psykiske strukturer. En epidemiologisk undersøkelse blant barn og unge.
	Løberg, Tor, Dr. philos.	Neuropsychological assessment in alcohol dependence.
1985	Hellesnes, Tore, Dr. philos.	Læring og problemløsning. En studie av den perseptuelle analysens betydning for verbal læring.
	Håland, Wenche, Dr. philos.	Psykoterapi: relasjon, utviklingsprosess og effekt.
1986	Hagtvet, Knut A., Dr. philos.	The construct of test anxiety: Conceptual and methodological issues.
	Jellestad, Finn K., Dr. philos.	Effects of neuron specific amygdala lesions on fear-motivated behavior in rats.
1987	Aarø, Leif E., Dr. philos.	Health behaviour and sosioeconomic Status. A survey among the adult population in Norway.
	Underlid, Kjell, Dr. philos.	Arbeidsløyse i psykososialt perspektiv.
	Laberg, Jon C., Dr. philos.	Expectancy and classical conditioning in alcoholics' craving.
	Vollmer, Fred, Dr. philos.	Essays on explanation in psychology.
	Ellertsen, Bjørn, Dr. philos.	Migraine and tension headache: Psychophysiology, personality and therapy.
1988	Kaufmann, Astrid, Dr. philos.	Antisocial atferd hos ungdom. En studie av psykologiske determinanter.

	Mykletun, Reidar J., Dr. philos.	Teacher stress: personality, work-load and health.
	Havik, Odd E., Dr. philos.	After the myocardial infarction: A medical and psychological study with special emphasis on perceived illness.
1989	Bråten, Stein, Dr. philos.	Menneskedyaden. En teoretisk tese om sinnets dialogiske natur med informasjons- og utviklingspsykologiske implikasjoner sammenholdt med utvalgte spedbarnsstudier.
	Wold, Bente, Dr. psychol.	Lifestyles and physical activity. A theoretical and empirical analysis of socialization among children and adolescents.
1990	Flaten, Magne A., Dr. psychol.	The role of habituation and learning in reflex modification.
1991	Alsaker, Françoise D., Dr. philos.	Global negative self-evaluations in early adolescence.
	Kraft, Pål, Dr. philos.	AIDS prevention in Norway. Empirical studies on diffusion of knowledge, public opinion, and sexual behaviour.
	Endresen, Inger M., Dr. philos.	Psychoimmunological stress markers in working life.
	Faleide, Asbjørn O., Dr. philos.	Asthma and allergy in childhood. Psychosocial and psychotherapeutic problems.
1992	Dalen, Knut, Dr. philos.	Hemispheric asymmetry and the Dual-Task Paradigm: An experimental approach.
	Bø, Inge B., Dr. philos.	Ungdoms sosiale økologi. En undersøkelse av 14-16 åringers sosiale nettverk.
	Nivison, Mary E., Dr. philos.	The relationship between noise as an experimental and environmental stressor, physiological changes and psychological factors.
	Torgersen, Anne M., Dr. philos.	Genetic and environmental influence on temperamental behaviour. A longitudinal study of twins from infancy to adolescence.
1993	Larsen, Svein, Dr. philos.	Cultural background and problem drinking.
	Nordhus, Inger Hilde, Dr. philos.	Family caregiving. A community psychological study with special emphasis on clinical interventions.
	Thuen, Frode, Dr. psychol.	Accident-related behaviour among children and young adolescents: Prediction and prevention.
	Solheim, Ragnar, Dr. philos.	Spesifikke lærevansker. Diskrepanskriteriet anvendt i seleksjonsmetodikk.
	Johnsen, Bjørn Helge, Dr. psychol.	Brain asymmetry and facial emotional expressions: Conditioning experiments.
1994	Tønnessen, Finn E., Dr. philos.	The etiology of Dyslexia.
	Kvale, Gerd, Dr. psychol.	Psychological factors in anticipatory nausea and vomiting in cancer chemotherapy.

	Asbjørnsen, Arve E., Dr. psychol.	Structural and dynamic factors in dichotic listening: An interactional model.
	Bru, Edvin, Dr. philos.	The role of psychological factors in neck, shoulder and low back pain among female hospital staff.
	Braathen, Eli T., Dr. psychol.	Prediction of excellence and discontinuation in different types of sport: The significance of motivation and EMG.
	Johannessen, Birte F., Dr. philos.	Det flytende kjønnnet. Om lederskap, politikk og identitet.
1995	Sam, David L., Dr. psychol.	Acculturation of young immigrants in Norway: A psychological and socio-cultural adaptation.
	Bjaalid, Inger-Kristin, Dr. philos.	Component processes in word recognition.
	Martinsen, Øyvind, Dr. philos.	Cognitive style and insight.
	Nordby, Helge, Dr. philos.	Processing of auditory deviant events: Mismatch negativity of event-related brain potentials.
	Raaheim, Arild, Dr. philos.	Health perception and health behaviour, theoretical considerations, empirical studies, and practical implications.
	Seltzer, Wencke J., Dr. philos.	Studies of Psychocultural Approach to Families in Therapy.
	Brun, Wibecke, Dr. philos.	Subjective conceptions of uncertainty and risk.
	Aas, Henrik N., Dr. psychol.	Alcohol expectancies and socialization: Adolescents learning to drink.
	Bjørkly, Stål, Dr. psychol.	Diagnosis and prediction of intra-institutional aggressive behaviour in psychotic patients
1996	Anderssen, Norman, Dr. psychol.	Physical activity of young people in a health perspective: Stability, change and social influences.
	Sandal, Gro Mjeldheim, Dr. psychol.	Coping in extreme environments: The role of personality.
	Strumse, Einar, Dr. philos.	The psychology of aesthetics: explaining visual preferences for agrarian landscapes in Western Norway.
	Hestad, Knut, Dr. philos.	Neuropsychological deficits in HIV-1 infection.
	Lugoe, L.Wycliffe, Dr. philos.	Prediction of Tanzanian students' HIV risk and preventive behaviours
	Sandvik, B. Gunnhild, Dr. philos.	Fra distriktsjordmor til institusjonsjordmor. Fremveksten av en profesjon og en profesjonsutdanning
	Lie, Gro Therese, Dr. psychol.	The disease that dares not speak its name: Studies on factors of importance for coping with HIV/AIDS in Northern Tanzania
	Øygard, Lisbet, Dr. philos.	Health behaviors among young adults. A psychological and sociological approach
	Stormark, Kjell Morten, Dr. psychol.	Emotional modulation of selective attention: Experimental and clinical evidence.

- Einarsen, Ståle, Dr. psychol. Bullying and harassment at work: epidemiological and psychosocial aspects.
- 1997** Knivsberg, Ann-Mari, Dr. philos. Behavioural abnormalities and childhood psychopathology: Urinary peptide patterns as a potential tool in diagnosis and remediation.
- Eide, Arne H., Dr. philos. Adolescent drug use in Zimbabwe. Cultural orientation in a global-local perspective and use of psychoactive substances among secondary school students.
- Sørensen, Marit, Dr. philos. The psychology of initiating and maintaining exercise and diet behaviour.
- Skjæveland, Oddvar, Dr. psychol. Relationships between spatial-physical neighborhood attributes and social relations among neighbors.
- Zewdie, Tekla, Dr. philos. Mother-child relational patterns in Ethiopia. Issues of developmental theories and intervention programs.
- Wilhelmsen, Britt Unni, Dr. philos. Development and evaluation of two educational programmes designed to prevent alcohol use among adolescents.
- Manger, Terje, Dr. philos. Gender differences in mathematical achievement among Norwegian elementary school students.
- 1998** Lindstrøm, Torill Christine, Dr. philos. «Good Grief»: Adapting to Bereavement.
- V** Skogstad, Anders, Dr. philos. Effects of leadership behaviour on job satisfaction, health and efficiency.
- Haldorsen, Ellen M. Håland, Dr. psychol. Return to work in low back pain patients.
- Besemer, Susan P., Dr. philos. Creative Product Analysis: The Search for a Valid Model for Understanding Creativity in Products.
- H** Winje, Dagfinn, Dr. psychol. Psychological adjustment after severe trauma. A longitudinal study of adults' and children's posttraumatic reactions and coping after the bus accident in Måbødalen, Norway 1988.
- Vosburg, Suzanne K., Dr. philos. The effects of mood on creative problem solving.
- Eriksen, Hege R., Dr. philos. Stress and coping: Does it really matter for subjective health complaints?
- Jakobsen, Reidar, Dr. psychol. Empiriske studier av kunnskap og holdninger om hiv/aids og den normative seksuelle utvikling i ungdomsårene.
- 1999** Mikkelsen, Aslaug, Dr. philos. Effects of learning opportunities and learning climate on occupational health.
- V** Samdal, Oddrun, Dr. philos. The school environment as a risk or resource for students' health-related behaviours and subjective well-being.
- Friestad, Christine, Dr. philos. Social psychological approaches to smoking.
- Ekeland, Tor-Johan, Dr. philos. Meining som medisin. Ein analyse av placebofenomenet og implikasjonar for terapi og terapeutiske teoriar.

H	Saban, Sara, Dr. psychol.	Brain Asymmetry and Attention: Classical Conditioning Experiments.
	Carlsten, Carl Thomas, Dr. philos.	God lesing – God læring. En aksjonsrettet studie av undervisning i fagtekstlesing.
	Dundas, Ingrid, Dr. psychol.	Functional and dysfunctional closeness. Family interaction and children's adjustment.
	Engen, Liv, Dr. philos.	Kartlegging av leseferdighet på småskoletrinnet og vurdering av faktorer som kan være av betydning for optimal leseutvikling.
2000 V	Hovland, Ole Johan, Dr. philos.	Transforming a self-preserving "alarm" reaction into a self-defeating emotional response: Toward an integrative approach to anxiety as a human phenomenon.
	Lillejord, Sølvi, Dr. philos.	Handlingsrasjonalitet og spesialundervisning. En analyse av aktørperspektiver.
	Sandell, Ove, Dr. philos.	Den varme kunnskapen.
	Oftedal, Marit Petersen, Dr. philos.	Diagnostisering av ordavkodingsvansker: En prosessanalytisk tilnæringsmåte.
H	Sandbak, Tone, Dr. psychol.	Alcohol consumption and preference in the rat: The significance of individual differences and relationships to stress pathology
	Eid, Jarle, Dr. psychol.	Early predictors of PTSD symptom reporting; The significance of contextual and individual factors.
2001 V	Skinstad, Anne Helene, Dr. philos.	Substance dependence and borderline personality disorders.
	Binder, Per-Einar, Dr. psychol.	Individet og den meningsbærende andre. En teoretisk undersøkelse av de mellommenneskelige forutsetningene for psykisk liv og utvikling med utgangspunkt i Donald Winnicotts teori.
	Roald, Ingvild K., Dr. philos.	Building of concepts. A study of Physics concepts of Norwegian deaf students.
H	Fekadu, Zelalem W., Dr. philos.	Predicting contraceptive use and intention among a sample of adolescent girls. An application of the theory of planned behaviour in Ethiopian context.
	Melesse, Fantu, Dr. philos.	The more intelligent and sensitive child (MISC) mediational intervention in an Ethiopian context: An evaluation study.
	Råheim, Målfrid, Dr. philos.	Kvinnens kroppserfaring og livssammenheng. En fenomenologisk – hermeneutisk studie av friske kvinner og kvinner med kroniske muskelsmerter.
	Engelsen, Birthe Kari, Dr. psychol.	Measurement of the eating problem construct.
	Lau, Bjørn, Dr. philos.	Weight and eating concerns in adolescence.
2002 V	Ihlebak, Camilla, Dr. philos.	Epidemiological studies of subjective health complaints.

	Rosén, Gunnar O. R., Dr. philos.	The phantom limb experience. Models for understanding and treatment of pain with hypnosis.
	Høines, Marit Johnsen, Dr. philos.	Fleksible språkrom. Matematikklæring som tekstutvikling.
	Anthun, Roald Andor, Dr. philos.	School psychology service quality. Consumer appraisal, quality dimensions, and collaborative improvement potential
	Pallesen, Ståle, Dr. psychol.	Insomnia in the elderly. Epidemiology, psychological characteristics and treatment.
	Midthassel, Unni Vere, Dr. philos.	Teacher involvement in school development activity. A study of teachers in Norwegian compulsory schools
	Kallestad, Jan Helge, Dr. philos.	Teachers, schools and implementation of the Olweus Bullying Prevention Program.
H	Ofte, Sonja Helgesen, Dr. psychol.	Right-left discrimination in adults and children.
	Netland, Marit, Dr. psychol.	Exposure to political violence. The need to estimate our estimations.
	Diseth, Åge, Dr. psychol.	Approaches to learning: Validity and prediction of academic performance.
	Bjuland, Raymond, Dr. philos.	Problem solving in geometry. Reasoning processes of student teachers working in small groups: A dialogical approach.
2003 V	Arefjord, Kjersti, Dr. psychol.	After the myocardial infarction – the wives' view. Short- and long-term adjustment in wives of myocardial infarction patients.
	Ingjaldsson, Jón Þorvaldur, Dr. psychol.	Unconscious Processes and Vagal Activity in Alcohol Dependency.
	Holden, Børge, Dr. philos.	Følger av atferdsanalytiske forklaringer for atferdsanalysens tilnærming til utforming av behandling.
	Holsen, Ingrid, Dr. philos.	Depressed mood from adolescence to 'emerging adulthood'. Course and longitudinal influences of body image and parent-adolescent relationship.
	Hammar, Åsa Karin, Dr. psychol.	Major depression and cognitive dysfunction- An experimental study of the cognitive effort hypothesis.
	Sprugevica, Ieva, Dr. philos.	The impact of enabling skills on early reading acquisition.
	Gabrielsen, Egil, Dr. philos.	LESE FOR LIVET. Lesekompetansen i den norske voksenbefolkningen sett i lys av visjonen om en enhetsskole.
H	Hansen, Anita Lill, Dr. psychol.	The influence of heart rate variability in the regulation of attentional and memory processes.
	Dyregrov, Kari, Dr. philos.	The loss of child by suicide, SIDS, and accidents: Consequences, needs and provisions of help.
2004 V	Torsheim, Torbjørn, Dr. psychol.	Student role strain and subjective health complaints: Individual, contextual, and longitudinal perspectives.

	Haugland, Bente Storm Mowatt Dr. psychol.	Parental alcohol abuse. Family functioning and child adjustment.
	Milde, Anne Marita, Dr. psychol.	Ulcerative colitis and the role of stress. Animal studies of psychobiological factors in relationship to experimentally induced colitis.
	Stornes, Tor, Dr. philos.	Socio-moral behaviour in sport. An investigation of perceptions of sportspersonship in handball related to important factors of socio-moral influence.
	Mæhle, Magne, Dr. philos.	Re-inventing the child in family therapy: An investigation of the relevance and applicability of theory and research in child development for family therapy involving children.
	Kobbeltvedt, Therese, Dr. psychol.	Risk and feelings: A field approach.
2004 H	Thomsen, Tormod, Dr. psychol.	Localization of attention in the brain.
	Løberg, Else-Marie, Dr. psychol.	Functional laterality and attention modulation in schizophrenia: Effects of clinical variables.
	Kyrkjebø, Jane Mikkelsen, Dr. philos.	Learning to improve: Integrating continuous quality improvement learning into nursing education.
	Laumann, Karin, Dr. psychol.	Restorative and stress-reducing effects of natural environments: Experiential, behavioural and cardiovascular indices.
	Hølgersen, Helge, PhD	Mellom oss - Essay i relasjonell psykoanalyse.
2005 V	Hetland, Hilde, Dr. psychol.	Leading to the extraordinary? Antecedents and outcomes of transformational leadership.
	Iversen, Anette Christine, Dr. philos.	Social differences in health behaviour: the motivational role of perceived control and coping.
2005 H	Mathisen, Gro Ellen, PhD	Climates for creativity and innovation: Definitions, measurement, predictors and consequences.
	Sævi, Tone, Dr. philos.	Seeing disability pedagogically – The lived experience of disability in the pedagogical encounter.
	Wium, Nora, PhD	Intrapersonal factors, family and school norms: combined and interactive influence on adolescent smoking behaviour.
	Kanagaratnam, Pushpa, PhD	Subjective and objective correlates of Posttraumatic Stress in immigrants/refugees exposed to political violence.
	Larsen, Torill M. B. , PhD	Evaluating principals` and teachers` implementation of Second Step. A case study of four Norwegian primary schools.
	Bancila, Delia, PhD	Psychosocial stress and distress among Romanian adolescents and adults.
2006 V	Hillestad, Torgeir Martin, Dr. philos.	Normalitet og avvik. Forutsetninger for et objektivt psykopatologisk avviksbegrep. En psykologisk, sosial, erkjennelsesteoretisk og teoriehistorisk framstilling.

	Nordanger, Dag Øystein, Dr. psychol.	Psychosocial discourses and responses to political violence in post-war Tigray, Ethiopia.
	Rimol, Lars Morten, PhD	Behavioral and fMRI studies of auditory laterality and speech sound processing.
	Krumsvik, Rune Johan, Dr. philos.	ICT in the school. ICT-initiated school development in lower secondary school.
	Norman, Elisabeth, Dr. psychol.	Gut feelings and unconscious thought: An exploration of fringe consciousness in implicit cognition.
	Israel, K Pravin, Dr. psychol.	Parent involvement in the mental health care of children and adolescents. Empirical studies from clinical care setting.
	Glasø, Lars, PhD	Affects and emotional regulation in leader-subordinate relationships.
	Knutsen, Ketil, Dr. philos.	HISTORIER UNGDOM LEVER – En studie av hvordan ungdommer bruker historie for å gjøre livet meningsfullt.
	Matthiesen, Stig Berge, PhD	Bullying at work. Antecedents and outcomes.
2006	Gramstad, Arne, PhD	Neuropsychological assessment of cognitive and emotional functioning in patients with epilepsy.
H	Bendixen, Mons, PhD	Antisocial behaviour in early adolescence: Methodological and substantive issues.
	Mrumbi, Khalifa Maulid, PhD	Parental illness and loss to HIV/AIDS as experienced by AIDS orphans aged between 12-17 years from Temeke District, Dar es Salaam, Tanzania: A study of the children's psychosocial health and coping responses.
	Hetland, Jørn, Dr. psychol.	The nature of subjective health complaints in adolescence: Dimensionality, stability, and psychosocial predictors
	Kakoko, Deodatus Conatus Vitalis, PhD	Voluntary HIV counselling and testing service uptake among primary school teachers in Mwanza, Tanzania: assessment of socio-demographic, psychosocial and socio-cognitive aspects
	Mykletun, Arnstein, Dr. psychol.	Mortality and work-related disability as long-term consequences of anxiety and depression: Historical cohort designs based on the HUNT-2 study
	Sivertsen, Børge, PhD	Insomnia in older adults. Consequences, assessment and treatment.
2007	Singhammer, John, Dr. philos.	Social conditions from before birth to early adulthood – the influence on health and health behaviour
V	Janvin, Carmen Ani Cristea, PhD	Cognitive impairment in patients with Parkinson's disease: profiles and implications for prognosis
	Braarud, Hanne Cecilie, Dr. psychol.	Infant regulation of distress: A longitudinal study of transactions between mothers and infants
	Tveito, Torill Helene, PhD	Sick Leave and Subjective Health Complaints

	Magnussen, Liv Heide, PhD	Returning disability pensioners with back pain to work
	Thuen, Elin Marie, Dr.philos.	Learning environment, students' coping styles and emotional and behavioural problems. A study of Norwegian secondary school students.
	Solberg, Ole Asbjørn, PhD	Peacekeeping warriors – A longitudinal study of Norwegian peacekeepers in Kosovo
2007 H	Søreide, Gunn Elisabeth, Dr.philos.	Narrative construction of teacher identity
	Svensen, Erling, PhD	WORK & HEALTH. Cognitive Activation Theory of Stress applied in an organisational setting.
	Øverland, Simon Nygaard, PhD	Mental health and impairment in disability benefits. Studies applying linkages between health surveys and administrative registries.
	Eichele, Tom, PhD	Electrophysiological and Hemodynamic Correlates of Expectancy in Target Processing
	Børhaug, Kjetil, Dr.philos.	Oppseding til demokrati. Ein studie av politisk oppseding i norsk skule.
	Eikeland, Thorleif, Dr.philos.	Om å vokse opp på barnehjem og på sykehus. En undersøkelse av barnehjemsbarns opplevelser på barnehjem sammenholdt med sanatoriebarns beskrivelse av langvarige sykehusopphold – og et forsøk på forklaring.
	Wadel, Carl Cato, Dr.philos.	Medarbeidersamhandling og medarbeiderledelse i en lagbasert organisasjon
	Vinje, Hege Forbech, PhD	Thriving despite adversity: Job engagement and self-care among community nurses
	Noort, Maurits van den, PhD	Working memory capacity and foreign language acquisition
2008 V	Breivik, Kyrre, Dr.psychol.	The Adjustment of Children and Adolescents in Different Post-Divorce Family Structures. A Norwegian Study of Risks and Mechanisms.
	Johnsen, Grethe E., PhD	Memory impairment in patients with posttraumatic stress disorder
	Sætrevik, Bjørn, PhD	Cognitive Control in Auditory Processing
	Carvalho, Susana Fonseca, PhD	Prevention of bullying in schools: an ecological model
2008 H	Brønnick, Kolbjørn Selvåg	Attentional dysfunction in dementia associated with Parkinson's disease.
	Posserud, Maj-Britt Rocio	Epidemiology of autism spectrum disorders
	Haug, Ellen	Multilevel correlates of physical activity in the school setting
	Skjerve, Arvid	Assessing mild dementia – a study of brief cognitive tests.

	Kjønniksen, Lise	The association between adolescent experiences in physical activity and leisure time physical activity in adulthood: a ten year longitudinal study
	Gundersen, Hilde	The effects of alcohol and expectancy on brain function
	Omvik, Siri	Insomnia – a night and day problem
2009 V	Molde, Helge	Pathological gambling: prevalence, mechanisms and treatment outcome.
	Foss, Else	Den omsorgsfulle væremåte. En studie av voksnes væremåte i forhold til barn i barnehagen.
	Westrheim, Kariane	Education in a Political Context: A study of Knowledge Processes and Learning Sites in the PKK.
	Wehling, Eike	Cognitive and olfactory changes in aging
	Wangberg, Silje C.	Internet based interventions to support health behaviours: The role of self-efficacy.
	Nielsen, Morten B.	Methodological issues in research on workplace bullying. Operationalisations, measurements and samples.
	Sandu, Anca Larisa	MRI measures of brain volume and cortical complexity in clinical groups and during development.
	Guribye, Eugene	Refugees and mental health interventions
	Sørensen, Lin	Emotional problems in inattentive children – effects on cognitive control functions.
	Tjomsland, Hege E.	Health promotion with teachers. Evaluation of the Norwegian Network of Health Promoting Schools: Quantitative and qualitative analyses of predisposing, reinforcing and enabling conditions related to teacher participation and program sustainability.
	Helleve, Ingrid	Productive interactions in ICT supported communities of learners
2009 H	Skorpen, Aina Øye, Christine	Dagliglivet i en psykiatrisk institusjon: En analyse av miljøterapeutiske praksiser
	Andreassen, Cecilie Schou	WORKAHOLISM – Antecedents and Outcomes
	Stang, Ingun	Being in the same boat: An empowerment intervention in breast cancer self-help groups
	Sequeira, Sarah Dorothee Dos Santos	The effects of background noise on asymmetrical speech perception
	Kleiven, Jo, dr.philos.	The Lillehammer scales: Measuring common motives for vacation and leisure behavior
	Jónsdóttir, Guðrún	Dubito ergo sum? Ni jenter møter naturfaglig kunnskap.
	Hove, Oddbjørn	Mental health disorders in adults with intellectual disabilities - Methods of assessment and prevalence of mental health disorders and problem behaviour
	Wageningen, Heidi Karin van	The role of glutamate on brain function

	Bjørkvik, Jofrid	God nok? Selvaktelse og interpersonlig fungering hos pasienter innen psykisk helsevern: Forholdet til diagnoser, symptomer og behandlingsutbytte
	Andersson, Martin	A study of attention control in children and elderly using a forced-attention dichotic listening paradigm
	Almås, Aslaug Grov	Teachers in the Digital Network Society: Visions and Realities. A study of teachers' experiences with the use of ICT in teaching and learning.
	Ulvik, Marit	Lærerutdanning som danning? Tre stemmer i diskusjonen
2010	Skår, Randi	Læringsprosesser i sykepleieres profesjonsutøvelse. En studie av sykepleieres læringserfaringer.
V	Roald, Knut	Kvalitetsvurdering som organisasjonslæring mellom skole og skoleeigar
	Lunde, Linn-Heidi	Chronic pain in older adults. Consequences, assessment and treatment.
	Danielsen, Anne Grete	Perceived psychosocial support, students' self-reported academic initiative and perceived life satisfaction
	Hysing, Mari	Mental health in children with chronic illness
	Olsen, Olav Kjellevoid	Are good leaders moral leaders? The relationship between effective military operational leadership and morals
	Riese, Hanne	Friendship and learning. Entrepreneurship education through mini-enterprises.
	Holthe, Asle	Evaluating the implementation of the Norwegian guidelines for healthy school meals: A case study involving three secondary schools
H	Hauge, Lars Johan	Environmental antecedents of workplace bullying: A multi-design approach
	Bjørkelo, Brita	Whistleblowing at work: Antecedents and consequences
	Reme, Silje Endresen	Common Complaints – Common Cure? Psychiatric comorbidity and predictors of treatment outcome in low back pain and irritable bowel syndrome
	Helland, Wenche Andersen	Communication difficulties in children identified with psychiatric problems
	Beneventi, Harald	Neuronal correlates of working memory in dyslexia
	Thygesen, Elin	Subjective health and coping in care-dependent old persons living at home
	Aanes, Mette Marthinussen	Poor social relationships as a threat to belongingness needs. Interpersonal stress and subjective health complaints: Mediating and moderating factors.
	Anker, Morten Gustav	Client directed outcome informed couple therapy

	Bull, Torill	Combining employment and child care: The subjective well-being of single women in Scandinavia and in Southern Europe
	Viiig, Nina Grieg	Tilrettelegging for læreres deltakelse i helsefremmende arbeid. En kvalitativ og kvantitativ analyse av sammenhengen mellom organisatoriske forhold og læreres deltakelse i utvikling og implementering av Europeisk Nettverk av Helsefremmende Skoler i Norge
	Wolff, Katharina	To know or not to know? Attitudes towards receiving genetic information among patients and the general public.
	Ogden, Terje, dr.philos.	Familiebasert behandling av alvorlige atferdsproblemer blant barn og ungdom. Evaluering og implementering av evidensbaserte behandlingsprogrammer i Norge.
	Solberg, Mona Elin	Self-reported bullying and victimisation at school: Prevalence, overlap and psychosocial adjustment.
2011	Bye, Hege Høivik	Self-presentation in job interviews. Individual and cultural differences in applicant self-presentation during job interviews and hiring managers' evaluation
V	Notelaers, Guy	Workplace bullying. A risk control perspective.
	Moltu, Christian	Being a therapist in difficult therapeutic impasses. A hermeneutic phenomenological analysis of skilled psychotherapists' experiences, needs, and strategies in difficult therapies ending well.
	Myrseth, Helga	Pathological Gambling - Treatment and Personality Factors
	Schanche, Elisabeth	From self-criticism to self-compassion. An empirical investigation of hypothesized change processes in the Affect Phobia Treatment Model of short-term dynamic psychotherapy for patients with Cluster C personality disorders.
	Våpenstad, Eystein Victor, dr.philos.	Det tempererte nærvær. En teoretisk undersøkelse av psykoterapeutens subjektivitet i psykoanalyse og psykoanalytisk psykoterapi.
	Haukebø, Kristin	Cognitive, behavioral and neural correlates of dental and intra-oral injection phobia. Results from one treatment and one fMRI study of randomized, controlled design.
	Harris, Anette	Adaptation and health in extreme and isolated environments. From 78°N to 75°S.
	Bjørknes, Ragnhild	Parent Management Training-Oregon Model: intervention effects on maternal practice and child behavior in ethnic minority families
	Mamen, Asgeir	Aspects of using physical training in patients with substance dependence and additional mental distress
	Espevik, Roar	Expert teams: Do shared mental models of team members make a difference
	Haara, Frode Olav	Unveiling teachers' reasons for choosing practical activities in mathematics teaching

2011 H	Hauge, Hans Abraham	How can employee empowerment be made conducive to both employee health and organisation performance? An empirical investigation of a tailor-made approach to organisation learning in a municipal public service organisation.
	Melkevik, Ole Rogstad	Screen-based sedentary behaviours: pastimes for the poor, inactive and overweight? A cross-national survey of children and adolescents in 39 countries.
	Vøllestad, Jon	Mindfulness-based treatment for anxiety disorders. A quantitative review of the evidence, results from a randomized controlled trial, and a qualitative exploration of patient experiences.
	Tolo, Astrid	Hvordan blir lærerkompetanse konstruert? En kvalitativ studie av PPU-studenters kunnskapsutvikling.
	Saus, Evelyn-Rose	Training effectiveness: Situation awareness training in simulators
	Nordgreen, Tine	Internet-based self-help for social anxiety disorder and panic disorder. Factors associated with effect and use of self-help.
	Munkvold, Linda Helen	Oppositional Defiant Disorder: Informant discrepancies, gender differences, co-occurring mental health problems and neurocognitive function.
	Christiansen, Øivin	Når barn plasseres utenfor hjemmet: beslutninger, forløp og relasjoner. Under barnevernets (ved)tak.
	Brunborg, Geir Scott	Conditionability and Reinforcement Sensitivity in Gambling Behaviour
Hystad, Sigurd William	Measuring Psychological Resiliency: Validation of an Adapted Norwegian Hardiness Scale	
2012 V	Rones, Dag	Hvorfor bli lærer? Motivasjon for utdanning og utøving.
	Fjermestad, Krister Westlye	The therapeutic alliance in cognitive behavioural therapy for youth anxiety disorders
	Jenssen, Eirik Sørnes	Tilpasset opplæring i norsk skole: politikeres, skolelederes og læreres handlingsvalg
	Saksvik-Lehouillier, Ingvild	Shift work tolerance and adaptation to shift work among offshore workers and nurses
	Johansen, Venke Frederike	Når det intime blir offentlig. Om kvinners åpenhet om brystkreft og om markedsføring av brystkreftsaken.
	Herheim, Rune	Pupils collaborating in pairs at a computer in mathematics learning: investigating verbal communication patterns and qualities
	Vie, Tina Løkke	Cognitive appraisal, emotions and subjective health complaints among victims of workplace bullying: A stress-theoretical approach
	Jones, Lise Øen	Effects of reading skills, spelling skills and accompanying efficacy beliefs on participation in education. A study in Norwegian prisons.

2012 H	Danielsen, Yngvild Sørebo	Childhood obesity – characteristics and treatment. Psychological perspectives.
	Horverak, Jøri Gytre	Sense or sensibility in hiring processes. Interviewee and interviewer characteristics as antecedents of immigrant applicants' employment probabilities. An experimental approach.
	Jøsendal, Ola	Development and evaluation of BE smokeFREE, a school-based smoking prevention program
	Osnes, Berge	Temporal and Posterior Frontal Involvement in Auditory Speech Perception
	Drageset, Sigrunn	Psychological distress, coping and social support in the diagnostic and preoperative phase of breast cancer
	Aasland, Merethe Schanke	Destructive leadership: Conceptualization, measurement, prevalence and outcomes
	Bakibinga, Pauline	The experience of job engagement and self-care among Ugandan nurses and midwives
	Skogen, Jens Christoffer	Foetal and early origins of old age health. Linkage between birth records and the old age cohort of the Hordaland Health Study (HUSK)
	Leveresen, Ingrid	Adolescents' leisure activity participation and their life satisfaction: The role of demographic characteristics and psychological processes
	Hanss, Daniel	Explaining sustainable consumption: Findings from cross-sectional and intervention approaches
Rød, Per Arne	Barn i klem mellom foreldrekonflikter og samfunnmessig beskyttelse	
2013 V	Mentzoni, Rune Aune	Structural Characteristics in Gambling
	Knudsen, Ann Kristin	Long-term sickness absence and disability pension award as consequences of common mental disorders. Epidemiological studies using a population-based health survey and official ill health benefit registries.
	Strand, Mari	Emotional information processing in recurrent MDD
	Veseth, Marius	Recovery in bipolar disorder. A reflexive-collaborative exploration of the lived experiences of healing and growth when battling a severe mental illness
	Mæland, Silje	Sick leave for patients with severe subjective health complaints. Challenges in general practice.
	Mjaaland, Thera	At the frontiers of change? Women and girls' pursuit of education in north-western Tigray, Ethiopia
	Odéen, Magnus	Coping at work. The role of knowledge and coping expectancies in health and sick leave.
	Hynninen, Kia Minna Johanna	Anxiety, depression and sleep disturbance in chronic obstructive pulmonary disease (COPD). Associations, prevalence and effect of psychological treatment.

	Flo, Elisabeth	Sleep and health in shift working nurses
	Aasen, Elin Margrethe	From paternalism to patient participation? The older patients undergoing hemodialysis, their next of kin and the nurses: a discursive perspective on perception of patient participation in dialysis units
	Ekornås, Belinda	Emotional and Behavioural Problems in Children: Self-perception, peer relationships, and motor abilities
	Corbin, J. Hope	North-South Partnerships for Health: Key Factors for Partnership Success from the Perspective of the KIWAKKUKI
	Birkeland, Marianne Skogbrott	Development of global self-esteem: The transition from adolescence to adulthood
2013	Gianella-Malca, Camila	Challenges in Implementing the Colombian Constitutional Court's Health-Care System Ruling of 2008
H	Hovland, Anders	Panic disorder – Treatment outcomes and psychophysiological concomitants
	Mortensen, Øystein	The transition to parenthood – Couple relationships put to the test
	Årdal, Guro	Major Depressive Disorder – a Ten Year Follow-up Study. Inhibition, Information Processing and Health Related Quality of Life
	Johansen, Rino Bandlitz	The impact of military identity on performance in the Norwegian armed forces
	Bøe, Tormod	Socioeconomic Status and Mental Health in Children and Adolescents
2014	Nordmo, Ivar	Gjennom nåløyet – studenters læringserfaringer i psykologutdanningen
V	Dovran, Anders	Childhood Trauma and Mental Health Problems in Adult Life
	Hegelstad, Wenche ten Velden	Early Detection and Intervention in Psychosis: A Long-Term Perspective
	Urheim, Ragnar	Forståelse av pasientaggresjon og forklaringer på nedgang i voldsrate ved Regional sikkerhetsavdeling, Sandviken sykehus
	Kinn, Liv Grethe	Round-Trips to Work. Qualitative studies of how persons with severe mental illness experience work integration.
	Rød, Anne Marie Kinn	Consequences of social defeat stress for behaviour and sleep. Short-term and long-term assessments in rats.
	Nygård, Merethe	Schizophrenia – Cognitive Function, Brain Abnormalities, and Cannabis Use
	Tjora, Tore	Smoking from adolescence through adulthood: the role of family, friends, depression and socioeconomic status. Predictors of smoking from age 13 to 30 in the "The Norwegian Longitudinal Health Behaviour Study" (NLHB)
	Vangsnes, Vigdis	The Dramaturgy and Didactics of Computer Gaming. A Study of a Medium in the Educational Context of Kindergartens.

	Nordahl, Kristin Berg	Early Father-Child Interaction in a Father-Friendly Context: Gender Differences, Child Outcomes, and Protective Factors related to Fathers' Parenting Behaviors with One-year-olds
2014	Sandvik, Asle Makoto	Psychopathy – the heterogeneity of the construct
H	Skotheim, Siv	Maternal emotional distress and early mother-infant interaction: Psychological, social and nutritional contributions
	Halleland, Helene Barone	Executive Functioning in adult Attention Deficit Hyperactivity Disorder (ADHD). From basic mechanisms to functional outcome.
	Halvorsen, Kirsti Vindal	Partnerskap i lærerutdanning, sett fra et økologisk perspektiv
	Solbue, Vibeke	Dialogen som visker ut kategorier. En studie av hvilke erfaringer innvandrerdommer og norskfødte med innvandrereldre har med videregående skole. Hva forteller ungdommenes erfaringer om videregående skoles håndtering av etniske ulikheter?
	Kvalevaag, Anne Lise	Fathers' mental health and child development. The predictive value of fathers' psychological distress during pregnancy for the social, emotional and behavioural development of their children
	Sandal, Ann Karin	Ungdom og utdanningsval. Om elevar sine opplevingar av val og overgangsprossessar.
	Haug, Thomas	Predictors and moderators of treatment outcome from high- and low-intensity cognitive behavioral therapy for anxiety disorders. Association between patient and process factors, and the outcome from guided self-help, stepped care, and face-to-face cognitive behavioral therapy.
	Sjølie, Hege	Experiences of Members of a Crisis Resolution Home Treatment Team. Personal history, professional role and emotional support in a CRHT team.
	Falkenberg, Liv Eggset	Neuronal underpinnings of healthy and dysfunctional cognitive control
	Mrdalj, Jelena	The early life condition. Importance for sleep, circadian rhythmicity, behaviour and response to later life challenges
	Hesjedal, Elisabeth	Tverrprofesjonelt samarbeid mellom skule og barnevern: Kva kan støtte utsette barn og unge?
2015	Hauken, May Aasebø	« <i>The cancer treatment was only half the work!</i> » A Mixed-Method Study of Rehabilitation among Young Adult Cancer Survivors
V	Ryland, Hilde Katrin	Social functioning and mental health in children: the influence of chronic illness and intellectual function
	Rønsen, Anne Kristin	Vurdering som profesjonskompetanse. Refleksjonsbasert utvikling av læreres kompetanse i formativ vurdering

	Hoff, Helge Andreas	Thinking about Symptoms of Psychopathy in Norway: Content Validation of the Comprehensive Assessment of Psychopathic Personality (CAPP) Model in a Norwegian Setting
	Schmid, Marit Therese	Executive Functioning in recurrent- and first episode Major Depressive Disorder. Longitudinal studies
	Sand, Liv	Body Image Distortion and Eating Disturbances in Children and Adolescents
	Matanda, Dennis Juma	Child physical growth and care practices in Kenya: Evidence from Demographic and Health Surveys
	Amugsi, Dickson Abanimi	Child care practices, resources for care, and nutritional outcomes in Ghana: Findings from Demographic and Health Surveys
	Jakobsen, Hilde	The good beating: Social norms supporting men's partner violence in Tanzania
	Sagoe, Dominic	Nonmedical anabolic-androgenic steroid use: Prevalence, attitudes, and social perception
	Eide, Helene Marie Kjærgård	Narrating the relationship between leadership and learning outcomes. A study of public narratives in the Norwegian educational sector.
2015	Wubs, Annegreet Gera	Intimate partner violence among adolescents in South Africa and Tanzania
H	Hjelmervik, Helene Susanne	Sex and sex-hormonal effects on brain organization of fronto-parietal networks
	Dahl, Berit Misund	The meaning of professional identity in public health nursing
	Røykenes, Kari	Testangst hos sykepleierstudenter: «Alternativ behandling»
	Bless, Josef Johann	The smartphone as a research tool in psychology. Assessment of language lateralization and training of auditory attention.
	Løvvik, Camilla Margrethe Sigvaldsen	Common mental disorders and work participation – the role of return-to-work expectations
	Lehmann, Stine	Mental Disorders in Foster Children: A Study of Prevalence, Comorbidity, and Risk Factors
	Knapstad, Marit	Psychological factors in long-term sickness absence: the role of shame and social support. Epidemiological studies based on the Health Assets Project.
2016	Kvestad, Ingrid	Biological risks and neurodevelopment in young North Indian children
V	Sælør, Knut Tore	Hinderløyper, halmstrå og hengende snører. En kvalitativ studie av håp innenfor psykisk helse- og rusfeltet.
	Mellingen, Sonja	Alkoholbruk, partilfredshet og samlivsstatus. Før, inn i, og etter svangerskapet – korrelerer eller konsekvenser?
	Thun, Eirunn	Shift work: negative consequences and protective factors

	Hilt, Line Torbjørnsen	The borderlands of educational inclusion. Analyses of inclusion and exclusion processes for minority language students
	Havnen, Audun	Treatment of obsessive-compulsive disorder and the importance of assessing clinical effectiveness
	Slåtten, Hilde	Gay-related name-calling among young adolescents. Exploring the importance of the context.
	Ree, Eline	Staying at work. The role of expectancies and beliefs in health and workplace interventions.
	Morken, Frøydis	Reading and writing processing in dyslexia
2016	Løvoll, Helga Synnevåg	Inside the outdoor experience. On the distinction between pleasant and interesting feelings and their implication in the motivational process.
H	Hjeltnes, Aslak	Facing social fears: An investigation of mindfulness-based stress reduction for young adults with social anxiety disorder
	Øyeflaten, Irene Larsen	Long-term sick leave and work rehabilitation. Prognostic factors for return to work.
	Henriksen, Roger Ekeberg	Social relationships, stress and infection risk in mother and child
	Johnsen, Iren	«Only a friend» - The bereavement process of young adults who have lost a friend to a traumatic death. A mixed methods study.
	Helle, Siri	Cannabis use in non-affective psychoses: Relationship to age at onset, cognitive functioning and social cognition
	Glambek, Mats	Workplace bullying and expulsion in working life. A representative study addressing prospective associations and explanatory conditions.
	Oanes, Camilla Jensen	Tilbakemelding i terapi. På hvilke måter opplever terapeuter at tilbakemeldingsprosedyrer kan virke inn på terapeutiske praksiser?
	Reknes, Iselin	Exposure to workplace bullying among nurses: Health outcomes and individual coping
	Chimhutu, Victor	Results-Based Financing (RBF) in the health sector of a low-income country. From agenda setting to implementation: The case of Tanzania
	Ness, Ingunn Johanne	The Room of Opportunity. Understanding how knowledge and ideas are constructed in multidisciplinary groups working with developing innovative ideas.
	Hollekim, Ragnhild	Contemporary discourses on children and parenting in Norway. An empirical study based on two cases.
	Doran, Rouven	Eco-friendly travelling: The relevance of perceived norms and social comparison
2017	Katisi, Masego	The power of context in health partnerships: Exploring synergy and antagonism between external and internal ideologies in implementing Safe Male Circumcision (SMC) for HIV prevention in Botswana
V		

Jamaludin, Nor Lelawati Binti	The “why” and “how” of International Students’ Ambassadorship Roles in International Education
Berthelsen, Mona	Effects of shift work and psychological and social work factors on mental distress. Studies of onshore/offshore workers and nurses in Norway.
Krane, Vibeke	Lærer-elev-relasjoner, elevers psykiske helse og frafall i videregående skole – en eksplorerende studie om samarbeid og den store betydningen av de små ting
Søvik, Margaret Ljosnes	Evaluating the implementation of the Empowering Coaching™ program in Norway
Tonheim, Milfrid	A troublesome transition: Social reintegration of girl soldiers returning ‘home’
Senneseth, Mette	Improving social network support for partners facing spousal cancer while caring for minors. A randomized controlled trial.
Urke, Helga Bjørnøy	Child health and child care of very young children in Bolivia, Colombia and Peru.
Bakhturidze, George	Public Participation in Tobacco Control Policy-making in Georgia
Fismen, Anne-Siri	Adolescent eating habits. Trends and socio-economic status.
2017 H	
Hagatun, Susanne	Internet-based cognitive-behavioural therapy for insomnia. A randomised controlled trial in Norway.
Eichele, Heike	Electrophysiological Correlates of Performance Monitoring in Children with Tourette Syndrome. A developmental perspective.
Risan, Ulf Patrick	Accommodating trauma in police interviews. An exploration of rapport in investigative interviews of traumatized victims.
Sandhåland, Hilde	Safety on board offshore vessels: A study of shipboard factors and situation awareness
Blågestad, Tone Fidje	Less pain – better sleep and mood? Interrelatedness of pain, sleep and mood in total hip arthroplasty patients
Kronstad, Morten	Frå skulebenk til deadlines. Korleis nettjournalistar og journaliststudentar lærer, og korleis dei utviklar journalistfagleg kunnskap
Vedaa, Øystein	Shift work: The importance of sufficient time for rest between shifts.
Steine, Iris Mulders	Predictors of symptoms outcomes among adult survivors of sexual abuse: The role of abuse characteristics, cumulative childhood maltreatment, genetic variants, and perceived social support.
Høgheim, Sigve	Making math interesting: An experimental study of interventions to encourage interest in mathematics

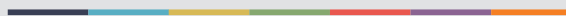
2018 V	Brevik, Erlend Joramo	Adult Attention Deficit Hyperactivity Disorder. Beyond the Core Symptoms of the Diagnostic and Statistical Manual of Mental Disorders.
	Erevik, Eilin Kristine	User-generated alcohol-related content on social media: Determinants and relation to offline alcohol use
	Hagen, Egon	Cognitive and psychological functioning in patients with substance use disorder; from initial assessment to one-year recovery
	Adólfssdóttir, Steinunn	Subcomponents of executive functions: Effects of age and brain maturations
	Brattabø, Ingfrid Vaksdal	Detection of child maltreatment, the role of dental health personnel – A national cross-sectional study among public dental health personnel in Norway
	Fylkesnes, Marte Knag	Frykt, forhandlinger og deltakelse. Ungdommer og foreldre med etnisk minoritetsbakgrunn i møte med den norske barnevernstjenesten.
	Stiegler, Jan Reidar	Processing emotions in emotion-focused therapy. Exploring the impact of the two-chair dialogue intervention.
	Egelandsdal, Kjetil	Clickers and Formative Feedback at University Lectures. Exploring students and teachers' reception and use of feedback from clicker interventions.
	Torjussen, Lars Petter Storm	Foreningen av visdom og veltalenhet – utkast til en universitetsdidaktikk gjennom en kritikk og videreføring av Skjervheims pedagogiske filosofi på bakgrunn av Arendt og Foucault. <i>Eller hvorfor menneskelivet er mer som å spille fløyte enn å bygge et hus.</i>
Selvik, Sabreen	A childhood at refuges. Children with multiple relocations at refuges for abused women.	
2018 H	Leino, Tony Mathias	Structural game characteristics, game features, financial outcomes and gambling behaviour
	Raknes, Solfrid	Anxious Adolescents: Prevalence, Correlates, and Preventive Cognitive Behavioural Interventions
	Morken, Katharina Teresa Enehaug	Mentalization-based treatment of female patients with severe personality disorder and substance use disorder
	Braatveit, Kirsten Johanne	Intellectual disability among in-patients with substance use disorders
	Barua, Padmaja	Unequal Interdependencies: Exploring Power and Agency in Domestic Work Relations in Contemporary India
	Darkwah, Ernest	Caring for "parentless" children. An exploration of work-related experiences of caregivers in children's homes in Ghana.
	Valdersnes, Kjersti Bergheim	Safety Climate perceptions in High Reliability Organizations – the role of Psychological Capital

2019 V	Kongsgården, Petter	Vurderingspraksiser i teknologirike læringsmiljøer. En undersøkelse av læreres vurderingspraksiser i teknologirike læringsmiljøer og implikasjoner på elevenes medvirkning i egen læringsprosess.
	Vikene, Kjetil	Complexity in Rhythm and Parkinson's disease: Cognitive and Neuronal Correlates
	Heradstveit, Ove	Alcohol- and drug use among adolescents. School-related problems, childhood mental health problems, and psychiatric diagnoses.
	Riise, Eili Nygard	Concentrated exposure and response prevention for obsessive-compulsive disorder in adolescents: the Bergen 4-day treatment
	Vik, Alexandra	Imaging the Aging Brain: From Morphometry to Functional Connectivity
	Krossbakken, Elfrid	Personal and Contextual Factors Influencing Gaming Behaviour. Risk Factors and Prevention of Video Game Addiction.
	Solholm, Roar	Foreldrenes status og rolle i familie- og nærmiljøbaserte intervensjoner for barn med atferdsvansker
	Baldomir, Andrea Margarita	Children at Risk and Mothering Networks in Buenos Aires, Argentina: Analyses of Socialization and Law-Abiding Practices in Public Early Childhood Intervention.
	Samuelsson, Martin Per	Education for Deliberative Democracy. Theoretical assumptions and classroom practices.
	Visted, Endre	Emotion regulation difficulties. The role in onset, maintenance and recurrence of major depressive disorder.
2019 H	Nordmo, Morten	Sleep and naval performance. The impact of personality and leadership.
	Sveinsdottir, Vigdis	Supported Employment and preventing Early Disability (SEED)
	Dwyer, Gerard Eric	New approaches to the use of magnetic resonance spectroscopy for investigating the pathophysiology of auditory-verbal hallucinations
	Synnevåg, Ellen Strøm	Planning for Public Health. Balancing top-down and bottom-up approaches in Norwegian municipalities.
	Kvinge, Øystein Røsseland	Presentation in teacher education. A study of student teachers' transformation and representation of subject content using semiotic technology.
	Thorsen, Anders Lillevik	The emotional brain in obsessive-compulsive disorder
	Eldal, Kari	Sikkerhetsnettet som tek imot om eg fell – men som også kan fange meg. Korleis erfarer menneske med psykiske lidningar ei innlegging i psykisk helsevern? Eit samarbeidsbasert forskingsprosjekt mellom forskarar og brukarar.

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