



# Implications of the COVID-19 Pandemic for the Well-Being of Emerging Adult Populations: A Synthesis of Findings From the COVID-19 Eating and Activity Over Time (C-EAT) Study

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## Abstract

Research addressing the impact of the COVID-19 pandemic on psychosocial well-being and health behavior is accumulating; however, implications for emerging adult populations are underexplored. This manuscript synthesizes findings from a mixed-methods study of well-being, eating and activity behaviors, and food insecurity among a diverse, longitudinal cohort of emerging adults. The review includes findings from 11 original studies that involved collecting online surveys from 720 emerging adults and in-depth, virtual interviews with 33 respondents who were food insecure. Findings indicated the pandemic had widespread impacts on well-being. Population groups at greatest risk for poor outcomes included women; those who identified as Black, Indigenous, or a Person of Color; persons in households of low socioeconomic status; parents of young children; and persons who previously experienced mental health challenges or weight stigma. Further research will be needed to evaluate efforts to improve the well-being of emerging adults in the aftermath of the pandemic.

## Keywords

emerging adulthood, psychosocial well-being, interpersonal relationships, eating behavior, physical activity

The COVID-19 pandemic has disrupted many educational, employment, and social opportunities, and evidence addressing the impact of these disruptions on psychosocial well-being and health behaviors is rapidly accumulating (Deng et al., 2021; Maynes & Waltner, 2020; Mont'Alvao et al., 2020; Settersten et al., 2020). For example, nationally representative survey data on psychosocial well-being have shown a concerning trend in the percentage of adults with symptoms of an anxiety or depressive disorder (Vahratian et al., 2021). It is important to extend this evidence base to inform responsive public health interventions. In particular, there is a need for more research with a focus on emerging adult populations as the implications of the pandemic have been underexplored with regards to the transition from adolescence to adulthood.

Emerging adulthood (18–29 years) is a critical life stage (Arnett, 2000; Nelson, 2021) that can provide young people with opportunities to prepare for the responsibilities of adulthood and establish behaviors that promote health and emotional well-being (Nelson, 2021). However, health

indicator data suggest that young people from low-income and ethnically/racially minoritized communities experience barriers to establishing supportive relationships, completing post-secondary education, and accessing resources necessary to support their well-being during the transition to adulthood (Nelson, 2021; Park et al., 2014). There is a critical need for

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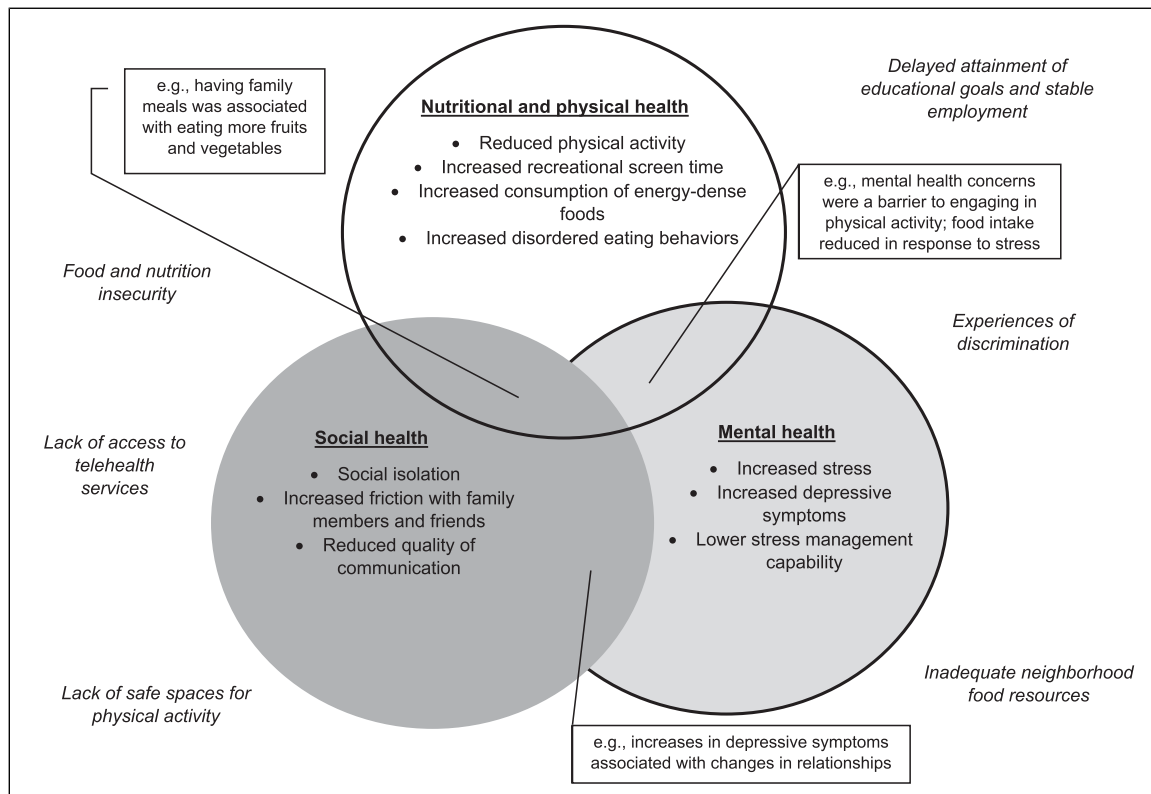
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research exploring the impact of the pandemic on disparities in access to resources to prepare for adult responsibilities. Previous reviews have synthesized research addressing different components of health during the COVID-19 pandemic (Haghshomar et al., 2022; Linardon et al., 2022; Mignogna et al., 2021; Neville et al., 2022; Stockwell et al., 2021; Trott et al., 2022; Violant-Holz et al., 2020), but these contributions have given limited attention to emerging adult populations and the connections between various aspects of psychosocial well-being and health behaviors. The lack of an integrative approach is problematic given the impact of the pandemic on multiple components of health and need for informing comprehensive policies and services.

To help fill gaps in the literature and direct future research that focuses on the challenges faced by emerging adult populations during public health crises, the current article presents a multidimensional health framework and synthesis of existing research. The multidimensional framework was developed to address social and structural barriers to health (e.g., lack of safe spaces for physical activity) and connections between the multiple components of health that have been negatively impacted by the COVID-19 pandemic. Figure 1 illustrates the multidimensional framework, including three

circles to represent impacts on mental (e.g., increased stress), social (e.g., reduced quality of communication), and nutritional and physical health (e.g., increased recreational screen time). The overlapping segments of the circles represent connections between health components (e.g., mental health concerns presenting as a barrier to physical activity), with examples based on evidence from existing observational studies among emerging adult populations.

The current article provides an in-depth synthesis of existing research with a focus on findings from previous mixed-methods studies that examined aspects of psychosocial well-being, food insecurity, and health behavior among a diverse longitudinal cohort of emerging adults (Emery et al., 2021; Larson et al., 2021a; Puhl et al., 2020; Simone et al., 2021). This research was conducted as part of the C-EAT (COVID-19 Eating and Activity over Time) study and designed to build understanding of the influence of the COVID-19 pandemic on the psychosocial well-being and health of emerging adult populations (Emery et al., 2021; Larson et al., 2021a; Puhl et al., 2020; Simone et al., 2021). It is important to synthesize these findings, including quantitative and qualitative data, to guide next steps for research and provide initial direction for policies and



**Figure 1.** Multidimensional health framework for guiding future research to address social and structural barriers and the multiple components of health that were negatively influenced by the COVID-19 pandemic as well as the connections between these components of emerging adult health. Note. Social and structural barriers are shown in italic font and are understood to influence multiple dimensions of health. Examples of connections between the components of health are shown with the intent of building understanding as additional connections are likely to impact overall wellbeing.

practices that might be evaluated with regard to their potential for promoting well-being. The article discusses findings of the C-EAT study within the contexts of domestic and international research on the health of emerging adult populations; implications for future research; and how the findings inform the proposed multidimensional health framework.

## Methods

The authors contributed to the design and implementation of the C-EAT study, and identified all relevant publications ( $n = 11$ ) that have made use of the study data for this research synthesis (Barr-Anderson et al., 2021; Berge et al., 2021a, 2021b; Emery et al., 2021; Folk et al., 2021; Larson et al., 2021a, 2021b, 2021c; Puhl et al., 2020; Simone et al., 2021; Wagner et al., 2021). A brief description of the mixed-methods design of the C-EAT study is provided below to explain the sequential explanatory approach taken to growing a rich understanding of the influence of the COVID-19 pandemic on the psychosocial well-being and health of emerging adult populations. The synthesis includes research that involved quantitative analysis of survey data, thematic analysis of open-ended survey responses, and thematic analysis of in-depth interview data on the experiences of food-insecure participants. Because the C-EAT survey was fielded in the early months of the COVID-19 pandemic, there were not yet established survey measures to assess the influence of events related to COVID-19. The C-EAT survey instead collected open-ended comments about the influence of the pandemic to capture information about diverse forms of influence. Additional details about survey measures, derived variables (i.e., scales, scores), and the sources of measures are included in [Supplementary Table 1](#) (Blumberg et al., 1999; Ellison et al., 2007; Godin & Shephard, 1985; Jackson et al., 2003; Kandel & Davies, 1982; Nelson et al., 2008; Yanovski, 1993). Regarding aspects of health, the review includes all analyses relating to psychosocial well-being (i.e., depressive symptoms, stress, and interpersonal relationships), food insecurity, physical activity, screen media use, eating behaviors, and disordered eating.

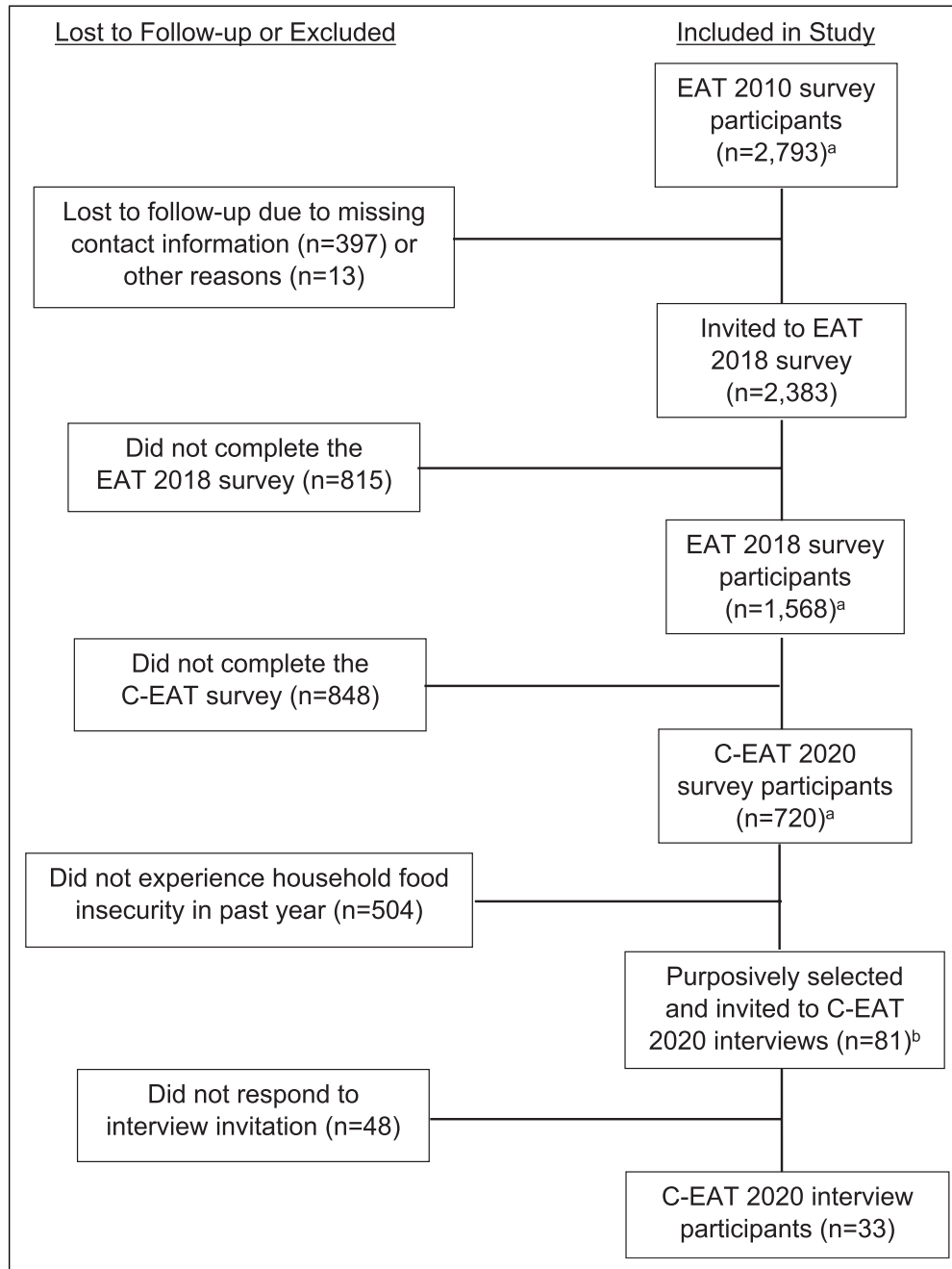
### C-EAT Study Design

The C-EAT study involved online surveys and virtual, individual in-depth interviews with participants in the EAT 2010–2018 (Eating and Activity over Time) longitudinal study (see [Figure 2](#)). The University of Minnesota Institutional Review Board Human Subjects Committee approved all protocols for the EAT 2010–2018 and C-EAT studies. Participants in the EAT 2010–2018 study were enrolled during the 2009–2010 academic year when they were adolescents (mean age =  $14.4 \pm 2.0$  years, total baseline sample  $n = 2,793$ ) and completed a

follow-up EAT 2018 survey as emerging adults in 2017–2018 (mean age =  $22.0 \pm 2.0$  years; total follow-up sample  $n = 1,568$ ) (Hazzard et al., 2021; Neumark-Sztainer et al., 2021). Details of the EAT 2010–2018 study design and the participants who completed both waves are available on the study website (<https://www.sph.umn.edu/research/projects/project-eat/>).

Participation in both waves of the EAT 2010–2018 longitudinal study was the sole inclusion criteria for invitation to participate in the C-EAT survey. Email and text message invitations for the C-EAT survey were sent out shortly after stay-at-home orders were implemented in Minnesota and up to five reminders were sent using multiple modes (mail, email, text messages) to reach participants during the initial months of the COVID-19 pandemic. All participants in the longitudinal study were eligible to participate; the C-EAT survey did not have any exclusion criteria. To ensure the timely dissemination of findings on the psychosocial well-being and health of young people, analyses of the C-EAT survey data were conducted throughout the initial months of the pandemic. Analyses were carried out using a combination of quantitative and qualitative methods. As detailed in previous publications, linear and logistic regression models were examined when appropriate and both inductive and deductive approaches to thematic analysis were employed (Emery et al., 2021; Larson et al., 2021a; Simone et al., 2021). There were multiple public health concerns identified based on survey data collected during stay-at-home orders, including a high prevalence of food insecurity (Larson et al., 2021c; Puhl et al., 2020). The researchers accordingly made the decision to continue collecting survey data through October 2020 and to additionally carry out in-depth, individual interviews with participants who had recently experienced food insecurity. Racial justice uprisings following the murder of George Floyd in Minneapolis, Minnesota in May 2020 also had a large impact on food access for many emerging adult participants in the study cohort (Prasad et al., 2021). The interview script accordingly addressed relevant concerns about neighborhood food access and experiencing racism in the context of accessing food resources.

**C-EAT Survey Sample.** Responses to the C-EAT survey had been received from 218 young people at the time that COVID-19 emergency stay-at-home orders were lifted in Minnesota on the 18th of May 2020 and a total of 720 young people completed the online survey between the months of April to October 2020 (46% of the cohort sample). Survey respondents included 447 females, 263 males, and 10 participants identifying with another gender identity. The distribution of ethnic/racial backgrounds reported by participants was similar but more diverse than the overall population in Minneapolis-St. Paul, Minnesota. Participants identified their ethnic/racial backgrounds as 30% White, 24% Asian American, 18%



**Figure 2.** Flow diagram of participation in the EAT 2010, EAT 2018, and C-EAT 2020 surveys and C-EAT interviews. (a) Participants who responded to at least 25% of survey items were included in the survey sample. (b) Participants were purposively selected to ensure the inclusion of parents and persons who were not parents.

African American or Black, 16% Hispanic, and 12% mixed or other. The distribution across categories of household socioeconomic status (SES) based primarily on parents' educational attainment at baseline was: 33% low, 37% low-middle or middle, and 30% upper-middle or high. Most survey respondents (90%) were living in Minnesota at the time they completed the C-EAT survey and had a mean age of  $24.7 \pm 2.0$  years.

**C-EAT Interview Sample.** Survey data on past year experiences of food insecurity (defined as lacking dependable access to adequate food for active, healthy living) were used in combination with reports of past month experiences of food insufficiency (defined by having eaten less than you felt you should and having been hungry because of lack of money to buy food) and parental status to identify an interview sample (Larson et al., 2021a). Potential participants were excluded if

they had not experienced food insecurity within the past year and participants were purposively selected to ensure the inclusion of parents and persons who were not parents. Interview invitations were sent out by email or text message and interviews were completed by phone or videoconference with 33 emerging adults during the months of July to October 2020. The interview sample included 29 females and 4 males; 42% of participants were the parent of one or more child. Participants identified their ethnic/racial backgrounds as 27% Hispanic, 24% Asian American, 21% African American or Black, 18% White, and 9% mixed or other. The living situations reported by participants were 9% living alone, 15% living with a spouse or partner, 18% living with roommates or friends, and 24% living with their parent(s).

## Results

A summary with quantitative details of key findings is provided for each of the dimensions of health that have been examined as part of research using C-EAT study data (see [Table 1](#)): mental health (psychosocial well-being), social health (interpersonal relationships), and nutritional and physical health (physical activity, screen time behaviors, and eating behaviors and disordered eating). Additionally, this summary provides a synthesis of findings regarding food insecurity and population groups at greatest risk for poor health outcomes.

### *Psychosocial well-being and interpersonal relationships*

Results of quantitative and qualitative analyses using C-EAT survey data have strongly suggested that events related to COVID-19 had consequences for psychosocial well-being and the interpersonal relationships of emerging adults (see below and [Table 1](#)). Most C-EAT survey respondents perceived that events related to COVID-19 had at least somewhat impacted their mood or stress ([Emery et al., 2021](#)). Persons at particularly high risk of reporting elevated levels of depressive symptoms and stress included those who had experienced weight stigma prior to the pandemic and males who were essential workers ([Berge et al., 2021b](#); [Puhl et al., 2020](#)). Respondents who experienced an impact of the pandemic on their mood or stress also endorsed higher levels of depressive symptoms and stress and lower levels of stress management capability ([Emery et al., 2021](#)). Themes among the open-ended comments of survey respondents suggested that psychosocial impacts have included high and persistent emotional distress, stress directly related to COVID-19 (e.g., fear of infection), stress related to interpersonal connectedness (e.g., social isolation), economic stress, and challenges in coping with stress (e.g., loss of coping strategies) ([Emery et al., 2021](#)). For example, one C-EAT survey respondent stated “*My stress level has been elevated and sometimes it affects my entire day...to the point where it makes me indecisive about my choices like what to make to eat or what to do for the day*” ([Emery et al., 2021](#)).

One-third of C-EAT survey respondents reported that substance use and alcohol consumption were influenced by events related to COVID-19 ([Emery et al., 2021](#)). Respondents’ detailed comments further revealed that impacts on substance use included modest to significant increases in alcohol consumption and, to a lesser extent, use of marijuana and tobacco products ([Emery et al., 2021](#)). Themes among the open-ended survey responses indicated that some emerging adult respondents had decreased their substance use due to reduced social activities; however, most reported using more substances during the pandemic for stress management or because of boredom and more time at home ([Emery et al., 2021](#)). Participants reported changes in both the frequency and quantity of alcohol consumption. For example, one respondent commented “*I have always loved an occasional drink here and there, but I find I’m drinking almost every night and drinking twice as much each time*” ([Emery et al., 2021](#)).

Approximately half of C-EAT survey respondents reported following public health recommendations for social distancing ([Berge et al., 2021b](#)). Another 42% of C-EAT respondents reported partial or not social distancing and eight percent reported being unable to social distance because of being an essential worker ([Berge et al., 2021b](#)). Adjustments in interpersonal relationships as a result of social distancing or events related to COVID-19 were reported by more than two-thirds of C-EAT survey respondents ([Larson et al., 2021b](#)). The extent of perceived influence of the pandemic was rated by respondents and, in models adjusted for demographic factors, living situation, and time spent using social media, the results showed the extent of this influence was related to multiple markers of poorer psychosocial well-being ([Larson et al., 2021b](#)). Respondents who perceived a greater extent of influence on their relationships had larger increases in depressive symptoms since the start of the pandemic ([Larson et al., 2021b](#)). Both depressive symptoms and stress during the pandemic were highest among respondents who reported that COVID-19 had very much versus somewhat or not at all influenced their relationships ([Larson et al., 2021b](#)). For example, the percentage of women who reported clinically significant depressive symptoms during the pandemic was 13% among those who did not perceive an influence of COVID-19 on their relationships, 33% among those who perceived there to be a moderate influence, and 54% among those who perceived that COVID-19 had a strong influence on their interpersonal relationships ([Larson et al., 2021b](#)).

The open-ended comments of C-EAT survey respondents on perceived adjustments in their relationships revealed both positive and negative consequences of the pandemic. Themes among the comments indicated that relationship adjustments included changes in time spent with family members and friends (e.g., more communication with family members, disconnected from friends), forms of communication (e.g., more phone calls, text messages), and the quality of communication and relationships (e.g., more bickering, socially “getting back to the basics”) ([Larson et al., 2021b](#)). One

**Table 1.** Results of the COVID-19 Eating and Activity over Time (C-EAT) Study: Mental Health, Social Health, and Nutritional and Physical Health Among Emerging Adults During the Pandemic.

Dimension of health	Outcomes assessed	Longitudinal component	Qualitative component	Findings
Psychosocial well-being (Berge et al., 2021b; Emery et al., 2021; Puhl et al., 2020)	Depressive symptoms Stress management Stress and mood Substance use	X	X	Most emerging adults (84%) reported that events related to the COVID-19 pandemic had influenced their mood or stress and 33% reported the pandemic had influenced their substance use. Major themes related to changes in mood and stress were identified along with factors that were perceived to influence changes in substance use. Males who were essential workers had higher average levels of depressive symptoms and perceived stress
Interpersonal relationships (Berge et al., 2021b; Larson et al., 2021b)	Changes in interpersonal relationships Depressive symptoms Stress	X	X	More than two-thirds (69%) of emerging adults reported that COVID-19 had somewhat or very much influenced their interpersonal relationships and time spent using social media was found to increase from 2018 to 2020. Events related to COVID-19 were perceived to have both positive and negative consequences for relationships
Physical activity (Folk et al., 2021; Barr-Anderson et al., 2021)	Hours of total and moderate-to-vigorous physical activity Recreational screen time	X	X	Changes in hours of moderate-to-vigorous (4.7–3.5 hours/week) and total physical activity (7.9–5.8 hours/week) showed decreases from 2018 to spring 2020 during COVID-19. Most (83.6%) participants likewise perceived that COVID-19 had influenced their physical activity and common reasons for change were identified
Screen time (Wagner et al., 2021; Larson et al., 2021b)	Media use, hours of recreational screen time	X	X	Recreational screen time (26.5–29.4 hours/week) showed an increase from 2018 to spring 2020 during COVID-19. The forms of screen time most commonly reported to increase were television shows and streaming services. Common reasons for changes in screen time were identified
Food insecurity (Larson et al., 2021c; Larson et al., 2021a)	Food insecurity Food insufficiency Ordering from fast-food restaurants Eating and food purchasing behaviors	X	X	During stay-at-home orders in spring 2020, the past-year prevalence of food insecurity was 28.4% and 41% of food insecure respondents had experienced food insufficiency. Food insecure respondents reported several changes in their eating behavior during the period of stay-at-home orders (e.g., having fewer meals and more snacks) Between Apr and Oct of 2020, nearly one third of emerging adults reported experiencing food insecurity in the past year. Interviews with food-insecure emerging adults led to the identification of several themes with regard to changes in their eating and feeding behavior

(continued)

Table 1. (continued)

Dimension of health	Outcomes assessed	Longitudinal component	Qualitative component	Findings
Eating behavior ( <a href="#">Berge et al., 2021a, 2021b</a> )	Family meal frequency Intake of food from fast-food restaurants	X		Emerging adults reported an average 0.6 meal/week increase in family meal frequency from prior to the pandemic. Family meals were associated with higher vegetable intake, greater home availability of fruit/vegetables and whole wheat bread, lower depressive symptoms and perceived stress, and greater perceived ability to manage stress. Female participants who partially or did not practice social distancing in line with recommendations had a higher prevalence of frequent fast-food restaurant use
Disordered eating ( <a href="#">Berge et al., 2021b</a> ; <a href="#">Simone et al., 2021</a> ; <a href="#">Puhl et al., 2020</a> )	Disordered eating (e.g., extreme weight control behaviors, binge eating) Eating to cope	X	X	The prevalence of disordered eating behaviors during the COVID-19 pandemic was assessed in reference to the past month and estimates were not directly comparable to previous prevalence estimates. Over eight percent of emerging adult participants endorsed extreme unhealthy weight control behaviors (UWCBs) in the past month, relative to approximately 13% of those who endorsed extreme UWCBs in the past year in 2018. Additionally, over 53% of the participants endorsed less extreme UWCBs in the past month during the COVID-19 pandemic, relative to around 52% reporting less extreme UWCBs in the past year in 2018. Over 14% of emerging adult participants reported binge eating in the past month compared to the 12% who reported past-year binge eating in 2018. The odds of binge eating during the COVID-19 pandemic were nearly three times greater for those who were teased about their weight prior to COVID-19 compared to those who were never teased about their weight. Stress, stress management, depressive symptoms, and extreme financial difficulties were significantly associated with eating to cope scores during the pandemic. Themes related to disordered eating during the pandemic were also identified. Female participants who partially or did not practice social distancing in line with recommendations had higher levels of eating to cope compared to participants who fully followed social distancing guidelines (score of 12.4 versus 11.0).

respondent, who was living with their family during the initial months of the pandemic, had the comment “*Varying views on COVID-19 and living the ‘new normal’ has caused disagreements and friction...causing a home relocation*” (Larson et al., 2021b).

### Physical activity and screen time

When responses to the EAT 2018 and C-EAT surveys were compared to examine changes during the COVID-19 pandemic, results showed evidence of decreases in physical activity and increases in use of social media and overall recreational screen time (Barr-Anderson et al., 2021; Folk et al., 2021; Wagner et al., 2021). Changes in activity patterns occurred across all intensities of physical activity and were attributed to several factors (e.g., stay-at-home orders, mental health concerns) (Folk et al., 2021). Moderate-to-vigorous and total weekly hours of physical activity were found to decrease between 2018 and the spring of 2020 (Barr-Anderson et al., 2021). Physical activity was observed to increase among 38% of emerging adult respondents and a small percentage (6%) reported no change in behavior; however, the majority (55%) reported spending less time being physically active during the pandemic than previously reported in the year 2018 (Folk et al., 2021). Social media use increased by an average of 11 minutes per day and overall recreational screen time increased from a weekly average of 25.9 hours in 2018 to 28.5 hours in spring 2020 (Wagner et al., 2021). Physical activity and recreational screen time during the pandemic were unrelated to self-reported adherence to social distancing recommendations, but observed changes in activity patterns were in line with the large percentages of emerging adults who reported events related to COVID-19 had influenced their physical activity and media use (Berge et al., 2021b; Folk et al., 2021; Wagner et al., 2021).

The C-EAT survey respondents made comments indicating the need for physical distancing and mental health concerns had contributed to changes in both physical activity and media use during the COVID-19 pandemic (Folk et al., 2021; Wagner et al., 2021). A grounded theory analysis of their detailed comments revealed that the spaces where emerging adults could engage in physical activity were limited by stay-at-home orders, gym closures, and safety concerns about exercising in public spaces (e.g., trails) (Folk et al., 2021). Some respondents reported having more free time for physical activity during the pandemic and being motivated to diversify how they engaged in activity; however, many participants reported shifting to more at-home physical activities and resulting challenges with maintaining a consistent routine were often experienced (Folk et al., 2021). For example, one respondent stated “*I have tried at-home workouts...but it doesn’t stick as well*” (Folk et al., 2021).

Media use was influenced by a desire to connect with others while maintaining physical distance along with experiencing

boredom during times when it was necessary to stay at home (Wagner et al., 2021). The open-ended comments of C-EAT survey participants indicated that mental health concerns served as both a barrier to physical activity (e.g., lack of energy) and a motivation for engaging in physical activity and limiting social media use (Folk et al., 2021; Wagner et al., 2021). Social media use contributed to anxiety and therefore some emerging adult participants made an effort to limit their screen time in order to help them maintain a more positive outlook (Wagner et al., 2021). Additional factors of relevance to changes in activity patterns during the pandemic were changes in occupational and active transportation patterns, concerns about neighborhood safety and racism, and a desire to stay informed of news (Folk et al., 2021; Wagner et al., 2021). With regard to screen time, one survey respondent stated “*I’ve been on social media a bit more than I usually would...there hasn’t been too [much] to do to fill my hours after work*” (Wagner et al., 2021).

### Food Insecurity

Food insecurity was highly prevalent with 30% of C-EAT survey participants indicating they had inadequate resources to purchase food in the past year (Larson et al., 2021a). Survey results indicated that 40% of food-insecure emerging adults had experienced food insufficiency at one or more times during the pandemic, representing 13% of the overall sample population. Changes in eating behavior occurred during COVID-19 because of food access challenges, but comments made in response to an open-ended survey question revealed that the dietary intake patterns of food-insecure participants were influenced by several additional factors such as changes in at-home food preparation behaviors (e.g., purchasing more food from stores and less food from restaurants; see Table 2). Additionally, in-depth interviews with food-insecure participants identified numerous barriers to local food access and accessing food assistance (Table 2) (Larson et al., 2021a). For example, interview participants described experiences of discrimination in food retail stores and concerns about the lack of safety measures to prevent COVID-19 transmission in stores and at food pick-up locations (Larson et al., 2021a).

### Eating Behavior and Disordered Eating

Changes in eating behavior and disordered eating (e.g., extreme weight control behaviors, binge eating) as a result of events related to the COVID-19 pandemic were reported by 73% of emerging adults in the overall C-EAT survey sample (Berge et al., 2021a; Simone et al., 2021). Among 585 participants who lived with at least one family member, family meal frequency was found to increase between 2018 and the spring of 2020 (Berge et al., 2021a). Emerging adult participants who reported at least one family meal per week during the pandemic were more likely to usually have fruits and vegetables available and fresh fruit accessible in the home, and



**Table 2.** Factors Influencing the Dietary Intake Patterns of Emerging Adults Who Experienced Food Insecurity During the COVID-19 Pandemic and Who Responded to Open-ended Survey Items<sup>a</sup> or Participated in an Individual, In-depth Interview<sup>b</sup>.

Factor	Themes	Selected quotes
Changing eating patterns <sup>a</sup>	<ul style="list-style-type: none"> <li>• Eating more or less food than normal</li> <li>• Eating fewer meals, more snacks</li> <li>• Eating different types of food</li> </ul>	“Sit around eating a lot more when I’m home all day. More snacking and have been eating more foods I can get via pickup rather than shopping at the store.”
Changing frequency of eating food from restaurants <sup>a</sup>	<ul style="list-style-type: none"> <li>• Less food from restaurants</li> <li>• More fast food</li> </ul>	“Just eating more and not very well lots of fast food.”
Preparing more food at home <sup>a</sup>	<ul style="list-style-type: none"> <li>• More at-home meal preparation</li> </ul>	“Making and preparing more food at home than eating out, not making as much income lately.”
Changing patterns of food shopping <sup>a</sup>	<ul style="list-style-type: none"> <li>• Frequency of shopping</li> <li>• Quantities of food purchased and shortages</li> </ul>	“I have been getting more food from the store and making dinners more often. But also getting a lot of snacks to eat.”
Barriers to local food access <sup>b</sup>	<ul style="list-style-type: none"> <li>• Concerns regarding the transmission of COVID-19 in food retail stores</li> <li>• Poor physical safety conditions and discrimination in food stores</li> <li>• Limited store hours and closures due to COVID-19 and racial justice uprisings</li> <li>• Limited availability of nutrient dense foods</li> </ul>	“When COVID first started with the president calling it the Chinese flu, it really affected us. My mom was more scared to go grocery shopping. So it was more convenient for me to go as I’m working, just grab the groceries...she was scared to get punched in the face and things like that.”
Barriers to accessing food assistance <sup>b</sup>	<ul style="list-style-type: none"> <li>• Failing to qualify for adequate benefits</li> <li>• Difficulties with locating food pantries and going during hours of operation</li> <li>• Poor availability of nutrient-dense, fresh foods at pantries</li> <li>• Safety concerns at food pick-up locations</li> </ul>	“I used to go to a food shelf in Saint Paul, but when COVID started, I was like, didn’t want to do that anymore because I didn’t want to go into those public places anymore.”

lower levels of perceived stress than those who had no family meals (Berge et al., 2021a). Additional markers of nutritional (e.g., eating more fruits and vegetables per day) and psychosocial (e.g., less depressive symptoms) well-being were associated with more frequent family meals in 2020 (Berge et al., 2021a). Female participants who partially or did not practice social distancing in line with recommendations had a higher prevalence of frequent fast-food restaurant use (i.e., three or more occasions per week) (Berge et al., 2021b). In contrast, the social distancing practices of male participants were unrelated to eating behavior (Berge et al., 2021b).

Many of the C-EAT survey participants reported engaging in disordered eating behaviors and eating to cope during the COVID-19 pandemic (Simone et al., 2021). In the past-month, the percentage of participants that reported disordered eating was 8% for extreme weight-control behaviors (e.g., self-induced vomiting), 53% for less extreme weight-control behaviors (e.g., skipping meals), and 14% for binge eating (Simone et al., 2021). Survey participants commented on mindless eating and snacking, a generalized decrease in appetite, marked increases in eating disorder symptoms, and eating in response to heightened emotional states (e.g., stress, anger, anxiety) (Simone et al., 2021). Additionally, some C-EAT survey participants reported reducing their food intake in response to stress or to avoid weight gain related to reductions in physical activity during

the pandemic (Simone et al., 2021). Persons who had previously reported experiencing weight stigma in response to the EAT 2018 survey were at particularly high risk for engaging in binge eating and having elevated levels of eating to cope during COVID-19 when compared to persons who had not experienced weight stigma (Puhl et al., 2020). Female participants who partially or did not practice social distancing in line with recommendations had higher levels of eating to cope (Berge et al., 2021b).

### *Population Groups at Greatest Risk for Poor Outcomes Across the Dimensions of Health*

Across multiple dimensions of health, the population groups at greatest risk for markers of compromised well-being and poor outcomes during the pandemic included women; emerging adults who identified as Black, Indigenous, or a Person of Color; those who were raised in lower SES households; parents of young children; and persons who had previously experienced mental health challenges or weight stigma. Women experienced more depressive symptoms and were more likely than men to experience an influence of the pandemic on their mood and interpersonal relationships (Emery et al., 2021; Larson et al., 2021b). Additionally, women were more likely than men to experience food insufficiency during COVID-19 (Larson et al.,

2021a). Compared to C-EAT survey participants who identified as non-Hispanic White, those who identified their ethnicity/race as Black, African American, or mixed/other were more likely to experience food insufficiency and had lower levels of physical activity during the pandemic while participants who identified as Asian American reported both lower levels of physical activity and higher levels of recreational screen time (Barr-Anderson et al., 2021; Larson et al., 2021a). Family meal frequency was lowest among participants who identified as Black, African American, or Asian American (Berge et al., 2021a). Emerging adults raised in lower SES households were similarly at risk due to elevated rates of food insufficiency, lower levels of physical activity, and fewer family meals; however, they were less likely than higher SES persons to experience an influence of the pandemic on their substance use (Berge et al., 2021a; Emery et al., 2021; Larson et al., 2021a). Parents of young children were more likely than participants without children to experience changes in their interpersonal relationships and food insufficiency (Larson et al., 2021a, 2021b).

## Discussion

Findings from the C-EAT study consistently demonstrated that the COVID-19 pandemic has negatively influenced multiple components of health (Figure 1) as a result of its impact on psychosocial well-being, food security, and the health behaviors of many emerging adults (Barr-Anderson et al., 2021; Berge et al., 2021b; Emery et al., 2021; Folk et al., 2021; Larson et al., 2021a, 2021b; Simone et al., 2021; Wagner et al., 2021). In only a few instances did the findings identify some promising practices (e.g., routines, effective coping strategies) that may help emerging adults to adapt during public health crises (Berge et al., 2021a; Emery et al., 2021). Among emerging adult populations, mental health challenges, food insecurity, and health risk behaviors were prevalent public health problems prior to the pandemic (El Zein A et al., 2018; Larson et al., 2020; VanKim et al., 2012; VanKim & Laska, 2012). Disparities in health behaviors and access to nutrient-dense foods and recreational facilities have also been documented by numerous previous studies in the past decade (Abercrombie et al., 2008; Engelberg et al., 2016; Hilmers et al., 2012; Nelson et al., 2009; Taylor et al., 2007). The prevalence of these problems has grown and existing health inequities have been exacerbated as a result of pandemic conditions, indicating an urgent need for attention to the potential long-term impact of the pandemic. The C-EAT study findings suggest the pandemic could compromise the health trajectories of emerging adults, unless positive shifts occur in health behaviors during the next phases and aftermath of the pandemic (Barr-Anderson et al., 2021; Berge et al., 2021a; Emery et al., 2021; Larson et al., 2021a). A more complete understanding of the potential for the pandemic to have a long-term impact on multiple components of health and its

implications for the transition to adulthood will require further research in diverse populations and ongoing surveillance.

This review provides a framework to synthesize what has been learned about the influence of the pandemic on multiple dimensions of health and help direct future research. The framework (Figure 1) summarizes observed problems that were commonly identified by emerging adults of diverse backgrounds along with examples of how these health problems were connected across the domains of mental, social, and nutritional and physical health. For example, across the domains of mental health and nutritional and physical health, it was observed that mental health concerns were a barrier to engaging in physical activity and further impacted decisions about the need to reduce screen time and interactions with others via social media (Folk et al., 2021; Wagner et al., 2021). Several social and structural barriers to health were highly relevant to health problems experienced during the pandemic, and in combination, created unique challenges that are important to understand and address as part of efforts to promote health equity. In particular, strategies to promote nutritional and physical health may benefit from attending to the finding that emerging adults who experienced food insecurity were also more likely to experience discrimination and live in neighborhoods where they felt unsafe (Larson et al., 2021c).

The theory of emerging adulthood is also relevant to building understanding of the impact of the pandemic on the health of emerging adult populations as it describes how the exploration of various educational, employment, and recreational opportunities are common during the transition to adulthood (Nelson, 2021). It is therefore notable that the COVID-19 pandemic has introduced many barriers to relocating and pursuing such opportunities (Settersten et al., 2020). Lost opportunities for completing a post-secondary degree, building one's professional networks, and gaining full-time employment will likely extend the time required for many emerging adults to complete the transition to adulthood (Maynes & Waltner, 2020; Settersten et al., 2020). The rapidly growing literature on the toll of the pandemic indicates that the mental health impact of lost opportunities in combination with the challenges of facing disrupted daily routines, social isolation, barriers to effective coping strategies, worries about COVID-19 infection, stigma, and financial struggles have led to high levels of stress, anxiety, and depressive symptoms among emerging adult populations (Baloch et al., 2021; Deng et al., 2021; Emery et al., 2021; Essadek & Rabeyron, 2020; Evans et al., 2021; Firkey et al., 2022; Fruehwirth et al., 2021; Germani et al., 2020; Giuntella et al., 2021; Hawes et al., 2022; Kaparounaki et al., 2020; Maynes & Waltner, 2020; Pearl & Schulte, 2021; Vahratian et al., 2021; Wang et al., 2020; Wathelet et al., 2020; Wilson et al., 2021). Although most existing studies have focused on college and university populations when investigating the impact of the pandemic on emerging adults, findings from the C-EAT study and national data suggest that high levels of depressive symptoms and

stress are broadly impacting students and non-students (Vahratian et al., 2021). The likely impact of anxiety, depressive symptoms, and stress on personal and interpersonal functioning among emerging adults is of immediate public health concern and a combination of interventions and ongoing monitoring will likely be needed to prevent any long-term effects that may delay young people in their efforts to gain independence (DeBattista, 2005; Knight & Baune, 2018). Additionally, it will be important for research to build on what is known about common barriers to receiving mental health care among emerging adults (e.g., work and childcare commitments, cost is not affordable) to help ensure that mental health care needs are met (Cadigan et al., 2019).

The theory of emerging adulthood identifies relational reorganization as another important task for young people to complete as part of the process of individuation; however, the COVID-19 pandemic has created many barriers to the re-centering of relationships (Nelson, 2021; Settersten et al., 2020). The pandemic has led to shifts in living arrangements, severely limited opportunities to socialize with friends, delayed cohabitation and marriage for romantic partners, and postponed attempts to conceive children (Bevan et al., 2022; Giuntella et al., 2021; Settersten et al., 2020). In line with other research on relationships during the COVID-19 pandemic, findings from the C-EAT study showed that pandemic-related adjustments in the relationships of emerging adults with their family members and friends have included both positive and negative changes in the time spent in communication, forms of communication, and the quality of communication and relationships (Bevan et al., 2022; Larson et al., 2021b). For example, as it has been necessary for many emerging adults to return to living with their family of origin, changes in communication patterns have created the opportunity for some emerging adults to improve their family relationships but others have experienced more bickering and limited autonomy (Larson et al., 2021b; Settersten et al., 2020). The impact of the pandemic on relationships is of public health concern with regard to observed linkages to poorer mental health and increases in relationship abuse (Larson et al., 2021b; Sacco et al., 2020).

Establishing independence with regard to eating, physical activity, and sleep behaviors is another critical task of emerging adulthood with the potential to impact stress and long-term health (Moriarty et al., 2021; Savage et al., 2021; VanKim et al., 2012; Zhang et al., 2020). The theory of emerging adulthood recognizes that many young people engage in risky and unhealthy behaviors during this life stage because, on average, brain development is not complete until well into the twenties (Nelson, 2021). Accordingly, many young people may struggle to conceptualize risk, delay pleasure, and control their emotions during emerging adulthood (Nelson, 2021). Many young people also experience increased freedom to make decisions for themselves during this life stage and have limited responsibility for the well-being of others (Nelson, 2021). Further, intense feelings of

uncertainty may lead to behaviors such as disordered eating, irregular sleeping, and spending excessive time engaged with screen media (Nelson, 2021). The COVID-19 pandemic has exacerbated risk for engaging in unhealthy behaviors as a result of its negative impacts on maintaining a sleep schedule along with access to nutrient-dense foods and opportunities for physical activity. Findings from the C-EAT survey showing modest to significant increases in substance use, reduced physical activity, and prevalent disordered eating behaviors are in line with a growing body of research documenting negative impacts of the pandemic on the health behaviors of populations across multiple life stages (Bertrand et al., 2021; Castañeda-Babarro et al., 2020; Emery et al., 2021; Firkey et al.; Folk et al., 2021; Giuntella et al., 2021; López-Valenciano et al., 2021; Moriarty et al., 2021; Neville et al., 2022; Romero-Blanco et al., 2020; Savage et al., 2021; Simone et al., 2021; Trott et al., 2022; Wilson et al., 2021; Zhang et al., 2020). As pictured in the multidimensional health framework that synthesizes aspects of pandemic-related changes in health among emerging adults (Figure 1), the developmental challenges of emerging adulthood may make the task of modifying unhealthy behaviors established during COVID-19 to be particularly difficult if young people do not have adequate sleep or resources and thereby lead to lasting health impacts in the aftermath of the pandemic (Du et al., 2021). For example, research has documented the experience of food insecurity during emerging adulthood is linked to chronic disease risk factors (e.g., elevated blood pressure, prediabetes) (Lee et al., 2018, 2019).

Surveillance of the high prevalences of food insecurity, psychosocial distress, and unhealthy behaviors among emerging adulthood populations has also identified evidence of disparities (Krueger et al., 2020; Marrast et al., 2016; Massetti et al., 2017; NeMoyer et al., 2020; Strutz et al., 2015; VanKim et al., 2012; VanKim & Laska, 2012). Historical accounts of previous pandemics and research conducted prior to the COVID-19 pandemic have documented the consequences of structural racism for health outcomes and evidence of glaring disparities by ethnicity, race, and SES among U.S. emerging adult populations (Hutchins et al., 2009; Krishnan et al., 2020; Marrast et al., 2016; Nelson Laska M et al., 2010; VanKim et al., 2012; VanKim & Laska, 2012). Young people from low SES and ethnically/racially minoritized backgrounds are more likely to experience food insecurity, consume fast food and sugar-sweetened beverages, participate in inadequate physical activity, have a high body mass index, and lack access to mental health care (Éliás & Jámor, 2021; Marrast et al., 2016; NeMoyer et al., 2020; VanKim & Laska, 2012). Additionally, young people of low SES have been found to more often use unhealthy weight control behaviors, have fewer family meals, and have poorer fruit and vegetable intakes (Utter et al., 2018; VanKim et al., 2012; VanKim & Laska, 2012). Findings from the C-EAT survey suggest the pandemic has exacerbated existing inequities in health behaviors among emerging adults and, if these disparities are not addressed,

they are likely to lead to starker disparities in future adult health outcomes (Berge et al., 2021a; Emery et al., 2021; Larson et al., 2021a). The research findings point to the need for strategies to address social and structural determinants of health, systemic racism, and interpersonal experiences of racism that are barriers to engaging in healthful behaviors. The findings further emphasized the importance of addressing supports for emerging adults to cope with experiences of racism as they form their personal racial identity (Folk et al., 2021; Hagiwara et al., 2021; Larson et al., 2021a; Thornton et al., 2016; Williams et al., 2019).

Findings from the C-EAT survey suggest that a portion of emerging adult populations are engaging in health-promoting behaviors during the COVID-19 pandemic. For example, 23% of emerging adults who reported pandemic-related changes in their mood or stress also reported engaging in adaptive coping strategies (e.g., self-care) to manage their distress (Emery et al., 2021). In addition, findings indicated that there were protective associations between engaging in family meals and emerging adult diet quality, healthy food availability, and emotional well-being (Berge et al., 2021a). Such findings suggest implications for future public health crises in that engaging in routines, such as family meals, may provide important opportunities for interacting with others as well as structure for eating healthy food, and act as a buffer for the highly stressful and uncertain environment brought about by the pandemic. More than a third of emerging adults (38%) increased their physical activity during COVID-19 by exercising at home, participating in outdoor activities, and engaging in active transportation (e.g., walking or biking to work/school) (Folk et al., 2021). These findings demonstrate resilience and highlight some “silver linings” of the pandemic that interventions targeting emerging adults could help to sustain and build upon.

There are both limitations and strengths to consider in drawing conclusions from this synthesis of findings from the C-EAT study. In contrast to most systematic reviews of the literature, the current review did not use a formal process to evaluate the quality of included studies and did not involve a quantitative meta-analysis of collected results. Caution should also be used in drawing generalizations from C-EAT findings as the observational design does not allow for drawing inferences regarding causality and many assessments used in the studies were qualitative in nature (e.g., perceived influence of events related to COVID-19 on eating and physical activity behaviors). Additional limitations of the design include that most C-EAT participants were living in Minnesota during the pandemic, the timing of the study led to a low response rate, men were underrepresented among the survey (36% male) and interview (12% male) participants, and survey data collection ended in October 2020. The C-EAT study findings may be less relevant for young people living in other regions of the U.S. and in other countries where similar research has been conducted, but not focused on

emerging adulthood (Forscher et al., 2020; Lamy et al., 2022; Uccella et al., 2021). As no information was collected on student status, it was also not possible for the C-EAT study to address pandemic challenges of specific relevance to students and non-students. Strengths include the integration of both quantitative and rich qualitative data, the participation of sociodemographically diverse emerging adult participants, and the timely collection of surveys during the initial phases of the pandemic. Mixed-methods study designs can help to deepen understanding of complex challenges in a timely manner as has been crucial in developing public health strategies during the COVID-19 pandemic. The combination of survey and interview data that were analyzed as part of C-EAT allowed for describing a broad scope and complexity of health problems with a unique focus on the impact for young people who were navigating the life stage of emerging adulthood.

In summary, the results of the C-EAT study and related research have several implications for future studies addressing the well-being of emerging adult populations during and in the aftermath of the COVID-19 pandemic (see Table 3). The existing evidence base suggests that young people of this age are vulnerable to the economic and psychosocial impacts of public health measures for reducing COVID-19 transmission (Gao et al., 2021; Settersten et al., 2020). The pandemic exposed gaps in health services and programs that led to a high prevalence of food insecurity, mental health challenges, and increases in health behavior inequities among emerging adults. Although some emerging adults experienced improvement in one or more dimensions of health, most changes in markers of well-being were reflective of increased risk for negative consequences. Future research among emerging adults and meta-analytic review studies will be needed to quantify the influence of the COVID-19 pandemic on the multiple dimensions of health that have been impacted (Figure 1) and the many connections between these dimensions of health. The development of validated measures for assessing the influence of the COVID-19 pandemic will be important for ongoing surveillance studies and quantifying changes in health outcomes over time to inform approaches to reduce health inequities and support young people in establishing independence (Table 3). Policies and health services and programs will need to be refined based on ongoing surveillance and efforts to evaluate interventions; however, findings from the C-EAT study and related research have demonstrated that action is needed to address the well-being of young people and prepare for future public health emergencies (Bevan et al., 2022; Mont’Alvao et al., 2020). For example, it will be critical that interventions are developed to support emerging adult populations in learning more adaptive coping strategies and reducing the use of unhealthy behaviors. Environmental supports, such as the designation of more outdoor spaces for physical activity and inclusive preventive messaging (e.g., representing diverse body shapes), along with

**Table 3.** Research Recommendations for Informing Approaches to Reduce Health Disparities and Improve Health among Emerging Adults in the Next Phases and Aftermath of the COVID-19 Pandemic.

- Conduct surveillance studies and related research to systematically investigate whether, how, and why the COVID-19 pandemic may differentially impact dimensions of well-being (e.g., psychosocial, physical activity, eating behavior) among individuals belonging to different gender, ethnic, racial, and socioeconomic groups
- Monitor indicators of psychosocial and behavioral well-being among emerging adults, including depressive symptoms, anxiety, stress management, substance use, family functioning, and quality of relationships. Pay special attention to high-risk groups, including those who experienced mental health challenges prior to COVID-19
- Monitor and assess the effectiveness of interventions for physical activity and eating behaviors, including disordered eating and eating disorders, with a particular focus on those at highest risk for problematic behaviors.
- Develop strategies and tools for mitigating the negative consequences of relying on videoconferencing technology and social media to communicate with others during times of isolation. Assess shifts in the use of screen media as physical distancing guidelines evolve and identify factors that influence whether use of screen media is correspondingly reduced.
- Continue to monitor trends and disparities in food insecurity, food shopping and preparation behaviors, and eating behaviors.
- Examine the role of family meals in mitigating chronic stress and supporting healthy eating behaviors among emerging adults with diverse living situations, forms of employment, and caregiving responsibilities.
- Monitor how emerging adults engage in opportunities to prepare for adulthood, including completion of a post-secondary degree, gaining various forms of employment, and cohabitation with a romantic partner.
- Assess trends in the timing of relational reorganization and family formation.
- Examine how experiencing various forms and possibly multiple forms of stigma and discrimination may impact dimensions of well-being as in-person activities are resumed.
- Assess whether routines that were identified as protective during the COVID-19 pandemic (e.g., family meals) may be continued and/or have long-term benefits.

supports for establishing routines such as shared meals, are further likely to be needed to support the broad adoption of healthy coping strategies during and in the aftermath of public health emergencies.

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### Transparency and Openness Statement

The data contained in this manuscript have been previously published or is under review. Additional details of the data described can be obtained from the corresponding author. No aspects of the study were pre-registered.

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### Supplemental Material

Supplemental material for this article is available online.

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### Author Biographies

**Nicole Larson**, PhD, MPH, RDN is a Senior Research Associate in the Division of Epidemiology and Community Health, School of Public Health at the University of Minnesota. Dr. Larson has been the Project Director for the Project EAT studies since 2007. She is a registered dietitian and behavioral health researcher with expertise in the eating behaviors of child, adolescent, and young adult populations. Her research focuses on the identification of factors within social and physical environments that may be modified to promote healthy lifestyle behaviors and reduce barriers to the attainment of health equity among diverse populations.

**Rebecca Emery Tavernier**, PhD, LP, PMH-C is a Licensed Clinical Health Psychologist and Adjunct Assistant Professor at the University Minnesota Medical School, Duluth campus. Her research primarily focuses on improving health in women, particularly during the perinatal period. She has expertise in smoking cessation, mental health promotion, weight management, and eating disorder treatment and prevention. Much of her work involves the use of clinical trials and public health approaches to identify and address health disparities to promote improved behavioral health outcomes.

**Jerica M. Berge**, PhD, MPH, LMFT, CFLE is a tenured Professor and Vice Chair for Research in the Department of Family Medicine and Community Health at the University

of Minnesota Medical School. Dr. Berge is both a researcher and behavioral medicine clinician. She is a licensed mental health therapist and supervisor who specializes in integrated care and community-based partnerships to address family health issues. Her NIH research agenda focuses broadly on child and family health promotion, with a particular focus on weight and weight-related health behaviors across the lifespan, women's health, and integrated care. She conducts both obesity prevention and treatment studies within primary care settings with the ultimate goal of decreasing obesity disparities in low income and minority households. Dr. Berge has expertise in conducting mixed-methods studies that include observational methods such as, ecological momentary assessment (EMA), mHealth, and video-recorded family tasks to more fully understand the complex family dynamics and processes related to health and well-being. She is the director of the Healthy Eating and Activity across the Lifespan (HEAL) Center. Additionally, she is the director for the Center for Women in Medicine and Science (CWIMS) and the Co-director of the Community and Collaborations core in the Clinical and Translational Science Institute (CTSI) at the University of Minnesota Medical School.

**Daheia J. Barr-Anderson**, PhD, MSPH is an Associate Professor in the Department of Kinesiology at the University of Minnesota. Dr. Barr-Anderson's research focuses on physical activity, sedentary behaviors, and obesity prevention in children and adults. She is particularly interested in home- and community-based, environmental interventions that incorporate both physical activity and nutrition to achieve healthy outcomes and to decrease racial/ethnic health inequalities.

**Dianne Neumark-Sztainer**, PhD, MPH is a Professor and the Division Head for the Division of Epidemiology and Community Health in the School of Public Health at the University of Minnesota. Her research focuses on the prevention and reduction of weight-related problems, including obesity, poor dietary intake, inadequate physical activity, disordered eating behaviors, and body dissatisfaction. Her qualitative, epidemiological, and intervention research has primarily focused on young people from ethnically/racially diverse and low-income backgrounds. As the Principal Investigator for the Project EAT studies, she leads a team of researchers who have greatly contributed to what we know about eating and weight-related problems in young people.