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Coping strategies and household stress/violence in remote Alaska: a longitudinal view across the COVID-19 pandemic

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ABSTRACT

The COVID-19 pandemic has introduced novel stressors. Remote/rural communities have experienced additional difficulties, while also potentially benefitting from unique sources of resilience against such stressors. However, very little research has been conducted in remote/rural communities regarding coping and stress/violence. This study examines coping strategies and household stress/violence in remote Alaska communities across the pandemic through three online survey waves (November 2020–September 2021) (total n = 1,020). Across all waves, personal care was reported most frequently followed by social activities, religious activities, and traditional/subsistence activities. Substance use combined (alcohol, nicotine, marijuana) and seeking counselling were less frequently reported, with significant differences across gender and age categories. Less than 10% of individuals reported physical violence towards children and/or other adults within the household. Overall, these findings indicate that individuals are primarily relying on positive coping strategies to contend with additional stress brought into their lives by the COVID-19 pandemic.

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Introduction

The COVID-19 pandemic has introduced novel stressors into communities, families, and the lives of individuals. Such stressors have exacerbated existing vulnerabilities in infrastructure, economic stability, mental and physical health, and other aspects of daily life. School and community-wide shutdowns as well as decreased access to basic services have contributed to increased social isolation, financial instability, food insecurity, and compromised mental and physical health (e.g. Ref [1–4].). Such increased stress has been associated with greater household tension and discord, and with the adoption and practice of a variety of coping mechanisms that vary by population and geographic location [5–7].

Individuals and families living in remote and rural communities in the US have experienced additional difficulties, while also having access to and benefitting from some sources of protection against such stressors. Vulnerabilities associated with living in rural communities include more limited access to health care services, greater disruptions in food and medical supply chains, as well as less stable internet infrastructure that many in urban and suburban areas relied upon more heavily for continuation of work and school attendance and activities (eg. Ref [1,8].). Many remote Alaska community residents experience high housing density, as well as particularly precarious access to health and basic services due to reduced and cancelled airline and/or ferry services and/or travel restrictions to and from communities; activities which are the lynchpin for many supply chains across the state [9–11]. Here, we define remote as off the road system, excluding Juneau, the capitol of Alaska, due to its greater access to health care, infrastructure, and relatively large population of more than 30,000 residents.

Conversely, living in rural and remote communities may also confer certain protections and access to coping strategies that help alleviate or reduce the impact of pandemic-related stressors. Due to lower population density and remote locations, many rural communities maintained greater continued access to the outdoors and food-harvesting activities (e.g. hunting, fishing, berry-picking) compared to urban areas. In Alaska, harvesting wild foods (also referred to as subsistence) and traditional Alaska Native food-related activities are vital for accessing nutritious foods, and are also a fundamental aspect of culture, identify, and self-determination for Alaska Native people [12–14]. Engaging in traditional food harvest and cultural

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activities are also may be protective for both mental and physical health outcomes among Alaska Native people [15–17]. The ability to continue subsistence/traditional food-related activities may also provide a more secure access to nutritious and culturally meaningful foods. Existing studies also indicate that continued access to the outdoors can have a protective effect for mental health [18], and other rural communities felt generally more prepared and adaptable for pandemic conditions [19]. Furthermore, historical resilience, traditional connection, and strong community may provide strength and support during the COVID-19 pandemic for Alaska Native people [20]. Although variable by community, rural residents overall may also experience more social connectedness and sense of belonging within communities with smaller populations. In Alaska in particular, remoteness also provided the ability for local municipal and Alaska Native tribal leadership to self-determine travel, testing, and vaccination requirements and protocols. This allowed more rapid implementation of COVID-19-related policies, which likely slowed COVID-19 transmission in remote communities especially prior to vaccine availability.

In response to increased tension or adversity as has been experienced during the COVID-19 pandemic, individuals may employ multiple coping strategies in order to relieve added, including maintaining healthy ways of life, finding alternative modes of socialising, engaging in prayer or other religious activities, or seeking professional health care services [6,21–24]. However, pandemic-related social disconnection and disruptions in economic security, schooling or childcare, and social/cultural gatherings can also be associated with increased alcohol, nicotine, and use of other types of substances [6,25,26]. Moreover, different coping strategies may be utilised by some groups more than others. For example, men and younger people have been shown to use substances more often than women and older people to cope with stress, respectively, [27–30], and older people may rely more on religious support compared to younger people [31].

In this paper, we use a strengths-based approach to understand how the COVID-19 pandemic impacted household stress and the ways in which remote Alaska residents responded using a variety of coping mechanisms. The data presented here were collected as a part of a larger study on the impacts of and responses to the COVID-19 pandemic on remote Alaska communities off of the road system. Between September 2020 and March 2021, we tracked the impacts of the pandemic on daily life and individual responses, including household stress and coping strategies, in remote Alaskan communities through three rounds of state-wide online surveys spanning multiple time periods across the pandemic from November 2020 to September 2021 [3,4]. This work is aimed at informing general and targeted public health and human services approaches to the current COVID-19 pandemic, and any similar future disruptions to daily life.

Materials and methods

Research context

The present study examining coping strategies and household stress/violence is part of a larger umbrella project on the impacts of COVID-19 on daily life in remote Alaska communities (see Ref [2–4].). In September 2020, approximately six months after the first COVID-19 cases were reported in Alaska, we began the umbrella project. To inform survey development, we first conducted 23 key informant interviews with leaders, providers, and residents of remote Alaska between September and December of 2020. These interviews allowed for the identification of areas of interest and culturally appropriate framing and wording of survey questions. The data presented here on coping and household stress represents a small portion of the larger online survey, which included questions regarding life changes due to COVID-19, emotions and worries related to the virus, perceived risks, sources of information, vaccine and testing perceptions, and demographic questions regarding age, gender, level of education, household income, occupation, healthcare access, number of people living in the household, and access to water and sanitation services. Healthcare access in this context refers to access to a hospital, clinic, and/or community health aids. There are a limited number of hospitals in remote Alaska, which are located in larger hub communities. Clinics provide mid-level care, and community health aids serve remote residents through the Alaska Tribal Health system assess and provide emergent, acute, and chronic care to residents in their communities. Alaska Native residents may utilise Indian Health Service health care providers and/or private insurance.

Study participants

Survey respondents were recruited through community contacts and a Facebook advertisement targeting people living in remote Alaskan communities. The Facebook advertisement and emails to community contacts including a link to the online survey on REDCap, a secure web platform for building and managing online surveys. All surveys were completed online.

Community contacts included the key informants mentioned above, the research team's professional contacts across remote Alaska, and those who the key informants and professional contacts suggested we send the survey to directly. Because survey participation remained anonymous, it is not possible to determine whether community contact participation changed across survey rounds, but the vast majority of respondents were recruited through Facebook, and community contacts were sent every round of the survey. All survey participants were at least 18 years old and were residents of a remote Alaska community, which was ensured by limiting responses to those reporting residential zip codes of remote communities. To be included in a drawing for one of several $75 gift cards and/or be considered for a survey follow-up interview, participants had the option to provide contact information. Survey responses were limited to remote communities in Alaska off the road system, excluding Juneau because of its large size (pop. 32,200) and greater access to basic and health care resources. More than 80% of all surveys were complete, and the average time taken to complete the survey did not exceed 23 minutes. Potential respondents were required to provide written, informed consent prior to filling out the survey. This study was approved by the Alaska Area IRB (Protocol #1590924-7) and the Alaska Native Tribal Health Consortium Health Research Review Committee, and the Southcentral Foundation Review Committee (concept review).

Data collection

Study data were collected through three rounds of statewide online surveys of remote Alaska community members (survey 1: November 9–15 December 2020; survey 2: March 9–25, 2021, survey 3: September 2–26, 2021) (see Ref [3]. for timeline of important relevant events). The varying duration of surveys was related to the number of individuals participating in the survey. For example, recruitment for the first wave was slow initially, so we continued to accept participants in order to improve response rate. It is reasonable to assume that the varied durations of the survey did not significantly impact responses or the interpretation of findings because there were no major COVID-19-related changes in policy or epidemiology within each time period.

To further contextualise survey results, survey wave 1 was conducted prior to FDA authorised emergency use of the COVID-19 vaccine and vaccine distribution in Alaska. Survey wave 2 was conducted approximately six months after the initial distribution of the COVID-19 vaccines and directly following when Alaska made COVID-19 vaccines available to anyone over the age of 16. Finally, survey wave 3 was conducted approximately three months after the Delta variant was found in Alaska, and approximately one month after the US Department of Human Services announced COVID-19 vaccine booster availability. While community shut-downs, transportation restrictions, and vaccine access varied by community and region, remote Alaska adult residents had widespread and relatively early access to COVID-19 vaccinations compared to much of the US and the world.

We asked participants to indicate whether they had participated in several different coping strategies in the past month, to each of which they answered, "yes" or "no". We combined their responses into six categories of coping strategies: participating in subsistence harvesting activities, personal care, social activities, religious activities, seeking health counselling, and substance use (Table 1). If a survey participant responded that they had participated in any of the strategies within a category, we coded them as using the corresponding type of coping category. Respondents also had the option of choosing "other" and writing in an alternative coping strategy not listed. These answers were coded using inductive coding analysis into thematic categories.

Information on household stress/violence was also collected by asking the question, "Have you experienced any of the following situations in your

Table 1. Categorisation of coping mechanisms used during the COVID-19 pandemic in rural Alaska.

Coping category	Coping strategies included in category
Personal care	Taking care of body by taking deep breaths, stretching, or meditating; Engaging in healthy behaviours like trying to eat healthy, well-balanced meals, hydrating body by drinking enough water, exercising regularly, getting plenty of sleep, or avoiding alcohol and drugs; Making time to relax; Making time to go for a walk or drive alone; Exercising more
Social activities	Visiting with friends and family over VHF radio, social media, or phone
Religious Activities	Praying alone; Praying with others (by phone, online, or in person); Contacting a pastor/priest
Traditional and subsistence activities	Spending time doing traditional and subsistence activities, such as fishing, hunting, gathering berries or greens, skin-sewing
Substance use (combined)	Using any of the substances below
Nicotine	*Smoking cigarettes or vaping*
Alcohol	*Drinking alcohol*
Marijuana	*Using marijuana or cannabis*
Seeking health counselling	Contacting a healthcare or a behavioural health provider

household more than usual since late winter (March 2020) due to COVID-related stress?" with the option to answer yes/no to each of the following four options: 1) Household members are short-tempered with one another but not physically violent, 2) Household members are short-tempered with one another and yelling, screaming, or saying hurtful things, 3) Household members are short-tempered with one another, and adults are spanking or hitting children, and 4) Household members are short-tempered with one another and adults in the home are hitting, harming, or throwing things at each other. This measure was developed and validated among diverse participant families by Stoddard and colleagues as part of the Coronavirus Impact Scale (2021).

Analysis

We tested the association between coping categories and age and sex using a Fisher's exact two-tailed test. For significant results from the age analysis, we conducted post hoc pairwise comparisons between age groups. In most cases, we compared the age group that was most divergent to all other age groups combined to avoid Type I error associated with multiple comparisons. In cases where the frequency of coping strategies was not obviously different for one age group and therefore necessitated multiple pairwise post-hoc comparisons, we used a Bonferroni correction to adjust our p-value (0.5/6 comparisons = 0.008). Otherwise, results were considered significant at alpha < 0.05. Data were analysed in SAS version 9.4 (SAS Institute Inc., Cary, NC).

Results

Survey respondent demographics

The total number of survey respondents that fit all eligibility criteria was 1,020 and resided in 144 remote Alaska communities (survey 1: n = 107 (34 communities); survey 2: n = 508 (106 communities); survey 3: n = 405 (92 communities)). Demographic details are summarised below in Table 2, including age, sex, race/ethnicity, educational attainment, household annual income, and healthcare access. The survey samples overrepresented females, 25–54 year olds, and Alaska Native people compared with the census-based estimates of age, sex, and race in remote Alaskan communities. For additional information on how this study compares to the overall demographics of remote Alaska, please refer to Ref *[3]*.

The majority of participants were female (survey 1: Male = 18.7%, n = 20 Female = 81.3%, n = 87; survey 2: Male = 23.8%, n = 121, Female = 76.2%, n = 387; survey 3: Male = 30.1%, n = 122, Female = 69.9%, n = 283), and the mean age of respondents was 43.2 years (SD = 14.0) in survey 1, 44.5 (SD = 14.8) in survey 2, and 43.3 (SD = 15.3) in survey 3. Approximately half of respondents to survey 1 were Alaska Native people (48.6%, n = 52), and over half of respondents to the subsequent surveys were Alaskan Native people (survey 2: 61.8%, n = 314; survey 3: 59.8%, n = 242). The most common educational attainment was some colleg, Associate's degree, or vocational program (survey 1: 51.4%, n = 55; survey 2: 42.5%, n = 216; survey 3: 36.9%, n = 149), with respondents ranging from 8th grade or less to college degree, post-graduate, or professional school.

Patterns of reported annual income differed between each survey wave. In survey 1, the most commonly reported category was $90,000 per year and over (29.0%, n = 31), followed by $30-49,999 (19.6%, n = 21) and $50-69,999 (16.8%, n = 18). Survey 2 respondents reported the lower income bracket of $10-29,999 (24.0%, n = 122) most frequently, followed by $90,000 and over (17.7%, n = 90) and $50-69,999 (16.1%, n = 82). Finally, survey 3 respondents also reported lower income brackets more frequently, including $30-49,000 (24.7%, n = 99) and $10-29,999 (19.5%, n = 78).

High-level healthcare access was more common among survey 1 respondents than the other two waves, with more than half reporting living in a community with a hospital (54.2%, n = 58), followed by 44.9% (n = 48) having access to a community health aid clinic. Participants of surveys 2 and 3 more commonly reported having access to a community health aid clinic (59%, n = 301 and 62.2%, n = 250 respectively). The second most commonly reported category was having access to a hospital (survey 2: 37.6%, n = 191; survey 3: 34.6%, n = 139), followed by health centre access and "none of the above".

Coping strategies

Coping strategies reported across all survey waves

In all survey waves, personal care was the most common coping category, with approximately 95% of respondents reporting that they had engaged in this type of activity within the past month prior to survey participation (Figure 1). Social and religious activities were the next most common coping categories reported, followed by engaging in subsistence activities. Substance use combined was the second-to-least frequently reported coping strategy, with alcohol use

Table 2. Demographic characteristics of survey respondents.

	Survey 1 (n = 107)		Survey 2 (n = 508)		Survey 3 (n = 405)	
Gender	No. of subjects	Proportion of total (%)	No. of subjects	Proportion of total (%)	No. of subjects	Proportion of total (%)
Male	20	18.7	121	23.8	122	30.1
Female	87	81.3	387	76.2	283	69.9
Age						
18–24	8	7.5	41	8.1	40	9.9
25–54	75	70.1	324	63.8	257	63.5
55–64	14	13.1	89	17.5	62	15.3
65+	10	9.3	54	10.6	46	11.4
Race						
African American	1	0.9	6	1.2	7	1.7
Alaska Native	52	48.6	314	61.8	242	59.8
Asian	2	1.9	10	2.0	6	1.5
White	43	40.2	128	25.2	119	29.4
Latino	0	0.0	1	0.2	1	0.3
More than one	9	8.4	49	9.6	30	7.4
Education						
8th grade or less	0	0.0	1	0.2	1	0.3
Did not finish high school	2	1.9	17	3.3	20	5.0
High school or GED	10	9.3	143	28.1	136	33.7
Some college, Associate's, or vocational programme	55	51.4	216	42.5	149	36.9
College degree, post-grad, or professional school	40	37.4	131	25.8	98	24.3
Missing	–	–	–	–	*1*	*0.2*
Annual Income						
< $10,000	6	5.6	76	15.0	60	15.0
$10,000-$29,999	15	14.0	122	24.0	78	19.5
$30,000-$49,999	21	19.6	76	15.0	99	24.7
$50,000-$69,999	18	16.8	82	16.1	57	14.2
$70,000-$89,999	14	13.1	55	10.8	41	10.2
$90,000 and over	31	29.0	90	17.7	66	16.5
Missing	*2*	*1.9*	*7*	*1.4*	*4*	*1.0*
Healthcare Access*						
Hospital	58	54.2	191	37.6	139	34.6
Health centre	36	33.6	132	26.0	128	31.8
Community health aid clinic	48	44.9	301	59.3	250	62.2
None of the above	3	2.8	12	2.4	10	2.5

*Participants could select more than one response.

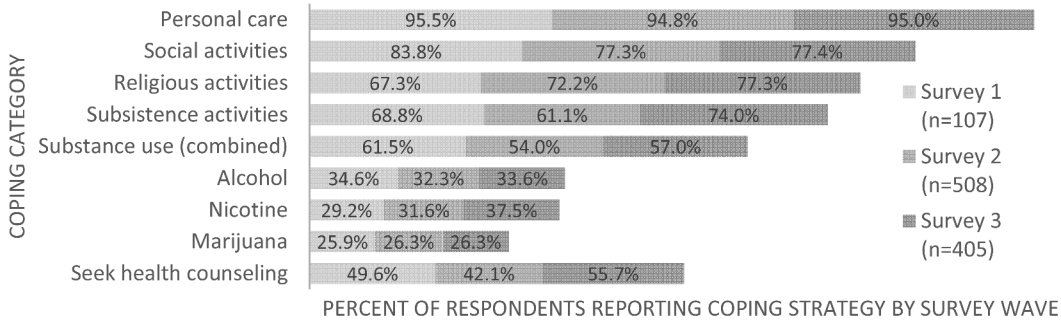

Figure 1. Percent of respondents who reported engaging in various coping strategies (n) in descending order of total frequency across all survey waves.

and nicotine being more common than marijuana use. Finally, seeking health counselling was the least commonly reported activitiy, but was still reported by 42–56% of respondents depending on survey wave.

The frequency of coping categories reported were relatively stable across all three survey waves, with religious activities increasing through time, and substance use (combined) decreasing between the first wave and the second and third waves. Alcohol use remained relatively stable, fluctuating between 32 and 35%, as did marijuana use at 26%. In contrast, nicotine use increased through time from 29% in survey 1, to 38% in survey 3.

A small number of survey respondents also wrote-in answers for other types of coping strategies they used (survey 1, n = 7; survey 2, n = 24; survey 3, n = 13 (total n = 44)). The most common theme (n = 7, 16%) that arose was outdoor activities, including hiking, kayaking,

Table 3. Percent of respondents who reported stress or violence in their household (n).

Stress manifestation	Survey 1 (n = 107)	Survey 2 (n = 508)	Survey 3 (n = 405)
1. Short-tempered but not physically violent	59.3 (67)	43.6 (212)	45.7 (181)
2. Yelling, screaming, or saying hurtful things	27.4 (31)	23.7 (116)	25.9 (102)
3. Adults are spanking or hitting children	5.3 (6)	3.3 (16)	9.4 (27)
4. Adults in the home are hitting, harming, or throwing things at other adults	1.8 (2)	2.3 (11)	6.1 (24)

chopping wood, and going on walks. Outdoor activities also included traditional Alaska Native and wild food harvesting, including fishing, trapping, and berry picking. Doing more arts and crafts by oneself or with others (n = 4, 9%), as well as spending more time talking with family (n = 3, 7%), and helping others (n = 3, 7%) were also mentioned. Watching more tv and/or movies (n = 4, 9%) or more social media/screen time (n = 2, 5%) were other strategies reported. Other coping strategies included keeping busy (n = 4), playing board games (n = 3, 7%), reading (n = 3, 7%), job searching (n = 2, 5%), focusing on domestic chores (n = 2, 5%), cooking (n = 2, 5%), isolating (n = 1, 2%), and breaking quarantine (n = 1, 2%).

Coping strategies by sex and age

Analyses of differences in coping strategies reported by self-identified sex/gender category revealed few distinctions between men and women. The only coping strategy that differed between male and female respondents for survey 1 was subsistence activities, in which males (90.0%; n = 18) reported engaging more frequently than females (62.8%; n = 54) (p = 0.02, two-tailed Fisher's exact test). No differences were found in survey 2 data, but social activities were reported significantly more frequently among female (81.3%; n = 213) compared to male survey respondents (68.8%; n = 75) (p = 0.01, two-tailed Fisher's exact test) in survey 3.

Differences in coping strategies reported by age group differed by survey as well. Survey respondents in the 18–24-year-old age group were significantly more likely to report to report using some kind of substance (cigarettes, alcohol, or marijuana) compared to people in the 55–64-year-old age group in survey 1 (p = 0.005, two-tailed Fisher's exact test), and were significantly more likely to report using marijuana compared to people in all other age groups (p = 0.01, two-tailed Fisher's exact test) in survey 3.

People in the 25–54-year-old age group were significantly more likely to report using some type of substance (cigarettes, alcohol, or marijuana) compared to people in all other age groups in both surveys 1 and 3, (p = 0.01, two-tailed Fisher's exact test) and (p = 0.005, two-tailed Fisher's exact test) respectively. More specifically, people in this mid-age range were significantly more likely to report using alcohol compared to people in all other age groups (p = 0.006, two-tailed Fisher's exact test) in survey 3. Older people in the 55–64-year-old age group were significantly less likely to report smoking or vaping cigarettes compared to people in all other age groups (p = 0.007, two-tailed Fisher's exact test) in survey 2.

Pointing to the importance of subsistence activities as a coping strategy, people in the 25–54-year-old age group were significantly more likely to report participating in such activities compared to people in all other age groups (p = 0.003, two-tailed Fisher's exact test) in survey 2.

Household stress and violence

Results from each round of surveys showed that the most common answer reported for the household stress and violence question was that "household members are short-tempered with one another but not physically violent" more than usual since late winter (March 2020) due to pandemic-related stress (Table 3). Fewer respondents reported the next most severe indicators household environement stress of "yelling, screaming, or saying hurtful things" (answer #2), with very few participants reporting experiencing the two most severe categories listed below (answers #3 and #4), including spanking or hitting children, and/or adults hitting, harming, or throwing things at other adults.

These trends were relatively stable across the three survey waves with some minor fluxuations over the course of the pandemic. The least severe categories were reported more frequently in survey 1 compared to survey waves 2 and 3. In contrast, the most two severe categories were reported most often in survey wave 3. Note that these categories were not mutually exclusive, so respondents were able to choose more than one answer if appropriate.

Discussion

Overall, our findings indicate that adult remote Alaska residents are relying on positive coping strategies to contend with additional stress brought into their lives by the COVID-19 pandemic. We examined coping

strategies and household stress across three time points during the pandemic among residents of remote Alaska communities. Personal care remained the most commonly reported coping strategy, with religious activities increasing over time, possibly due to increased desire and/or access to online opportunities. Subsistence activities also increased across survey waves, which may be due to such activities (fishing, hunting, berry picking) being more common during the spring (survey wave 2), and summer (reflected in survey wave 3). Furthermore, while alcohol and marijuana use remained relatively consistent over time, nicotine use increased. These results indicate that sustained stress may lead to use of nicotine as a coping strategy for a greater number of individuals, which is consistent with other findings in the US [eg. 32]. However, due to the unique and specific nature of both subsistence activities in Alaska and the novelty of the COVID-19 pandemic, these deductions are not verifiable without additional retrospective data collection but are nevertheless highly plausible.

Personal care, in this study, was defined by engaging in healthy behaviours such as healthy eating and sufficient hydration, exercising, adequate sleep, as well as relaxing and engaging in meditative practices. Greater measures of healthy ways of life, personal hygiene, and relaxation practices such as these have been associated with higher reported wellbeing and reduced stress, indicating that these are helpful ways of reducing pandemic-related tension across different cultures including Germany, Lebanon, and the US **[**6,21,22,31–33**]**.

While these activities may be more difficult to engage in given more crowded living conditions, limited access to water, and other barriers present in remote communities, they still ranked the highest among coping strategies, possibly further indicating the high value placed on them in this population. Similarly, social activities are connected to increased feelings of support and positively predict engagement in other positive coping strategies in the context of the pandemic, therefore potentially providing additional stress relief. Analogous patterns have been observed among Latinx communities in the US **[**6**]**, study participants in Pakistan, India, and Saudi Arabia **[**34**]**, England **[**35**]**, and Australia **[**36**]**.

In this study, social activities were reported significantly more frequently among female compared to male survey respondents in survey 3 (March 2021), indicating that women may utilise this coping strategy more often. Religious activities, including praying alone and with others and contacting a pastor or priest, is positively correlated with support and connection, as well as "placing worries in God's hands"; all of which provide stress relief and additional support among diverse populations including US, European, and East Asian countries **[**6,24,34,37**]**. In addition, approximately 50% of respondents reported contacting a professional health care provider as a coping strategy, which has been shown to be a less common, but still important strategy for maintaining wellbeing during the pandemic **[**19,23,34**]**. Given our findings and others related to the pandemic reviewed above, remote Alaska residents are commonly engaging in coping strategies associated with greater support, connection, healthy practices, and seeking professional health care support.

Participating in subsistence and traditional Alaska Native activities such as hunting, fishing, and harvesting foods from the land and water were also revealed to be a frequently used coping strategy by study participants. We are unaware of any other study that has identified these specific activities as coping strategies during the pandemic in other geographic areas, pointing to the idea that this may be an important and relatively unique source of stress relief available to remote Alaska residents. However, these activies are in line with the recommended interventions by Shamblaw et al. to improve effective coping during COVID 19 by emphasising self-efficacy and connectedness. (2021). Indeed, prior research in the Yukon-Kuskokwim region of Alaska has demonstrated the protective effects of engaging in traditional activities for both physical and mental health before the pandemic **[**16**]**. Interestingly, among survey 1 respondents (November – December 2020), subsistence/traditional activities were reported significantly more among men compared to women, which may indicate that this coping strategy is more accessible and/or more desired among men compared to other coping mechanisms that showed no difference across gender. In addition, people in the 25–54-year-old age group were significantly more likely to report participating in subsistence activities compared to people in all other age groups in survey 2 (March 2021), which indicates that this age group is more likely to engage in these activities compared to older or younger adults. Other studies conducted during the pandemic, including in the US, Africa, Europe, and East Asia, have also shown the importance for men and women of spending time outside in gardens, parks, or other green spaces for improved wellbeing and helping unwind from additional pressures brought on by the pandemic **[**34,38,39**]**.

Substance use including alcohol, nicotine, and marijuana, was among the least-frequently reporting coping strategies, only slightly surpassing seeking professional health counselling. This finding is in line with studies among other populations that have also

reported increased use of alcohol, nicotine, and other substances as a coping strategy, which found up to 29% increase in alcohol use during the early pandemic [26,40]. In addition, analysing these data across gender and age revealed some variation between groups. In contrast to prior studies that found increased alcohol consumption among women [27,41] or men [26] during the pandemic, no difference between genders was found in terms of alcohol use or other substances. Regardless of age and gender differences, the fact that substance use was one of the least commonly reported coping strategies may be related to protective factors that rural communities can confer, including greater social support, interaction, and community attachment [19].

Further demonstrating the comparatively lower use of substances as a coping mechanism among older adults, older people were less likely to report using alcohol or other substances as a coping strategy compared to younger age categories. These results are similar to those found in studies during the pandemic, where young adults (18–34 years) reported greater alcohol use compared to older adults [27]. However, this may differ by population as evidenced by Pollard and colleagues finding an increase in alcohol use among those age 30–59 in the US (2020). And although this study asked about increased substance use, not substance misuse, these findings do reflect the overall pattern of alcohol use disorder being the lowest among adults 65 years of age and above in the US [29]. These differences between age groups suggest that public health efforts related to curtailed substance use as a coping strategy be targeted towards adults aged 55 years and below and identifies older age as a potential protective factor for utilising substances in times of increased stress.

The identification of coping strategies used among remote Alaskan residents is particularly important considering our findings that demonstrate increased family and household stress among approximately half of survey respondents. Previous studies have found that the pandemic is accompanied by multifaceted changes to family environment and dynamics, many of which led to increased stress and tension due to more limited resources, limited household space, long periods of confinement, increased caregiving demands, decreased, patience, and increased frustration [6,34,42]. These findings like those reported here with participants reporting greater household stress since the onset of the pandemic, with these patterns generally decreasing between winter 2020 and fall of 2021. Conversely, although reported at relatively low rates (<10%), more severe indicators of household stress, including reports of adults spanking or hitting children, or adults hitting, harming, or throwing things at other adults in the home increased across this same time, potentially indicating the cumulative effects of pandemic-related stress. Increases in intimate partner violence have been reported in other populations during the pandemic as well and associated with restricted access to resources and use of negative coping mechanisms such as excessive alcohol consumption [6,43,44].

This study had a number of limitations. Although the survey data collected over three time periods provides snapshots of coping strategies used and household stress patterns, each wave had different participants so conclusions about change over time should take that into consideration. Moreover, survey 1 had a small number of participants, which could potentially skew the results in some ways. These online surveys were potentially not available to some individuals, especially those in possibly some of the most vulnerable groups (e.g. non-English speakers, people without reliable internet, older adults). In addition, data were only collected from individuals 18 years old and above, and therefore does not capture potentially major impacts on children and adolescents. And, although providing contact information was voluntary (so survey could be anonymous), people may be more likely to report positive coping strategies. Women were also overrepresented among survey participants, which is a common sampling bias pattern [45]. This may be because a higher percentage of women use Facebook, which was the primary mode of recruitment for the study [46], or because fewer men respond to study recruitment in general [47,48]. In order to encourage a more representative sample for future studies, the authors would suggest specifically targeting underrepresented demographics (e.g. men) through Facebook ads, as well as distributing the survey through community contacts, city and Tribal government websites, and other more targeted online and in-person groups. The choice to recruit on Facebook was made on advice of key informants and community stakeholders with prior knowledge of the efficacy of various forms of survey distribution; knowledge that should be sought after and leveraged when possible. The present study was limited by time and the urgency of collecting timely data on the evolving COVID-19 pandemic, and the necessity of online distribution for ensuring safety of participants and study personnel. Finally, while informative, the study sample is not wholly representative of all remote Alaska residents and should therefore be interpreted and utilised with that taken into consideration.

Conclusions

This three-wave cross-sectional study revealed that positive coping strategies, including personal care,

social activities, religious activities, and engaging in subsistence/traditional-food related activities were the most reported among the residents of remote Alaska communities across multiple time points during the COVID-19 pandemic. In contrast, use of alcohol, nicotine, or marijuana was among the least commonly reported coping strategies within this population, and such patterns differed between age groups with older adults 55 years and above exhibiting the least risk of substance use as a coping strategy. This study also provides the novel finding of wild food harvesting and traditional Alaska Native activities as an important coping strategy in remote Alaska communities. In addition, increased pandemic-related low-level stress was found to be common in households and more severe violence was much less common, but occurring, nonetheless. Future studies should further explore gender and age differences of coping strategies utilised during times of increased stress and examine the impact of various coping strategies on supporting a safe and supportive household environment. Overall, this study indicates that even in major disruptive events such as infectious-disease pandemics, the importance of behavioural health support and interventions are paramount to maintain overall health and wellbeing.

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