Adolescents' online-offline interactions with peers and the intergenerational transmission of loneliness

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Abstract

Loneliness—defined as a perceived gap between one's desired and actual levels of social connectedness —is increasing across all age groups, particularly among adolescents. Research remains divided on whether online social interactions alleviate loneliness, and especially on whether they are as effective as in-person contacts. Meanwhile, a growing body of literature suggests loneliness may be transmitted across generations. Several mechanisms might explain this transmission, such as that lonely parents pass on lower social confidence and competence, which in turn encourages social withdrawal in their children. However, no study has yet examined whether such withdrawal is reflected in online and/or offline social behaviors. Differences in these forms of social engagement among children of lonely parents may, indeed, represent a potential pathway in the intergenerational continuity of loneliness.

Using data from the youth section of the *UK Household Longitudinal Study – Understanding Society*, we contribute to this debate in three ways. First, we assess whether online and offline peer interactions offer equal protection against adolescent loneliness. Second, we test for an intergenerational link between parental and adolescent loneliness. Third, we explore whether this link is mediated by adolescents' patterns of online and offline social habits.

Results show that offline interactions are consistently more effective in protecting against loneliness than online ones. We also find a strong association between parental and adolescent loneliness. Children's diminished social activity offline accounts for a small yet statistically significant indirect effect explaining such parent–child transmission in loneliness, whereas no mediation effect is found for online interactions.

Introduction

Loneliness is a subjective experience, arising from a perceived gap between one's desired and actual levels of intimacy and social connectedness (Beller & Wagner, 2018; Russell et al., 2012). Given the fundamental human need for belonging, it is unsurprising that a perceived lack of meaningful social ties and interactions has been linked to numerous adverse cognitive, behavioral, and health outcomes (Hawkley & Cacioppo, 2010; Wesselmann & Williams, 2017). In recent decades, loneliness has been rising at an alarming rate among the general population (Cacioppo & Cacioppo, 2018; Newmyer et al., 2022). The COVID-19 lockdowns have not only contributed to this upward trend (Ernst et al., 2022), but also brought the issue to the forefront of the public debate.

Among adolescents in particular, feelings of loneliness have increased worldwide starting from the 2010s (Twenge et al., 2021). Concurrently, cohort-level research indicates that adolescents in the United States spend less time meeting friends in person compared to previous generations, a decline that has occurred alongside a rise in time spent on social media (Twenge et al., 2019). However, linking these shifts in in-person and digital sociality to loneliness is complex. At the individual level, while there is strong consensus that in-person social interactions help protect against loneliness (Steptoe et al., 2013), the evidence regarding the impact of digital social interactions remains inconsistent (Mao et al., 2023; Wang et al., 2018). Some studies suggest that digital interactions are less effective than in-person meetings in mitigating loneliness (Lee et al., 2011; Yao & Zhong, 2014). Conversely, others indicate that adolescents may experience a strong sense of belonging within online peer communities—sometimes even stronger than in offline settings (Lehdonvirta & Räsänen, 2011; Smith et al., 2021). Whether or not online social contacts will enhance connectedness seems to be influenced by various factors. For instance, time spent online matters: moderate users tend to report the greatest benefits (Wang et al., 2018), whereas high levels of internet use—often referred to as "internet addiction"—have been linked to increased risks of loneliness (Saadati et al., 2021; Yao & Zhong, 2014). Individual traits and social skills also play a role, though research remains divided on which characteristics most effectively predict positive outcomes (Pouwels et al., 2022). Some argue that "socially rich" adolescents—those with strong social skills and large offline networks—are best positioned to use social media to deepen their connectedness (Cheng et al., 2019). Others suggest that less socially confident individuals may benefit more, using digital platforms to build skills and form new relationships (Van Zalk et al., 2014). However, due to their addictive design, social media can also lead socially vulnerable users to retreat further from face-to-face interaction (Nowland et al., 2018).

The family plays a crucial role in shaping many of the dynamics discussed above. Psychological theory and empirical research consistently emphasize that positive parental involvement and supportive social interactions within the household are decisive in at least two respects. First, they help shield children from risky behaviors—such as excessive internet use (Chang et al., 2015; Gámez-Guadix et al., 2022). Second, they model constructive social behavior, providing the foundation for children to develop satisfying social lives of their own (Bowlby, 2008). An underdeveloped yet promising body of research suggests that loneliness may be transmitted across generations (Augustijn, 2021; Curran, 2019). The proposed mechanisms behind such transmission include the passing of poor social competence and low self-confidence, and thus of a habit of withdrawing from social life, from parents to children. But does this withdrawal affect both online and offline social life equally? Do children of lonely parents spend less time with friends in person, online, or both, compared to children of socially satisfied parents? If so, these distinct social habits, likely to eventually influence children's own experiences of loneliness, would constitute a behavioral mechanism of transmission of this condition. To the best of our knowledge, however, no study has yet examined whether the passing down of loneliness from parents to adolescent children is mediated by children's online and/or offline social habits. Only one study has addressed a related question, finding a link between parental

loneliness and children's online gaming addiction, mediated by the children's own loneliness and poor social skills (Mun & Lee, 2022).

This study contributes to the debate on loneliness on three grounds. First, we examine whether the frequency of in-person and online peer interactions offers comparable protection against loneliness to adolescents. Second, we test for an association between parental and adolescent loneliness, thus engaging with the literature on the intergenerational transmission of such experience. Third, we explore whether this intergenerational pattern is explained—at least in part—by mediation pathways of adolescents' differing use of online and/or offline social contacts.

To address these research questions, we use data from the youth module (administered to individuals aged 10–15) of *Understanding Society*, a large, nationally representative UK household survey. This dataset offers several advantages. First, it includes two directly comparable measures of adolescents' weekly interactions with friends, one assessing in-person interactions and the other online interactions. Both are collected using nearly identical questions and response options: this enables a straightforward comparison of how these two forms of social contact relate to loneliness. So far, these two variables in the youth section of *Understanding Society* have not yet been used simultaneously to examine adolescent loneliness. The broader *Understanding Society* dataset, on the other hand, has been employed to explore links between social media use and well-being across a wider age range (10–80 years), showing the strongest negative association among young adolescents (Orben et al., 2022). Moreover, using a large and multigenerational dataset allows us to gather information not only on parents' own sense of connectedness, but also on a wide range of covariates known to influence adolescent loneliness, social networks, and internet use, rarely examined together. These include socio-economic and demographic indicators, as well as measures of family cohesion.

Online vs offline socialization: which relationship with loneliness?

Peer interactions play a vital role during adolescence, as building and maintaining social networks beyond the family of origin is crucial for psychological wellbeing and social development at this stage of life (Korkiamäki, 2014; Verity et al., 2021). Under favorable conditions, peer relationships foster a sense of belonging and social support (Newman et al., 2007; Stanton-Salazar & Spina, 2005). There is strong consensus that spending time with friends in person helps reduce loneliness (Steptoe et al., 2013). However, over recent decades, internet-based socializing has become an increasingly common mode of peer interaction among adolescents. The relationship between digital sociality and loneliness —and more broadly, subjective wellbeing (Karim et al., 2020; Marinucci et al., 2022) —remains a subject of debate.

Theoretically, digital interactions may influence loneliness through two distinct mechanisms. First, digital interactions may influence loneliness directly. In theory, online communication offers a means for adolescents to connect with others and build community, thereby reinforcing their sense of identity and belonging (Smith et al., 2021; Valkenburg & Peter, 2011). This is echoed in qualitative research on adolescents' own perceptions of social media, where opportunities for connection and peer support are frequently reported as key benefits of these communication platforms (Popat & Tarrant, 2023). However, other studies present contrasting evidence, suggesting that online interactions may be insufficiently rewarding or effective in providing genuine emotional and social support (Biolcati & Cani, 2015; Rains et al., 2017). Moreover, digital sociality carries inherent risks, including exposure to cyberviolence, exclusion, and online ostracism (Webster et al., 2021).

Secondly, digital interactions may affect loneliness indirectly, either by facilitating in-person interactions (which would enhance connectedness) or by replacing them (which could increase the risk of loneliness). Twenge et al. (2019) found that the two forms of sociality are negatively correlated at the cohort level – suggesting a generational time displacement from face-to-face interactions to internet socializing – but positively correlated at the individual level. Other studies support this latter

finding, indicating that socially active adolescents tend to engage more in both online and offline interactions (Bowden-Green et al., 2020; Lima et al., 2017). There is also evidence that online interactions can help sustain and even expand offline social networks. Social media can indeed serve as a "practice space" where adolescents develop key interpersonal skills—such as self-disclosure—that are essential for initiating and maintaining friendships, also offline (Koutamanis et al., 2013; Towner et al., 2022; Valkenburg et al., 2011).

On the other hand, some authors have cautioned that social media use may lead to withdrawal from in-person interactions (Nowland et al., 2018). Face-to-face encounters are typically more demanding and less controllable than online ones, where individuals can more easily curate their self-presentation and manage the timing and nature of exchanges. This risk appears particularly pronounced for individuals who are already socially fragile or lonely: studies found that those individuals may be inclined to engage primarily online and avoid offline social contexts (Morahan-Martin & Schumacher, 2003; Nowland et al., 2018), thereby reinforcing a cycle of isolation.

Intergenerational transmission of loneliness: mediated by children's social habits?

Like other psychological and mental health issues (Garber & Cole, 2010; Goodman, 2020; Johnston et al., 2013), loneliness has been shown to follow a pattern of intergenerational transmission (Curran, 2019; Lobdell & Perlman, 1986). This transmission occurs not only from parents to their young or adolescent children (Henwood & Solano, 1994; Junttila & Vauras, 2009; Luoma et al., 2019); it also persists into children's adulthood (Augustijn, 2021; Elovainio et al., 2024). Surprisingly, however, this phenomenon remains relatively underexplored compared to other inheritable mental health conditions and psychological experiences. Several theories have been proposed to explain why loneliness may be transmitted across generations. Suggested mechanisms include genetic inheritance, environmental influences, socio-cultural factors, and, most plausibly, an interplay of nature and nurture (Branje et al., 2020; T. L. Cheng et al., 2016). Of particular relevance to our approach are psychological mechanisms. These, indeed, support our hypothesis that parents who experience loneliness may transmit this condition to the next generation by influencing their children's social habits, in the first stance: such habits would then serve as mediating pathways.

Psychological mechanisms behind the passing of loneliness across generations can be understood within the framework of established theories such as attachment theory (Ainsworth & Bowlby, 1991; Bowlby, 2008) and social learning theory (Bandura & Walters, 1977; Grusec, 1994). Both theories emphasize the critical role of parental behaviors and emotional patterns in shaping children's capacity to form and maintain fulfilling social relationships throughout their life. In fact, research has shown that adults experiencing loneliness often struggle with interpersonal relationships due to underdeveloped social skills or limited opportunities to acquire and develop them (Segrin et al., 2013; Vanhalst et al., 2013). Through social learning, their children may also develop inadequate interpersonal skills and reduced social confidence (Burke et al., 2012, 2013), which can, in turn, increase their own vulnerability to loneliness (Di Blasio et al., 2017; Su et al., 2023). Arguably, this mechanism of reduced social confidence is also likely to affect children's online and offline social activity. As discussed above, indeed, social skills and competence are positively associated with frequent peer interactions among adolescents (Bowden-Green et al., 2020), at least in person. On the other hand, the connection between engagement in online social interactions and traits such as extraversion and social confidence appears to be more complex, with existing research yielding mixed findings (Pouwels et al., 2022). Altogether, this mechanism of intergenerational transmission of loneliness would suggest us to expect a negative association between parental loneliness and children's social habits, at least offline, and possibly a mediating pathway of the latter in the parent-child passing of loneliness.

Another important mechanism identified in the literature as contributing to the inheritability of loneliness is low parental involvement in the emotional and social lives of their children (Lobdell &

Perlman, 1986). Indeed, lonely parents tend to engage less with family members and may struggle to provide adequate emotional support (Curran, 2019; Segrin et al., 2013). In contrast, high levels of family cohesion and parental involvement have been shown to protect adolescents not only from loneliness (Ayhan & Beyazit, 2021; Chen et al., 2022; Cooper et al., 2021), but also from various risky behaviors (Arbona & Power, 2003; DiClemente et al., 2001). More specifically, a growing body of research highlights the importance of positive parent-child interactions in preventing excessive internet use and its associated negative outcomes among adolescents (Chang et al., 2015; Favotto et al., 2019; Gámez-Guadix et al., 2022; Sanders et al., 2000). According to this second mechanism of loneliness transmission, therefore, we could expect to find in our data a positive association between parental loneliness and online and/or offline social habits: adolescents of lonely (and likely disengaged) parents would, indeed, seek alternative sources of social connection and emotional support by increasing their social interactions with peers. Importantly, our study attempts at exploring the subtle social and psychological dynamics behind the intergenerational transmission of loneliness. For this reason, more tangible factors, such as the actual frequency of shared parent-child activities, will be controlled for as a separate, moderating factor in our models.

This same reasoning applies to a third and meaningful mechanism underlying the intergenerational passing of loneliness (which we acknowledge and control for in our regressions): socioeconomic deprivation, which has been shown to affect both perceived and actual social isolation across generations within disadvantaged households (Macdonald et al., 2018; Qualter et al., 2021). For younger members of these households, the effects of adverse socioeconomic conditions on loneliness can be long-lasting, often persisting into adulthood (Kamiya et al., 2014). Socioeconomic deprivation may also limit adolescents' opportunities for social interaction. This is sometimes assumed to apply primarily to online activities, due to the need for internet-enabled devices. In reality, access to digital technology has become increasingly equal, with smartphone ownership being now nearly universal among Western teenagers (Anderson et al., 2023). However, adolescents from lower socioeconomic backgrounds may still encounter barriers to participating in offline leisure activities, which has been linked to having fewer friendships and reduced social networks (Hjalmarsson & Mood, 2015).

Methodology

Data and sample

We use data from *Understanding Society*, the UK Household Longitudinal Study (UKHLS), a large, nationally representative survey conducted annually since 2009. Our analyses mainly draw on the youth self-completion questionnaire, which targets all children aged 10–15 in participating households. Additional information is drawn from the adult questionnaire. We work with the three most recent waves of the survey: Wave 12 (2020–2022), Wave 13 (2021–2023), and Wave 14 (2022–2024). These are indeed the only waves for which information on children's loneliness and frequency of interactions with friends is available. Due to COVID-19 restrictions, response rates to the youth questionnaire (administered via paper and self-completion) were relatively low during those years, resulting in a limited number of longitudinal observations: only 455 children completed the questionnaire across all three waves. Consequently, we adopt a cross-sectional approach, using the most recent available observation for each child. This results in a final sample of 2,464 children, of whom 54% come from Wave 14 (n = 1,354), 36% from Wave 13 (n = 888), and 9% from Wave 12 (n = 222). These figures reflect the exclusion of cases with missing data on one or more variables; no imputation procedures were applied.

Main variables

Children's loneliness: We measured adolescents' loneliness using the survey item: "How often do you feel lonely?", which is the only question on loneliness included in the youth questionnaire. Response

options were “Hardly ever or never,” “Some of the time,” and “All of the time.” We recoded this variable into a dichotomous measure, assigning a value of 1 to respondents who reported feeling lonely sometimes or always (45.9% of cases), and 0 otherwise. Robustness checks using the original three-category measure yielded consistent results.

Weekly frequency of meeting with friends, offline and online: These variables are derived from the following survey items, respectively: “In a typical week, how often do you get together with friends in person (outside of school or work)?” and “In a typical week, how often do you get together with friends online (including on your mobile phone, on social media, or through online gaming)?”. These questions share identical response options: “Never,” “Less often,” “About once a week,” “Several times a week,” and “Every day or almost every day”. They are hence directly comparable and offer a rare opportunity to examine, in parallel, two distinct forms of social interaction and their associations with loneliness. The proportion of children who reported never meeting friends was similar across the two modalities (around 10%). However, a much larger share reported meeting friends online every day or almost every day (38.3%) compared to in person (12.6%). To further explore how patterns of online and offline socializing relate to perceived connectedness, we constructed a typology combining both dimensions. Adolescents were categorized into low–low, low–high, high–low, and high–high groups, depending on whether they were frequent or infrequent users of each type of social interaction. A frequent user was defined as someone who socializes more often than the sample average in a given modality—that is, several times a week or daily for online interactions, and at least once a week for offline meetings.

Parental loneliness: Unlike the youth questionnaire, the one targeting adults includes four items assessing loneliness. The first—“How often do you feel lonely?”—has its direct equivalent in the youth survey section. The remaining three items are drawn from the UCLA 3-Item Loneliness Scale, a brief and validated version of the original UCLA Loneliness Scale (Hughes et al., 2004): “How often do you feel you lack companionship?”, “How often do you feel left out?”, and “How often do you feel isolated from others?”. All items share the same response options: “Never,” “Some of the time,” and “Often”. We constructed several measures of parental loneliness, including a scale summing responses from all four items, and a dichotomous indicator based solely on the first question. This latter variable, coded 1 if the respondent reported feeling lonely some of the time or often, mirrors the coding used for adolescent loneliness. It is used in the analyses presented here, although results obtained using the four-item scale were substantively similar. Information on parental loneliness was collected for both parents within the household. For each child, we retained the highest reported level of loneliness between the two parents. The dichotomous variable hence takes the value 1 if at least one parent reported feeling lonely some of the time or often (53% of cases in our sample).

Control variables

Additional variables on social media and internet use: We include a dichotomous indicator of whether respondents have personal access to an internet-enabled device—in this case, a smartphone. The youth questionnaire also asks two additional questions relevant to online engagement. The first concerns whether respondents have “a social media profile or account on any sites or apps”. Those who answer affirmatively are then asked how many hours they spend interacting with friends on such sites or apps during a typical weekend (a similar question exists for school days; we tested both, obtaining equivalent results). Responses range from “None” to “7 or more hours”. Including *hourly* information on time spent using social media alongside our main independent variable—on the *weekly* frequency of online interactions—may provide important insights. Prior research suggests indeed the existence of a curvilinear relationship between social media use and loneliness (Wang et al., 2018), whereby moderate use may foster connectedness, whereas excessive engagement can become isolating. Thus, adolescents who chat online daily but only for short periods may experience lower loneliness than those who spend prolonged time online. We therefore construct two variables: a dummy variable indicating whether the respondent has a social media account, and a categorical variable capturing

hours spent interacting with friends on such social media. In the latter, adolescents without a social media account are coded as a distinct category—separate from those who have an account but report never using it. These two variables are not used simultaneously, since the second already encompasses the first; instead, they are included alternatively in different model specifications (see Statistical Analyses section). Importantly, by survey design, the measure of weekly online meetings with friends was collected for all respondents, including those without a social media account. In fact, 20.1% of adolescents without a social media account in our sample still reported meeting friends online daily—likely through instant messaging, video calls, or online gaming. Unfortunately, the survey does not include an equivalent question on time spent socializing in person during weekends.

Additional information on the child's social life within and outside the household: An essential control in a study of loneliness—a subjective perception of social connectedness—is an objective indicator of social ties. These two dimensions are typically correlated, though not always strongly (Coyle & Dugan, 2012). In our analysis, the most suitable proxy for objective connectedness is the number of close friends reported by each respondent. To construct this variable, we recoded all values above ten as ten, since higher counts were highly dispersed and, conceptually, all represent similarly "socially rich" adolescents. We also include a control for parental involvement in the child's daily life and family cohesion, as previous research has shown this to influence both adolescent wellbeing and social behavior. To capture this dimension, we use a variable indicating how often, in the past seven days, the child shared an evening meal with all other household members (response options range from "None" to "6–7 times"). While the survey also asks about the frequency of other shared family activities (e.g., watching sports, attending the theatre, or visiting art galleries), we consider shared evening meals to be the most universal and reliable indicator of parental involvement across social and cultural contexts.

Demographic and socio-economic confounders: We control for the adolescent's age at the time of the interview and their sex. Sex is a key demographic factor influencing a wide range of social and psychological outcomes (Rosenfield & Mouzon, 2013) as well as patterns of online and offline social interaction (Liang et al., 2016; Orben et al., 2022). Although loneliness has historically been more prevalent among boys (Koenig et al., 1994), recent evidence suggests that the rise in adolescent loneliness has been more pronounced among girls (Twenge et al., 2021). Intergenerational pathways of loneliness also appear to be gender-specific, with girls more strongly influenced by their mothers and boys by their fathers (Salo et al., 2020). Socioeconomic status (SES) is another important factor to control for, as it affects both loneliness—across generations—and individuals' social lives. Our data allow for a detailed set of socioeconomic controls, many of which are derived from the parents' questionnaire. These include indicators for urban residence (dichotomous), ethnic minority background (dichotomous), highest parental education (coded as "Lower secondary", "Upper secondary", or "Higher"), and household income (log-transformed). We also account for family composition, controlling for whether parents are divorced and whether the child has siblings (both dichotomous). Finally, we include a control for the year of interview, as some data were collected during the COVID-19 pandemic—a period that profoundly affected individuals' social interactions and sense of connectedness. Controlling for interview year allows us to account for variation potentially attributable to these broader contextual effects.

Statistical analyses

The first part of our analysis examines whether the frequency of online and offline contact with peers is associated with loneliness among UK adolescents. To address this research question, we estimate logistic regression models in which the main independent variables are: (a) the two separate indicators of online and offline contact frequency, included simultaneously, and (b) a combined typology capturing patterns of online/offline social interaction. All models adjust for a comprehensive set of potential confounders, including: smartphone ownership, hours spent interacting with friends online during weekends, number of close friends, frequency of shared family meals, age, sex, urban

residence, ethnic minority status, parental education, household income (log-transformed), parental divorce, presence of siblings, and year of interview.

In the second part of the analysis, we investigate whether parental loneliness is associated with adolescent loneliness, and whether this relationship is mediated by adolescents' social habits—specifically, their frequency of online and offline interactions with friends. For the mediation analysis, we employ the KHB method (from the name of its three authors: Karlson et al., 2012), implemented in Stata 18.5 using the *khb* package. The KHB approach enables a statistically valid comparison between estimates from (a) a model regressing the outcome variable (adolescent loneliness) on the exposure (parental loneliness) and all control variables—unadjusted for the mediator—and (b) the same model adjusted for the mediator (either online or offline contact frequency). The unadjusted model captures the *total effect* of parental loneliness on adolescent loneliness, while the adjusted model isolates the *direct effect*; the difference between the two represents the *indirect (mediated) effect* (see Figure 1 for the Directed Acyclic Graph). Separate mediation analyses are conducted for each potential mediator. All models are estimated using logistic regression. Following the framework by Baron & Kenny (1986), we also verify that a significant association exists between the exposure (parental loneliness) and each mediator (online and offline interaction with friends). These auxiliary models are estimated using ordinal logistic regression, given the categorical nature of the mediators. All regressions include the same set of controls as in the first part of the analysis, with one exception: we substitute the variable measuring hours spent interacting with friends online during weekends with a simpler indicator of whether the adolescent has a social media account. The latter provides, indeed, a more general measure of online connectedness, although results remain consistent when using the former.

Figure 1. Directed Acyclic Graph (DAG) illustrating the direct effect of parental loneliness on adolescent loneliness, as well as the indirect effects mediated through adolescents' online and offline social habits.

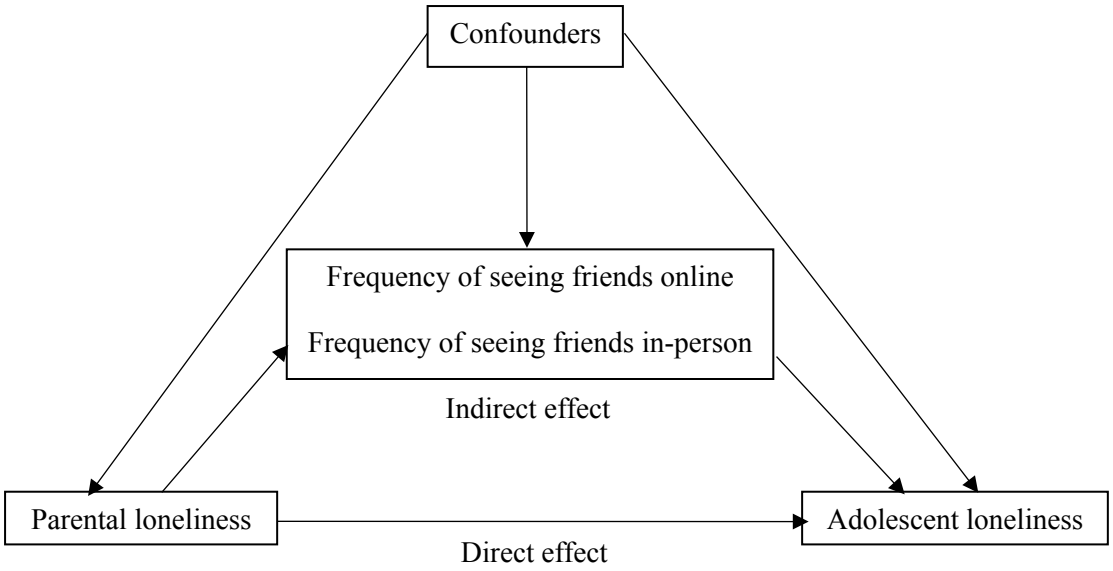

Table 1: Sample description according to adolescents' loneliness status

	Not lonely (N=1333)		Lonely (N=1131)	
	%	N	%	N

Weekly frequency of meeting friends in person				
Never	8.10	108	11.67	132
Less often	28.58	381	34.75	393
About once a week	28.13	375	25.73	291
Several times a week	19.35	258	19.10	216
Every day or almost every day	15.83	211	8.75	99
Weekly frequency of meeting friends online				
Never	11.18	149	12.11	137
Less often	11.25	150	11.05	125
About once a week	12.30	164	15.12	171
Several times a week	26.33	351	24.14	273
Every day or almost every day	38.93	519	37.58	425
Typologies of weekly meetings with friends				
Low online, low in-person	17.25	230	21.40	242
High online, low in-person	19.43	259	25.02	283
Low online, high in-person	17.48	233	16.89	191
High online, high in-person	45.84	611	36.69	415
Parental loneliness	48.91	652	57.74	653
Hours spent interacting with friends on social media				
Never - has no social media	20.93	279	14.06	159
None - has social media	3.45	46	4.69	53
Less than an hour	29.03	387	26.79	303
1 - 3 hours	36.53	487	39.61	448
4 - 6 hours	8.63	115	12.47	141
5 - 7 or more hours	1.43	19	2.39	27
Owns a smartphone	86.35	1151	85.68	969
Number of close friends (mean)	6.5393		5.5066	
Weekly frequency of sharing a meal with family				
Never	5.48	73	8.05	91
1 - 2 times	11.48	153	18.74	212
3 - 5 times	23.11	308	23.34	264
6 - 7 times	59.94	799	49.87	564
Age (mean)	12.67		12.93	
Sex (female)	43.59	581	63.93	723
Highest level of parental education				
Lower secondary	17.78	237	16.89	191
Upper secondary	16.20	216	15.83	179
Higher	66.02	880	67.29	761
Ethnic minority status	39.53	527	34.39	389
Urban residence	77.57	1034	75.33	852
Household income (log)(mean)	7.3793		7.4112	
Parents are divorced	8.33	111	10.08	114
Has siblings	72.17	962	64.28	727
Year of interview				
2020	1.05	14	0.44	5
2021	26.26	350	29.97	339
2022	45.46	606	43.94	497
2023	27.23	363	25.64	290

Results

Table 1 presents all variables included in our model, along with the sample characteristics by adolescents' loneliness status.

Results from the first part of our analysis are shown in Table 2. Model (1), in particular, examines the association between adolescent loneliness and the two independent variables capturing respondents' weekly habits of meeting friends online and offline. Compared with the baseline category of "never" meeting friends, the findings clearly indicate that increasing the frequency of offline meetings to at least once per week is progressively associated with lower odds of experiencing loneliness, with statistically significant effects. Meeting friends daily, in particular, is associated with a 62.3% reduction in the odds of loneliness compared with the reference category ($p = 0.000$). In contrast, the frequency of online interactions shows no statistically significant association with loneliness beyond the baseline "never." The corresponding odds ratios also suggest that frequent online socializing offers comparatively less benefit in reducing loneliness than offline encounters.

Regarding the hourly use of social media during the weekend, all categories of this variable are significantly associated with higher odds of experiencing loneliness compared to the reference group —adolescents without a social media account. Even those who have an account but never use it show nearly double the odds of feeling lonely relative to non-users (OR = 1.994; $p = 0.004$). Interestingly, the odds decrease substantially for adolescents who use social media for less than one hour (OR = 1.380; $p = 0.026$) but increase again among those engaging in more intensive use. Overall, these results suggest that, despite the general negative association between social media ownership and loneliness, the least detrimental effects of online communication platforms occur with limited, short-duration use.

This finding is further supported by Model (2), in which the two variables capturing weekly online and offline social habits are replaced with a typology combining both forms of contact. In this model, adolescents who frequently engage in both types of social interaction on a weekly basis exhibit the lowest odds of experiencing loneliness compared with the reference group, that is, those who are infrequent users of both modalities (OR: 0.608; $p = 0.000$). Model (2) also replicates the earlier pattern for hourly social media use, showing a lower peak in the odds of loneliness among adolescents who use social media for less than one hour per weekend. This provides further evidence that short, regular spans of online social interaction (several times a week or daily) may be comparatively less harmful in relation to loneliness. Nevertheless, in-person interactions remain more effective: frequent offline contact continues to be significantly associated with reduced odds of loneliness, even when combined with limited online interaction (although results for the "low online, high in-person" typology are weaker than for the high–high typology: OR = 0.728; $p = 0.031$).

These regressions produce consistent results, including across several robustness checks (e.g., using a three-category measure of loneliness as the dependent variable or including hours spent online during a weekday as a control). Before turning to the next part of the analysis, it is worth briefly discussing the control variables that also emerged as significant. As expected, a higher number of close friends was associated with lower odds of feeling lonely (approximately a 10% reduction in both models). Similarly, frequent family meals (6–7 times per week) were linked to a substantially lower likelihood of loneliness (OR = 0.636; $p = 0.011$ in Model (1)), as well as having siblings. The same protective pattern appeared for ethnic minority status, after controlling for multiple socioeconomic indicators. Conversely, higher parental education and female gender were both associated with increased odds. In

particular, girls exhibited more than twice the odds of experiencing loneliness compared with boys ($p = 0.000$ in both models).

We next examine the parent–child continuum of loneliness and its potential mediation pathways. Table 3 presents the results of a logistic regression (Model (3)) of adolescent loneliness on parental loneliness and various control variables, excluding the potential mediators: it hence presents parental loneliness' total effect on adolescent loneliness. A strong and statistically significant association emerges: adolescents with lonely parents are 42.2% more likely to feel lonely themselves ($p = 0.000$). This model also largely reproduces the associations between the control variables and adolescent loneliness observed in Models (1) and (2). The only exception concerns ethnic minority status, whose lower odds of loneliness do not reach conventional levels of statistical significance in this specification ($p = 0.059$). These findings remain consistent across several robustness checks, including analyses using a three-category measure of adolescent loneliness and an alternative scale for parental loneliness.

We then turn to the question of whether the intergenerational transmission of loneliness may be mediated by adolescents' social habits, either online, offline, or both. As a first step, we test whether parental loneliness is associated with each potential mediator after adjusting for control variables, following the procedure outlined by Baron & Kenny (1986) for establishing a mediation pathway. As shown in Model (4), parental loneliness is significantly associated with a 17.8% decrease in the odds of frequently meeting friends in person ($p = 0.008$). In contrast, the association with meeting friends online is not statistically significant ($p = 0.093$). These findings provide initial evidence against the possibility that adolescents' online sociality mediates the intergenerational transmission of loneliness, while suggesting that offline sociality could play a mediating role. Before turning to the results of the KHB effects decomposition, it is worth briefly discussing the control variables that show significant associations with adolescents' online and offline social habits. As expected, both forms of sociality are positively associated with the number of close friends reported by respondents. Owning a smartphone, having a social media account, and higher household income are also linked to more frequent social interactions—all factors that facilitate socializing and maintaining peer connections. Conversely, girls report less frequent meetings with friends, both online and offline, as do adolescents from ethnic minority backgrounds. Adolescents with siblings tend to spend less time interacting online, while older respondents meet friends in person less often than younger ones. Although the latter finding may seem counterintuitive, it could be explained by increasing academic commitments among older adolescents, which may limit their available time for social activities.

Lastly, Table 4 presents the decomposition of the association between parental and adolescent loneliness through two potential mediators: adolescents' online and offline social habits (i.e., the frequency of meeting friends in each modality on a weekly basis). The results confirm that no meaningful mediation occurs for online sociality. The indirect effect—representing the portion of the association between parental and adolescent loneliness explained by the mediator—is not statistically significant ($p = 0.591$). We also replicated the analysis using hourly social media use as an alternative mediator (results not shown), as this variable provides a more nuanced measure of online engagement; this effect was, likewise, non-significant. By contrast, the indirect effect for offline social habits is statistically significant ($p = 0.035$). However, this pathway explains only a small share of the total effect of parental loneliness on adolescent loneliness (5.52%), although the result remains robust across multiple model specifications. These findings suggest a limited but reliable mediating role of adolescents' offline social interactions, warranting further investigation in future research.

Table 2: Logistic regression results for associations between adolescents' reported loneliness and online/offline social behaviors, with control variables (odds ratios, standard errors in parentheses; N = 2464)

	(1)	(2)
Weekly frequency of meeting friends in person (baseline: "never")		
Less often	0.754	
	(0.124)	
About once a week	0.540***	
	(0.0936)	
Several times a week	0.622**	
	(0.114)	
Every day or almost every day	0.377***	
	(0.0753)	
Weekly frequency of meeting friends online (baseline: "never")		
Less often	0.884	
	(0.163)	
About once a week	1.169	
	(0.209)	
Several times a week	0.966	
	(0.158)	
Every day or almost every day	0.889	
	(0.142)	
Typologies of weekly meetings with friends (baseline: "low online, low in-person")		
High online, low in-person		0.978
		(0.138)
Low online, high in-person		0.728*
		(0.107)
High online, high in-person		0.608***
		(0.0812)
Hours spent with friends on social media (baseline: "never – has no social media")		
None – has social media	1.994**	1.968**
	(0.483)	(0.472)
Less than an hour	1.380*	1.373*
	(0.200)	(0.194)
1 – 3 hours	1.896***	1.847***
	(0.276)	(0.262)
4 – 6 hours	2.415***	2.378***
	(0.465)	(0.448)
5 – 7 or more hours	2.345*	2.171*
	(0.813)	(0.744)
Owns a smartphone	0.871	0.862
	(0.116)	(0.113)
Number of close friends	0.901***	0.897***
	(0.0139)	(0.0137)
Weekly frequency of sharing a meal with family (baseline: "never")		
1 – 2 times	1.069	1.106

	(0.215)	(0.221)
3 - 5 times	0.764	0.780
	(0.145)	(0.147)
6 - 7 times	0.636*	0.658*
	(0.113)	(0.116)
Age (baseline: 10)		
11	0.970	0.978
	(0.160)	(0.160)
12	0.899	0.923
	(0.146)	(0.150)
13	0.790	0.807
	(0.131)	(0.134)
14	1.042	1.083
	(0.170)	(0.176)
15	1.084	1.122
	(0.168)	(0.172)
Sex (female)	2.157***	2.128***
	(0.191)	(0.187)
Highest level of parental education (baseline: "lower secondary")		
Upper secondary	1.179	1.171
	(0.179)	(0.177)
Higher	1.336*	1.342*
	(0.163)	(0.163)
Ethnic minority status	0.763**	0.778**
	(0.0718)	(0.0723)
Urban residence	0.856	0.854
	(0.0888)	(0.0882)
Household income (log)	1.131	1.128
	(0.0890)	(0.0878)
Parents are divorced	1.089	1.086
	(0.166)	(0.164)
Has siblings	0.748**	0.760**
	(0.0716)	(0.0724)
Year of interview (baseline: 2020)		
2021	2.397	2.480
	(1.330)	(1.375)
2022	2.256	2.315
	(1.246)	(1.278)
2023	2.234	2.295
	(1.241)	(1.274)
Constant	0.367	0.280

	(0.310)	(0.235)

*** p<0.001, ** p<0.01, * p<0.05

Table 3: Results of logistic and ordinal logistic regressions examining associations between parental loneliness and adolescents' outcomes (loneliness, online and offline social behaviors), with control variables (odds ratios and standard errors in parentheses; N = 2464)

	Loneliness (3)	Frequency of in-person meetings (4)	Frequency of online meetings (5)
Parental loneliness	1.422***	0.822**	0.881
	(0.125)	(0.0609)	(0.0666)
Has a social media account	1.565***	1.889***	3.212***
	(0.195)	(0.203)	(0.343)
Owns a smartphone	0.819	1.402**	1.756***
	(0.106)	(0.161)	(0.197)
Number of close friends	0.892***	1.150***	1.059***
	(0.0133)	(0.0150)	(0.0137)
Weekly frequency of sharing a meal with family (baseline: "never")			
1 - 2 times	1.120	0.960	0.936
	(0.222)	(0.169)	(0.163)
3 - 5 times	0.752	1.258	1.128
	(0.140)	(0.210)	(0.187)
6 - 7 times	0.644*	0.944	1.088
	(0.112)	(0.148)	(0.169)
Age (baseline: 10)			
11	0.966	0.889	1.282
	(0.157)	(0.126)	(0.180)
12	0.964	0.607***	1.064
	(0.155)	(0.0842)	(0.145)
13	0.847	0.606***	0.944
	(0.139)	(0.0861)	(0.132)
14	1.121	0.680**	1.084
	(0.181)	(0.0943)	(0.151)
15	1.173	0.671**	1.207
	(0.178)	(0.0879)	(0.158)
Sex (female)	2.195***	0.798**	0.635***
	(0.190)	(0.0590)	(0.0479)
Highest level of parental education (baseline: "lower secondary")			
Upper secondary	1.135	1.178	1.036
	(0.170)	(0.153)	(0.135)

Higher	1.283*	1.002	0.941
	(0.154)	(0.105)	(0.0977)
Ethnic minority status	0.841	0.542***	0.669***
	(0.0771)	(0.0428)	(0.0527)
Urban residence	0.847	0.919	0.936
	(0.0871)	(0.0793)	(0.0836)
Household income (log)	1.128	1.161*	1.150*
	(0.0869)	(0.0775)	(0.0767)
Parents are divorced	1.082	1.047	1.233
	(0.163)	(0.135)	(0.166)
Has siblings	0.758**	0.912	0.844*
	(0.0718)	(0.0736)	(0.0701)
Year of interview (baseline: 2020)			
2021	2.533	1.520	0.587
	(1.412)	(0.700)	(0.268)
2022	2.314	1.859	0.471
	(1.284)	(0.851)	(0.214)
2023	2.283	1.959	0.495
	(1.274)	(0.902)	(0.226)
Constant	0.207		
	(0.174)		
Cut 1		1.091	0.593
		(0.780)	(0.425)
Cut 2		8.304**	1.444
		(5.960)	(1.035)
Cut 3		28.15***	2.993
		(20.25)	(2.145)
Cut 4		97.01***	9.282**
		(69.90)	(6.660)

*** p<0.001, ** p<0.01, * p<0.05

Table 4: Decomposition of the association between parental loneliness and adolescent loneliness via two mediators: adolescents' online and offline social habits (*khb* method; N = 2464)

	Odds ratios	Standard errors	95% confidence interval
Frequency of in-person meetings			
Total effect	1.4242***	.1252	1.1987-1.6922
Direct effect	1.3966***	.1229	1.1753-1.6596
Indirect effect	1.0197*	.0094	1.0013-1.0384
Frequency of online meetings			

Total effect	1.4225***	.1245	1.1981-1.6888
Direct effect	1.4200***	.1244	1.1960-1.6861
Indirect effect	1.0017	.0031	.9954-1.0080

*** p<0.001, ** p<0.01, * p<0.05

Discussion and conclusions

This study offers three primary contributions to the literature on adolescent loneliness. First, our analysis shows that, among UK adolescents, in-person interactions with friends are far more effective in protecting against loneliness than online interactions. The relative benefits of offline versus online social contact for fostering connectedness have been widely debated, with mixed and often conflicting evidence. Our findings provide strong support for the superiority of face-to-face meetings in safeguarding adolescents from loneliness. We also found significant risks linked to social media use, in line with previous research (Orben et al., 2022). However, while simply owning a social media account was consistently linked to greater loneliness, our results indicate that moderate use of social media and other online tools to connect with friends can be relatively beneficial. Specifically, adolescents who interact with friends both online and offline on a regular (weekly) basis, but for limited (hourly) durations, tend to report the highest levels of connectedness. These findings hence align with previous studies suggesting a curvilinear relationship between time spent online and social wellbeing (Wang et al., 2018). Limited and balanced online engagement—complementing rather than replacing offline interaction—thus appears to be the most advantageous pattern for adolescent connectedness.

Secondly, our study confirmed the existence of a pattern of intergenerational transmission of loneliness, as previously suggested by a growing, though still underdeveloped, body of research (Augustijn, 2021; Curran, 2019). The effect of parental loneliness on adolescents' loneliness was sizeable and robust across multiple specifications. We further examined whether this transmission could plausibly be mediated by adolescents' online or offline social behaviors, or both. Several potential mechanisms could explain such mediation, particularly that lonely parents may pass on poor social skills, low confidence, and a tendency toward social withdrawal, thereby contributing to their offspring experiencing a poor sense of connectedness too. Prior research has also linked parental loneliness to increases in risky behaviors, such as gaming addiction, as a consequence of parental disengagement (Mun & Lee, 2022). However, in our analyses, the association between parental and adolescent loneliness was not mediated by changes in online use. Nor did we find evidence that parental loneliness was associated with greater use of social media or online interactions with friends, to begin with. Unlike studies focusing on gaming addiction, our analysis specifically examined social uses of online tools. It is possible that two opposing mechanisms offset one another: on the one hand, inherited social withdrawal could reduce social interactions, including in online contexts; on the other hand, the need to self-soothe in response to parental disengagement might increase online and social media activity, as suggested by prior research on gaming addiction.

It is noteworthy, however, that this potential conflict was not observed when we examined adolescents' offline social habits as a possible mediator in the intergenerational transmission of loneliness. In this case, parental loneliness was more clearly associated with a reduction in adolescents' frequency of in-person interactions with friends. The potential self-soothing response—spending more time with friends to compensate for parental disengagement—thus either did not occur or was less influential than the social withdrawal mechanism. Adolescents' diminished social activity offline accounted for a small yet statistically significant indirect effect explaining the parent–child association in loneliness. However, this effect was likely too modest to confidently conclude that adolescents' offline social

behavior represents a substantive mediating pathway in the transmission of loneliness. Nonetheless, as several authors have observed, small mediation effects are common and should not be dismissed, particularly in studies addressing complex psychological and social processes (Walters, 2019). It is also plausible that a more nuanced and fine-grained measure of offline social habits—beyond what was available in our dataset—might have revealed a stronger mediating effect.

On the other hand, it is also possible that the indirect effect we identified captures other underlying dynamics that our model was unable to account for. One such factor could be the presence of localized patterns of loneliness (e.g., at the neighborhood or regional level). For instance, communities characterized by limited social infrastructure—such as few community organizations, entertainment venues, or, more broadly, low levels of social capital (Putnam, 2000)—may foster environments in which both parents and children experience loneliness, while adolescents also have fewer opportunities for in-person interactions with friends. On the other hand, this mechanism would less plausibly influence adolescents' online sociality as well. Given that our analyses rely on national-level data, such geographical variations may have influenced our results but could not be directly controlled for. Although some of our socio-economic variables (e.g., urban versus rural residence) may partially capture these differences, more specific geographical controls would have provided a clearer understanding of these contextual effects.

In all respects, we do not claim causality for any of our findings. A major limitation of our study is the lack of longitudinal data, which would have allowed for more robust causal inference. The data source we utilized is promising, however, and if Understanding Society continues to include questions on loneliness and social habits in its adolescent questionnaire in future waves, sufficient repeated observations may become available to enable panel regression analyses. It is also important to note that a portion of our data was collected during the COVID-19 pandemic, a period marked by exceptional circumstances that likely influenced reports of loneliness and social habits—particularly offline interactions. Although we controlled for the year of the interview in our regressions, this may not fully account for the complex and lasting effects of lockdown measures. Further research is certainly needed.

Bibliography

Ainsworth, M. S., & Bowlby, J. (1991). An ethological approach to personality development. *American Psychologist*, *46*(4), 333.

Anderson, M., Faverio, M., & Gottfried, J. (2023). Teens, social media and technology 2023. *Pew Research Center*, *11*. https://abfe.issuelab.org/resources/43096/43096.pdf

Arbona, C., & Power, T. G. (2003). Parental attachment, self-esteem, and antisocial behaviors among African American, European American, and Mexican American adolescents. *Journal of Counseling Psychology*, *50*(1), 40.

Augustijn, L. (2021). The intergenerational transmission of loneliness between parents and their adult children. *Journal of Family Research*, *33*(1), 1–21.

Ayhan, A. B., & Beyazit, U. (2021). The Associations between Loneliness and Self-Esteem in Children and Neglectful Behaviors of their Parents. *Child Indicators Research*, *14*(5), 1863–1879. https://doi.org/10.1007/s12187-021-09818-z

Bandura, A., & Walters, R. H. (1977). *Social learning theory* (Vol. 1). Prentice hall Englewood Cliffs, NJ. http://www.asecib.ase.ro/mps/Bandura_SocialLearningTheory.pdf

Beller, J., & Wagner, A. (2018). Loneliness, social isolation, their synergistic interaction, and mortality. *Health Psychology*, *37*(9), 808.

Biolcati, R., & Cani, D. (2015). Feeling alone among friends: Adolescence, social networks and loneliness. *Webology*, *12*(2), 1–9.

Bowden-Green, T., Hinds, J., & Joinson, A. (2020). How is extraversion related to social media use? A literature review. *Personality and Individual Differences*, *164*, 110040.

Bowlby, J. (2008). *A secure base: Parent-child attachment and healthy human development*. Basic books.

Branje, S., Geeraerts, S., de Zeeuw, E. L., Oerlemans, A. M., Koopman-Verhoeff, M. E., Schulz, S., Nelemans, S., Meeus, W., Hartman, C. A., & Hillegers, M. H. (2020). Intergenerational transmission: Theoretical and methodological issues and an introduction to four Dutch cohorts. *Developmental Cognitive Neuroscience*, *45*, 100835.

Burke, T. J., Woszidlo, A., & Segrin, C. (2012). Social Skills, Family Conflict, and Loneliness in Families. *Communication Reports*, *25*(2), 75–87. https://doi.org/10.1080/08934215.2012.719461

Burke, T. J., Woszidlo, A., & Segrin, C. (2013). The Intergenerational Transmission of Social Skills and Psychosocial Problems among Parents and their Young Adult Children. *Journal of Family Communication*, *13*(2), 77–91. https://doi.org/10.1080/15267431.2013.768247

Cacioppo, J. T., & Cacioppo, S. (2018). The growing problem of loneliness. *The Lancet*, *391*(10119), 426.

Chang, F.-C., Chiu, C.-H., Miao, N.-F., Chen, P.-H., Lee, C.-M., Chiang, J.-T., & Pan, Y.-C. (2015). The relationship between parental mediation and Internet addiction among adolescents, and the association with cyberbullying and depression. *Comprehensive Psychiatry*, *57*, 21–28.

Chen, W., Li, X., Huebner, E. S., & Tian, L. (2022). Parent–child cohesion, loneliness, and prosocial behavior: Longitudinal relations in children. *Journal of Social and Personal Relationships*, *39*(9), 2939–2963. https://doi.org/10.1177/02654075221091178

Cheng, C., Wang, H., Sigerson, L., & Chau, C. (2019). Do the socially rich get richer? A nuanced perspective on social network site use and online social capital accrual. *Psychological Bulletin*, *145*(7), 734.

Cheng, T. L., Johnson, S. B., & Goodman, E. (2016). Breaking the intergenerational cycle of disadvantage: The three generation approach. *Pediatrics*, *137*(6). https://publications.aap.org/pediatrics/article/52423/Breaking-the-Intergenerational-Cycle-of

Cooper, K., Hards, E., Moltrecht, B., Reynolds, S., Shum, A., McElroy, E., & Loades, M. (2021). Loneliness, social relationships, and mental health in adolescents during the COVID-19 pandemic. *Journal of Affective Disorders*, *289*, 98–104.

Curran, T. (2019). Intergenerational Transmissions of Mother-Child Loneliness: A Moderated Mediation Model of Familial Social Support and Conflict Avoidance. *Health Communication*, *34*(10), 1166–1172. https://doi.org/10.1080/10410236.2018.1466229

Di Blasio, P., Camisasca, E., Miragoli, S., Ionio, C., & Milani, L. (2017). Does Maternal Parenting Stress Mediate the Association Between Postpartum PTS Symptoms and Children's Internalizing and Externalizing Problems? A Longitudinal Perspective. *Child & Youth Care Forum*, *46*(5), 685–701. https://doi.org/10.1007/s10566-017-9400-7

DiClemente, R. J., Wingood, G. M., Crosby, R., Sionean, C., Cobb, B. K., Harrington, K., Davies, S., Hook III, E. W., & Oh, M. K. (2001). Parental monitoring: Association with adolescents' risk behaviors. *Pediatrics*, *107*(6), 1363–1368.

Elovainio, M., Komulainen, K., Hakulinen, C., Pahkala, K., Rovio, S., Hutri, N., Raitakari, O. T., & Pulkki-Råback, L. (2024). Intergenerational continuity of loneliness and potential mechanisms: Young Finns Multigenerational Study. *Scientific Reports*, *14*(1), 5465.

Ernst, M., Niederer, D., Werner, A. M., Czaja, S. J., Mikton, C., Ong, A. D., Rosen, T., Brähler, E., & Beutel, M. E. (2022). Loneliness before and during the COVID-19 pandemic: A systematic review with meta-analysis. *American Psychologist*, *77*(5), 660.

Favotto, L., Michaelson, V., Pickett, W., & Davison, C. (2019). The role of family and computer-mediated communication in adolescent loneliness. *PloS One*, *14*(6), e0214617.

Gámez-Guadix, M., Mateos, E., Wachs, S., & Blanco, M. (2022). Self-harm on the internet among adolescents: Prevalence and association with depression, anxiety, family cohesion, and social resources. *Psicothema*, *34*(2), 233–239.

Garber, J., & Cole, D. A. (2010). Intergenerational transmission of depression: A launch and grow model of change across adolescence. *Development and Psychopathology*, *22*(4), 819–830.

Goodman, S. H. (2020). Intergenerational Transmission of Depression. *Annual Review of Clinical Psychology*, *16*(1), 213–238. https://doi.org/10.1146/annurev-clinpsy-071519-113915

Grusec, J. E. (1994). *Social learning theory and developmental psychology: The legacies of Robert R. Sears and Albert Bandura.* https://psycnet.apa.org/record/1994-98230-016

Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, *40*(2), 218–227.

Henwood, P. G., & Solano, C. H. (1994). Loneliness in Young Children and Their Parents. *The Journal of Genetic Psychology*, *155*(1), 35–45. https://doi.org/10.1080/00221325.1994.9914756

Hjalmarsson, S., & Mood, C. (2015). Do poorer youth have fewer friends? The role of household and child economic resources in adolescent school-class friendships. *Children and Youth Services Review*, *57*, 201–211.

Johnston, D. W., Schurer, S., & Shields, M. A. (2013). Exploring the intergenerational persistence of mental health: Evidence from three generations. *Journal of Health Economics*, *32*(6), 1077–1089.

Junttila, N., & Vauras, M. (2009). Loneliness among school-aged children and their parents. *Scandinavian Journal of Psychology*, *50*(3), 211–219. https://doi.org/10.1111/j.1467-9450.2009.00715.x

Kamiya, Y., Doyle, M., Henretta, J. C., & Timonen, V. (2014). Early-life circumstances and later-life loneliness in Ireland. *The Gerontologist*, *54*(5), 773–783.

Karim, F., Oyewande, A. A., Abdalla, L. F., Ehsanullah, R. C., & Khan, S. (2020). Social media use and its connection to mental health: A systematic review. *Cureus*, *12*(6). https://www.cureus.com/articles/31508-social-media-use-and-its-connection-to-mental-health-a-systematic-review.pdf

Korkiamäki, R. (2014). Rethinking loneliness—A qualitative study about adolescents' experiences of being an outsider in peer group. *Open Journal of Depression*, *3*(4), 125–135.

Koutamanis, M., Vossen, H. G., Peter, J., & Valkenburg, P. M. (2013). Practice makes perfect: The longitudinal effect of adolescents' instant messaging on their ability to initiate offline friendships. *Computers in Human Behavior*, *29*(6), 2265–2272.

Lee, P. S. N., Leung, L., Lo, V., Xiong, C., & Wu, T. (2011). Internet Communication Versus Face-to-face Interaction in Quality of Life. *Social Indicators Research*, *100*(3), 375–389. https://doi.org/10.1007/s11205-010-9618-3

Lehdonvirta, V., & Räsänen, P. (2011). How do young people identify with online and offline peer groups? A comparison between UK, Spain and Japan. *Journal of Youth Studies*, *14*(1), 91–108. https://doi.org/10.1080/13676261.2010.506530

Lima, M. L., Marques, S., Muiños, G., & Camilo, C. (2017). All you need is Facebook friends? Associations between online and face-to-face friendships and health. *Frontiers in Psychology*, *8*, 68.

Lobdell, J., & Perlman, D. (1986). The intergenerational transmission of loneliness: A study of college females and their parents. *Journal of Marriage and the Family*, 589–595.

Luoma, I., Korhonen, M., Puura, K., & Salmelin, R. K. (2019). Maternal loneliness: Concurrent and longitudinal associations with depressive symptoms and child adjustment. *Psychology, Health & Medicine*, *24*(6), 667–679. https://doi.org/10.1080/13548506.2018.1554251

Macdonald, S. J., Nixon, J., & Deacon, L. (2018). 'Loneliness in the city': Examining socio-economics, loneliness and poor health in the North East of England. *Public Health*, *165*, 88–94.

Mao, J., Fu, G., & Huang, J. (2023). The double-edged sword effects of active social media use on loneliness: The roles of interpersonal satisfaction and fear of missing out. *Frontiers in Psychology*, *14*, 1108467.

Marinucci, M., Pancani, L., Aureli, N., & Riva, P. (2022). Online social connections as surrogates of face-to-face interactions: A longitudinal study under Covid-19 isolation. *Computers in Human Behavior*, *128*, 107102.

Morahan-Martin, J., & Schumacher, P. (2003). Loneliness and social uses of the Internet. *Computers in Human Behavior*, *19*(6), 659–671.

Mun, I. B., & Lee, S. (2022). A longitudinal study of the impact of parental loneliness on adolescents' online game addiction: The mediating roles of adolescents' social skill deficits and loneliness. *Computers in Human Behavior*, *136*, 107375.

Newman, B. M., Lohman, B. J., & Newman, P. R. (2007). Peer group membership and a sense of belonging: Their relationship to adolescent behavior problems. *Adolescence*, *42*(166). https://www.researchgate.net/profile/Philip-Newman/publication/5990459_Peer_group_membership_and_sense_of_belonging_Their_relationship_to_adolescent_behavior_problems/links/55479c010cf2b0cf7acdcf21/Peer-group-membership-and-sense-of-belonging-Their-relationship-to-adolescent-behavior-problems.pdf?origin=journalDetail&_tp=eyJwYWdlIjoiam91cm5hbERldGFpbCJ9

Newmyer, L., Verdery, A. M., Wang, H., & Margolis, R. (2022). Population Aging, Demographic Metabolism, and the Rising Tide of Late Middle Age to Older Adult Loneliness Around the World. *Population and Development Review*, *48*(3), 829–862. https://doi.org/10.1111/padr.12506

Nowland, R., Necka, E. A., & Cacioppo, J. T. (2018). Loneliness and Social Internet Use: Pathways to Reconnection in a Digital World? *Perspectives on Psychological Science*, *13*(1), 70–87. https://doi.org/10.1177/1745691617713052

Orben, A., Przybylski, A. K., Blakemore, S.-J., & Kievit, R. A. (2022). Windows of developmental sensitivity to social media. *Nature Communications*, *13*(1), 1649.

Popat, A., & Tarrant, C. (2023). Exploring adolescents' perspectives on social media and mental health and well-being – A qualitative literature review. *Clinical Child Psychology and Psychiatry*, *28*(1), 323–337. https://doi.org/10.1177/13591045221092884

Pouwels, J. L., Keijsers, L., & Odgers, C. (2022). Who benefits most from using social media, the socially rich or the socially poor? *Current Opinion in Psychology*, *47*, 101351.

Qualter, P., Hennessey, A., Yang, K., Chester, K. L., Klemera, E., & Brooks, F. (2021). Prevalence and social inequality in youth loneliness in the UK. *International Journal of Environmental Research and Public Health*, *18*(19), 10420.

Rains, S. A., Brunner, S. R., Akers, C., Pavlich, C. A., & Goktas, S. (2017). Computer-mediated communication (CMC) and social support: Testing the effects of using CMC on support outcomes. *Journal of Social and Personal Relationships*, *34*(8), 1186–1205. https://doi.org/10.1177/0265407516670533

Russell, D. W., Cutrona, C. E., McRae, C., & Gomez, M. (2012). Is Loneliness the Same as Being Alone? *The Journal of Psychology*, *146*(1–2), 7–22. https://doi.org/10.1080/00223980.2011.589414

Saadati, H. M., Mirzaei, H., Okhovat, B., & Khodamoradi, F. (2021). Association between internet addiction and loneliness across the world: A meta-analysis and systematic review. *SSM-Population Health*, *16*, 100948.

Sanders, C. E., Field, T. M., Miguel, D., & Kaplan, M. (2000). The relationship of Internet use to depression and social isolation among adolescents. *Adolescence*, *35*(138), 237.

Segrin, C., Nevarez, N., Arroyo, A., & Harwood, J. (2013). Family of origin environment and adolescent bullying predict young adult loneliness. In *Loneliness Updated* (pp. 122–137). Routledge. https://www.taylorfrancis.com/chapters/edit/10.4324/9781315873367-11/family-origin-environment-adolescent-bullying-predict-young-adult-loneliness-chris-segrin-natalie-nevarez-analisa-arroyo-jake-harwood

Smith, D., Leonis, T., & Anandavalli, S. (2021). Belonging and loneliness in cyberspace: Impacts of social media on adolescents' well-being. *Australian Journal of Psychology*, *73*(1), 12–23. https://doi.org/10.1080/00049530.2021.1898914

Stanton-Salazar, R. D., & Spina, S. U. (2005). Adolescent Peer Networks as a Context for Social and Emotional Support. *Youth & Society*, *36*(4), 379–417. https://doi.org/10.1177/0044118X04267814

Steptoe, A., Shankar, A., Demakakos, P., & Wardle, J. (2013). Social isolation, loneliness, and all-cause mortality in older men and women. *Proceedings of the National Academy of Sciences*, *110*(15), 5797–5801. https://doi.org/10.1073/pnas.1219686110

Su, S., Lin, X., & McElwain, A. (2023). Parenting, loneliness, and stress in Chinese international students: Do parents still matter from thousands of miles away? *Journal of Family Studies*, *29*(1), 255–268. https://doi.org/10.1080/13229400.2021.1910540

Towner, E., Grint, J., Levy, T., Blakemore, S.-J., & Tomova, L. (2022). Revealing the self in a digital world: A systematic review of adolescent online and offline self-disclosure. *Current Opinion in Psychology*, *45*, 101309.

Twenge, J. M., Haidt, J., Blake, A. B., McAllister, C., Lemon, H., & Le Roy, A. (2021). Worldwide increases in adolescent loneliness. *Journal of Adolescence*, *93*, 257–269.

Twenge, J. M., Spitzberg, B. H., & Campbell, W. K. (2019). Less in-person social interaction with peers among U.S. adolescents in the 21st century and links to loneliness. *Journal of Social and Personal Relationships*, *36*(6), 1892–1913. https://doi.org/10.1177/0265407519836170

Valkenburg, P. M., & Peter, J. (2011). Online communication among adolescents: An integrated model of its attraction, opportunities, and risks. *Journal of Adolescent Health*, *48*(2), 121–127.

Valkenburg, P. M., Sumter, S. R., & Peter, J. (2011). Gender differences in online and offline self-disclosure in pre-adolescence and adolescence. *British Journal of Developmental Psychology*, *29*(2), 253–269. https://doi.org/10.1348/2044-835X.002001

Van Zalk, M. H. W., Van Zalk, N., Kerr, M., & Stattin, H. (2014). Influences between Online–Exclusive, Conjoint and Offline–Exclusive Friendship Networks: The Moderating Role of Shyness. *European Journal of Personality*, *28*(2), 134–146. https://doi.org/10.1002/per.1895

Vanhalst, J., Goossens, L., Luyckx, K., Scholte, R. H., & Engels, R. C. (2013). The development of loneliness from mid-to late adolescence: Trajectory classes, personality traits, and psychosocial functioning. *Journal of Adolescence*, *36*(6), 1305–1312.

Verity, L., Schellekens, T., Adam, T., Sillis, F., Majorano, M., Wigelsworth, M., Qualter, P., Peters, B., Stajniak, S., & Maes, M. (2021). Tell me about loneliness: Interviews with young people about what loneliness is and how to cope with it. *International Journal of Environmental Research and Public Health*, *18*(22), 11904.

Wang, K., Frison, E., Eggermont, S., & Vandenbosch, L. (2018). Active public Facebook use and adolescents' feelings of loneliness: Evidence for a curvilinear relationship. *Journal of Adolescence*, *67*, 35–44.

Webster, D., Dunne, L., & Hunter, R. (2021). Association Between Social Networks and Subjective Well-Being in Adolescents: A Systematic Review. *Youth & Society*, *53*(2), 175–210. https://doi.org/10.1177/0044118X20919589

Wesselmann, E. D., & Williams, K. D. (2017). Social life and social death: Inclusion, ostracism, and rejection in groups. *Group Processes & Intergroup Relations*, *20*(5), 693–706. https://doi.org/10.1177/1368430217708861

Yao, M. Z., & Zhong, Z. (2014). Loneliness, social contacts and Internet addiction: A cross-lagged panel study. *Computers in Human Behavior*, *30*, 164–170.