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Rapid Systematic Review: The Impact of Social Isolation and Loneliness on the Mental Health of Children and Adolescents in the Context of COVID-19

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Objective: Disease containment of COVID-19 has necessitated widespread social isolation. We aimed to establish what is known about how loneliness and disease containment measures impact on the mental health in children and adolescents.

Method: For this rapid review, we searched MEDLINE, PsycInfo, and Web of Science for articles published between January 1, 1946, and March 29, 2020. Of the articles, 20% were double screened using predefined criteria, and 20% of data was double extracted for quality assurance.

Results: A total of 83 articles (80 studies) met inclusion criteria. Of these, 63 studies reported on the impact of social isolation and loneliness on the mental health of previously healthy children and adolescents (n = 51,576; mean age 15.3 years). In all, 61 studies were observational, 18 were longitudinal, and 43 were cross-sectional studies assessing self-reported loneliness in healthy children and adolescents. One of these studies was a retrospective investigation after a pandemic. Two studies evaluated interventions. Studies had a high risk of bias, although longitudinal studies were of better methodological quality. Social isolation and loneliness increased the risk of depression, and possibly anxiety at the time at which loneliness was measured and between 0.25 and 9 years later. Duration of loneliness was more strongly correlated with mental health symptoms than intensity of loneliness.

Conclusion: Children and adolescents are probably more likely to experience high rates of depression and most likely anxiety during and after enforced isolation ends. This may increase as enforced isolation continues. Clinical services should offer preventive support and early intervention where possible and be prepared for an increase in mental health problems.

Key words: loneliness, pandemic, COVID-19, disease containment, mental health

The COVID-19 pandemic has resulted in governments implementing disease containment measures such as school closures, social distancing, and home quarantine. Children and adolescents are experiencing a prolonged state of physical isolation from their peers, teachers, extended families, and community networks. Quarantine in adults generally has negative psychological effects including confusion, anger, and post-traumatic distress. Duration of quarantine, fear of infection, boredom, frustration, lack of necessary supplies, lack of information, financial loss, and stigma appear to increase the risk of negative psychological outcomes. Social distancing and school closures may therefore increase mental health problems in children and adolescents, already at higher risk of developing mental health problems compared to adults at a time when they are also experiencing anxiety over a health threat and threats to family employment/income.

Social distancing and school closures are likely to result in increased loneliness in children and adolescents whose usual social contacts are curtailed by the disease containment measures. Loneliness is the painful emotional experience of a discrepancy between actual and desired social contact. Although social isolation is not necessarily synonymous with loneliness, early indications in the COVID-19 context indicate that more than one-third of adolescents report high levels of loneliness and almost half of 18- to 24-year olds are lonely during lockdown. There are well established links between loneliness and mental health. The purpose of this review was to establish what is known about the relationship between loneliness and mental health problems in healthy children and adolescents,
and to determine whether disease containment measures including quarantine and social isolation are predictive of future mental health problems. We included cross-sectional, observational, retrospective, and case control studies if studies included mainly children and adolescents who had experienced loneliness or had used validated measures of social isolation and mental health problems. To capture the possible effects of social isolation and the expected mediator (ie, loneliness) on mental health problems, we included search terms to capture these two areas.

METHOD

We conducted a rapid review to provide a timely evidence synthesis to inform urgent healthcare policy decision making.9 A rapid review adheres to the essential principles of systematic reviews, including scientific rigor, transparency, and reproducibility. 9,10 It uses “abbreviated” systematic review methodology, including limiting search criteria, faster data extraction, and using narrative synthesis methods.11,12

Search Strategy and Selection Criteria

Table S1, Table S2, and Table S3, available online, provide the full search strategy. Briefly, we searched MEDLINE, PsycInfo, Web of Science, and the Cochrane Library. Our search terms were informed by recent rapid reviews in the COVID-19 context1 and included definitions of loneliness and social isolation to capture the impact of social distancing and school closures. Terms captured “children” or “adolescents” AND “quarantine” or “social isolation” or “loneliness” AND mental health related terms with a focus on the most common mental health problems in this age group, namely, depression and anxiety.

Peer-reviewed studies were selected according to the following inclusion criteria: published between 1946 and March 29, 2020; reported primary research; included predominantly children/adolescents (mean age <21 years)13; published in English (Web of Science only); participants had experienced either social isolation or loneliness; and valid assessment of depression, anxiety, trauma, obsessive-compulsive disorder (OCD), mental health, or mental well-being.

Study Selection and Data Collection

We checked 20% of all study eligibility results (both included and excluded) to ensure adherence to the eligibility criteria. Data were extracted into a purpose-designed database. A random 20% of the data was double-entered to ensure accuracy.

A truncated quality assessment was conducted by one author (SR) using criteria adapted from the National Institutes of Health (NIH)14 (Table 1).

Data Synthesis

We conducted a narrative synthesis within the following categories: (1) the impact of loneliness on mental health in healthy populations (further divided into cross-sectional and longitudinal evidence); (2) pandemic-specific findings; and (3) intervention studies.

RESULTS

We located 4,531 articles (Figure 1), of which 83 articles (80 studies) met the inclusion criteria. Of these, 18 articles (17 studies) reported on the impact of loneliness in individuals with a variety of health conditions, including mental health problems (12 studies), physical health problems (one study) and neurodevelopmental conditions (4 studies). The remaining 65 articles reported on 63 studies that examined the impact of loneliness or disease containment measures on healthy children and adolescents. For the purposes of this rapid review, we will focus our analyses on these 63 studies.

Figure 1 provides a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram showing search results.15

The 63 studies were mainly from the United States, China, Europe, and Australia. Included studies were also conducted in India, Malaysia, Korea, Thailand, Israel, Iran, and Russia. A total of 61 studies were observational, and 2 studies reported on interventions. Of the 61 observational studies, 43 studies were cross-sectional only, 6 were longitudinal only, and 12 reported both cross-sectional and longitudinal findings. One study was a retrospective study after a pandemic. In cross-sectional studies, likely confounders (eg, adversity, socioeconomic status [SES]) were rarely controlled for, meaning that the association between loneliness and mental health outcomes in these studies is very likely to be inflated.16 Four longitudinal studies used multi-informant approaches, including self-report and parent and/or teacher report to assess mental health outcomes. Importantly, they typically assessed and controlled for confounds and could assess the most plausible direction of causality between loneliness/social isolation and mental health.

Impact of Loneliness on Mental Health

Table 217-60 and Table 361-79 describe the 60 studies that examined the impact of loneliness on mental health. A total of 53 studies stated that they measured the impact of
loneliness on mental health. Seven studies stated that they measured the impact of social isolation on mental health, but the social isolation measures used were either subscales or questions from loneliness scales, or strongly overlapped with the construct of loneliness. Therefore, we have considered them together with studies that measured loneliness. Participants were mainly school or university students or taking part in longitudinal cohort studies.

A total of 45 studies examined the cross-sectional relationship between depressive symptoms and loneliness and/or social isolation. The majority were conducted in adolescent (N = 23) and young adult (N = 16) samples, although 6 studies included children under the age of 10 years. Most reported moderate to large correlations (0.12 ≤ r ≤ 0.81), and most included a measure of depressive symptoms. Two studies reported odds ratios, with those who were lonely 5.8 to 40 times more likely to score above clinical cut-offs for depression. The associations were stronger in older participants and in female participants. However, the strength and direction of the associations did not differ by age of the sample. Fewer studies (N = 23) examined symptoms of anxiety. Those that did found small to moderate associations between anxiety and loneliness/social isolation (0.18 ≤ r ≤ 0.54). The duration of loneliness was more strongly associated with anxiety than intensity of loneliness. Social anxiety was moderately to strongly associated with loneliness/social isolation (0.33 ≤ r ≤ 0.72) and there were moderate associations between generalized anxiety and loneliness/social isolation (r = 0.37, 0.40). One study found a small association between panic and loneliness (r = 0.13). In the single study that reported odds ratios, being lonely was associated with increased odds of being anxious by 1.63 to 5.49 times. Positive associations were also reported between social isolation/loneliness and suicidal ideation, self-harm, and eating disorder risk behavior. Negative associations were reported between social isolation/loneliness and well-being and mental health. Eighteen studies followed participants over time (Table 3). Several of these were
conducted in childhood (N = 6), or adolescence (N = 8), although three were in university students. Most (N = 12) had only one follow up time point, usually between 1 and 3 years.

In all, 12 of the 15 studies found that loneliness is associated with depression and explained a significant amount of the variance in severity of depression symptoms several months to several years later.61,62,64,65,67-72,74-77,79,80 Two studies found that loneliness in childhood at age 5 years was not associated with depression several years later,73,74 although other studies that assessed loneliness during childhood found evidence that it is associated with subsequent depression.61,64 One large study of adolescents (n = 3,088) found that loneliness was not associated with depression 1 year later.63 There were mixed findings in another large study of adolescents (n = 541), which found a significant association between loneliness and subsequent depression, although this did not hold in a cross-lagged model,69 suggesting a possible bidirectional relationship between the variables. A study of university students found evidence of a sex difference, with loneliness being associated with later depression in female participants but not in male participants.70 In a large longitudinal cohort of vulnerable young people, aged 11 to 17 years, after controlling for caregiver neglect and other relevant covariates, a substantial increase in self-reported peer isolation (1 SD) was associated with an increase in depression symptoms (0.49 SD).62 Duration of peer loneliness rather than intensity of peer loneliness was associated with depression 8 years later (ie, from age 5 to age 13 years); in contrast, family-related loneliness was not independently associated with subsequent depression.73 Three of the four studies that examined the longitudinal effect of loneliness on anxiety found that loneliness was
| Authors (Year), Country | Sample | Male (%), Young Adult (19 y) | Age Range at Baseline, Mean Age (SD) | Social Isolation/Loneliness Measure | Mental Health Measure | Associations Between Social Isolation/Loneliness and Mental Health [r (p)] |
|-------------------------|--------|-----------------------------|--------------------------------------|-----------------------------------|----------------------|----------------------------------------------------------------------|
| Alpaslan et al. (2016), Turkey | School students 487 (41.7) | Adolescent 14-18, 16.07 (1.05) | UCLA Loneliness Scale | Male participants: OR 1.21, Female participants: OR 1.05 |
| Arslan (2020), Turkey | School students 244 (47.5) | Adolescent 14-18, 16.27 (1.02) | 8-item UCLA Loneliness Scale | Loneliness problem: 0.41 (<0.001), Internalizing and Externalizing behavior: 0.22 (<0.01) |
| Baskin et al. (2010), USA | School students 294 (NS) | Adolescent NS, Estimated 13-14, 13.11 (0.469) | Children's Loneliness Scale (CLS) | BDI-Y R² = 0.28 (<0.001), Moderated by belongingness |
| Brage et al. (1993, 1995), USA | School students 156 (39.7) | Adolescent 11-18, 14 (1.56) | Loneliness Inventory Short Form | Loneliness: 0.646 (<0.001), Anxiety: 0.365 (<0.01) |
| Chang et al. (2017), USA | University students 228 (23.7) | Young adult 18-28, 19.69 (1.38) | Revised UCLA Loneliness scale | Lon - suicidal ideation: 0.52 (<0.001), Lon R² = 0.269 (0.013) |
| Doman and Le Roux (2012), South Africa | School students 275 (62.3) | Young adult 19-24, 20.92 (NS) | Revised UCLA Scale (CLS) | Loneliness: 0.517 (<0.01), Anxiety + depression: 0.51 (<0.05) |
| Erdur-Baker and Bugay (2011, 2011), Turkey | School students 144 (64) | Adolescent 11-16, 13.90 (1.5) | The Loneliness Rating Scale, Children's Manifest Anxiety Scale (RCMAS) | Frequency of Lon-Anx: 0.33 (<0.001), Intensity of Lon-Anx: 0.18 (<0.05) |
| Ginter et al. (1996), Israel | School students 144 (45.1) | Adolescent 11-16, 13.90 (1.5) | The Loneliness Rating Scale, Children's Manifest Anxiety Scale (RCMAS) | Loneliness: 0.646 (<0.001), Anxiety: 0.365 (<0.01) |

(continued)
| Authors (Year), Country            | Sample                          | Total N (% Male Participants) | Age Range at Baseline y, Mean Age (SD) | Social Isolation/Loneliness Measure | Mental Health Measure | Associations Between Social Isolation/Loneliness and Mental Health \[ r (p) \] Unless Otherwise Stated |
|-----------------------------------|---------------------------------|-------------------------------|----------------------------------------|-------------------------------------|-----------------------|-----------------------------------------------------------------|
| Heredia et al. (2017), USA        | School students                 | 394 (50.2)                    | Adolescent 12–15 13.52 (0.63)          | LSDQ                                | Well-being - World Health Organisation Well-being Index (WHO-5)  |
| Houghton et al. (2016), Australia | School students                 | 1143 (46.3)                   | Adolescent 10.1–16 13.20 (1.2)         | Perth Aloneness Scale (includes friendship-related loneliness subscale) | Warwick–Edinburgh Mental Well Being Scale (WEMWBS)             |
| Hudson et al. (2000), USA         | Adolescent mothers post-partum recruited from primary health care practices Female school students (and their mothers) | 21 (0)                        | Adolescent 16–19 18 (1.14)             | Revised UCLA Loneliness Scale | CES-D (child version)                                             |
| Hutcherson and Epkins (2009, USA) | Female school students          | 100 (0)                       | Child 9–12 10.52 (1.04)                | Loneliness Scale (LS)              | Social Anxiety Scale for Children-Revised (SASC-R), CDI Symptom Checklist-90 (SCL-90) |
| Jackson and Cochran (1991, USA)   | University students             | 293 (49.8)                    | Young adult 17–26 Median 19            | Revised UCLA Loneliness Scale       | 0.62 (< .001) Controlling for social Anx 0.36 (< .001)           |
| Johnson et al. (2001, USA)        | University students             | 124 (43.5)                    | Young adult 17–21 Male participants 19.41 (NS) Female participants 19.69 (NS) | UCLA Loneliness Scale (Revised) | Franke and Hymel Social Anxiety and Social Avoidance Scale BDI |
| Kim (2001, Korea)                 | University students             | 452 (44.7)                    | Young adult 18–25 20.9 (2.0)           | Revised UCLA Loneliness Scale       | Male participants: $\beta = 0.49$ (< .01), 24% shared variance |

(continued)
### Table 2 Continued

| Authors (Year), Country | Sample | Total N (% Male Participants) | Child (≤11 y)/ Adolescent (12–18 y)/ Young Adult (≥19 y) Age Range at Baseline y, Mean Age (SD) | Social Isolation/Loneliness Measure | Mental Health Measure | Associations Between Social Isolation/ Loneliness and Mental Health [r (p)] Unless Otherwise Stated |
|-------------------------|--------|------------------------------|---------------------------------------------------------------------------------|-----------------------------------|---------------------|------------------------------------------------------------------------------------------------|
| Koenig et al. (1994), USA | School students | 397 (38.3) | Adolescent 14–18 NS | Revised UCLA Loneliness Scale | BDI | Male participants: 0.55 (<.001) Female participants: 0.49 (<.001) 23% of the variance Peer-related Lon — Dep β = 0.26, r² = 0.076; family-related Lon — Dep β = 0.29, r² = 0.089 |
| Lasgaard, Goosens et al. (2011), Denmark | School students | 1009 (43) | Adolescent NS 17.11 (1.11) | SELSA—SF (3 subscales: social lon, family-related lon, romantic lon) | BAI-Y, BDI-Y, Social Interaction Anxiety Scale (SIAS), Suicide Ideation subscale from the Suicide Probability Scale, Deliberate self-harm (DSH), Risk Behavior related to Eating Disorders (RIBED-8) | BAI-Y, BDI-Y, Social Interaction Anxiety Scale (SIAS), Suicide Ideation subscale from the Suicide Probability Scale, Deliberate self-harm (DSH), Risk Behavior related to Eating Disorders (RIBED-8) | 23% of the variance Peer-related Lon — Dep β = 0.26, r² = 0.076; family-related Lon — Dep β = 0.29, r² = 0.089 |
| Lau et al. (1999), Hong Kong | School students | 6,356 (NS estimated 48) | Child/adolescent 9–14 NS | Marcoen and Brumagne’s Loneliness Scale (3 subscales: Peer-Related Lon, Parent-Related Lon, and Aloneness) | CDI, RCADS | Primary school students: 0.71 (<.001) Peer-related Lon 0.67 (<.001), parent-related Lon 0.49 (<.001), aloneness — 0.65 (<.001). 46% shared variance Secondary school |

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### TABLE 2 Continued

| Authors (Year), Country | Sample | Child (≤11 y)/ Adolescent (12–18 y)/ Young Adult (≥19 y) | Age Range at Baseline y,_mean Age (SD) | Social Isolation/ Loneliness Measure | Mental Health Measure | Associations Between Social Isolation/ Loneliness and Mental Health \( [r (p)] \) Unless Otherwise Stated |
|-------------------------|--------|----------------------------------------------------------|--------------------------------------|-------------------------------------|----------------------|---------------------------------------------------------------|
| Majd Ara et al. (2017), Iran | Female school students | 301 (0) | Adolescent | 15–18 | 16.6 (1.1) | Children’s Loneliness Scale | DASS-21 | Depression: 0.81 (<.001) Peer-related Lon 0.77, (<.001), parent-related Lon 0.56 (<.001), aloneness – Dep 0.72 (<.001) 65% shared variance |
| Mahon et al. (2001), USA | School students | 127 (43.3) | Adolescent | 12–14 | 12.9 (0.63) | Revised UCLA Loneliness Scale | Profile of Mood States - Depression-Depression subscale | YSR | 0.57 (<.001) |
| Markovic and Bowker (2015), USA | School students | 157 (45) | Adolescent | NS | 13.84 (75) | LSDQ | 0.39 (<.001) Anx: 0.35 (<.001) |
| Matthews et al. (2016), UK | Twin birth cohort | 2066 (49) | Young adult | 18 | 18.4 (0.36) | Multidimensional Scale of Perceived Social Support (MSPSS) | Diagnostic Interview Schedule | 0.21 (<.001) |
| McIntyre et al. (2018), UK | University students | 1135 | Young adult | NS | 20.78 (4.35) | UCLA Loneliness Scale | PHQ-9, GAD-7, Self-harm (4 items) | Anx: 0.54 (<.001) |
| Moore and Schultz (1983), USA | School students | 99 (45) | Adolescent | 14–19 | 17 (0.98) | UCLA Loneliness Scale (ULS) + frequency, duration, characteristics and perceived causes of loneliness | SDS, STAI | State anx: 0.48 (<.001) Lon duration 0.46 (<.001) Lon frequency -Dep 0.70 (<.001) Lon frequency 0.48 (<.001) |
| Mounts et al. (2006), USA | University students – ethnically diverse sample | 350 (36) | Young adult | 18–19 | NS | Revised UCLA Loneliness Scale | BDI, BAI | Anx: 0.30 (<.001) |

(continued)
### TABLE 2 Continued

| Authors (Year), Country | Social Isolation/Loneliness and Concurrent Mental Health Symptoms | Total N (% Male Participants) | Age Range at Baseline y, Mean Age (SD) | Sample | Sample 1: CDI. | Sample 1: CDI. | Sample 2: Iowa short form of CES-D. | Sample 1: 12.47 (1.89) | Sample 2: 12.81 (0.42) | Sample 1: Revised UCLA Loneliness Scale | Sample 2: Revised UCLA Loneliness Scale | Sample 1: Revised UCLA Loneliness Scale | Sample 2: Revised UCLA Loneliness Scale |
|------------------------|------------------------------------------------------------------|--------------------------------|---------------------------------------|--------|---------------|---------------|-----------------------------------|----------------------|------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Neto and Barros (2000), Portugal | School students | 487 (39.3) | Adolescent | NS (estimated 15–18) | Cape Verde 17.5 (1.2): Portugal 17.8 (1.0) | Revised UCLA Loneliness Scale items from UCLA Loneliness Scale | Social Anxiety subscale | Social Anxiety subscale | 0.33 (0.35) (|<| .001) | | | |
| Purwono and French (2016), Indonesia | Muslim school students | 453 (45.9) | Adolescent | 13–16 | 7th grade: 13.57 (0.44) | Revised UCLA Loneliness Scale items from UCLA Loneliness Scale | CES-D | 0.59 (|<| .01). | | | | |
| Richardson et al. (2019), Australia | Community | 528 (51) | Child/Adolescent | 10–12 | 3 items from School Belonging and Isolation Scale | Social Anxiety subscale | SCAS-C— subscales | 0.46 (|<| .001) | OR = 5.8 (|<| .001) | Suicidal ideation: | OR 5.0 | |
| Roberts and Chen (1995), USA | School students | 2614 (n.s) | Adolescent | 11–14 | NS (NS) | 8 item UCLA Loneliness Scale | Social Anxiety subscale | SCAS-C— subscales | 0.50 (|<| .001) | Generalized Anx 0.42 (|<| .001) | Separation anx 0.41 (|<| .001) | |
| Singhvi et al. (2011), India | School students | 300 (50) | Adolescent | 15–17 | NS | Revised UCLA Loneliness Scale | Social Anxiety subscale | SCAS-C— subscales | 0.46 (|<| .001) | Social Anxiety | 0.46 (|<| .001) | Social Anxiety | 0.46 (|<| .001) |
| Spithoven et al. (2017), Belgium and Netherlands | NS | Sample 1: 417 (48.4) | Adolescent | NS | Sample 1: 12.47 (1.89) | Sample 1: peer-related loneliness subscale | LACA — peer-related loneliness subscale | Social Anxiety subscale | 0.46 (|<| .001) | Female participants: 0.683 (|<| .001) | Male participants: | Lon associated with Dep t = 6.32 (|<| .005) |
| | | Sample 2: 1140 (48.7) | Child | 9–12 | Sample 2: 12.81 (0.42) | Sample 1: peer-related loneliness subscale | LSDQ | Social Anxiety subscale | 0.46 (|<| .001) | Female participants: 0.683 (|<| .001) | Male participants: | Lon associated with Dep t = 11.38 (|<| .005) |
| | | 102 (0) | | | 10.46 (1) | | | | | | Male participants: | Lon associated with perceived stress [t = 1.50, p < .01, β = -.108] |
| Authors (Year), Country | Sample | Total N (% Male Participants) | Child (≤11 y)/Adolescent (12–18 y)/Young Adult (≥19 y) Age Range at Baseline y, Mean Age (SD) | Social Isolation/Loneliness Measure | Mental Health Measure | Associations Between Social Isolation/Loneliness and Mental Health \[r (p)\] Unless Otherwise Stated |
|------------------------|--------|-----------------------------|---------------------------------------------------------------------------------|-------------------------------------|------------------------|-------------------------------------------------|
| Stednitz and Epkins (2006), USA | Community sample | 31 (42) | Adolescent 11–18 13.0 (2.0) | Short version of PROMIS Health Organisation Social Isolation Lon item from CES-D | CES-D (minus Lon item), 12 statement anxiety scale | Social anxiety: self-rated 0.72 (<.001). Mother-rated 0.36 (<.001) |
| Stacciarini et al. (2015), USA | Church and community (Latina/o immigrants) | 31 (42) | Adolescent 13–15 NS | Revised UCLA Loneliness Scale | LSDQ | Mental health \( r = -0.38 \) (<.05) |
| Stickley et al. (2016), Czech, Russia and USA | School students | Sample 1: 2205 (NS) Sample 2: 1995 (NS) Sample 3: 2050 (NS) | Adolescent 13–15 NS | Revised UCLA Loneliness Scale | YSR | Anx: ORs: 0.63–4.59 |
| Thomas and Bowker (2015), USA | School students | 103 (51.4) | Child/Adolescent NS (estimated 10–13) | Revised UCLA Loneliness Scale | LSDQ | Stress: \( \gamma = 0.381 \) (<.001) \( \beta = 0.297 \) (<.001) |
| Tu and Zhang (2014), China | University students | 444 (38.4) | Young adult NS | Revised UCLA Loneliness Scale | CES-D (7 item version), Perceived Stress Scale | Mental health \( r = -0.38 \) (<.05) |
| Uba et al. (2012), Malaysia | School students | 242 (49.2) | Adolescent 13–16 14.67 (1.27) | Revised UCLA Loneliness Scale | CDI | Stress: \( \gamma = 0.381 \) (<.001) \( \beta = 0.297 \) (<.001) |
| Vanhalst, Luyckx, Raes (2012), Belgium | University students | 370 (16.5) | Young adult NS | Revised UCLA Loneliness Scale | CES-D | Peer-related Lon \( 0.58 \) (<.001) Parent-related Lon \( 0.23 \) (<.001) |
| Wang and Yao (2020), China | Schools (left behind children in rural China) | 442 (54) | Child/Adolescent 8–16 11.5 (2.098) | UCLA Loneliness Scale | Social Anxiety Subscale | Social Anx: 0.332 (<.001) |
| Xu and Chen (2019), China | School students | 724 (59.5) | Child/Adolescent 6–14 9.15 (1.79) | LSDQ | CES-D | Social Anx: 0.332 (<.001) |

(continued)
| Authors (Year), Country Sample | Total N (%) | Male Participants | Child (<11 y)/ Adolescent (12-17 y)/ Young Adult (≥18 y) | Mean Age (SD) | Social Isolation/Loneliness Measure | Mental Health Measure | Associations Between Social Isolation/Loneliness and Concurrent Mental Health Symptoms |
|--------------------------------|-------------|-------------------|---------------------------------------------------------|---------------|------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------|
| Yadegarfard et al. (2014), Thailand | 260 (100) | 200 (100) | Adolescent/Young adult (male transgender and cisgender) | 15-25 | SSA | DASS-21 (short version), Positive and Negative Suicide Inventory | Transgender: Lower social support associated with higher negative risk factors related to suicidal behavior (B = 0.28); Cisgender: Lower social support associated with higher negative risk factors related to suicidal behavior (B = 0.23) |

(continued)
| Authors (Year), Country Sample | Social Isolation/Loneliness and Concurrent Mental Health Symptoms | Associations Between Social Isolation/ Loneliness and Mental Health [r (p)] Unless Otherwise Stated |
|--------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------|
| Sprang and Silman (2013), USA, Canada, and Mexico Parents of children (who experienced H1N1/SARS/avian flu pandemics) | 398 (NS) Child Social Isolation/Quarantine in the Context of Infectious Disease Children experienced pandemic; 20.9% social isolation and 3.8% quarantine | PTSD-RI; PCL-C PTSD-RI: Children who experienced isolation/quarantine were more likely to meet cut-off score for PTSD (30%) than those who had not been in isolation or quarantine; 1.1%; \( \chi^2 = 49.56 (\langle .001) \), Cramer \( V = 0.449 \) \( t \) \( 6.59 \) (000) \( PCL-CL: \) Children who experienced isolation/quarantine were more likely to meet cut-off score for PTSD (28%); \( \chi^2 = 31.44 (\langle .001) \) |

**Note:** Anx = Anxiety; BAI = Beck Anxiety Inventory; BAI-Y = Beck Anxiety Inventory for Youth; BDI = Beck Depression Inventory; BDI-Y = Beck Depression Inventory for Youth; CBCL = Child Behaviour Checklist; CDI = Children’s Depression Inventory; CES-D = Center for Epidemiologic Studies Depression Scale; DASS-21 Depression, Anxiety, and Stress Scale, Dep = depression; GAD-7 = Generalized Anxiety Disorder – 7; Lon = Loneliness; LSDQ = Loneliness and Social Dissatisfaction Questionnaire; LACA = Loneliness and Aloneness Scale for Children and Adolescents; OR = Odds Ratio; PCL-C = PTSD Checklist Civilian Version; PHQ-9 = Patient Health Questionnaire; PTSD-RI = UCLA Posttraumatic Stress Disorder Reaction Index; RCADS = Revised Children’s Anxiety and Depression Scale; SAS-A = Social Anxiety Scale for Adolescents; SCAS-C = Spence Children’s Anxiety Scale-Child; SDS = Zung Self-rating Depression Scale; SDQ = Strengths and Difficulties Questionnaire; SELSA = Social and Emotional Loneliness Scale for Adults; SMFQ = Short Mood and Feelings Questionnaire-Child; SSA = Social Support Appraisals scale; STAI = State Trait Anxiety Inventory; TRF = Teacher Rating Form; YSR = Youth Self-Report Form.
| Author                  | Sample (Selection Criteria)                                                                 | Total N (% Male Participants) | Mean Age (SD) at T1 | Social Isolation/Loneliness Measure | Mental Health Measures | Cross-Sectional Associations r (p) | Length of follow-up, y | Is Social Isolation/Loneliness Associated With Later Mental Health? |
|------------------------|---------------------------------------------------------------------------------------------|--------------------------------|---------------------|-------------------------------------|------------------------|----------------------------------|----------------------|---------------------------------------------------------------|
| Boivin et al. (1995)   | School students                                                                            | 774 (51.8)                    | 10.8 (NS)           | LSDQ                                | CDI                    | Lon-Dep 0.53 (p < .001)           | 1                    | T1 Lon – T2 Dep: r = 0.36 (p < .01)                           |
|                        |                                              |                                |                     |                                     |                        |                                  |                      | T1 Lon accounted for 8.3% of variance in T2 Dep               |
|                        |                                              |                                |                     |                                     |                        |                                  |                      | Controlling for caregiver neglect and covariates, a 1-SD increase in peer isolation was associated with a 0.49-SD increase in depression |
|                        |                                              |                                |                     |                                     |                        |                                  |                      | Not significant                                             |
|                        |                                              |                                |                     |                                     |                        |                                  |                      | Lon → Social anxiety β = 0.10 (p < .001)                       |
| Christ et al. (2017)   | National Survey of Child and Adolescent Well-being (child welfare cohort)                  | 2776 (47)                     | 13.5 (NS)           | LDSQ 7 peer isolation items         | 4 items from YSR        | NS                               | 7                    | T2 Lon → Anx/Dep symptoms at T3 $\gamma^2 = 0.18, z = 2.60 (p < .01)$ |
|                        |                                              |                                |                     |                                     |                        |                                  |                      | Indirect effects T1 Lon → T2 Suicidal thoughts through Dep β = 0.06, p < .001 |
|                        |                                              |                                |                     |                                     |                        |                                  |                      | Changes in Lon associated with changes in Dep reported by teachers (r = 0.63, p < .001) and adolescents (r = 0.65, p < .001), but not parents (r = 0.18, p = .13) |
|                        |                                              |                                |                     |                                     |                        |                                  |                      | T1 Lon → T2 Dep AOR = 2.93, CI = 1.74–4.91 (p < .001)          |
|                        |                                              |                                |                     |                                     |                        |                                  |                      | T1 lonely female participants were 5.09 times more likely (CI 2.24–11.56 (p < .001) to be depressed at T2 |
|                        |                                              |                                |                     |                                     |                        |                                  |                      |                                                             |
|                        |                                              |                                |                     |                                     |                        |                                  |                      |                                                             |
|                        |                                              |                                |                     |                                     |                        |                                  |                      |                                                             |
### TABLE 3 Continued

| Author (Year), Country | Sample (Selection Criteria) | Total N (% Male Participants) | Sample (Selection Criteria) | Total N (% Male Participants) | Mean Age (SD) at T1 | Social Isolation/Loneliness Measure | Mental Health Measures | Cross-Sectional Associations r (p) | Length of follow-up, y | Depression | Anxiety |
|------------------------|-----------------------------|--------------------------------|-----------------------------|--------------------------------|---------------------|-------------------------------------|-----------------------|-----------------------------|----------------------|-----------|---------|
| Lapierre et al. (2019), USA | College Students             | 346 (33.6)                     | Young adult                 | 19.11 (0.75)                   | UCLA Loneliness Scale  | Lon-Dep 0.628 (T1), 0.666 (T2) (p < .001) | Lon-Dep 0.61 (p < .0005), Lon-Anx 0.51 (p < .0005), Soc support–Dep r = −0.12, −0.18, −0.28 (all p < .0005) | 1.5 (T2), 3 (T3) | T1 Lon → T2 Dep (r = 0.524, p < .001) T1 Lon → T2 Dep b = 0.21, SE = 0.05 (p < .001) T1 Lon → T2 Dep (r = 0.37, p < .0005) Cross-lagged structural equation modeling found T1 Lon did not predict Dep at T2 |
| Lasgaard et al. (2011b), Denmark | School students              | T1: 1009 (43) T2: 541 (40)    | Adolescent/Young adult      | 15–26 (1.11)                   | SELSA-short form, MSPSS | Lon-Dep 0.61 (p < .0005), Lon-Anx 0.51 (p < .0005), Soc support–Dep r = −0.12, −0.18, −0.28 (all p < .0005) | Lon-Dep 0.61 (p < .0005), Lon-Anx 0.51 (p < .0005), Soc support–Dep r = −0.12, −0.18, −0.28 (all p < .0005) | 1.5 (T2), 3 (T3) | T1 Lon → T2 Dep (r = 0.524, p < .001) T1 Lon → T2 Dep b = 0.21, SE = 0.05 (p < .001) T1 Lon → T2 Dep (r = 0.37, p < .0005) Cross-lagged structural equation modeling found T1 Lon did not predict Dep at T2 |
| Liu et al. (2020), China | College students             | 741 (28.3)                     | Young adult                 | 18.47 (0.87)                   | 6 item index of SDS social isolation based on only child status, number of friends, frequency of contact with friends and family, UCLA Loneliness Scale | Lon-social anxiety 0.41 = 0.45 (p < .01) | Lon-social anxiety 0.41 = 0.45 (p < .01) | 1.5 (T2), 3 (T3) | T1 Lon → T2 Dep (r = 0.524, p < .001) T1 Lon → T2 Dep b = 0.21, SE = 0.05 (p < .001) T1 Lon → T2 Dep (r = 0.37, p < .0005) Cross-lagged structural equation modeling found T1 Lon did not predict Dep at T2 |
| Mak et al. (2018), USA | School students (randomized trial) | 687 (47.7)                     | Adolescent                  | 11.27 (0.49)                   | LSDQ SAS-A            | Lon-Dep 0.61 (T1), 0.666 (T2) (p < .001) | Lon-Dep 0.61 (p < .0005), Lon-Anx 0.51 (p < .0005), Soc support–Dep r = −0.12, −0.18, −0.28 (all p < .0005) | 1.5 (T2), 3 (T3) | T1 Lon → T2 Dep (r = 0.524, p < .001) T1 Lon → T2 Dep b = 0.21, SE = 0.05 (p < .001) T1 Lon → T2 Dep (r = 0.37, p < .0005) Cross-lagged structural equation modeling found T1 Lon did not predict Dep at T2 |

(continued)
| Author (Year), Country | Sample (Selection Criteria) | Total N (% Male Participants) | Mean Age (SD) at T1 Age Range, y | Social Isolation/ Loneliness Measure 6 items from CBCL (parent) and TRF (teacher) | Mental Health Measures | Cross-Sectional Associations r (p) | Length of follow-up, y | Anxiety | Depression |
|-----------------------|-----------------------------|--------------------------------|---------------------------------|---------------------------------------------------------------------------------|----------------------|-------------------------------|---------------------|---------|-----------|
| Matthews et al. (2015), UK | Twin birth cohort 2232 (NS) Child | 2232 (NS) | child 5 | T1 and T2: Peer and Parent subscales LACA | T1: T-CARS T2 and T3: DDPCA | T1 Peer Lon-internalizing symptoms 0.32 (p < .01) Parent Lon-Internalizing Symptoms 0.09. T2 Peer Lon-Dep 0.13 (p < .05) Parent Lon-Dep 0.12 (p < .05) | 8 | 7 | T1 Peer Lon-T2 Dep r = 0.07 T1 Peer Lon-T3 Dep r = 0.06 T2 Peer Lon → T3 Dep r = 0.12 (p < .05) T1 Parent Lon → T2 Dep r = 0.19, p < .01 T1 Parent Lon-T3 Dep r = 0.13 (p < .05) T2 Parent Lon-T3 Dep r = 0.08 Structural model: Duration of Peer Lon → T3 Dep T1 and T2 Peer Lon, Parent Lon (T1, T2, and duration) did not independently predict T3 Dep T1 Lon-T3 Dep r = 0.01 T2 Lon-T3 Dep r = 0.01 T1 Lon-T3 Suicidal ideation r = 0.00 T2 Lon-T3 suicidal ideation r = 0.03 T1 Lon-T3 suicide attempt r = 0.02 T2 Lon-T3 suicide attempt r = 0.01 T1 Lon → T2 Dep symptoms (B = 0.13, p < .001) |
| Qualter et al. (2010), UK | School students 296 (49.3) | 296 (49.3) | Child 5 | T1 and T2: Peer and Parent subscales LACA | T1: T-CARS T2 and T3: DDPCA | T1 Peer Lon-internalizing symptoms 0.32 (p < .01) Parent Lon-Internalizing Symptoms 0.09. T2 Peer Lon-Dep 0.13 (p < .05) Parent Lon-Dep 0.12 (p < .05) | 8 | 7 | T1 Peer Lon-T2 Dep r = 0.07 T1 Peer Lon-T3 Dep r = 0.06 T2 Peer Lon → T3 Dep r = 0.12 (p < .05) T1 Parent Lon → T2 Dep r = 0.19, p < .01 T1 Parent Lon-T3 Dep r = 0.13 (p < .05) T2 Parent Lon-T3 Dep r = 0.08 Structural model: Duration of Peer Lon → T3 Dep T1 and T2 Peer Lon, Parent Lon (T1, T2, and duration) did not independently predict T3 Dep T1 Lon-T3 Dep r = 0.01 T2 Lon-T3 Dep r = 0.01 T1 Lon-T3 Suicidal ideation r = 0.00 T2 Lon-T3 suicidal ideation r = 0.03 T1 Lon-T3 suicide attempt r = 0.02 T2 Lon-T3 suicide attempt r = 0.01 T1 Lon → T2 Dep symptoms (B = 0.13, p < .001) |
| Schinka et al. (2013), USA | Longitudinal cohort study 832 (53) | 832 (53) | Child 9 | T1: CBCL (mother) T3: CDI — Short form; Suicide items from CBCL and YSR | T1: CBCL (mother) T3: CDI — Short form; Suicide items from CBCL and YSR | T1: CBCL (mother) T3: CDI — Short form; Suicide items from CBCL and YSR | 9 | 6 | T1: CBCL (mother) T3: CDI — Short form; Suicide items from CBCL and YSR |
| Vanhalst, Goosens et al. (2013), Netherlands | Community sample via municipality registers 389 (53) | 389 (53) | Adolescents 15 | 15.22 (0.60) LACA Peer-related loneliness subscale | LACA Peer-related loneliness subscale | T1: CBCL (mother) T3: CDI — Short form; Suicide items from CBCL and YSR | 15 | 5 | 15.22 (0.60) LACA Peer-related loneliness subscale |

(continued)
| Author and Country | Sample | Total N (% Male Participants) | Young Adults (≥19 y) | Mean Age (SD) at T1 | Social Isolation/Loneliness Measure | Mental Health Measures | Cross-Sectional Associations r (p) | Length of follow-up, y | Depression | Anxiety |
|--------------------|--------|-------------------------------|----------------------|---------------------|-----------------------------------|-----------------------|-----------------------------------|----------------------|------------|---------|
| Vanhalst et al., Belgium (2012) | Sample 1: 514 (10.9) Sample 2: 437 (17) | Young adults Sample 1: 514 (10.9) Sample 2: 437 (17) | NS 19.62 (0.62) Sample 2: 18.22 (1.21) | Sample 1: 8-item revised UCLA Loneliness Scale Sample 2: 20-item CES-D | Lon-Dep r = 0.49—0.52 (p < .001) Sample 2: Lon-Dep r = 0.40—0.60 (p < .001) | | 2 | Sample 1: T1 Lon 1 — T2 Dep r = 0.35 (p < .001) Sample 2: T1 Lon 1 — T3 Dep r = 0.36 (p < .001) Lon 1 → associated with Dep across both time intervals. Sample 2: cross-lagged path from Lon associated with Dep (b = 0.12, p < .05) | |
| Wang et al., China (2020) | School students 921 (48.3) Adolescents 12—15 12.98 (0.66) | Sample 1: 765 Sample 2: 482 | Sample 1: 12-item CES-D Sample 2: 20-item CES-D | Revised UCLA Loneliness Scale (T1 and T2) SCARED; DSRSC (T1 and T3) | Lon-Dep r = 0.56 (p < .001) | Sample 1: T1 Lon 1 — T2 Dep r = 0.36 (p < .001) Sample 2: T2 Lon 1 — T3 Dep r = 0.46 (p < .001) Lon 1 → associated with Dep (b = 0.29, p < .001) T2 Lon 1 — T3 Anx r = 0.36 (p < .001) | 1 |
| Zhou et al., China (2020) | School students 866 (49) Adolescents 11—15 12.98 (0.67) | Sample 1: 742 Sample 2: 424 | Sample 1: 12-item CES-D Sample 2: 20-item CES-D | Revised UCLA Loneliness Scale (T1 and T2) SCARED; DSRSC (T3) | Lon-Dep r = 0.56 (p < .001) | Sample 1: T1 Lon 2 — T2 Dep r = 0.38 (p < .001) Controlling for age, sex, and SES, T2 Lon 1 — T3 Dep adjusted b = 0.34 (p < .001) | 2 | Sample 1: T1 Lon 1 — T2 Dep r = 0.35 (p < .001) Sample 2: T1 Lon 1 — T3 Dep r = 0.36 (p < .001) Lon 1 → associated with Dep (b = 0.12, p < .05) | |

Note: Anx = Anxiety; BAI-Y = Beck Anxiety Inventory for Youth; BDI-Y = Beck Depression Inventory for Youth; CBCL = Child Behaviour Checklist; CDI = Children’s Depression Inventory; CES-D = Center for Epidemiologic Studies Depression Scale; DDPCA = Depression Profile for Children and Adolescents; Dep = depression; DSRSC = Birmelon Depression Self-Rating Scale for Children; Lon = Loneliness; LSDQ = Loneliness and Social Dissatisfaction Questionnaire; LACA = Loneliness and Aloneness Scale for Children and Adolescents; MASC = Multidimensional Anxiety Scale for Children; MSPSS = Multidimensional Scale of Perceived Social Support; NS = not specified; SAS-A = Social Anxiety Scale for Adolescents; SCARED = Scale for Child Anxiety Related Emotional Disorders; SES = socioeconomic status; SDS = Zung Self-rating Depression Scale; SEPSA = Social and Emotional Loneliness Scale for Adults; T-CARS = Teacher-Classroom Adjustment Rating Scale; T1 = Time 1; T2 = Time 2; T3 = Time 3; TRF = Teacher Rating Form; YSR = Youth Self-Report Form.
associated with later anxiety.71 Two of these studies assessed social anxiety, and one measured anxiety as a broad construct. One study did not find that loneliness/social isolation at age 5 years was associated with anxiety at age 12 years.72 One study of young adolescents found differences by sex, with loneliness being associated with later social anxiety in male participants but not female participants.71 None of these studies measured loneliness during childhood.

Other mental health outcomes reported over time included internalizing symptoms which were associated with prior loneliness in primary school age children,64 and suicidal ideation during adolescence, which was not associated with prior loneliness during childhood.74

Impact of Social Isolation in an Infectious Disease Context
One study60 reported on mental health and social isolation in the context of different infections, including H1N1, severe acute respiratory syndrome, and avian flu (Table 2). This retrospective study included 398 parents of exposed children from the United States, Canada, and Mexico, of whom 20.9% experienced social isolation and a further 3.8% had been quarantined. Parents of children reported on their child’s experience of trauma and on their current mental health. One-third of parents whose children had been subjected to disease containment measures said that their child had needed mental health service input because of their pandemic-related experiences. The most frequently reported diagnoses were acute stress disorder (16.7%), adjustment disorder (16.7%), grief (16.7%), and post-traumatic stress disorder (PTSD) (6.2%). Two different parent-reported measures of PTSD symptoms found that those children exposed to disease containment measures scored significantly higher for PTSD symptoms post-pandemic. On the PTSD Checklist Civilian Version, 28% of children who had experienced isolation/quarantine scored about the cut-off for PTSD, compared to 5.8% of those who had not experienced isolation/quarantine. Similarly, on the UCLA PTSD Reaction Index, 30% of children who experienced isolation/quarantine scored above the cut-off for PTSD, compared to 1.1% of those who had not experienced isolation/quarantine (effect size: Cramer $V = 0.449$). Mean scores were four times higher in the isolated/isolated group than in those who had not been isolated/quarantined. The most common trauma symptoms in the isolated/isolated group were avoidance/numbing (57.8%), re-experiencing (57.8%), and arousal (62.5%).

Interventions
Two randomized controlled trials measured loneliness and mental health outcomes following an intervention aimed at the general population (peer mentoring81 and classroom based82 (Table 4). In both instances, the comparator was no intervention/with follow-up and education as usual. A relatively intensive peer mentor program, with an adult mentor, 4 to 6 hours per month for 4 months on average, reduced loneliness and mental health problems (small to medium effects) for victims of bullying and victimization. However, a brief (two-session) universal classroom-based program delivered in schools including psychosocial support through peer mentors and a staff mental health support team did not reduce loneliness. Neither intervention specifically addressed mental health problems that had developed in the context of loneliness; therefore, we are unable to answer our second review question, which was what interventions are effective for individuals who have developed mental health problems as a result of social isolation or loneliness.

DISCUSSION
This rapid systematic review of 63 studies of 51,576 participants found a clear association between loneliness and mental health problems in children and adolescents. Loneliness was associated with future mental health problems up to 9 years later. The strongest association was with depression. These findings were consistent across studies of children, adolescents, and young adults. There may also be sex differences, with some research indicating that loneliness was more strongly associated with elevated depression symptoms in girls and with elevated social anxiety in boys.70,71 The length of loneliness appears to be a predictor of future mental health problems.73 This is of particular relevance in the COVID-19 context, as politicians in different countries consider the length of time that schools should remain closed, and the implementation of social distancing within schools.

Furthermore, in the one study that examined mental health problems after enforced isolation and quarantine in previous pandemics, children who had experienced enforced isolation or quarantine were five times more likely to require mental health service input and experienced higher levels of posttraumatic stress. This suggests that the current social distancing measures enforced on children because of COVID-19 could lead to an increase in mental health problems, as well as possible post-traumatic stress. These results are consistent with preliminary unpublished data emerging from China during the COVID-19 pandemic, where children and adolescents aged 3 to 18 years are commonly displaying behavioral manifestations of anxiety, including clinginess, distraction, fear of asking questions about the pandemic, and...
| Author               | Year, Country | Sample | Total N (% Male Participants) | Age Range at Baseline, y | Mean Age (SD) | Loneliness Measure | Mental Health Measures | Intervention Condition | Main Findings |
|---------------------|---------------|--------|-------------------------------|--------------------------|---------------|--------------------|-----------------------|----------------------|---------------|
| King et al. (2018), USA | Experienced bullying/victimization, recruited via paediatric medical emergency services | 218 (33.5) | 12-19 | 15.50 (1.1) | Revised UCLA Loneliness Scale | Reynolds Adolescent Depression Scale | Columbia Suicide Severity Rating Scale | LETS CONNECT (LC) mentorship program (strengths-based approach) | Mentorship lasted an average of 120.32 days (SD 69.69), 4 h/mo | At 6 months, loneliness decreased more in LC intervention group than in control group (p < .01), ES = 0.4 |
| Larsen et al. (2019), Norway | School students | 2254 (NS; estimate 53) | 15-19 | 16.82 (NS) | Loneliness Scale (modified) | Symptom Checklist | Dream School | Education as usual | No significant effects on mental health or loneliness for either group |

Note: ES = effect size; NS = not specified.
irritability. Furthermore, a large survey of young adult students in China has reported that around one in four are experiencing at least mild anxiety symptoms. In the United Kingdom, early results from the Co-SPACE (COVID-19 Supporting Parents, Adolescents and Children in Epidemics) online survey of more than 1,500 parents suggest high levels of COVID-19—related worries and fears, with younger children (aged 4–10 years) significantly more worried than older children and adolescents (aged 11–16 years).

In addition to the more direct effects of enforced isolation and quarantine, loneliness as an unintended consequence of disease containment measures seems to be particularly problematic for young people. This may be because of the particular importance of the peer group for identity and support during this developmental stage. This propensity to experience loneliness may make young people particularly vulnerable to loneliness in the COVID-19 context, which, based on our findings, may further exacerbate the mental health impacts of the disease containment measures. More studies have examined the relationship between loneliness and depression than between loneliness and anxiety. Losing links to other people and feeling excluded can result in an affective response of depression. Social anxiety was more strongly associated with loneliness than other anxiety subtypes. This may be because social anxiety is triggered by a perceived threat to social relationships or status.

It is difficult to predict the effect that COVID-19 will have on the mental health of children and young people. The subjective social isolation experienced by study participants did not mirror the current features of social isolation experienced by many children and adolescents worldwide. Social isolation was not enforced upon the participants, nor was social isolation almost ubiquitous across their peer groups and across the communities in which they lived. As loneliness involves social comparison, it is possible that the shared experience of social isolation imposed by disease containment measures may mitigate the negative effects. The studies were also not in the context of an uncertain but dangerous threat to health. These features limit the extent to which we can extrapolate from existing evidence to the current context. To make evidence-based decisions on how to mitigate the impact of a second wave, we need further research on the mental health impacts of social isolation in the disease containment context of a global pandemic. In this context, to more specifically understand the impacts of loneliness, measures such as the Loneliness and Aloneness Scale for Children and Adolescents (LACA) that assess the duration and the intensity of loneliness, and that separate peer-related loneliness from parent-related loneliness could be elucidating.

This rapid systematic review was conducted rapidly, in 3 weeks, to inform our response to COVID-19. We double screened 20% of all articles and data extracted. In line with Cochrane rapid review guidance, gray literature, and trial registry databases were not searched, hand-search strategies were not used, and only English-language publications were included, meaning that some relevant studies may have been missed. During the rapid data extraction phase, there was no scope to contact authors to request any missing information. The main limitation of this review is the lack of high-quality studies investigating mental health problems after enforced isolation. All but one study investigated social isolation that was not enforced on young people and was not common across a peer group. The effect of widespread social distancing could mitigate against the social isolation described with increased use of Internet-mediated relationships, which can be beneficial to adolescents. Most studies were cross-sectional, and therefore the direction of the association cannot be inferred. Few studies used independent (ie, not self-report) measures of mental health or social isolation/loneliness, thereby increasing the risk of bias. Furthermore, the studies were mainly observational and did not consistently control for potential confounders. The majority of studies focused on depression and anxiety, and other mental health problems are important to measure in future research.

However, we used all available evidence on social isolation and loneliness to inform the likely outcome for healthy children and adolescents subjected to social isolation. The results were consistent across all study methodology for depression (but less so for anxiety), suggesting that these results are reliable. The results are also consistent with one study investigating mental health problems in children after pandemics, improving our confidence in the results. However, the postpandemic study has several limitations in that the sample was self-selecting, and the demographics of the children and the time elapsed since the experience were not reported. There is little evidence pertaining to interventions. We have focused on healthy populations in this review and will report on those with pre-existing conditions including mental health problems elsewhere.

Implications for Policy and Practice

The review indicates that loneliness is associated with adverse mental health in children and adolescents. There is limited evidence that indicates specific interventions to prevent loneliness or to reduce its effects on mental health.
and well-being. However, there are well-established practical and psychological strategies that may help to promote child and adolescent mental health in the context of involuntary social isolation, for example, during the COVID-19 pandemic. Reducing the impact of enforced physical distancing by maintaining the structure, quality, and quantity of social networks, and helping children and adolescents to experience social rewards, to feel part of a group, and to know that there are others to whom they can look for support is likely to be important. Finding ways to give children and adolescents a sense of belonging within the family and to feel that they are part of a wider community should be a priority. Therefore, providing accurate information about the relative risks and benefits of social media and networking to parents who overestimate the dangers of allowing their children too much screen time may help young people to access the benefits of virtual social contact.

However, simply increasing the frequency of contact may not address young people’s subjective experience of loneliness. Helping young people to identify valued alternative activities and build structure and purpose into periods of involuntary social isolation may help to provide a wider range of rewards. Addressing negative thoughts about social encounters (eg, self-blame, self-devaluation) may also be effective. During periods of prolonged social isolation, digital technology that provides evidence-based interventions to help young people to reappraise their thoughts and to change their behavior within the confines of the home setting may be particularly welcome.

Although this review did not provide evidence on interventions to improve social isolation or loneliness in healthy children and adolescents, given social distancing, digital interventions may be appropriate. A computerized self-help program that is based on cognitive–behavioral therapy (CBT), BRAVE-TA was shown to be effective for anxiety following the Christchurch earthquake in New Zealand. Furthermore, computerized CBT, such as MoodGym, SPARX, and “Think, Feel, Do” generally have small but positive effects on mental health. Although mobile applications for mental health have been found to be generally acceptable to children and adolescents, there is a lack of convincing evidence of effectiveness on intended mental health outcomes and few mobile health apps have been thoroughly tested. Self-help interventions including bibliotherapy and computerized therapy have shown a moderate positive effect size when compared to control groups although they are generally less effective than face to face therapies. Importantly, reviews have tended to conclude that effects are better if there is some therapist input and if parents are involved especially for younger children.

The rapid review suggests that loneliness that may result from disease containment measures in the COVID-19 context could be associated with subsequent mental health problems in young people. Strategies to prevent the development of such problems should be an international priority.
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# APPENDIX. DATABASE SEARCHES –03/29/2020

| Table | Search | Results |
|-------|--------|---------|
| **TABLE S1 Ovid MEDLINE (R)** | exp Adolescent/ or exp Child/ or exp Child, Preschool/ or exp Infant/ or exp Minors/ or exp Pediatrics/ | 3533050 |
| | (adolesc* or preadolesc* or pre-adolesc* or boy* or girl* or child* or infan* or preschool* or pre-school* or juvenil* or minor* or pe?diatri* or pubescen* or pre-pubescen* or prepubescen* or puberty or teen* or young* or youth* or school* or high-school* or highscool* or schoolchild* or school child*).tw,kf. | 2951684 |
| | 1 or 2 | 4748091 |
| | quarantine*.tw,kf. | 4350 |
| | exp Quarantine/ | 2093 |
| | Quarantine.tw,kf. | 3975 |
| | exp social isolation/ | 17148 |
| | (isolation and (infect* or SARS or influenza or flu or MERS or ebola or COVID-19)).tw,kf. | 34141 |
| | exp Loneliness/ | 3552 |
| | 4 or 5 or 6 or 7 or 8 or 9 | 56227 |
| | anxiet*/ or anxious*/ or "anxiety disorder**.tw,kf. | 29320 |
| | depress*/ or "internal* disord*"/ or "low mood".tw,kf. | 737 |
| | depressive disorder/ | 72188 |
| | exp depression/ | 115922 |
| | depress*.tw,kf. | 445459 |
| | exp adjustment disorders/ | 4197 |
| | adjustment disorder*.tw,kf. | 1642 |
| | low mood.tw,kf. | 737 |
| | obsessive-compulsive disorder.tw,kf. | 12336 |
| | stress disorders, traumatic/ | 672 |
| | stress disorders, post-traumatic/ | 31840 |
| | trauma*.tw,kf. | 353295 |
| | (((post-trauma* or posttrauma*) adj stress) or PTSD).tw,kf. | 35040 |
| | 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 | 853134 |
| | 3 and 10 and 24 | 1277 |

*Full references saved as Medline 290320 v1*
|   | Description                                                                 | Count       |
|---|-----------------------------------------------------------------------------|-------------|
| 1 | (adolescent or child or child, preschool or infant or minor or pediatrics).ti,ab,id. | 425212      |
| 2 | (adolesc* or preadolesc* or pre-adolesc* or boy* or girl* or child* or infan* or preschool* or pre-school* or juvenil* or minor* or pe?diasi* or pubescen* or pre-pubescen* or prepubescen* or puberty or teen* or youth* or school* or high-school* or schoolchild* or school child*).ti,ab,id. | 1227549     |
| 3 | 1 or 2                                                                      |             |
| 4 | quarantine.ti,ab,id.                                                         | 179         |
| 5 | exp *Social Isolation/                                                      | 5944        |
| 6 | (isolation and (infect* or SARS or influenza or flu or MERS or ebola or COVID-19)).ti,ab,id. | 437         |
| 7 | Disease containment*.ti,ab,id.                                              | 5           |
| 8 | Lonel*.ti,ab,id.                                                            | 10569       |
| 9 | exp *loneliness/                                                            | 3642        |
| 10| 4 or 5 or 6 or 7 or 8 or 9                                                  | 16688       |
| 11| anxiet*/ or anxious*/ or "anxiety disorder*".ti,ab,id.                     | 33786       |
| 12| depress*/ or "internal* disord*"/ or "low mood".ti,ab,id.                   | 673         |
| 13| exp *depression/                                                            | 19678       |
| 14| depress*.ti,ab,id.                                                          | 301583      |
| 15| exp adjustment disorders/                                                   | 719         |
| 16| adjustment disorder*.ti,ab,id.                                              | 1851        |
| 17| obsessive-compulsive disorder.ti,ab,id.                                     | 15268       |
| 18| post-traumatic stress disorder.ti,ab,id.                                    | 10195       |
| 19| trauma*.ti,ab,id.                                                           | 107899      |
| 20| (((post-trauma* or posttrauma*) adj stress) or PTSD).ti,ab,id.             | 44403       |
| 21| 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20                    | 431601      |
| 22| 3 and 10 and 21                                                             | 1303        |

Full references saved as PsycINFO 290320 v1
### TABLE S3  Web of Science Core Collection

| #  | Count | Query                        |
|----|-------|------------------------------|
| 22 | 3,211 | #21 AND #10 AND #3          |
| 21 | 1,173,555 | #20 OR #19 OR #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12 OR #11 |
| 20 | 64,185 | TS=((post-trauma* or posttrauma*) NEAR stress) or PTSD |
| 19 | 387,085 | TS=trauma* |
| 18 | 15,994 | TS=post traumatic stress disorder |
| 17 | 25,733 | TS=obsessive compulsive disorder |
| 16 | 22,119 | TS=adjustment disorder* |
| 15 | 22,104 | TS=adjustment disorders |
| 14 | 627,349 | TS=depress* |
| 13 | 494,240 | TS=depression |
| 12 | 628,267 | TS=(depress* OR * internal* disord* " OR * low mood ") |
| 11 | 283,559 | TS=(anxiet* OR anxious* OR * anxiety disorder* *) |
| 10 | 77,296 | #9 OR #8 OR #7 OR #6 OR #5 OR #4 |
| 9  | 12,570 | TS=loneliness |
| 8  | 15,420 | TS=Lonel* |
| 7  | 2,586 | TS=Disease containment* |
| 6  | 35,721 | TS=(isolation and (infect* or SARS or influenza or flu or MERS or ebola or COVID-19)) |
| 5  | 17,794 | TS=social isolation |
| 4  | 8,759 | TS=quarantine |
| 3  | 3,591,598 | #2 OR #1 |
| 2  | 3,581,837 | TS=(adolesc* or preadolesc* or pre-adolesc* or boy* or girl* or child* or infan* or preschool* or pre-school* or juvenil* or minor* or pediatri* or pubescen* or pre-pubescen* or puberity or teen* or youth* or school* or high-school* or highschool* or schoolchild* or school child*) |
| 1  | 2,450,709 | TS=(adolescent OR child OR child, preschool OR infant OR minor OR pediatrics) |

Applied 'English language' limit = 3012