Received: 19 June 2021 | Revised: 12 April 2022 | Accepted: 25 April 2022

DOI: 10.1111/jomf.12844

ORIGINAL ARTICLE

Journal of Marriage and Family

Sleep in adolescence: Considering family structure and family complexity

Sondre Aasen Nilsen[1] | **Malin Bergström**[2,3] | **Børge Sivertsen**[4,5,6] | **Kjell Morten Stormark**[1,7] | **Mari Hysing**[1,8]

[1]Regional Centre for Child and Youth Mental Health and Child Welfare, NORCE Norwegian Research Centre, Bergen, Norway

[2]Centre for Health Equity Studies (CHESS), Stockholm University/Karolinska Institute, Stockholm, Sweden

[3]Clinical Epidemiology, Department of Medicine, Karolinska Institute, Stockholm, Sweden

[4]Department of Health Promotion, Norwegian Institute of Public Health, Bergen, Norway

[5]Department of Research & Innovation, Helse-Fonna HF, Haugesund, Norway

[6]Department of Mental Health, Norwegian University of Science and Technology, Trondheim, Norway

[7]Department of Health Promotion and Development, University of Bergen, Bergen, Norway

[8]Department of Psychosocial Science, Faculty of Psychology, University of Bergen, Bergen, Norway

Correspondence
Sondre Aasen Nilsen, Norwegian Research Centre, Regional Centre for Child and Youth Mental Health and Child Welfare, Postbox 22, Nygårdstangen, 5838 Bergen, Norway.
Email: sondre.nilsen@norceresearch.no

Funding information
Bergen Child Study

Abstract

Objectives: To investigate associations between family structure, family complexity, and sleep in adolescence.

Background: Family structure may be associated with sleep patterns and sleep problems among adolescents. Yet, research documenting this association has not captured the complexity of modern families and used crude measures of sleep.

Method: The youth@hordaland study ($N = 8833$) of adolescents aged 16–19 conducted in 2012 in Norway provided a detailed assessment of family structure, family complexity (i.e., living with half-/stepsiblings), and multiple sleep parameters. Insomnia and delayed sleep–wake phase disorder (DSWPD) were defined in alignment with diagnostic criteria. Ordinary least squares and Poisson regression analyses were used to assess associations between family structure, family complexity, and sleep outcomes.

Results: Adolescents in joint physical custody (JPC) had more similar sleep parameters as peers in nuclear families than in single-and stepparent families. Adolescents in single- and stepparent families had a higher risk of short sleep duration on weekdays, long sleep onset latency, long wake after sleep onset, oversleeping, insomnia, and DSWPD than peers in nuclear families. Family complexity was also associated with a higher risk of sleep problems, but the risk attenuated when considered jointly with family structure. Socioeconomic status and depressive symptoms partly attenuated the differences between the groups.

Conclusion: Inequalities in sleep exist by family structure and, in part, family complexity. Despite alternating between two homes and often experiencing family complexity, sleep

among adolescents in JPC was more similar to peers in nuclear families than in single- and stepparent families.

KEYWORDS

adolescence, divorce, family complexity, family structure, joint physical custody, shared custody, sleep

Since the 1960s, rising divorce rates coupled with multipartner fertility augmented the complexity of Western family life (Pearce et al., 2018). Consequently, the share of single- and stepparent families increased in most European countries and the US (Smock & Schwartz, 2020; Steinbach et al., 2016). The past two decades have further seen a rapid increase in joint physical custody (JPC) arrangements in many countries. JPC represents a new kind of family structure where the child lives about equally with both parents after a separation, alternating between two homes (see Steinbach & Augustijn, 2021). In Norway, the prevalence of JPC in separated families rose from 8% in 2002 to 30% in 2012 (Kitterød & Wiik, 2017).

Parallel with these family developments, epidemiological studies indicate that a growing proportion of youth is sleep deprived (Keyes et al., 2015; Matricciani et al., 2012) and that as many as 85% are sleeping less than recommended (Saxvig et al., 2020). Sleep problems are associated with lower academic achievement (Hysing et al., 2016) and a higher odds of developing mental health problems during adolescence and early adulthood (Scott et al., 2021). As a result, short sleep duration and insomnia during adolescence have been stated as major public health concerns (Barnes & Drake, 2015).

By providing the physical and emotional space within which sleep occurs, the family context is important in understanding sleep patterns among youth (Dahl & El-Sheikh, 2007). Still, despite numerous studies on family structure and youth adjustment, few studies have investigated sleep as the primary outcome. The few studies that exist, have insufficiently captured the complexity of modern family life, examined broad age groups, and relied on few sleep-related outcomes (e.g., Adam et al., 2007; Schmeer et al., 2019; Troxel et al., 2014). To address these limitations, we consider sleep patterns and sleep problems, including insomnia and delayed sleep–wake phase disorder (DSWPD), among Norwegian adolescents aged 16–19 in modern family structures. We contribute to work seeking to expand our knowledge of the familial influences on sleep and to an emerging research field studying whether integrating information about half-and stepsiblings (i.e., family complexity) provides a more nuanced view of how youth adjust across modern family structures (e.g., Brown et al., 2015; Fomby et al., 2021). We find that inequalities in sleep exist by family structure and family complexity. Adolescents in single- and stepparent families had less favorable sleep patterns and a higher risk of sleep problems than youth in nuclear families, but few differences between youth in JPC and nuclear families were detected. Family complexity was also associated with poorer sleep, but to a lesser extent when considered conjointly with family structure. These patterns were mostly robust to adjustments to socioeconomic status and symptoms of depression.

BACKGROUND

In the wake of the increased complexity of the modern family, a substantial body of research has documented that children and youth in single- or stepparent families have more physical- and mental health problems than peers in nuclear families (Coles, 2015; Nilsen et al., 2020; Perales et al., 2017; Sweeney, 2010). Emerging research further suggests that children and youth in JPC are better adjusted than those residing mostly in a single- or stepparent family (Bergström et al., 2013; Nielsen, 2018; Nilsen et al., 2018; Steinbach, 2019). However, JPC

continues to be debated. Key arguments against JPC fixate on the stress that moving between two homes, exposure to parental conflicts, and different parenting may impose on children (Chisholm & McIntosh, 2008; Gilmore, 2006). On the other hand, advocates note that JPC may increase parental and economic resources, dampen custody disputes, and improve parental cooperation and parent–child relationships, thus alleviating some of the common risks associated with parental separation (Braver & Lamb, 2018).

High divorce- and separation rates have also increased the probability of living with half-or stepsiblings (i.e., experiencing family complexity; Brown et al., 2015). Through multipartner fertility, family complexity may be evident across all family structures and is thus not synonymous with stepfamilies, as a parent may have a child from a previous or newly established relationship (see Brown et al., 2015). However, this complexity is often lost, as studies seldom have information about siblings (Sanner & Jensen, 2021). Indeed, using data from the US, Brown et al. (2015) showed that children and youth in nuclear two-parent-(7–14%) and single-parent families (3–12%) also experience family complexity. Existing work suggests that family complexity is associated with poorer outcomes rather independent of family structure (Fomby et al., 2016; Halpern-Meekin & Tach, 2008; Tillman, 2008). One study, however, found that family complexity was associated with notably higher odds of receipt of public assistance among children and youth in nuclear two-parent families (Brown et al., 2015).Thus, the influence of family complexity may, for some outcomes, depend on family structure. Still, this line of research is in its early stages (Sanner & Jensen, 2021).

Whether the modern family structure is associated with adolescent sleep has been largely overlooked. This is rather curious, given the profound research into the consequences of family dissolution and family structure on adolescents' adjustment and later life chances. As noted by Troxel et al. (2014), adolescence is a key developmental period of studying the relationships between family structure and sleep, as it is characterized by prominent biological determined changes in sleep in combination with increased autonomy from parents and influences from peers and other social relations.

Adolescent sleep and family structure

In adolescence, a phase delay in circadian physiology in tandem with a slower accumulation of sleep need sustains evening alertness and induces a preference for later bedtimes and waketimes (Carskadon, 2011; Crowley et al., 2018). Screen time, social media use, and bedtime autonomy further delay sleep timing (Scott et al., 2019; Tashjian et al., 2019). However, sleep need remains stable and combined with early school start, these factors create an unfavorable chain of events taxing sleep among youth (Bowers & Moyer, 2017). Attesting to these changes, research consistently finds that adolescents do not obtain the 8–10 h of sleep recommended for their age (Galland et al., 2018), and that the prevalence of sleep problems is high and potentially increasing (de Zambotti et al., 2018; Keyes et al., 2015). Drawing on the same study sample as the current investigation, a previous study found an average sleep duration of 6:25 h on weekdays, more than 1 h less than their estimated sleep need, with an overall prevalence of insomnia of 18.5% (Hysing et al., 2013).

A few studies have documented the association between family structure and adolescent sleep (Delaruelle et al., 2021; Schmeer et al., 2019; Troxel et al., 2014). Collectively, these studies suggest that later bedtimes, short sleep duration, and sleep problems may be more common among adolescents in single- or stepparent families than in nuclear families. For example, a recent study found that adolescents in single- and stepparent families had lower sleep quality (i.e., more sleep problems) than peers in nuclear families (Delaruelle et al., 2021). Two studies have also assessed sleep among children and youth in JPC. One study reported fewer sleep problems among youth in JPC and nuclear families than in single-parent families (Bergström

et al., 2015). Another study found that although children and youth in JPC reported similar levels of social jetlag, they were more likely to report later bedtimes and difficulties initiating sleep than youth in nuclear families (Turunen et al., 2021).

Besides being few, shortcomings across these studies preclude more definitive conclusions. First, various definitions of family structure have been used. This makes it difficult to provide harmonized and accurate estimates of how youth sleep in modern family structures. Second, existing work has mainly examined age groups spanning early to late adolescence and focused on few sleep outcomes. As sleep undergoes substantial changes from early to late adolescence (Dahl & Lewin, 2002), there is a need for studies on more targeted age groups. Relatedly, sleep is multifaceted, and sleep problems may take many forms (El-Sheikh & Kelly, 2017). Thus, assessing sleep patterns and multiple sleep problems may aid our understanding of the relationship between family structure and sleep. As short sleep duration is common in adolescence, there is also a need to assess sleep problems such as insomnia using more formal diagnostic criteria. Lastly, we are unaware of research documenting whether family complexity is associated with adolescent sleep.

Theoretical considerations

Studies have only recently sought to document adolescent sleep within a family context (El-Sheikh & Kelly, 2017). These scholars often start with the notion that sleep requires a sense of safeness and security, whereas heightened arousal and vigilance tax sleep (Dahl & El-Sheikh, 2007). Thus, family environments perceived as stressful or unsafe may lead to sleep disturbances. Along these lines, family stressors, including conflicts (Gregory et al., 2006; Kelly & El-Sheikh, 2011), economic hardship (El-Sheikh et al., 2020), poor family functioning (Schmeer et al., 2019), and poor parent–adolescent relationships (Haines et al., 2016) have been associated with sleep problems in adolescence. Mechanisms suggested to underlie these associations involve the lack of stable family routines, including rules regarding bed- and waketimes and use of electronic devices (see Bartel et al., 2015), and other stress-inducing internal (e.g., conflicts) and external family attributes (i.e., poor housing and unsafe neighborhood conditions) (Philbrook et al., 2020), which raise vigilance and disrupt sleep.

Bridging the above findings with theoretical and empirical contributions from the family structure literature, one could also hypothesize that sleep may vary by family composition. From a theoretical view, instability, stress, resource, and investment perspectives are often used when explaining how family structure is linked to youth adjustment (Amato, 2010; Carlson & Corcoran, 2001; Hadfield et al., 2018). In simpler terms, these perspectives focus on how family transitions may induce stress and instability in children's lives, and how family structure may impact the time, money, and other abilities that parents can invest in or transfer to their children.

To start, single-parent families are more prone to experience financial strain than other family structures. Low-income families are predisposed to lower-quality housing options and less control over external environments, which may negatively influence sleep by increased exposure to external and internal noise and lack of predictable family routines (Philbrook et al., 2020). Financial strain may also increase parental stress and mental health issues through heavy workloads or job instability, diminishing the capacity for sleep-positive parenting such as parent-set bedtimes (Short et al., 2011).

Adapting to a new family dynamic is a key challenge for youth in stepparent families. For instance, youth may struggle to accept and get along with their parent's new partner (Koster et al., 2021), reducing feelings of belongingness to the family (King et al., 2015). A stepparent may also introduce new parenting practices, leading to conflicts and unclear rules and

boundaries (Amato, 2010). In theory, this could extend to sleep-related activities such as bedtimes. Thus, it is viable that stepfamily formation also may influence adolescent sleep.

JPC presents unique challenges and opportunities. The stress of constant shifts between two households and thus sleeping environments could inherently impact sleep negatively. JPC may also expose youth to inconsistent rules regarding bedtime and other sleep-disturbing activities (Turunen et al., 2021). For some, JPC may also lead to longer travel distances to school, friends, and other leisure activities, leaving less time for sleep. On a positive note, JPC may alleviate stress by easing access to both parents' resources, facilitate parent–child relationships and collaboration between parents (Braver & Lamb, 2018), and buffer against feelings of worry and missing the other parent (Berman, 2018), thus leading to fewer sleep problems than living mostly in a single- or stepparent family. This would align with findings of better adjustment for youth in JPC (Steinbach, 2019).

As evident, through the experience of family dissolution, non-nuclear family structures may share common stressors but also present unique challenges and opportunities (e.g., adapting to stepparents or dual households). Whether to expect that the sum of these shared and non-shared features should produce similar outcomes regarding sleep has not been sufficiently addressed. Research on other outcomes tends to find few differences between youth in single- and stepparent families (Amato, 2010), which has been interpreted as a sign that the potential benefits of introducing a stepparent (e.g., better family finances) are offset by the stress of establishing a new family structure (Coleman et al., 2000). JPC, on the other hand, could perhaps alleviate some of these stressors through more equal contact with both biological parents. Still, in the context of adolescent sleep, these notions are tentative.

Family complexity may also influence sleep, although we are unaware of previous studies on this relationship. Family complexity has been linked to small but consistent negative effects across measures of family functioning (e.g., parental involvement, conflicts, economic well-being) and youth adjustment (e.g., depressive symptoms) (Sanner et al., 2018), outcomes also linked to sleep problems among youth (Chang et al., 2019; Hysing et al., 2016; Khor et al., 2020). Theoretically, family complexity may induce stress by complicating the distribution of parental resources (Brown et al., 2015) and by instigating a role and boundary ambiguity, whereby obligations and commitments among adults (also nonresident parents) and children become unclear (Fomby et al., 2016). From this view, family complexity likely amplifies existing stressors in some families (e.g., in the case of stepfamilies) and may in other family structures add new stressors, such as in nuclear and single-parent families. In sum, we thus expect that family complexity is negatively associated with sleep within all family structures.

Sleep problems and mental health problems often co-occur (Alvaro et al., 2017). Coexisting mental health problems may thus possibly explain potential differences in sleep across family structures. Depression is one candidate due to its high prevalence during adolescence (Lundervold et al., 2013), the robust link between depression and insomnia (Alvaro et al., 2017), and as symptoms of depression vary among youth by family structure (Perales et al., 2017). To address this, we also investigate the relationship between family structure, family complexity, and sleep outcomes net of symptoms of depression.

Finally, it is important to note that a divorce or separation is not a random event but influenced by various selection mechanisms (e.g., childhood experiences, personality traits, educational qualifications; see Amato (2010)). Such mechanisms may also select youth into post-separation family structures (Hjern et al., 2020) and family complexity (Brown et al., 2015). For example, parents choosing JPC tend to have better family finances and higher education than those in other post-separation family structures (Hjern et al., 2020; Poortman & van Gaalen, 2017). Conversely, maternal mental health- and financial issues increase the likelihood of living with a single father (Goldscheider et al., 2015). Thus, inequalities in sleep by family structure and family complexity may stem from such selection mechanisms. Drawing on cross-sectional

data, this study is primarily descriptive. Other research designs are needed to establish a causal relationship between family structure, family complexity, and sleep among youth.

The present study

This study aimed to detail sleep patterns and sleep problems among adolescents in modern family structures. The current paper extends on the existing literature in two main ways: First, previous sleep research has insufficiently captured the heterogeneity of modern family life. This study contributes by assessing sleep across a broad range of modern family structures and the influence of half- and stepsiblings on adolescent sleep. Second, previous research on sleep within a family context has focused on few sleep-related outcomes. This study contributes by a more comprehensive assessment of sleep, including multiple sleep parameters on weekdays and weekends, and key sleep- or circadian disorders such as insomnia and DSWPD measured according to diagnostic criteria.

We address four research questions: First, how are family structure and family complexity associated with sleep patterns among adolescents? Second, how are family structure and family complexity associated with sleep problems among adolescents? Third, to what extent do socioeconomic status and symptoms of depression attenuate these associations? Fourth, does the association between family structure and sleep outcomes depend on family complexity?

Based on previous theory and research, we had two main sets of hypotheses: First, we expect that inequalities in sleep patterns and sleep problems exist by family structure and hypothesize that: (1). Adolescents in JPC have similar sleep patterns to peers in nuclear families and are not at higher risk of sleep problems. (2) Adolescents in single- and stepparent families have less favorable sleep patterns on weekdays (e.g., later bedtimes, shorter sleep duration, longer sleep onset latency and wake after sleep onset), and a higher risk of sleep problems than peers in nuclear families. Second, we hypothesize that: (1) Family complexity is separately associated with less favorable sleep patterns on weekdays and a higher risk of sleep problems. (2) Family complexity is associated with a higher risk of sleep problems net of family structure, and the associated risk of sleep problems by family complexity is similar within each family structure. Lastly, we expect that any observed association would only be partially explained by variation in socioeconomic status and symptoms of depression.

METHOD

Procedures

Data stem from the population-based youth@hordaland study of adolescents in the former Hordaland County in Western Norway conducted during spring of 2012. All adolescents born between 1993 and 1995 were invited to participate ($N = 19{,}439$). Youth in school at the time of the study received study information and a link to participation by SMS and their school e-mail address. The schools were encouraged to allocate one school hour for them to complete the questionnaire. Adolescents not enrolled in school were sent information by postal mail to their home address. The adolescents could respond at their convenience throughout the data collection period, and alternative solutions were made for students in hospitals or institutions. Survey staff was available by telephone to answer any queries.

The questionnaire was web-based and among the topics covered was a detailed assessment of sleep, mental health, and experiences of parental divorce or separation and family structure. The adolescents consented to participate, as Norwegian law states that youth aged 16 years and older decide matters of consent on health issues. Parents or guardians received information

about the study in advance. The study has received ethical approval by the Regional Committee for Medical and Health Research Ethics in Western Norway (approval number: 2011/811). Overall, Hordaland County is considered representative of Norway regarding gender and rural/urban residence distribution, and the median household income is also similar to that of the national average (Statistics Norway, 2012).

Sample

A total of 10,257 adolescents agreed to participate, yielding a participation rate of 53% for the entire study. The mean age of participants was 17.4 years (SD = 0.84), with a slightly higher participation rate among girls (53%) than boys (47%). In the present study, a subsample of adolescents stating to live at home with parent(s) (i.e., who had not moved out of their parents' home, or were living in institutions or with foster/adoptive parents) was examined ($N = 8833$).

Representativeness of the sample

The grade point average of participants was about equal to national and county-level statistics (Hysing et al., 2016). However, the proportion of parents with higher education was higher than observed in official statistics, although differences in methodology do not allow for direct comparison by numbers. More psychological problems among non-participants have also been documented in previous waves of the Bergen Child Study (in which the youth@hordaland study is nested within) a finding that could also apply to the present study (Stormark et al., 2008).

The proportion of adolescents categorized as living in a nuclear family was higher (71% vs. 63%) than official country-level statistics in 2012. Of separated families, the proportions of youth in single-mother- (45% vs. 49%), single-father- (9% vs. 14%), and stepparent families (28% vs. 37%) were lower (Statistics Norway, 2021). However, the latter differences were expected, as official statistics do not capture JPC, meaning that the estimates are not directly comparable. Of note, official statistics only include youth aged <18 years, so the sample was compared to the closest possible age group (15–17-year-olds). Based on these considerations, we note that our sample was skewed toward higher socioeconomic status but representative regarding academic achievement and fairly well captured the distribution of youth in various family structures based on what could be expected from official statistics.

Measures

Sociodemographic characteristics

We obtained gender and date of birth from the adolescents' national identity number in the National Population Register. Exact age was calculated from the date of participation and date of birth. Ethnicity was based on self-reported country of origin and categorized as "Norwegian"- or "foreign"- born. Maternal and paternal education were reported separately, using the options "primary school," "high school vocational," "high school general," "college/university less than four years," "college/university four years or more," and "do not know." We combined the two high school alternatives into one category (i.e., "high school"). Perceived economic well-being was assessed by the following question: "Compared to others, how would you rate your family's economic situation?" Response options were "poorer than others," "equal to others," and "better than others." Similar questions have previously been used to determine adolescents' perceived socioeconomic status (Bøe et al., 2019; Quon & McGrath, 2014).

Family structure

Family structure was measured by self-report on five items: (1) if their biological parents lived together ("yes," "no"), (2) if their biological parents were divorced/separated ("yes," "no"), (3) whom they lived with most of the time ("biological mother," "biological father," or "both"), (4) where they presently lived (e.g., with parents, residential care, own apartment) and (5) who they presently shared a household with (including biological mother, biological father, and stepparents). Based upon these items, we constructed a vector of dummy variables classifying the adolescents into five mutually exclusive family structures based on the parental adults present in the household: Nuclear families (lives with their two biological parents who had not divorced or separated), joint physical custody (lives equally with both parents after they had divorced/separated), single-mother families (lives primarily with a divorced/separated mother), single-father families (lives primarily with a divorced/separated father), and stepparent families (lives primarily with their divorced/separated mother or father and their new partner). Note that the nuclear family structure group includes both married and cohabiting parents.

Family complexity

The adolescents reported whether they lived with biological siblings, half-siblings, and stepsiblings. We operationalized family complexity as the presence of either half-and/or stepsiblings in the household, following the definition as proposed in the seminal work by Brown et al. (2015). In this view, family complexity is considered as a dimension that may be present across all family structures. For instance, youth in nuclear families may live with a half-sibling if a parent has a child from a previous relationship. We constructed a dummy indicator that differentiated between youth who lived with at least one half- or stepsibling (coded 1), and youth who lived with only biological siblings or had no siblings (coded 0).

Sleep patterns

Sleep patterns were assessed by asking the respondents about their habitual sleeping patterns. A detailed description of the sleep inventory has been published elsewhere (Hysing et al., 2013), but in short, bedtime and rise time were reported separately for weekends and weekdays, and respondents also reported the time spent in bed before falling asleep (sleep onset latency), and time spent awake during the night (wake after sleep onset). Sleep duration was defined as time spent in bed minus sleep onset latency and wake after sleep onset, and sleep efficiency as the ratio of sleep duration to time spent in bed. Subjective sleep need was assessed by asking the respondents about how much sleep they needed to feel rested, and sleep deficit was calculated by subtracting subjective sleep need from sleep duration.

Sleep problems

We created a series of binary variables to assess indicators of sleep problems. These were short sleep duration on weekdays (≤5:30 h; 1 h less than the observed mean). Long sleep onset latency (≥60 min), long wake after sleep onset (≥30 min), frequent oversleeping (monthly or more often), and high sleep deficit on weekdays (≥2:30 h, shown in supplementary).

Insomnia was defined in close alignment with the Diagnostic and Statistical Manual of Mental Disorders criteria (5th ed.; DSM-5; American Psychiatric Association, 2013). To fulfill the DSM-5 criteria for insomnia, they had to report difficulties initiating and maintaining sleep

at least three times a week, with a duration of 3 months or more. Further, they had to report tiredness/sleepiness during daytime at least 3 days per week. This operationalization is thoroughly described in a previous publication (Hysing et al., 2013).

To approximate assessment of the International Classification of Sleep Disorders Revised (ICSD-R) criteria for Delayed sleep–wake phase disorder (DSWPD), the following criteria were used (1) minimum 1-h shift in sleep-onset AND wake times from the weekdays to the weekend, (2) complaint of frequent (≥3 days per week) difficulty falling asleep, (3) report of little or no (≤1 day per week) difficulty maintaining sleep, and (4) frequent difficulty awakening (oversleep "sometimes" or more often). A full description of all the items used in this operationalization is presented in a previous publication (Sivertsen et al., 2013).

Symptoms of depression

Symptoms of depression were measured by the short version of the Moods and Feelings Questionnaire (SMFQ; Angold et al., 1995). The SMFQ contains 13 items describing depressive tendencies rated on a Likert scale ("not true," "sometimes true," and "true"). The SMFQ is considered to have good psychometric properties in population-based studies (Sharp, Goodyer, & Croudace, 2006; Turner, Joinson, Peters, Wiles, & Lewis, 2014), and essential unidimensionality has been shown in a previous study on the current sample (Lundervold et al., 2013). The omega internal consistency coefficient of the SMFQ in the current study was 0.92.

Statistical analyses

To address our first research question, we used ordinary least squares (OLS) regression to examine the association between family structure, family complexity, and sleep patterns on weekdays and weekends, using the formula:

$$y_i = \alpha + \beta x_i + \beta z_i + \varepsilon_i.$$

y_i represents the sleep parameter of interest for the ith youth, α the intercept, x_i is family structure or family complexity captured by a vector of dummy coded variables, and z_i represents a vector of covariates. Age and gender were added as covariates. To obtain mean estimates of our sleep pattern variables, estimated marginal means with 95% confidence intervals (95% CI) were calculated from the above OLS model using the *R*-package "emmeans" (Lenth, 2020).

To address our second and third research question, we used Poisson regression analyses with a robust error variance (sandwich error term) to estimate the relative risk (RR) (see Zou, 2004) of sleep problems by family structure and family complexity. We first document the bivariate (i.e., separate) associations between family structure and family complexity and sleep problems (shown combined in the "Baseline model"). In the next model (Model 1), we entered family structure and family complexity jointly as predictors of sleep problems. This model answers our question of whether family structure was associated with sleep problems net of family complexity, and thus whether family complexity independently enhances our ability to account for variation in youth sleep problems. Model 2–3 introduced SES and symptoms of depression to answer our third research question of whether differences in sleep problems between the groups were robust net of SES and symptoms of depression. Nuclear family and "no family complexity" were reference groups in these analyses. Sensitivity checks using JPC as a reference group were also performed. The results are presented as regression coefficient plots created with the ggplot2 R-package (Wickham, 2016). The robust standard errors were obtained by the

Sandwich R-package (Zeileis, 2006). All numerical estimates from these models are provided in Table S1. We also calculated the adjusted prevalence rates of each sleep outcome by family structure from the above baseline models.

To address our final research question, we specified a set of contrasts that compared adolescents with and without family complexity present within each family structure. We estimate the adjusted prevalence rate of the given sleep outcome for each pair and the associated relative risk of the difference between the pairs. Due to the low frequency of family complexity among youth in a single-father structure ($n = 17$), severely limiting meaningful statistical inference, pairwise comparison by family complexity was not performed in this group.

Missing data due to item nonresponse was highest for the subjective sleep need (24%) and family structure (13%) variables. The other sleep variables had 3.3–7.5% missing responses after setting 293 responses to missing due to impossible values on one or more sleep variables (e.g., negative sleep duration). For parental education, we recoded the "do not know" option to missing before conducting our substantive analyses. After this procedure, parental education variables had 25–27% missing. The rest of the sociodemographic variables had <5.4% missing values. The frequency of missing cases stratified by family structure on all background variables is reported in the result section.

Having parents with low educational qualifications (compared with higher), living in a single-parent family (compared with nuclear), and having more depressive symptoms, were associated with a higher odds ratio (OR) of missing values (OR range = 1.3–1.7) across key sleep variables included in our primary analyses. Thus, missing data was assumed to be missing at random (MAR) and imputed by multiple imputation performed with the R-package "mice," which performs multivariate imputation by chained equations (van Buuren & Groothuis-Oudshoorn, 2011). We performed 30 imputations with all variables present in our substantive analyses included in the imputation model. The estimates and standard errors were pooled into overall estimates according to Rubin's rules (Rubin, 1987). Multiple imputation performs superior to conventional techniques (e.g., listwise deletion) unless data is missing completely at random (MCAR), an assumption that seldom holds (Schafer & Graham, 2002). Thus, we primarily report and interpret the results from analyses based on multiple imputed data. Robustness checks were performed using complete case analysis. Scripts reproducing all analyses are available on the Open Science Framework: https://osf.io/akdwe/.

RESULTS

In total, 71% lived in a nuclear family. Of adolescents with separated parents, 45% lived in a single-mother family, 28% in a stepparent family, 18% had JPC, and 9% lived in a single-father family. Having parents with high school or university level education and perceiving their economic well-being to be better than others was more frequent among adolescents in nuclear families and JPC than in single- and stepparent families. Overall, about 10% resided in complex families. Family complexity was most prevalent among youth in stepparent families (61%) and JPC (38%) and least in nuclear families (1.5%, see Table 1 for details).

The first research question considers how sleep patterns vary by family structure and family complexity. Across all weekday and weekend sleep parameters, adolescents in JPC had similar estimates to peers in nuclear families (all *p*s >.05). On weekdays, significantly shorter sleep duration (15–18 min) and later bedtimes (5–8 min) were observed in single- and stepparent families compared with nuclear families. Adolescents in single-mother and stepfamilies also had significantly higher sleep deficit (about 22 min) and slightly lower sleep efficiency.

On weekends, later bedtimes and rise times (about 20 min) were observed for adolescents in single- and stepparent families. Only adolescents in stepparent families had significantly lower sleep duration (9 min). Adolescents in single-mother and stepparent families, on average, spent

TABLE 1 Descriptive characteristics by family structure

	Nuclear family	JPC	Single-father family	Single-mother family	Stepfamily
	***n* = 5457 (70.8%)**	***n* = 398 (5.2%)**	***n* = 212 (2.8%)**	***n* = 1011 (13.1%)**	***n* = 629 (8.2%)**
Age (mean [SD])	17.41 (0.84)	17.28 (0.80)	17.50 (0.86)	17.46 (0.84)	17.36 (0.82)
Missing (*n*)	11	0	2	5	1
Gender					
Female	2860 (52.4)	195 (49.0)	94 (44.3)	582 (57.6)	391 (62.2)
Male	2597 (47.6)	203 (51.0)	118 (55.7)	429 (42.4)	238 (37.8)
Ethnicity: adolescent					
Norwegian	5177 (95.7)	395 (99.5)	195 (92.9)	941 (94.1)	584 (94.2)
Foreign	233 (4.3)	2 (0.5)	15 (7.1)	59 (5.9)	36 (5.8)
Missing (*n*)	47	1	2	11	9
Ethnicity: mother					
Norwegian	4974 (91.2)	382 (96.0)	180 (85.3)	921 (91.2)	571 (90.9)
Foreign	479 (8.8)	16 (4.0)	31 (14.7)	89 (8.8)	57 (9.1)
Missing (*n*)	4	0	1	1	1
Ethnicity: father					
Norwegian	4928 (90.5)	372 (93.7)	187 (88.6)	860 (85.6)	544 (86.9)
Foreign	519 (9.5)	25 (6.3)	24 (11.4)	145 (14.4)	82 (13.1)
Missing (*n*)	10	1	1	6	3
Maternal education					
Primary school	356 (6.6)	15 (3.8)	25 (12.0)	89 (8.9)	71 (11.4)
Secondary school	1666 (30.7)	123 (31.1)	63 (30.3)	315 (31.4)	218 (34.9)
College/university (<4 years)	913 (16.8)	60 (15.2)	20 (9.6)	135 (13.4)	66 (10.6)
College/university (4+ years)	1271 (23.4)	95 (24.0)	39 (18.8)	219 (21.8)	113 (18.1)
Do not know	1225 (22.6)	103 (26.0)	61 (29.3)	246 (24.5)	157 (25.1)
Missing (*n*)	26	2	4	7	4
Paternal education					
Primary school	352 (6.5)	27 (6.8)	18 (8.6)	94 (9.4)	77 (12.4)
Secondary school	1888 (34.8)	140 (35.4)	85 (40.7)	304 (30.3)	227 (36.4)
College/university (<4 years)	580 (10.7)	40 (10.1)	13 (6.2)	83 (8.3)	41 (6.6)
College/university (4+ years)	1417 (26.1)	90 (22.8)	44 (21.1)	183 (18.3)	84 (13.5)
Do not know	1188 (21.9)	98 (24.8)	49 (23.4)	338 (33.7)	194 (31.1)
Missing (*n*)	32	3	3	9	6
Family complexity	84 (1.5)	152 (38.2)	17 (8.0)	123 (12.2)	381 (60.6)
Perceived economic well-being					
Worse than others	172 (3.2)	23 (5.8)	25 (11.8)	204 (20.5)	57 (9.2)
Like most others	3655 (68.0)	273 (69.3)	146 (69.2)	631 (63.5)	440 (70.9)
Better than others	1549 (28.8)	98 (24.9)	40 (19.0)	159 (16.0)	124 (20.0)
Missing (*n*)	81	4	1	17	8

Note: All figures are presented in *n* (%) unless otherwise specified. Missing = number of missing cases by family structure.

7–8 min longer falling asleep after going to bed (SOL), and had slightly longer awakenings during the night (WASO; 3–4 min) than peers in nuclear families ($p < .01$). No significant differences in subjective sleep need were detected across family structure (see Table 2).

Family complexity was associated with significantly shorter sleep duration (17 min), lower sleep efficiency, and higher sleep deficit among adolescents on weekdays (16 min). On weekends, family complexity was also associated with later bedtimes and rise times. On average, youth experiencing family complexity also had slightly longer SOL (8 min) and WASO (5 min) but reported a similar subjective sleep need to peers not experiencing family complexity (see Table 3).

The second research question focused more specifically on sleep problems. The Baseline model in Figure 1 shows the bivariate associations between family structure, family complexity, and sleep problems. Living in JPC was associated with a higher risk of oversleeping and DSWPD compared with nuclear family. The single- and stepparent groups had a similar and significantly higher risk across most sleep outcomes. The risk was highest for DSWPD, whereby adolescents in all post-separation family structures had about twice the risk compared with youth in nuclear families. Across the other outcomes, the relative risk for youth in single- and stepparent families was in the range of about 1.2–1.6. Translated into prevalence rates, long SOL, high sleep deficit, and frequent oversleeping were most prevalent and present among about one-third of youth in single-parent and stepparent families. For insomnia, the prevalence rates ranged from 20 to 23% among adolescents in single and stepparent families, compared with 15–15.5% for adolescents in nuclear families and JPC (see Figure 2). Sensitivity checks using JPC as a reference group yielded a similar pattern of results, though fewer significant differences (at $p < .05$) were detected (see Table S4).

Family complexity was associated with significantly higher risk of all sleep problems. The magnitude of the risk was similar as when comparing adolescents in single-parent and stepparent families to those in nuclear families. Considering family structure and family complexity jointly (Model 1), we observed two main trends; first, the estimated risk of sleep problems among youth in stepparent families was partly attenuated, whereby adolescents in stepparent families were no longer at a higher risk of long WASO and high sleep deficit than peers in nuclear families. Moreover, adolescents in JPC did not have a significantly higher risk of DSWPD after adjusting for family complexity. Second, the associated risk of sleep problems by family complexity decreased after adjusting for family structure, and family complexity was only significantly associated with a higher risk of oversleeping and insomnia.

The third research question focused on whether family SES (Model 2) and symptoms of depression (Model 3) attenuated the associations between family structure, family complexity, and sleep problems. As a general pattern, introducing these covariates to the analyses only partly reduced the associated risk of sleep problems by family structure and family complexity, suggesting that these variables explained a small part of the differences between the groups.

Our last set of models examined the research question of whether the associated risk of sleep problems by family structure depended on family complexity. Using a contrast approach, we compared the risk and prevalence of sleep problems within each family structure by family complexity. In nuclear families, family complexity was associated with a significantly higher risk of insomnia (RR = 1.66, $p < .01$), short sleep duration (RR = 1.51, $p = .03$) and frequent oversleeping (R = 1.61, $p < .01$). Although no other significant differences were detected, we note a general trend whereby the adjusted prevalence rates for most sleep outcomes were higher across family structures when family complexity was present (see Table S5).

Robustness checks were performed using complete case analyses. The overall pattern of findings was highly similar as reported above. For example, sleep pattern estimates on weekdays and weekends were all within a 2–3-min margin. Moreover, the pattern of significant results for the main sleep problems outcomes (Figure 1), was almost identical using complete

TABLE 2 Sleep patterns by family structure

	Nuclear family	JPC	Single-mother family	Single-father family	Stepfamily
Weekdays (mean [95% CI])					
Bedtime	23:17 (23:16, 23:19)	23:21 (23:15, 23:26)	**23:22 (23:19, 23:26)***	**23:26 (23:18, 23:34)***	**23:23 (23:18, 23:28)****
Rise time	6:46 (6:45, 6:47)	6:43 (6:39, 6:47)	6:46 (6:43, 6:49)	6:46 (6:41, 6:52)	6:46 (6:43, 6:50)
Sleep duration	6:30 (6:28, 6:33)	6:27 (6:17, 6:37)	**6:15 (6:09, 6:21)****	**6:12 (5:58, 6:27)***	**6:13 (6:05, 6:20)****
Time in bed	7:29 (7:27, 7:31)	7:23 (7:17, 7:29)	**7:24 (7:20, 7:27)***	7:20 (7:11, 7:30)	**7:23 (7:19, 7:28)***
Sleep efficiency (%)	86.6 (86.2, 87.1)	87.1 (85.4, 88.8)	**84.2 (83.1, 85.3)****	83.8 (81.3, 86.3)	**83.5 (82.0, 84.9)****
Sleep deficit	−2:06 (−2:10, −2:01)	−2:04 (−2:20, −1:49)	**−2:28 (−2:38, −2:18)****	−2:28 (−2:51, −2:04)	**−2:27 (−2:40, −2:14)****
Weekends (mean [95% CI])					
Bedtime	01:31 (01:29, 01:33)	01:38 (01:29, 01:47)	**01:49 (01:43, 01:54)****	**01:51 (01:38, 02:03)****	**01:49 (01:42, 01:56)****
Rise time	11:12 (11:10, 11:14)	11:22 (11:13, 11:31)	**11:35 (11:29, 11:40)****	**11:30 (11:16, 11:43)***	**11:32 (11:25,11:39)****
Sleep duration	8:42 (8:30, 8:45)	8:47 (8:36, 8:59)	8:37 (8:30, 8:44)	8:31 (8:15, 8:46)	**8:33 (8:23, 8:42)***
Time in bed	9:41 (9:39, 9:43)	9:43 (9:35, 9:52)	9:46 (9:41, 9:51)	9:39 (9:27, 9:50)	9:43 (9:37, 9:50)
Sleep efficiency (%)	89.8 (89.4, 90.2)	90.4 (88.9, 91.8)	**87.9 (87.0, 88.8)****	**87.7 (85.7, 89.8)***	**87.7 (86.5, 88.8)****
Sleep deficit	0:06 (0:02, 0:11)	0:16 (0:02, 0:32)	**−0:05 (−0:15, 0:05)***	−0:09 (−0:32, 0:13)	−0:07 (−0:21, 0:06)
Weekdays/weekends (mean [95% CI])					
Sleep onset latency	0:45 (0:44, 0:47)	0:45 (0:39, 0:50)	**0:52 (0:49, 0:56)****	0:51 (0:43, 0:59)	**0:53 (0:48, 0:57)****
Wake after sleep onset	0:13 (0:12, 0:14)	0:11 (0:08, 0:15)	**0:16 (0:14, 0:19)***	0:17 (0:12, 0:23)	**0:18 (0:15, 0:21)****
Subjective sleep need	8:36 (8:33, 8:39)	8:31 (8:19, 8:44)	8:42 (8:34, 8:50)	8:40 (8:22, 8:58)	8:40 (8:30, 8:50)

Note: Estimated marginal means with 95% confidence intervals, adjusted by age and gender. Results are displayed in hours and minutes unless otherwise specified. Estimates and *p*-values derived from pooled estimates from 30 multiple imputed data sets. Reference group = Nuclear family. Bold estimates are significant at $p < .05$.
*$p < .05$. **$p < .01$.

TABLE 3 Sleep patterns by family complexity

	No family complexity	Family complexity
Weekdays (mean [95% CI])		
Bedtime	23:19 (23:17, 23:20)	23:21 (23:17, 23:25)
Rise time	6:46 (6:45, 6:47)	6:45 (6:42, 6:48)
Sleep duration	6:28 (6:26, 6:30)	**6:11 (6:04, 6:18)****
Time in bed	7:28 (7:26, 7:29)	7:24 (7:19, 7:28)
Sleep efficiency (%)	86.3 (85.9, 86.7)	**83.1 (81.9, 84.4)****
Sleep deficit	−2:09 (2:13, 2:06)	**−2:25 (2:36, 2:14)****
Weekends (mean [95% CI])		
Bedtime	01:35 (01:33, 01:37)	**01:44 (01:38, 01:50)****
Rise time	11:17 (11:15, 11:19)	**11:25 (11:19, 11:31)***
Sleep duration	8:42 (8:40, 8:45)	**8:28 (8:20, 8:36)****
Time in bed	9:42 (9:40, 9:44)	9:41 (9:35, 9:47)
Sleep efficiency (%)	89.5 (89.2, 89.9)	**86.1 (86.1, 88.1)****
Sleep deficit	0:05 (0:02, 0:09)	**−0:08 (−0:19, 0:03)***
Weekdays/weekends (mean [95% CI])		
Sleep onset latency	0:46 (0:45, 0:47)	**0:54 (0:50, 0:58)****
Wake after sleep onset	0:14 (0:13, 0:15)	**0:19 (0:16, 0:21)****
Subjective sleep need	8:37 (8:34, 8:40)	8:36 (8:27, 8:45)

Note: Estimated marginal means with 95% confidence intervals, adjusted by age and gender. Results are displayed in hours and minutes unless otherwise specified. Estimates and *p*-values derived from pooled estimates from 30 multiple imputed data sets. Bold estimates are significant at $p < .05$.
*$p < .05$. **$p < .01$.

case analyses (see Tables S2–S3 and Figure S1 for all details when using complete case analysis).

DISCUSSION

This study examined whether inequalities in sleep among adolescents exist by family structure and family complexity. We addressed this topic by providing a detailed assessment of sleep patterns and sleep problems among youth across modern family structures and by family complexity.

We report five main findings: First, whereas adolescents in JPC had similar sleep patterns as youth in nuclear families on weekdays, adolescents in single- and stepparent families had shorter sleep duration and lower sleep efficiency. Similarly, family complexity was associated with shorter sleep duration and lower sleep efficiency. These findings were driven by slightly later bedtimes and longer SOL and WASO. Moreover, a greater shift in circadian rhythm from weekdays to weekends was observed in single- and stepparent families, with later bed- and rise-times (about 20 min) than in nuclear families. These results accord with a few studies suggesting that sleep patterns among youth may vary as a function of family structure (Schmeer et al., 2019; Troxel et al., 2014). However, previous studies have used less fine-tuned family structure and sleep measures and examined broader age groups, making it difficult to compare the results. For instance, aligned with our findings, a study found lower sleep efficiency among adolescents (aged 14–19) in single-parent than two-parent families (Troxel et al., 2014). However, that study also found significantly shorter sleep duration in single-parent families on

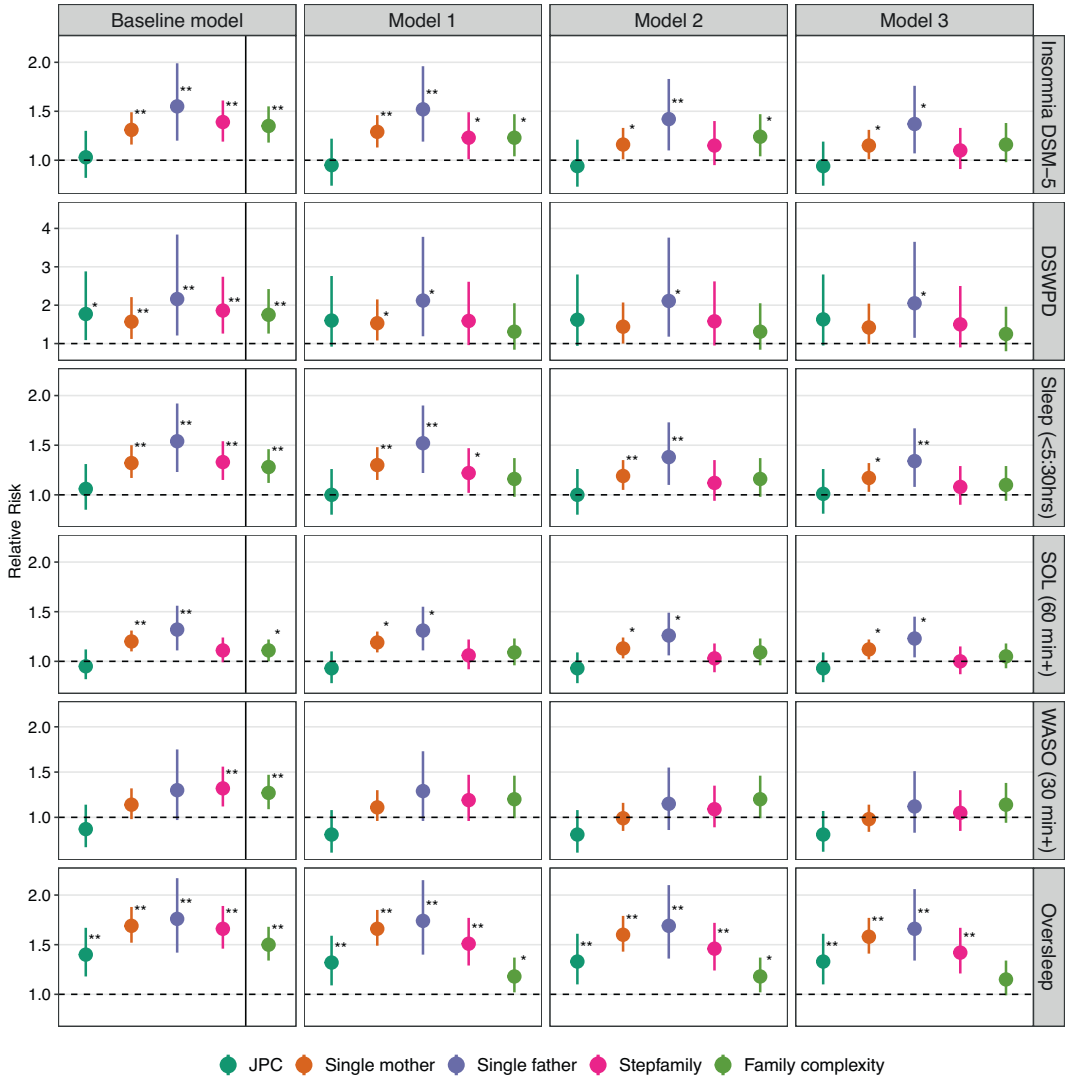

FIGURE 1 Relative risk of sleep problems by family structure and family complexity. **Baseline model**: Crude associations between family structure and family complexity and sleep outcomes, adjusted by age and gender. A solid vertical line separates the two models. The dotted horizontal line represents the reference group (i.e., nuclear family and no family complexity). **Model 1**: Family structure and family complexity entered in the same model (i.e., adjusted by each other) + age and gender. **Model 2**: Model 1 + socioeconomic measures. **Model 3**: Model 2 + symptoms of depression. DSWPD, delayed sleep–wake phase disorder; JPC, joint physical custody; SOL, sleep onset latency; Sleep, sleep duration on weekdays; WASO, wake after sleep onset. Note that the *y*-axis for the DSWPD panel is scaled differently than the other panels. [Color figure can be viewed at wileyonlinelibrary.com]

weekends (but not on weekdays), opposite to the pattern detected in the present study. Moreover, a recent found that adolescents (aged 11–15) in JPC had later bedtimes (reported on a five-point rating scale) on weekdays than peers in nuclear families and more sleep initiation difficulties (Turunen et al., 2021). Whether the discrepancy between their and our findings is due to differences in measurements or age groups is hard to infer.

Second, adolescents in JPC had a similar risk for most sleep problems as peers in nuclear families but had a higher risk of oversleeping and DWSPD. With these two exceptions in

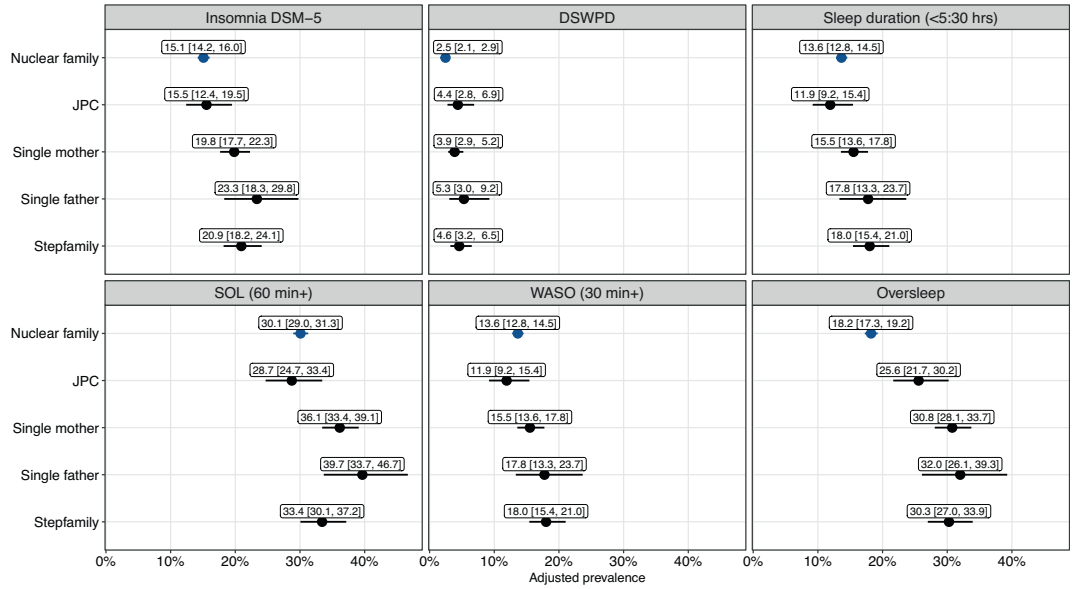

FIGURE 2 Adjusted prevalence rates of sleep problems by family structure. Adjusted prevalence rates by family structure of insomnia, delayed sleep–wake phase disorder (DSWPD), short sleep duration on weekdays (<5:30 h), long sleep onset latency (SOL 60 min+), long wake after sleep onset (WASO 30 min+), and frequent oversleeping (Oversleep). The estimates are adjusted by age and gender. Error bars represent 95% confidence intervals of the point estimate. JPC, joint physical custody. [Color figure can be viewed at wileyonlinelibrary.com]

mind, our results suggest that despite the potential stress of frequently moving between homes and thus sleeping environments (e.g., Chisholm & McIntosh, 2008), the prevalence of sleep problems among adolescents in JPC is more similar to peers in nuclear families than in single- and stepparent families. These results corroborate two studies from Sweden, generally finding fewer sleep problems among youth in JPC and nuclear families than single-parent families (Bergström et al., 2015; Turunen et al., 2021). The results also extend previous work focused on mental health-related outcomes among youth in JPC (Nielsen, 2018; Steinbach, 2019), and suggest that the positive outcomes associated with JPC also extend to sleep.

Several positive features of JPC have been proposed, such as better access to financial and parental resources, improved parental cooperation, and parent–child relationships (Steinbach, 2019). Recent studies have found that co-parenting quality and parent–child relationships explain much of the differences in adjustment problems between young children in JPC and single-parent families (Bergström et al., 2021; Hagquist, 2016; Steinbach & Augustijn, 2022). Such mechanisms may also apply to our findings, as parenting practices have also been linked to sleep problems among youth (Meijer et al., 2016). Unfortunately, such measures were not available in the present study.

The higher risk for oversleeping and DSWPD among adolescents in JPC is still noteworthy. The risks remained stable after adjustments of SES, family complexity, and symptoms of depression. It is possible that frequent shifting between two households makes it more difficult to obtain stable bedtime- and rise time routines, thus increasing the risk of frequent oversleeping and DSWPD. Future studies are needed to detail potential mechanisms underlying this finding.

Third, adolescents in single- and stepparent families had a higher risk for most sleep problems than peers in nuclear families. As shown by the adjusted prevalence rates, the absolute differences between these groups were small. Overall, these results align with a recent study

finding poorer sleep quality among youth in single- and stepparent families than in nuclear families (Delaruelle et al., 2021), and the often reported finding of similar levels of adjustment problems in single- and stepparent families (Amato, 1993; Coleman et al., 2000).

Adjustments of sociodemographic measures and symptoms of depression partly attenuated the risk of sleep problems among youth in single- and stepparent families. Still, net of these measures, single-parent families had a significantly higher risk of several outcomes, including insomnia, and all post-separation family structures had a higher risk of oversleeping. Thus, although our results support the notion of low SES as a marker of risk of sleep problems (e.g., Philbrook et al., 2020), low SES did not fully explain the higher rates of sleep problems observed in single-parent families. Moreover, the small attenuating effect of depression illustrates that the higher risk of sleep problems is not just a byproduct of coexisting depressive symptoms. Other unmeasured factors such as family dysfunction, parental monitoring, and sleep hygiene have been linked to sleep problems among youth (Billows et al., 2009; Chang et al., 2019), and may differ by family structure and family complexity. Future studies are needed to test their importance as potential mechanisms.

Fourth, family complexity was associated with a higher risk of all sleep outcomes. This result is consistent with a recent review, concluding that living with half-and stepsiblings was associated with a small but consistent higher risk of adjustment problems (Sanner et al., 2018). When considering family structure and family complexity jointly, family complexity remained significantly associated with a higher risk of insomnia and frequent oversleeping. Thus, our results suggest that family complexity has some independent associations with sleep problems net of family structure. This finding aligns with previous research suggesting that family complexity is associated with negative outcomes (e.g., behavioral and financial problems) net of family structure (Brown et al., 2015; Fomby et al., 2016). It should be noted that in the latter study, some outcome measures became insignificant (i.e., $p > .05$) when jointly considering family complexity and family structure, as in the present study.

Accounting for family complexity attenuated the associated risk of living in a stepfamily. In sensitivity analyses using JPC as the reference group, we also note that the risk for insomnia increased for single-parent families after adjustments of family complexity but attenuated for youth in stepparent families. Together with the fact that family complexity was most prevalent in stepparent families (61%) followed by JPC (38%), and much less prevalent in single-parent families (8–12%), these results suggest that on the group level, family complexity may be a risk for sleep problems among youth not only in stepparent families, but also in JPC.

Lastly, we examined whether the association between family complexity and sleep outcomes depended on family structure. In short, family complexity was only significantly associated with sleep outcomes among adolescents in nuclear families, with a higher risk for insomnia, short sleep duration, and frequent oversleeping. Children and youth with family complexity in nuclear families are also more likely to receive financial support than children in other family structures (Brown et al., 2015). These findings may suggest that children and youth in nuclear families are especially vulnerable to family complexity. Still, for most outcomes, we observed a similar but weaker pattern within each of the post-separation family structures whereby the presence of family complexity was associated with a higher risk of the given sleep outcome, although these differences were not statistically significant (at $p < .05$). This observable trend aligns with previous studies suggesting that the influence of family complexity is rather similar across family structures (Fomby et al., 2016; Halpern-Meekin & Tach, 2008). We acknowledge that the sample sizes for these subgroup analyses are small. Future studies using larger samples are needed to test for these associations more robustly.

Strengths and limitations

The strengths of the present study are the detailed assessment of sleep, family structure, and family complexity in a large sample of older adolescents. Specifically, the use of SOL and WASO to estimate sleep duration, and the ability to approximate the diagnostic criteria of insomnia and DSWPD, are key strengths. Similarly, our ability to distinguish between five modern family structures and measure family complexity is unique compared to previous research on family structure and sleep.

We note some limitations to this work. Although drawing on a large sample, the sample sizes are low for some of the family categorizations. These impacts the reliability of the point estimates. Moreover, our analyses pool youth with married or cohabiting biological parents, half-or stepsiblings, and youth in stepparent families. We also treat JPC as a single group with the unique defining feature of frequently alternating between two homes, although heterogeneity within JPC also exists (e.g., shifting between single- or stepparent households). Some may also experience "bird's nest" arrangements, where the youth stay put in one household and the parents shift between them in living with their children. Despite these potential complexities, our findings indicate JPC as a meaningful category as sociodemographic characteristics and sleep patterns among JPC-youth resembled youth in nuclear families more than those in single- or stepfamilies. Still, our measure of family structure may miss nuances if underlying unobserved groups vary on the dependent variables.

Another limitation is the parsimonious set of covariates in our analyses. Other unobserved characteristics may influence the association between family structure, family complexity, and sleep. In particular, previous research has linked measures of family dysfunction and parental monitoring to sleep patterns among youth (Buxton et al., 2015; Chang et al., 2019). Many factors may also select youth into a given family structure, with or without family complexity, and to experiencing sleep problems. Notably, studies have documented an association between repeated changes in parental union status and child adjustment (Cavanagh & Fomby, 2019). Hence, the higher risk of sleep problems in non-nuclear families and by family complexity could be attributable to prior family instability and not family composition as measured at one point in time. The lack of longitudinal data also prevents us from drawing conclusions about the temporal order of the relationship between family structure, family complexity, and sleep, and whether these associations vary by the age of when experiencing parental divorce or separation. We also lacked data on how many siblings were present in the household, which is a limitation, as the number of siblings could also be an indicator of the economic and parental resources available.

Our study relied on self-reported measures of family structure, siblings, and sleep. It has been noted that youth may be reluctant to use labels such as half- or stepsiblings to siblings with whom they have shared their childhood with (Sanner et al., 2018), which could have introduced some noise in our findings. In addition, our measures of sleep are not based on clinical evaluation or more objective measures (e.g., actigraphy). Still, although differences between self-reported and objective measures of sleep have been detected (Lauderdale et al., 2008), self-reported sleep assessments are considered applicable when investigating sleep in clinical and population-based research (Zinkhan et al., 2014). Self-reported measures of sleep duration also show good agreement with actigraphy-measures (Kong et al., 2011).

Finally, with a response rate of 53%, attrition from the study could affect the generalizability of the results. Unfortunately, low response rates are increasingly common in epidemiological research (Morton et al., 2012). As noted, the sample was skewed toward higher socioeconomic status. Thus, the reported prevalence rates of sleep problems may be conservative estimates of the true prevalence in the population. Still, as the study captured well the distribution of adolescents in various family structures based on available official statistics and had considerable

variability across socioeconomic and sleep measures, we do not believe that a more representative sample would change the main conclusions drawn from the present study.

Despite these limitations, this study contributes by providing a detailed assessment of adolescent sleep within a modern family context. Our results suggest that although sleep problems are evident across all family constellations, inequalities in sleep exist by family structure and family complexity. Moreover, these inequalities are not fully explained by socioeconomic factors or symptoms of depression. As this study is one of the first to comprehensively assess sleep patterns and sleep problems among adolescents in modern family constellation, there is a need for future studies to corroborate these findings and explore other mechanisms that may advance our understanding of the links between family and sleep among youth. There is also a need for longitudinal studies to assess how family instability may influence sleep during adolescence. Our findings highlight that the family context, through the lens of family structure and family complexity, may provide a viable framework to further expand our knowledge of social determinants of sleep during adolescence.

ACKNOWLEDGMENTS

We want to thank the Bergen Child Study group, and most importantly, we are grateful to all participants that made this study possible.

ORCID

Sondre Aasen Nilsen https://orcid.org/0000-0002-3179-1277
Malin Bergström https://orcid.org/0000-0002-6030-401X
Børge Sivertsen https://orcid.org/0000-0003-4654-9296
Kjell Morten Stormark https://orcid.org/0000-0001-8543-1878
Mari Hysing https://orcid.org/0000-0001-5303-8879

REFERENCES

Adam, E. K., Snell, E. K., & Pendry, P. (2007). Sleep timing and quantity in ecological and family context: A nationally representative time-diary study. *Journal of Family Psychology*, *21*(1), 4–19. https://doi.org/10.1037/0893-3200.21.1.4

Alvaro, P. K., Roberts, R. M., Harris, J. K., & Bruni, O. (2017). The direction of the relationship between symptoms of insomnia and psychiatric disorders in adolescents. *Journal of Affective Disorders*, *207*, 167–174. https://doi.org/10.1016/j.jad.2016.08.032

Amato, P. R. (1993). Children adjustment to divorce—Theories, hypotheses, and empirical support. *Journal of Marriage and the Family*, *55*(1), 23–38. https://doi.org/10.2307/352954

Amato, P. R. (2010). Research on divorce: Continuing trends and new developments. *Journal of Marriage and Family*, *72*(3), 650–666. https://doi.org/10.1111/j.1741-3737.2010.00723.x

American Psychiatric Association (Ed.). (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Association.

Angold, A., Costello, E. J., Messer, S. C., Pickles, A., Winder, F., & Silver, D. (1995). Development of a short questionnaire for use in epidemiological studies of depression in children and adolescents. *International Journal of Methods in Psychiatric Research*, *5*(4), 237–249.

Barnes, C. M., & Drake, C. L. (2015). Prioritizing sleep health: Public health policy recommendations. *Perspectives on Psychological Science*, *10*(6), 733–737. https://doi.org/10.1177/1745691615598509

Bartel, K. A., Gradisar, M., & Williamson, P. (2015). Protective and risk factors for adolescent sleep: A meta-analytic review. *Sleep Medicine Reviews*, *21*, 72–85. https://doi.org/10.1016/j.smrv.2014.08.002

Bergström, M., Fransson, E., Modin, B., Berlin, M., Gustafsson, P. A., & Hjern, A. (2015). Fifty moves a year: Is there an association between joint physical custody and psychosomatic problems in children? *Journal of Epidemiology and Community Health*, *69*(8), 769–774. https://doi.org/10.1136/jech-2014-205058

Bergström, M., Modin, B., Fransson, E., Rajmil, L., Berlin, M., Gustafsson, P. A., & Hjern, A. (2013). Living in two homes—A Swedish national survey of wellbeing in 12 and 15 year olds with joint physical custody. *BMC Public Health*, *13*(1), 868. https://doi.org/10.1186/1471-2458-13-868

Bergström, M., Salari, R., Hjern, A., Hognäs, R., Bergqvist, K., & Fransson, E. (2021). Importance of living arrangements and coparenting quality for young children's mental health after parental divorce: A cross-sectional parental survey. *BMJ Paediatrics Open*, *5*(1), e000657. https://doi.org/10.1136/bmjpo-2020-000657

Berman, R. (2018). Children's influence on dual residence arrangements: Exploring decision-making practices. *Children and Youth Services Review*, *91*, 105–114. https://doi.org/10.1016/j.childyouth.2018.05.038

Billows, M., Gradisar, M., Dohnt, H., Johnston, A., McCappin, S., & Hudson, J. (2009). Family disorganization, sleep hygiene, and adolescent sleep disturbance. *Journal of Clinical Child & Adolescent Psychology*, *38*(5), 745–752. https://doi.org/10.1080/15374410903103635

Bøe, T., Petrie, K. J., Sivertsen, B., & Hysing, M. (2019). Interplay of subjective and objective economic well-being on the mental health of Norwegian adolescents. *SSM-Population Health*, *9*, 100471. https://doi.org/10.1016/j.ssmph.2019.100471

Bowers, J. M., & Moyer, A. (2017). Effects of school start time on students' sleep duration, daytime sleepiness, and attendance: A meta-analysis. *Sleep Health*, *3*(6), 423–431. https://doi.org/10.1016/j.sleh.2017.08.004

Braver, S. L., & Lamb, M. E. (2018). Shared parenting after parental separation: The views of 12 experts. *Journal of Divorce & Remarriage*, *59*(5), 372–387. https://doi.org/10.1080/10502556.2018.1454195

Brown, S. L., Manning, W. D., & Stykes, J. B. (2015). Family structure and child well-being: Integrating family complexity. *Journal of Marriage and Family*, *77*(1), 177–190. https://doi.org/10.1111/jomf.12145

Buxton, O. M., Chang, A.-M., Spilsbury, J. C., Bos, T., Emsellem, H., & Knutson, K. L. (2015). Sleep in the modern family: Protective family routines for child and adolescent sleep. *Sleep Health*, *1*(1), 15–27. https://doi.org/10.1016/j.sleh.2014.12.002

Carlson, M. J., & Corcoran, M. E. (2001). Family structure and children's behavioral and cognitive outcomes. *Journal of Marriage and Family*, *63*(3), 779–792. https://doi.org/10.1111/j.1741-3737.2001.00779.x

Carskadon, M. A. (2011). Sleep in adolescents: The perfect storm. *Pediatric Clinics*, *58*(3), 637–647. https://doi.org/10.1016/j.pcl.2011.03.003

Cavanagh, S. E., & Fomby, P. (2019). Family instability in the lives of American children. *Annual Review of Sociology*, *45*, 493–513. https://doi.org/10.1146/annurev-soc-073018-022633

Chang, L.-Y., Wu, C.-C., Yen, L.-L., & Chang, H.-Y. (2019). The effects of family dysfunction trajectories during childhood and early adolescence on sleep quality during late adolescence: Resilience as a mediator. *Social Science & Medicine*, *222*, 162–170. https://doi.org/10.1016/j.socscimed.2019.01.010

Chisholm, R., & McIntosh, J. (2008). Cautionary notes on the shared care of children in conflicted parental separation. *Journal of Family Studies*, *14*(1), 37–52. https://doi.org/10.5172/jfs.327.14.1.37

Coleman, M., Ganong, L., & Fine, M. (2000). Reinvestigating remarriage: Another decade of progress. *Journal of Marriage and Family*, *62*(4), 1288–1307. https://doi.org/10.1111/j.1741-3737.2000.01288.x

Coles, R. L. (2015). Single-father families: A review of the literature. *Journal of Family Theory & Review*, *7*(2), 144–166. https://doi.org/10.1111/jftr.12069

Crowley, S. J., Wolfson, A. R., Tarokh, L., & Carskadon, M. A. (2018). An update on adolescent sleep: New evidence informing the perfect storm model. *Journal of Adolescence*, *67*, 55–65. https://doi.org/10.1016/j.adolescence.2018.06.001

Dahl, R. E., & El-Sheikh, M. (2007). Considering sleep in a family context: Introduction to the special issue. *Journal of Family Psychology*, *21*(1), 1–3. https://doi.org/10.1037/0893-3200.21.1.1

Dahl, R. E., & Lewin, D. S. (2002). Pathways to adolescent health sleep regulation and behavior. *Journal of Adolescent Health*, *31*(6), 175–184. https://doi.org/10.1016/S1054-139X(02)00506-2

de Zambotti, M., Goldstone, A., Colrain, I. M., & Baker, F. C. (2018). Insomnia disorder in adolescence: Diagnosis, impact, and treatment. *Sleep Medicine Reviews*, *39*, 12–24. https://doi.org/10.1016/j.smrv.2017.06.009

Delaruelle, K., Dierckens, M., Vandendriessche, A., Deforche, B., & Poppe, L. (2021). Adolescents' sleep quality in relation to peer, family and school factors: Findings from the 2017/2018 HBSC study in Flanders. *Quality of Life Research*, *30*(1), 55–65. https://doi.org/10.1007/s11136-020-02614-2

El-Sheikh, M., & Kelly, R. J. (2017). Family functioning and children's sleep. *Child Development Perspectives*, *11*(4), 264–269. https://doi.org/10.1111/cdep.12243

El-Sheikh, M., Shimizu, M., Philbrook, L. E., Erath, S. A., & Buckhalt, J. A. (2020). Sleep and development in adolescence in the context of socioeconomic disadvantage. *Journal of Adolescence*, *83*, 1–11. https://doi.org/10.1016/j.adolescence.2020.06.006

Fomby, P., Goode, J. A., & Mollborn, S. (2016). Family complexity, siblings, and children's aggressive behavior at school entry. *Demography*, *53*(1), 1–26. https://doi.org/10.1007/s13524-015-0443-9

Fomby, P., Ophir, A., & Carlson, M. J. (2021). Family complexity and children's behavior problems over two US cohorts. *Journal of Marriage and Family*, *83*(2), 340–357. https://doi.org/10.1111/jomf.12706

Galland, B. C., Short, M. A., Terrill, P., Rigney, G., Haszard, J. J., Coussens, S., Foster-Owens, M., & Biggs, S. N. (2018). Establishing normal values for pediatric nighttime sleep measured by actigraphy: A systematic review and meta-analysis. *Sleep*, *41*(4), zsy017. https://doi.org/10.1093/sleep/zsy017

Gilmore, S. (2006). Contact/shared residence and child well-being: Research evidence and its implications for legal decision-making. *International Journal of Law, Policy and the Family*, *20*(3), 344–365. https://doi.org/10.1093/lawfam/ebl016

Goldscheider, F., Scott, M. E., Lilja, E., & Bronte-Tinkew, J. (2015). Becoming a single parent: The role of father and mother characteristics. *Journal of Family Issues*, *36*(12), 1624–1650. https://doi.org/10.1177/0192513X13508405

Gregory, A. M., Caspi, A., Moffitt, T. E., & Poulton, R. (2006). Family conflict in childhood: A predictor of later insomnia. *Sleep*, *29*(8), 1063–1067. https://doi.org/10.1093/sleep/29.8.1063

Hadfield, K., Amos, M., Ungar, M., Gosselin, J., & Ganong, L. (2018). Do changes to family structure affect child and family outcomes? A systematic review of the instability hypothesis. *Journal of Family Theory & Review*, *10*(1), 87–110. https://doi.org/10.1111/jftr.12243

Hagquist, C. (2016). Family residency and psychosomatic problems among adolescents in Sweden: The impact of child–parent relations. *Scandinavian Journal of Public Health*, *44*(1), 36–46. https://doi.org/10.1177/1403494815610664

Haines, J., Rifas-Shiman, S. L., Horton, N. J., Kleinman, K., Bauer, K. W., Davison, K. K., Walton, K., Austin, S. B., Field, A. E., & Gillman, M. W. (2016). Family functioning and quality of parent–adolescent relationship: Cross-sectional associations with adolescent weight-related behaviors and weight status. *International Journal of Behavioral Nutrition and Physical Activity*, *13*(1), 1–12. https://doi.org/10.1186/s12966-016-0393-7

Halpern-Meekin, S., & Tach, L. (2008). Heterogeneity in two-parent families and adolescent well-being. *Journal of Marriage and Family*, *70*(2), 435–451. https://doi.org/10.1111/j.1741-3737.2008.00492.x

Hjern, A., Bergström, M., Kjaer Urhoj, S., & Nybo Andersen, A.-M. (2020). Early childhood social determinants and family relationships predict parental separation and living arrangements thereafter. *Acta Paediatrica*, *110*, 247–254. https://doi.org/10.1111/apa.15322

Hysing, M., Harvey, A. G., Linton, S. J., Askeland, K. G., & Sivertsen, B. (2016). Sleep and academic performance in later adolescence: Results from a large population-based study. *Journal of Sleep Research*, *25*(3), 318–324. https://doi.org/10.1111/jsr.12373

Hysing, M., Pallesen, S., Stormark, K. M., Lundervold, A. J., & Sivertsen, B. (2013). Sleep patterns and insomnia among adolescents: A population-based study. *Journal of Sleep Research*, *22*(5), 549–556. https://doi.org/10.1111/jsr.12055

Kelly, R. J., & El-Sheikh, M. (2011). Marital conflict and children's sleep: Reciprocal relations and socioeconomic effects. *Journal of Family Psychology*, *25*(3), 412–422. https://doi.org/10.1037/a0023789

Keyes, K. M., Maslowsky, J., Hamilton, A., & Schulenberg, J. (2015). The great sleep recession: Changes in sleep duration among US adolescents, 1991–2012. *Pediatrics*, *135*(3), 460–468. https://doi.org/10.1542/peds.2014-2707

Khor, S. P., McClure, A., Aldridge, G., Bei, B., & Yap, M. B. (2020). Modifiable parental factors in adolescent sleep: A systematic review and meta-analysis. *Sleep Medicine Reviews*, *56*, 101408. https://doi.org/10.1016/j.smrv.2020.101408

King, V., Boyd, L. M., & Thorsen, M. L. (2015). Adolescents' perceptions of family belonging in stepfamilies. *Journal of Marriage and Family*, *77*(3), 761–774. https://doi.org/10.1111/jomf.12181

Kitterød, R. H., & Wiik, K. A. (2017). Shared residence among parents living apart in Norway. *Family Court Review*, *55*(4), 556–571. https://doi.org/10.1111/fcre.12304

Kong, A. P., Wing, Y.-K., Choi, K. C., Li, A. M., Ko, G. T. C., Ma, R. C., Tong, P. C., Ho, C.-S., Chan, M. H., Ng, M. H., Lau, J., & Chan, J. C. (2011). Associations of sleep duration with obesity and serum lipid profile in children and adolescents. *Sleep Medicine*, *12*(7), 659–665. https://doi.org/10.1016/j.sleep.2010.12.015

Koster, T., Poortman, A.-R., van der Lippe, T., & Kleingeld, P. (2021). Parenting in postdivorce families: The influence of residence, repartnering, and gender. *Journal of Marriage and Family*, *83*(2), 498–515.

Lauderdale, D. S., Knutson, K. L., Yan, L. L., Liu, K., & Rathouz, P. J. (2008). Self-reported and measured sleep duration: How similar are they? *Epidemiology*, *19*, 838–845.

Lenth, R. (2020). *emmeans: Estimated marginal means, aka least-squares means* [Manual]. https://CRAN.R-project.org/package=emmeans

Lundervold, A. J., Breivik, K., Posserud, M. B., Stormark, K. M., & Hysing, M. (2013). Symptoms of depression as reported by Norwegian adolescents on the Short Mood and Feelings Questionnaire. *Frontiers in Psychology*, *4*, 613. https://doi.org/10.3389/fpsyg.2013.00613

Matricciani, L., Olds, T., & Petkov, J. (2012). In search of lost sleep: Secular trends in the sleep time of school-aged children and adolescents. *Sleep Medicine Reviews*, *16*(3), 203–211. https://doi.org/10.1016/j.smrv.2011.03.005

Meijer, A. M., Reitz, E., & Dekovi⊠, M. (2016). Parenting matters: A longitudinal study into parenting and adolescent sleep. *Journal of Sleep Research*, *25*(5), 556–564. https://doi.org/10.1111/jsr.12406

Morton, S. M. B., Bandara, D. K., Robinson, E. M., & Carr, P. E. A. (2012). In the 21st century, what is an acceptable response rate? *Australian and New Zealand Journal of Public Health*, *36*(2), 106–108. https://doi.org/10.1111/j.1753-6405.2012.00854.x

Nielsen, L. (2018). Joint versus sole physical custody: Outcomes for children independent of family income or parental conflict. *Journal of Child Custody*, *15*(1), 35–54. https://doi.org/10.1080/15379418.2017.1422414

Nilsen, S. A., Breivik, K., Wold, B., & Bøe, T. (2018). Divorce and family structure in Norway: Associations with adolescent mental health. *Journal of Divorce & Remarriage*, *59*(3), 175–194. https://doi.org/10.1080/10502556.2017.1402655

Nilsen, S. A., Hysing, M., Breivik, K., Heradstveit, O., Vingen Sunde, E., Stormark, K. M., & Bøe, T. (2020). Complex families and health complaints among adolescents: A population-based cross-sectional study. *Scandinavian Journal of Public Health*, *48*(7), 733–742. https://doi.org/10.1177/1403494819893903

Pearce, L. D., Hayward, G. M., Chassin, L., & Curran, P. J. (2018). The increasing diversity and complexity of family structures for adolescents. *Journal of Research on Adolescence*, *28*(3), 591–608. https://doi.org/10.1111/jora.12391

Perales, F., Johnson, S. E., Baxter, J., Lawrence, D., & Zubrick, S. R. (2017). Family structure and childhood mental disorders: New findings from Australia. *Social Psychiatry and Psychiatric Epidemiology*, *52*(4), 423–433. https://doi.org/10.1007/s00127-016-1328-y

Philbrook, L. E., Saini, E. K., Fuller-Rowell, T. E., Buckhalt, J. A., & El-Sheikh, M. (2020). Socioeconomic status and sleep in adolescence: The role of family chaos. *Journal of Family Psychology*, *34*, 577–586. https://doi.org/10.1037/fam0000636

Poortman, A. R., & van Gaalen, R. (2017). Shared residence after separation: A review and new findings from The Netherlands. *Family Court Review*, *55*(4), 531–544. https://doi.org/10.1111/fcre.12302

Quon, E. C., & McGrath, J. J. (2014). Subjective socioeconomic status and adolescent health: A meta-analysis. *Health Psychology*, *33*(5), 433–447. https://doi.org/10.1037/a0033716

Rubin, D. B. (1987). *Multiple imputation for survey nonresponse*. Wiley.

Sanner, C., & Jensen, T. (2021). Toward more accurate measures of family structure: Accounting for sibling complexity. *Journal of Family Theory & Review*, *13*, 110–127. https://doi.org/10.1111/jftr.12406

Sanner, C., Russell, L. T., Coleman, M., & Ganong, L. (2018). Half-sibling and stepsibling relationships: A systematic integrative review. *Journal of Family Theory & Review*, *10*(4), 765–784. https://doi.org/10.1111/jftr.12291

Saxvig, I. W., Bjorvatn, B., Hysing, M., Sivertsen, B., Gradisar, M., & Pallesen, S. (2020). Sleep in older adolescents. Results from a large cross-sectional, population-based study. *Journal of Sleep Research*, *30*(4). https://doi.org/10.1111/jsr.13263C

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*(2), 147–177. https://doi.org/10.1037/1082-989X.7.2.147

Schmeer, K. K., Tarrence, J., Browning, C. R., Calder, C. A., Ford, J. L., & Boettner, B. (2019). Family contexts and sleep during adolescence. *SSM-Population Health*, *7*, 100320. https://doi.org/10.1016/j.ssmph.2018.11.004

Scott, H., Biello, S. M., & Woods, H. C. (2019). Identifying drivers for bedtime social media use despite sleep costs: The adolescent perspective. *Sleep Health*, *5*(6), 539–545. https://doi.org/10.1016/j.sleh.2019.07.006

Scott, J., Kallestad, H., Vedaa, O., Sivertsen, B., & Etain, B. (2021). Sleep disturbances and first onset of major mental disorders in adolescence and early adulthood: A systematic review and meta-analysis. *Sleep Medicine Reviews*, PM" class="new" updatedon="12 May, 12:2 PM" mytype="content" id="7.5(6)fbfc61-6aae-40e1-abf5-5bcab2eddd8a">5(4). https://doi.org/10.1016/j.smrv.2021.101429

Sharp, C., Goodyer, I. M., & Croudace, T. J. (2006). The Short Mood and Feelings Questionnaire (SMFQ): A unidimensional item response theory and categorical data factor analysis of self-report ratings from a community sample of 7-through 11-year-old children. *Journal of Abnormal Child Psychology*, *34*(3), 379–391. https://doi.org/10.1007/s10802-006-9027-x

Short, M. A., Gradisar, M., Wright, H., Lack, L. C., Dohnt, H., & Carskadon, M. A. (2011). Time for bed: Parent-set bedtimes associated with improved sleep and daytime functioning in adolescents. *Sleep*, *34*(6), 797–800. https://doi.org/10.5665/SLEEP.1052

Sivertsen, B., Pallesen, S., Stormark, K. M., Bøe, T., Lundervold, A. J., & Hysing, M. (2013). Delayed sleep phase syndrome in adolescents: Prevalence and correlates in a large population based study. *BMC Public Health*, *13*(1), 1–10. https://doi.org/10.1186/1471-2458-13-1163

Smock, P. J., & Schwartz, C. R. (2020). The demography of families: A review of patterns and change. *Journal of Marriage and Family*, *82*(1), 9–34. https://doi.org/10.1111/jomf.12612

Statistics Norway. (2021). *Families and households*. 06204: Children 0-17 Years, by Number of Parents in the Family, the Parents' Cohabitation Arrangements and the Child's Age 2001–2021. https://www.ssb.no/en/statbank/table/06204/

Statistics Norway. (2012). Income and Wealth statistics for households. https://www.ssb.no/en/inntekt-og-forbruk/statistikker/ifhus/aar/2013-12-18.

Steinbach, A. (2019). Children's and parents' well-being in joint physical custody: A literature review. *Family Process*, *58*(2), 353–369. https://doi.org/10.1111/famp.12372

Steinbach, A., & Augustijn, L. (2021). Post-separation parenting time schedules in joint physical custody arrangements. *Journal of Marriage and Family*, *83*, 595–607. https://doi.org/10.1111/jomf.12746

Steinbach, A., & Augustijn, L. (2022). Children's well-being in sole and joint physical custody families. *Journal of Family Psychology*, *36*(2), 301–311. https://doi.org/10.1037/fam0000875

Steinbach, A., Kuhnt, A.-K., & Knüll, M. (2016). The prevalence of single-parent families and stepfamilies in Europe: Can the Hajnal line help us to describe regional patterns? *The History of the Family*, *21*(4), 578–595. https://doi.org/10.1080/1081602X.2016.1224730

Stormark, K. M., Heiervang, E., Heimann, M., Lundervold, A., & Gillberg, C. (2008). Predicting nonresponse bias from teacher ratings of mental health problems in primary school children. *Journal of Abnormal Child Psychology*, *36*(3), 411–419. https://doi.org/10.1007/s10802-007-9187-3

Sweeney, M. M. (2010). Remarriage and stepfamilies: Strategic sites for family scholarship in the 21st century. *Journal of Marriage and Family*, *72*(3), 667–684. https://doi.org/10.1111/j.1741-3737.2010.00724.x

Tashjian, S. M., Mullins, J. L., & Galván, A. (2019). Bedtime autonomy and cellphone use influence sleep duration in adolescents. *Journal of Adolescent Health*, *64*(1), 124–130. https://doi.org/10.1016/j.jadohealth.2018.07.018

Tillman, K. H. (2008). "Non-traditional" siblings and the academic outcomes of adolescents. *Social Science Research*, *37*(1), 88–108. https://doi.org/10.1016/j.ssresearch.2007.06.007

Troxel, W. M., Lee, L., Hall, M., & Matthews, K. A. (2014). Single-parent family structure and sleep problems in black and white adolescents. *Sleep Medicine*, *15*(2), 255–261. https://doi.org/10.1016/j.sleep.2013.10.012

Turunen, J., Norell-Clarke, A., & Hagquist, C. (2021). How do children and adolescents of separated parents sleep? An investigation of custody arrangements, sleep habits, sleep problems, and sleep duration in Sweden. *Sleep Health*, *7*, 716–722. https://doi.org/10.1016/j.sleh.2021.06.002

Turner, N., Joinson, C., Peters, T. J., Wiles, N., & Lewis, G. (2014). Validity of the Short Mood and Feelings Questionnaire in Late Adolescence. *Psychological Assessment*, *26*(3), 752–762. https://doi.org/10.1037/a0036572

van Buuren, S., & Groothuis-Oudshoorn, K. (2011). mice: Multivariate imputation by chained equations in R. *Journal of Statistical Software*, *45*(3), 1–67. https://doi.org/10.18637/jss.v045.i03

Wickham, H. (2016). *ggplot2: Elegant graphics for data analysis*. Springer-Verlag. http://ggplot2.org

Zeileis, A. (2006). Object-oriented computation of sandwich estimators. *Journal of Statistical Software*, *16*(9), 1–16. https://doi.org/10.18637/jss.v016.i09

Zinkhan, M., Berger, K., Hense, S., Nagel, M., Obst, A., Koch, B., Penzel, T., Fietze, I., Ahrens, W., Young, P., Happe, S., Kantelhardt, J. W., Kluttig, A., Schmidt-Pokrzywniak, A., Pillmann, F., & Stang, A. (2014). Agreement of different methods for assessing sleep characteristics: A comparison of two actigraphs, wrist and hip placement, and self-report with polysomnography. *Sleep Medicine*, *15*(9), 1107–1114. https://doi.org/10.1016/j.sleep.2014.04.015

Zou, G. (2004). A modified poisson regression approach to prospective studies with binary data. *American Journal of Epidemiology*, *159*(7), 702–706. https://doi.org/10.1093/aje/kwh090

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Nilsen, S. A., Bergström, M., Sivertsen, B., Stormark, K. M., & Hysing, M. (2022). Sleep in adolescence: Considering family structure and family complexity. *Journal of Marriage and Family*, 1–23. https://doi.org/10.1111/jomf.12844