Pamlico County CCTF Findings and Proposals

Partners for Pamlico, Assessment & Adaptation Team

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Executive Summary

- Pamlico County's COVID-19 Community Task Force is a community-based organization that was assembled in response to the COVID-19 pandemic. It seeks to mitigate contagion through mask creation and delivery, a medical surge team, and dissemination of information through a community response network.
- This report reviews the internal dynamics of the task force, evaluates its effectiveness, and proposes recommendations for improvement and adaptations.
- Data was gathered through a literature review, qualitative interviews and focused discussions, Mailchimp software, Google Forms, and Qualtrics surveys from September 2020-April 2021.
- From our surveying of the Community Response Network's various tiers, we found that utilizing Community-Based Organizations members as primary end users of informational distribution networks resulted in a high variance in engagement depending on organizational coordinator & contact dedication, personal relationships, and political affiliation.
- SMS text messaging services can be an effective way to distribute critical COVID-19 information as an adjunct to the CRN and reach populations without broadband internet access.
- We obtained a $500 Twilio grant for SMS text messaging use with the CCTF, equivalent to roughly ~80,000 text messages
- We developed and piloted a simple-to-use text message alert service that allows individuals to subscribe to receive custom alerts from CCTF administrators.
- The Pamlico County Disaster Recovery Coalition (PCDRC) has several synergies with the CCTF and future collaboration may be beneficial for Pamlico County's future public health and disaster response efforts.

Introduction

The Assessment and Adaptation Team (AAT) sought to evaluate Pamlico County's COVID-19 Community Task Force (CCTF) to better address the pandemic in this area. The AAT consists of three undergraduates from Duke University: Ryan H. Sellers, Biology Class of 2021, Sayle Evarts, Public Policy Class of 2021, and Advika Kumar, Biology/Global Health, Class of 2024. Our primary goal is to understand the dynamics of CCTF, provide metrics for evaluating output performance in mitigating the spread of coronavirus disease 2019 (COVID-19), and improve the efficiency and effectiveness of the task force. Our recommendations aimed to assess member engagement, create systems to monitor and evaluate task force functioning, and provide potential pathways for adapting aspects of the CCTF, primarily the CRN and Editorial Branches, for other priority areas in Pamlico County, such as aiding chronic care efforts and disaster responses to hurricanes and flooding.



Background

Pamlico County and COVID-19

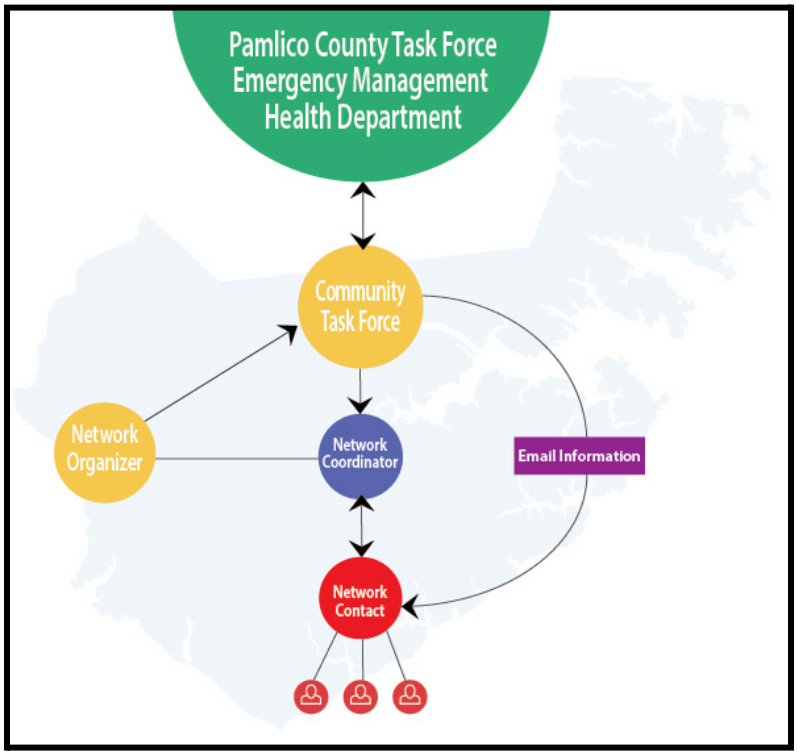
Pamlico County is located in a rural area on the coast of North Carolina, with a lower population density than many of the surrounding areas. The major industries in the county are farming, fishing, forestry and tourism with the recreation and retirement industry. Located near larger cities such as New Bern, Greenville, and Morehead City, citizens in Pamlico have still experienced hurdles in accessing basic medical care (Pamlico Health Department, 2020).

A volunteer organization known as the COVID-19 Community Task Force in Pamlico County formed in the wake of the discovery of the disease colloquially referred to as "Covid". SARS-CoV-2 COVID-19 is a novel coronavirus that causes COVID-19. The disease has a wide range of reported symptoms -- from mild to severe. Fever, cough, and fatigue are common, but acute respiratory arrest can occur. In addition to these symptoms, long-term health effects are poorly understood. In recent months, immunizations have been developed for COVID-19, including options released by Pfizer and Moderna.

Overview of the CCTF

The CCTF consists of 5 main action teams: the Community Response Network, the Editorial team, the Medical Surge Capacity Team, the Masketeers, and the Youth Action Team. The Community Response Network (CRN) is the largest branch of the CCTF. It was designed to create a communication channel and facilitate a two-way conversation with County residents through Network Coordinators and Contacts at

120+ churches and local organizations. The CRN has typically had around 14-20 coordinators (which is currently down to 4-8) and approximately 5,000 potential end users. The Editorial team develops user-friendly messaging to send to the Network by gathering info from government and scientific sources to develop guidance and recommendation. The Medical Surge Capacity team was originally designed to support the Health Department's efforts for testing, contact tracing, isolation of infected people, and expanding medical capacity. It evolved to work with local businesses to keep employees and customers safe, develop editorial content, and distribute advice on best practices during COVID. The Masketeer is dedicated to finding and cutting materials, sewing cloth masks, and distributing them to the Pamlico community. The most recent addition to the CCTF is a Youth Action Team, an initiative focused on collaboration with youth representatives and encouraging youth to get involved with information dissemination regarding these best practices.



AAT Project Objectives

Objective 1: Describe the Internal Dynamics of the CCTF and Pamlico County

As noted above, the CCTF consists of several teams and levels. To effectively evaluate what is working well and what is not, we focused on understanding how these levels function and interact with each other. Further, the CCTF does not act in isolation. The efforts of the task force are mediated within the broader context of Pamlico County, surrounding counties, the state, and the nation. It was necessary to understand the interactions between these forces to identify areas of improvement.

Objective 2: Develop and Implement a Framework for Evaluating the CCTF

Community-based organizations such as the CCTF and those connected to the CCTF via the Community Response Network are common enough that bodies of literature exist on how to evaluate them. However, Pamlico County is unique in terms of its location, population, and needs. Therefore, the evaluative frameworks that work well for similar organizations needed to be tailored to meet the specific needs of the CCTF in Pamlico.

Objective 3: Elucidate Possible Recommendations

After understanding the inner mechanisms of the CCTF, evaluating what works well and what does not, and discovering the gaps in function, we needed to synthesize how to improve the CCTF. Through assessing the literature on similar organizations and compiling feedback from members of the CCTF, we created a list of suggestions that would increase productivity and member satisfaction. Furthermore, we developed recommendations to adapt CCTF functions for future disaster responses and information dissemination.

Methods

Literature Review Methods

In order to define the CCTF and its public health efforts with community-based organizations (CBOs), a literature review was conducted over the months of September-November, 2020. Three main research databases we used: (1) PubMed, (2) Google Scholar, and (3) JSTOR. These were primarily navigated using the Duke University Libraries online website. Articles were searched for by combining (add # a number of) key terms related to the CCTF, such as "community-based organizations" and "COVID-19". Papers were included on the basis of their relevance to the CCTF and the potential impact of their findings. From an initial search result yielding 4,504,000 articles, 56 were selected for further analysis, and 16 were chosen for full review in our findings.

Qualitative Interview Methods

Between September 2020 and March 2021, eight qualitative interviews were conducted, seven of them with CCTF Action Team leaders and one with a representative from an innovative community health-related company, Grand-Aides. Interviews took approximately 30-60 min and were conducted using video conferencing software Zoom or by phone. A semi-structured interview script was developed, focusing on better understanding the experiences that the CCTF leaders have had with their work and assessing the strengths/weaknesses of the CCTF. Furthermore, these interviews sought out community leader perspectives on potential future directions and sustainability of the CCTF. Prior to beginning, interviewees were informed of their

confidentiality and understood that they could end the interview at any time for any reason. All consented to being recorded and these recordings were stored in a secure Google Drive folder, shared only with the Partners for Pamlico team.

Mailchimp Analysis Methods

Mailchimp is a marketing platform designed for small businesses. The CRN uses Mailchimp to distribute emails containing COVID-19 information relevant to Pamlico County to network subscribers. This software automatically collects information regarding general open rates, click rates, and member-specific data. These data are plotted and graphed to reflect changes over time. Email titles and open rates were compared to look for an association between specific words or phrases and higher or lower open rates. Mailchimp login access was granted in October and analysis of 98 newsletters and emails sent out from April 16th 2020 to April 13th, 2021 was conducted.

Focused Discussion Group Methods

In order to reach our organizational coordinators in a streamlined manner, we conducted a 40-minute focused discussion with coordinators during the time of their monthly meeting with the Action Team Leaders of the Covid Response Network (CRN). This discussion featured broader questions about the experiences, perceptions, and recommendations from the coordinators present at the meeting. This discussion was recorded via Zoom and stored in the secure Partners for Pamlico Google Drive.

Survey Methods

One component of our data collection included surveying newsletter recipients on CCTF's as well as organizational contacts. Our "end user" survey, or survey of

newsletter recipients, focused on feedback concerning the content of CCTF's newsletter. It was a Google Form to maximize readability and platform usability of CCTF leaders. This has thus far received 15 responses, and we hope that in coming newsletters this form will remain a consistent feedback loop.

Newsletter Feedback Form Methods

To inform our recommendations and follow through on our goal to develop feedback loops to gather input from organizational contacts and end users, we created a Google Form to attach to CRN newsletters and communication materials. This form allows mailing list subscribers (a group consisting of both organizational contacts as well as end users that are directly subscribed to the newsletter) to provide direct and anonymous feedback on editorial content. The form utilized a combination of question styles, including multiple choice and open-ended questions, for ease of use. The combination of the two question styles furthermore made it possible for us to capture both easily quantifiable data as well as longer, more detailed responses. As of April 27th, 2021, the form has been live for approximately 2 weeks and garnered a total of 16 responses (n=16). Considering that most newsletters have approximately 80 opens, this is a good beginning sample and yielded valuable results.

Findings

Literature Review Findings

Community-based Organizations and Social Determinants

From the articles analyzed, a few key findings are highlighted. Community health programs (CHOs) are similar in style to the CCTF, but emphasize providing medical care in addition to information dissemination. The Center for the Advancement of Community Based Public Health devised an evaluation framework for CHOs that can be applied to the CCTF (2000). Their four standards of program evaluation are (1) utility, (2) feasibility, (3) propriety, and (4) accuracy. Utility analyzes the usefulness of the evaluation. In other words, will the evaluation garner results that can further improve the organization? Feasibility refers to how viable and practical the evaluation is. For example, it is not practical to have daily surveys on performance, nor is this ethical, which is what propriety refers to. Finally, accuracy references how correct the evaluative measures are.

Community-based organizations (CBOs) are a crucial component of the CRN in the CCTF. CBOs "include social service agencies, nonprofit organizations, and formal and informal community groups, like neighborhood groups or recreational or special-interest clubs. Depending on the nature of their work, a CBO's stakeholders may include volunteers, members, clients, supporters, patrons, program participants, and event attendees." They aim to supplement but not replace regulations and laws. Lowest risk activities for COVID-19 are virtual meetings and activities, and the highest risk includes normal activities (especially potluck-style events) (CDC 2020).

Stakeholders comprise both those served by a program and those involved with implementing the program. An effective evaluation must include a variety of stakeholders so that unique perspectives are understood, referred to as Stakeholder Theory. Excluding this diversity of thought will not only result in incomplete findings, but these findings may be ignored, unproductively criticized, or actively resisted. While the CCTF is relatively nascent, we can identify stakeholders on the Advisory Council level, within each action team, in CBOs, and down to the individual end-user level. As of now, our evaluation framework lacks stakeholders from specific parts of the task force, such as the organizational contacts and the end-users. These stakeholders will be included as our evaluation methods mature.

In times of public health crises, effectively engaging with communities to address pandemics requires a collaboration with groups at greatest risk (Michener et al., 2020). Furthermore, crafting priorities and building on the strengths of these at-risk communities while engaging with leaders are the best ways to address the ongoing epidemic: the trust and engagement of these communities is vital in implementing recommended prevention strategies. Collaborating with high-risk groups first requires an identification and assessment of the most vulnerable populations during the COVID-19 pandemic.

Rural populations, such as that of Pamlico County, face an increased risk for a number of reasons, including their older population (Baernholdtet al., 2012), relatively higher rates of underlying chronic conditions, and limited healthcare infrastructure (Rural Communities, 2020). Furthermore, racial and ethnic minority populations within

Pamlico County are at an especially heightened risk of contracting COVID-19. Reasons for disparities within these groups may include "structural inequities and social injustice, misinformation about infection risk, limited testing availability and health care access, and disproportionate prevalence of preexisting conditions" (Farmer et al., 2020). The 2018 Pamlico County Health Needs Assessment indicated that fishing and farming are major industries in Pamlico, providing ground for industry-related vulnerabilities as well, considering that agricultural and food-processing industries and their workers are especially vulnerable to contracting COVID-19 due to the in-person nature of their work and lack of provisions for leave (Klassen & Murphy, 2020).

Mailchimp Findings

As of April 22, 2021, the Community Response Network (CRN) has 238 subscribers to the CRN weekly newsletter, meaning that they signed up to receive email updates from the network. Approximately 53 of these organizations are churches, underscoring the possibility that churches are a primary source of information distribution within Pamlico County. Other types of organizations included community clubs and stores.

The average open rate, which shows how many delivered email campaigns were opened by subscribers, of all the campaigns has been around 48.78%, indicating that on average, 48.78% of the subscribed audience have been opening the CRN communications over the last 12 months, from April 2020 to April 2021. This is relatively close to the average open rate around November 20th, 2020, signaling relatively consistent engagement with CRN editorial materials. This is considerably higher than average industry open rates of 21.33% for a campaign (Email Marketing Benchmarks). The software additionally provides an overall contact rating to each subscriber on a scale from 1-5, which updates after each newsletter, with a score of 1 indicating an unsubscribed contact with minimal engagement and a score of 5 indicating consistently high engagement. Open rates might not directly correlate with retention and engagement (i.e. it is possible to just open an email and not read its contents), but they provide a valuable starting point for beginning to gauge engagement.

Specific data on organizational contacts was collected by utilizing the segmenting feature on the Mailchimp software, based on levels of the "Email Marketing Engagement'' condition. This yielded four different spreadsheets organized by engagement levels: rarely, sometimes, and often. Approximately 193 out of 238 of the organizational contacts and subscribed end users fit the criteria of "often" engaging with the network emails, with member ratings of 4 and 5. The "sometimes" and "rarely" categories each had 15 and 24 total contacts, respectively. A total of 21 members had unsubscribed, but this list provided little value as many of the contacts were repeated emails (i.e. multiple accounts belonging to the main person were signed up for correspondence) or members that exited the mailing list for other logistical reasons.

While Mailchimp numbers have been beneficial in tracking average open rates, qualitative data collection provides a more detailed glance at which campaigns resonated. Some of the most successful campaigns did not have the highest open rates. The newsletter released on March 15th, 2021, titled "**CDC Guidance for people who are fully vaccinated**" was well-received according to the editorial feedback form, but only had an open rate of approximately 33.8%, which is lower than the average open rate of 48.78%. This might be due to the convenience sampling approach taken towards feedback form distribution— the people who were likely to open that feedback form are most likely similar to the groups of people opening the newsletters in general, even the ones with lower than average open rates.

The CCTF currently utilizes the free version of Mailchimp, which limits further analysis related to predicted demographics of the CRN end-users. This kind of

information would answer other questions, such as the exact populations being reached that are engaging with the newsletter to be investigated. It would provide the opportunity to access comparative reports with customized preferences for custom "snapshots" that can provide a clearer picture of campaign performance and reception. Mailchimp provides a valuable way to quantify email reception, but open and click rates do not always provide the clearest idea of which campaigns were best received by audiences. This necessitates the maintenance of consistent feedback loops maintained directly by the CCTF with room for open-ended responses.

Qualitative Interview Findings

We conducted seven action leader interviews covering the context and structure of the CCTF, the nature of each leader's work, experiences so far with the CCTF, and any personal insights and suggestions they had. Key takeaways during our interviews with various leaders on the CCTF arms included insights about the sustainability of the volunteers, engagement of end users, and overall climate of Pamlico. By conducting these high-level interviews, we were able to evaluate how information and advice was being distributed. We could also better ascertain the long-term direction of the task force, and all stakeholders involved in the process of the CCTF's mission.

Firstly, there exists a growing prevalence of "COVID fatigue" amongst volunteers and the broader Pamlico community, as anecdotal reports of burnout related to the pandemic have increased. Participation in the CCTF exploded overnight in March but has since declined in volunteer numbers -- in the Masketeer arm, volunteers have gone from 12-15 to 4 consistent volunteers. Secondly, there is not yet a formalized recruitment or volunteer process for acquiring volunteers or new CBO partners or other kinds of organizations to distribute information to end users. The CCTF relies primarily on word-of-mouth: every team's leaders originated from the recruitment and networking of a few individuals in current leadership. Thirdly, there is uncertainty in end user engagement and how effective the CRN is -- there are ideally a current approximate 5,000 end users that should be distributed COVID-19-related information. However, there is uncertainty backed by MailChimp data that these stakeholders are being saturated at a maximally effective level. The reach and effective response of end users is maximized when the organization representative as well as the CRN

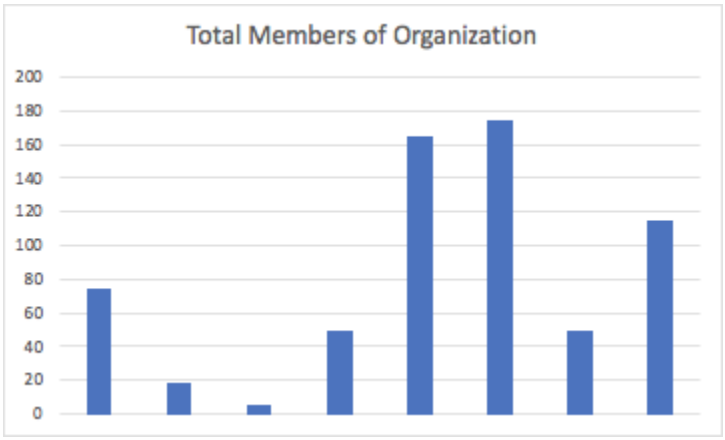
coordinator in contact with the organization has a personal connection, which is noted to be the case in some but not all of CRN coordinators. This brings us to the observation that there is a difference in communal strength in the local and retiree populations in the Pamlico community. “Come here” retirees, who are members of the population that move to Pamlico to retire but had not previously resided there, often differ in terms of the depth of relationships that locals have with community organizations and contacts. This might manifest as a less intense level of involvement or long-term relationships with members of the community.

Organizational Coordinator Focused Discussion Findings

6 coordinators were present at the focused discussion we held during the time of the CRN's monthly meeting with CRN leaders. All coordinators at the meeting, who were all currently still active, have been a part of the CCTF since inception (11 months). The goal of the discussion was to determine which contacts, or types of contacts and organizations, are the most active and valuable to reach out to or look for in our survey. We hoped to elucidate communication pathways in the CRN, determine challenges and strengths of current pathways, and ascertain their ideas on how to connect to contacts (also end-users) and how to facilitate the AAT's next steps.

Generally, the focused discussion resulted in a need to confirm and further deepen an analysis of end users and contacts. Elucidating the personal relationships and various scales of involvement of each coordinator and corresponding organizational contacts was crucial to strengthening the CRN.

Organizational Contact Survey Findings



Total numbers of organizational members OCs reported to be distributing information to.

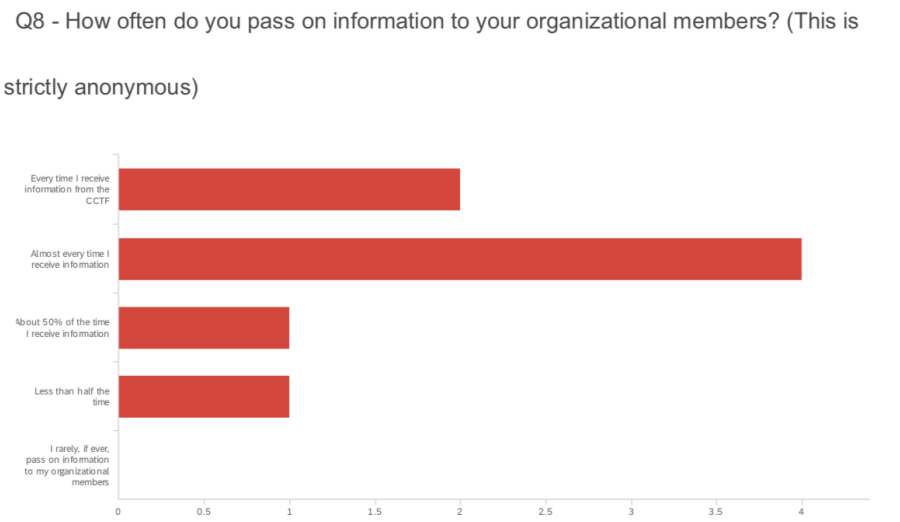
The organizational contact survey was distributed via the organizational coordinator distribution channel. It received 8 total responses at the time of this report. Contacts reported that the total members of their organizations varied between 5 and in the hundreds, as can be seen in the above figure.



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	What proportion of members of your organization do you believe you reach through your work as an organizational contact for the CCTF?	2.00	5.00	3.00	1.12	1.25	8

Zero contacts reported that they believed they reached 100% of their members of their organizations via their distribution methods of CCTF newsletters and general

work as a contact. This indicated that there was a general lack of saturation of organizational members of the newsletter, either caused by a lack of consistent pass-through of the newsletters or engagement and choice to open the newsletters by members.



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How often do you pass on information to your organizational members? (This is strictly anonymous)	1.00	4.00	2.13	0.93	0.86	8

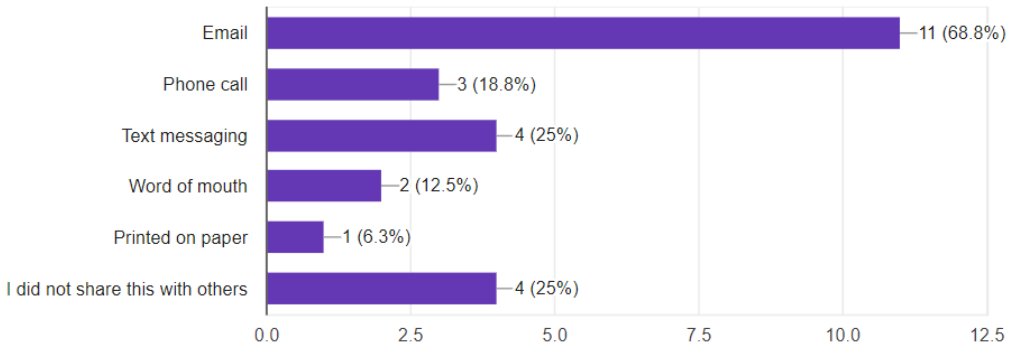
Saturation of end users and consistency of OC contact with their organization about CCTF matters varied hugely across organizations in Pamlico. While some contacts reported that they always pass on CCTF information and content, the majority did not. 20% of respondents passed on information to their members 50% of the time or less. This process of distribution is not necessarily direct, as well -- our Google Form to end users displayed that sometimes the newsletter is supplemental to other organization-specific content or hyperlinked.

Additionally, 50% of contacts believed that text messaging would be an effective method to distribute information. The other half that disagreed thought so because of

logistical reasons. These included the fact that many believed that text messages would need to be extraordinarily concise to be read by the recipients. Contacts also had concerns that their own job might include forwarding on texts rather than emails similar to the current distribution model. This would ideally not be the case. Text messaging would be effective should they remain short and easy for contacts to send out via Twilio, discussed later in the report.

Newsletter Feedback Form Findings

The feedback form received a total of 16 responses (n=16). Out of these responses, 75% rated the relevance of newsletter content at a 5 on a scale from 1-5, and 25% rated it at a 4. Opinions on the ease of understanding were considerably more variable, with a majority of respondents rating it at a 4 or 5 on a scale from 1-5, with some respondents rating it a 3. There were similarly mixed opinions on the visual appeal of newsletters, with the following breakdown of responses (also on the 1-5 scale): 1 (1 response), 2 (0 responses), 3 (3 responses), 4 (6 responses), and 5 (6 responses). All respondents indicated that the newsletters increased their level of information of COVID-19, responding with scores of 4 and 5.



Mixed methods were used to disseminate CCTF information; not all respondents shared content with others. As indicated in the figure above, the majority of communications were forwarded via email, but mediums such as text messaging, phone calls, and word of mouth were also valuable.

When asked about what they liked most about these newsletters, respondents

indicated that they appreciated the timeliness of the information, its current and up-to-date nature, as well as its relevance to Pamlico County.

When asked to identify potential changes they would like to see in the future as well as challenges, feedback included the following:

- Length (make information more concise)
- Style/Structure
- Avoid jargon, supplement with graphics when unavoidable
- Add in-text links to more detailed info for those that want it
- More graphics, whitespace, and headings
- Continue to improve the relevance of information to Pamlico County
- Maintained wariness of COVID information overload
- Include information on the relaxation of restrictions and navigating the transition to a "post-COVID" world

Suggestions, Questions, and Additional Input

The form provided room for respondents to pose suggestions and questions for future content, and share any additional input they might have. Respondents indicated several suggestions for future content, including information regarding post-vaccination immunity, updated information on hospital restrictions, death and recovery rates, and contact tracing, as well as vaccination rates. In terms of other newsletter content, some responses suggested including a call for volunteers in each issue. This could serve as a valuable way to move beyond word-of-mouth recruiting

and give community members a path to involvement, bolstering the sustainability of volunteer-based organizations such as the CCTF in the future. It will also be beneficial to continue being transparent with newsletter recipients, and share information of the CRN and CCTF's plans for the future as operations begin to wind down.

Main Recommendations

#1: Expand Access to CRN information

Text Messages as Information Delivery

During our interviews with CCTF advisory council members in the previous semester, the idea of sending out nugget-sized chunks of health information through text messages was suggested. We looked into this and found that text messages typically have over a 95% open rate, which is over double that of our current email newsletter open rate. Further, text messages do not require broadband internet access to send out information. Broadband internet access is not readily available to a large portion of Pamlico County residents. The populations without internet access can be the most vulnerable. We developed and piloted a mass short messaging service (SMS) text messaging system that can readily deploy several hundreds of text messages in minutes. This system is scalable and adaptable for future uses, such as emergency information related to natural disasters.

Why Text Messages?

The current CRN model of information distribution relies heavily on email newsletters. Text messages boast over a 95% open rate, over double that of the CCTF's current email open rate. At its peak, the CCTF newsletters open rate was close to 70%. While the depth of information in a text may be limited, there is a higher likelihood that the information sent is read by the individual.

In a survey of Pamlico residents by the American Community Survey, 14.5% of respondents reported living below the poverty line. Populations below the poverty line

are less likely to have access to broadband internet access, smartphone devices, and computers. Text messaging works well because it functions in the absence of the previously listed technologies. A regular cell phone can view and respond to text messages even when power is out. This is because cell phones use their own batteries and connect to cell towers that are unlikely to fail.

Another benefit of using text messages to deliver critical information is that text messages are typically opened relatively quickly compared to emails. This means that time-sensitive information can be delivered and read quickly. The conciseness of text messages (one message is limited to 160 characters) means that the information is more likely to be remembered. These short messages are not meant to replace the current CRN newsletter, but rather to serve as an adjunct. The newsletters provide information-rich content to organization contacts while the text messaging reaches a broader population to deliver critical, time-sensitive information in a succinct manner.

Twilio SMS Platform and Impact Access Program

Twilio is an online platform for utilizing mass SMS texts, automated phone calls, and more digital communication technologies. We have developed a text messaging system on this platform using their software (written in JavaScript). Twilio allows for us to write our own code to specialize how we use text messages.

Twilio.org is the nonprofit sector of Twilio. We applied for and obtained admission into the Twilio.org Impact Access Program. From their website, "the Twilio.org Impact Access Program is your gateway to support from Twilio to help you

reach your communication goals and scale your organization's impact. Program support encompasses Twilio technology, employees, the Impact Corps developer community, Twilio.org partners, and more." This program offers a $500 Twilio credit, which is enough for sending and receiving nearly 80,000 text messages. For scale, this is enough to send every individual in the CRN a unique text message over 250 times.

Other awards from this program include discounted pricing on Twilio products, volunteer support through Twilio's Impact Corps, access to extensive Twilio resources for using their services, and invitation to apply for additional grants and investments through a different program known as the Impact Fund, which may be of interest in the future as it provides up to $150,000 in funding for nonprofits. With our discounted pricing, each text message costs $0.0056 to send and costs the same amount to receive. Our award credits are also covering a $1/month fee to keep a phone number with the Pamlico area code. The award funds do not expire. Upon request, we can provide our complete documentation of Twilio and the award (contact Ryan at rhzellers@gmail.com).

Table Summary of Potential SMS Text Messaging Services Uses

Potential Short-term Uses	*Potential Future Uses*
Sending COVID-19 health related information directly to organizational coordinators, contacts, or individuals in Pamlico County	Sending generalized health related information directly to residents of Pamlico
Encouraging health behaviors that mitigate COVID-19 spread	Local disaster updates (in support with Code RED)
Spreading vaccine information (locations, dates, clarifications)	Dividing subscribers into groups to better personalize alerts
Connecting different arms of the CCTF for increased feedback and communication	Optional surveying to better understand what difficulties Pamlico County residents face and ways to assist them
	With Hope Clinic: Sending health information directly to Hope Clinic patients, follow-ups, check-ins (e.g. have you taken your medication?)

Potential Short-term Uses of SMS Text Messaging

The CCTF could use SMS text messaging to provide COVID-19 alerts directly to members of Pamlico County. The World Health Organization (WHO) advises "telecommunications companies worldwide to support the delivery of [health information] messages and unleash the power of communication technology to save lives from COVID-19" (WHO 2020). On a national level, South Korea (Gold 2020), Taiwan (Chen 2020) and New Zealand (Matthews 2020) have been relatively successful in containing the spread of COVID-19, partly due to intensive use of mobile alert systems. Representatives from these nations claim that the alerts help slow COVID-19 spread by reminding and instructing individuals on health behaviors such as social distancing, wearing masks, and washing hands (Gold 2020). In the US, a study by Meyer et al. assessed the COVID-19 infection rates and death between states and localities that used various informational alert systems and states and localities that did not (2020). Counties that used these notifications during saw "considerably lower transmission rates and somewhat slower growth rates in deaths after message issuance than than the 24 states that [did not issue messages]". These data support the use of COVID-19 informational text alerts in Pamlico County to slow the spread of COVID-19 by encouraging healthy behaviors.

The content of the information texted to individuals is important. After COVID-19 statewide orders were issued, the second largest group of responses on social media related to seeking clarity (Bean 2021). Text message alerts should take note that the content should be clear, concise, and complete. Undoubtedly, questions for further clarity will arise, so further information should be readily accessible and subscribers

should know where to request more information. This can be as simple as adding the local health department's phone number to every other text.

There is more research supporting the use of text messaging as a tool for promoting healthy behaviors. While these studies need to be replicated across various populations and geographical areas, the conclusions will likely still apply to Pamlico as the current studies were based in similar US areas. One review found that 82 percent of articles investigating SMS healthcare interventions led to positive outcomes (Yeager 2011). Further, there is evidence that SMS messages can support health education and promote large-scale public health initiatives (Wei 2011).

Altogether, the use of COVID-19 SMS text message alerts in Pamlico County is likely to aid in mitigating the spread of the disease based on similar public health efforts. After the pandemic winds down, SMS text messaging may play important roles in natural disaster response and in encouraging other healthy behaviors such as regular exercise.

Potential Future Uses of SMS Text Messaging

The CCTF was originally created as an organization to prepare and respond to natural disasters in Pamlico County. Attention shifted towards slowing the spread of the COVID-19 pandemic, but as the pandemic comes to a close, several components of the CCTF may want to be continued and redirected into different public causes.

Several studies have demonstrated successes in using text messaging as a tool for preventative healthcare in weight loss, smoking cessation, and diabetes management

(Vodopiven-Jamsek 2012).

Hope Clinic is a free health clinic based in Pamlico County. Chronic care management is an everyday reality for many individuals in Pamlico County and the majority of Hope Clinic patients. SMS messages have been shown to promote patient compliance in taking medications regularly as prescribed, encourage healthy living, improve education of patients' diseases, and function as an effective tool for measuring patient satisfaction and outcomes (Kannisto 2014). Should the CCTF's mission and goals align with aiding Hope Clinic, SMS text messaging could prove to be a valuable tool for improving the public health of Pamlico County.

For more reasons than one, it may be useful to divide the subscribers into groups so that targeted messaging can be achieved. This can make the alerts more relevant for unique groups of individuals. A significant portion of Pamlico County residents primarily speak Spanish at home. One example group would be a Spanish-only subscriber list where the messages are sent in Spanish. While the current Twilio subscriber coding does not have the feature to divide subscribers into groups, it may be useful for consideration in the future.

Once a sizable subscriber-base is accumulated, SMS texting could be used for a variety of surveying needs. Compared to traditional in-person or phone-based surveys, SMS texting surveys are about 1/10 the cost. Text-based surveys with a local context are more likely to obtain responses and text-based surveys for a known population are known to be effective in obtaining responses (Hoe 2015). It is possible to write code that anonymizes who is responding to text surveys so that their phone number is not

associated with their responses. Collecting information about broadband internet access, feedback on alerts, and general desires of the community could drive future innovations and inform ways to improve use of SMS text messaging. Additionally, should there be established groups of populations within the subscription database, we could obtain specific information about the difficulties each group experiences and ways the CCTF could assist. While mass surveying of this form may face apprehension about privacy, there are ethical ways to obtain sensitive information in a secure manner through SMS text messaging. The aggregate results and takeaways from these surveys would be shared with the participants and would serve to aid the community in ways that are more personalized.

Our Current Text Messaging Setup and Trials

To subscribe to the CCTF COVID-19 text alert system, individuals only need to send a text message with the word "Subscribe" to our alert system phone number: (252) 672-2727. There are no special applications required, however messaging and data rates apply. The user will then receive a confirmation text from the same number stating that they have been successfully subscribed. Their number is added to the list of subscribers and they will receive text alerts whenever sent out by an "administrator".

As of April 2021, there are three administrators specified in the Twilio code to send out text messages to all subscribers. These administrators are Ryan Sellers, Cathy Cresswell, and Dr. Diana Silimperi. Administrators can use the "Broadcast" tool to send out whatever message they desire to all subscribers. They do this by texting our alert

phone number the word "Broadcast" followed by the message to be sent out, written exactly as they wish it to appear when delivered. Once sent, the message cannot be retracted, so great care should be taken prior to sending out a message. Upon request, we can provide our comprehensive guide to using the text messaging service (contact Ryan at rhzellers@gmail.com).

There have been three major trials of the Broadcast feature. The initial trial consisted of three subscribers and confirmed that all features (subscribe, start/stop, and broadcast) functioned as intended. The second trial went out to the Partners for Pamlico Team and the third trial went to the CCTF Advisory Council. From these trials, we identified and fixed some coding bugs and learned more about how to better navigate this service. The text messaging alert service is now ready to be deployed to all members of Pamlico County. We will continue assessing its performance and will address any bugs should they be discovered.

Limitations of Twilio

Twilio limits the amount of text messages that can be sent to 1 message per second. However, our preliminary trials so far have found messages to be delivered much faster than this, with almost all subscribers (less than 20) receiving text alerts instantly and at the same time. We currently use a "Twilio SMS-capable mobile number" which has the local Pamlico area code and looks just like a normal mobile phone number. We can queue up to 14,400 text messages to be delivered. This means that if all of Pamlico County's ~13,000 population subscribed, we could send out a text

message to all individuals without serious delays or limits placed by phone carrier service systems.

Should we ever face delays or require faster text message delivery times, we would need to apply for a Twilio Short Code. These 5 or 6-digit numbers can send text messages out at a minimum speed of 100 text messages per second, with a maximum queue of over 1 million texts. There is an application process and annual fees in the thousands. Currently, this service is unnecessary for our purposes, but is something to consider should we face issues with delivery speeds or carrier-placed limitations.

Legality of SMS Subscription-based Services

From Twilio:

> "As a rule, you should never initiate an SMS campaign without your customer's permission. Depending on your geographic location, your company is likely required to comply with wireless carrier compliance rules, industry standards, and applicable local law. One key compliance requirement is to ensure that recipients of your SMS messages have expressly consented or "opted-in" to receiving texts as part of your campaign."

We have ensured that all known legal requirements for Twilio subscription and unsubscription methods are met. As other similar organizations have done in the past, we assume that when an individual messages "Subscribe" to our text messaging service number that they are providing consent to receive text alerts from the CCTF. After they text "Subscribe" they receive this confirmation of content from our text messaging

service:

> *"Thanks! You have now subscribed to receive COVID-19 updates and alerts from Pamlico County's COVID-19 Community Task Force. Message 'stop' if you wish to unsubscribe."*

- It is immensely important that when advertising the subscription to Pamlico residents that the **content** and **estimated amount of weekly/bi-weekly texts** is clear.
- They must also be made aware they are signing up and that **they can unsubscribe at any time, for any reason**.
- Subscribers should **never receive any spam or advertising** to purchase a product.

By law, these rules must be adhered to at all times or risk legal action and/or loss of the text messaging service.

Recommendations for Expanding SMS Subscribers

The CRN is best suited for expanding the amount of SMS subscribers. Attaching a small blurb about how individuals can sign-up to receive critical healthcare alerts from CCTF could be attached to each newsletters. Otherwise, an entire email can be devoted to promoting CCTF text alert subscriptions.

TownDock.net is an information website dedicated to Pamlico and local

communities. The majority of current subscribers to the CCTF email newsletters originated from a posting on TownDock. This highly effective way of gaining subscribers could be used for expanding sign-ups for text alerts as well.
Below is an example of what subscription directions could look like:

> Are you interested in receiving short, timely, and relevant text message alerts from local Pamlico voices about COVID-19? Text "Subscribe" to (252) 672-2727 to receive bi-weekly text message updates with the most important up-to-date COVID-19 information and guidelines. Messaging and data rates apply. Text "STOP" to unsubscribe at any time.

From our feedback forms, we found that those hesitant to sign-up for text message alerts did not want to be spammed with multiple text messages on a daily basis or be sent the newsletter in text message form. Those who liked the idea of signing-up for text message alerts suggested concise, punchy bits of information sent only as necessary. This feedback should be taken into account when asking people to subscribe and when planning text message content and send rates.

#2: Increasing Feedback to Monitor and Maintain Effectiveness

Coordinator Focused-Discussion Analysis

Throughout the discussion we learned about the CRN's thoughts on best next steps and the CCTF's role post-covid, their perception on challenges and opportunities, their preferences on how to move forward and in what ways. Personal connection played the largest role in success, as we suspected from our literature review about CBOs. By joining an organization such as a church's services, making phone calls, and engaging in casual conversations, coordinators yielded some of their best insights about contacts and organizations themselves. Barriers included a lack of internet access for organizational members to receive newsletters. Additionally, some feedback from contacts led coordinators to believe that they might be receiving redundant information from multiple sources similar to CCTF's newsletter content. As the pandemic wore on, coordinators noted that engagement as well as feedback from contacts has decreased. Speculatively, coordinators stated that a potential reason for this was political pullback -- notably, conservative-leaning organizations and members have not responded well to receiving COVID-related information and recommendations. Most notably, churches have left the CRN recently as organizations. Increasing personal relationships and decreasing the burden of frequent communications between organizational contacts and the coordinators is key.

Contact Survey Analysis

Prominent takeaways from our contact survey via Qualtrics, distributed by organizational coordinators to their organizational contacts, included:

- Text messages are a feasible implementation to be used in the CRN distribution channel given that they are short, concise, and easy to distribute for the organizational contacts.
- Contacts or organizations must be encouraged & motivated to pass on information in order to saturate an entire network.
- Currently, email and word-of-mouth are the most commonly used methods of distributing COVID information for contacts to their organization members (as opposed to print, phone calls, etc.).

Newsletter Feedback Form Analysis

The findings indicate that overall, the CRN communications have made a tangible impact in Pamlico County, and have been well-received over the course of the pandemic. Newsletter subscribers find the information relevant, valuable, and noted that it has improved their overall understanding of COVID-19. In terms of potential suggestions for future communication, the greatest focus should be on ensuring that information continues to be easy to understand and concise. Avoiding jargon and encouraging transparency about the relaxation of restrictions and transition to a post-pandemic world is also critical. In terms of the newsletters themselves, a large portion of the feedback provided suggestions for boosting the visual appeal of the information by including whitespace, headings, and adjusting the structure to make some of the information easier to digest.

This feedback in turn informed a large portion of our text messaging

intervention. Through Twilio, the CCTF and its future iterations can easily disseminate concise, visually appealing information in a very accessible medium. Utilizing feedback loops such as this google form in future mass communications will allow leaders to tailor newsletters and updates to the community's needs.

#3: Developing and Adapting for Future Disasters

Synergy between CCTF and PCDRC

The CCTF has a unique ability to connect rural community members under a common goal. The CCTF was originally created to prepare and respond to natural disasters in Pamlico County. Focus shifted as the pandemic became a growing concern. The original mission of the CCTF has evolved to address specific elements of public health, but the goal of ensuring public safety has remained constant. Elements of the CCTF such as the CRN could become a sustainable part of Pamlico County to contribute to public safety and health.

The Pamlico County Disaster Recovery Coalition (DRC) and the CCTF have similar broad goals but address them in different ways. Where the CCTF has focused on information delivery and devising a network of rapid communication, the DRC is more hands-on in its efforts. The DRC has traditionally sought to aid in public safety related to natural disaster preparation and response by aiding in public safety projects. The DRC also has had a role in more traditional information delivery. In the hurricane season of 2020, the DRC went to great lengths to write, design, and distribute printed and digital pamphlets on hurricane safety tips, resources, and aid. The pamphlet was tailored to Pamlico County information and related COVID-19 to hurricane safety. The

CCTF and the DRC possess a common goal of public safety and components such as the CRN could be useful in the future.

Another synergy between the DRC and the CCTF are their relationships with local governmental offices. The CCTF has worked closely with the Pamlico County Health Department while the DRC has experience with the Emergency Management Department. Connections with official departments are invaluable in promoting a strong, unified effort against any issue. Health is a major concern following hurricanes and flooding as well, as mold and water quality are common issues.

Finally, the DRC is in the process of becoming an official 501(c)(3) nonprofit organization. This is immensely useful in obtaining grants and other funding opportunities. The Twilio Impact Fund is a grant that allows up to $150,000 for supporting goals similar to both the CCTF and DRC. In the future, the nonprofit status of the DRC could be incredibly beneficial for obtaining funding to better serve Pamlico County.

While COVID-19 may wind down, hurricanes and flooding will continue to be recurring issues in coastal communities such as Pamlico County. The DRC is under new, ambitious leadership and the CCTF may wish to explore options of uniting efforts as specific goals turn away from the pandemic and towards broad public safety and health.

Key Lessons and Legacies

One of the challenges identified in our interim presentation was the decentralized nature of the CCTF. While this allows community leaders, coordinators, and contacts the freedom to apply unique and personalized touches to their work, it can make assessment and adaptation a challenging process. Our subteam addressed this challenge by conducting a series of qualitative interviews with action team leaders and CCTF Advisory Board members and synthesizing our findings to gain a more complete picture of CCTF functions.

Information Flow

A common concern was the "black box" in terms of understanding how information flows through the different levels of the CCTF, from action team leader → coordinators → contacts → end users. Our work primarily focused on the coordinator and contact levels. By holding focused discussion groups with CCTF coordinators and developing a Qualtrics survey to sample organizational contacts, we were able to obtain a more complete picture of the Community Response Network's (CRN) efficacy and recommend best practices for future endeavors. The link between coordinators and contacts thrives on personal connections, individualized communication, and the knowledge of Pamlico's internal dynamics that these members bring to the CRN. The connection between contacts and end users is one we hope to continue elucidating through end user surveys.

The information provided in this report has been primarily the work of the Assessment and Adaptation subteam of Duke's Partners for Pamlico. We worked

closely with another subteam, the Health Innovations Team, to create and distribute an end user survey to better understand CCTF effectiveness and other health information. The top 20 most active organizational contacts distributed the survey to at least 5 members of their organization. This survey is ongoing, but preliminary results have been gathered and discussed by the Health Innovations Team. In short, they have found that most respondents trusted local health officials for COVID-19-related information and were generally familiar with the CCTF. Further analysis is limited at this moment, but will likely be discussed in a future report.

Formal Roles and Feedback Loops

Although not overly emphasized in this report, our previous work highlighted the effectiveness of having explicit roles for members of the CCTF. This helps mitigate the chance that any one person is overextending and burning out quickly. Having clear, assigned responsibilities to maintain on a regular basis divides the work more equally and fairly, and member satisfaction is critical for volunteer organization longevity and productivity.

Formal feedback loops allow the CCTF to measure effectiveness and prioritize goals. This can be as simple as attaching copies of our Google Form Feedback Form to the end of each newsletter. The information gleaned from these forms was valuable for assessing CCTF effectiveness. Furthering communication between different arms of the CCTF and with Pamlico County individuals is beneficial for establishing trust, improving productivity, and increasing overall effectiveness.

Outside the AAT's Scope

All members of the AAT are enrolled in a Bass Connections course at Duke that was originally timelined for two semesters, beginning in August 2020 and ending May 2021. As our final semester comes to a close, it is apparent that the COVID-19 pandemic remains present. The future of the pandemic and the CCTF is uncertain and unfortunately, we are not all in positions to continue assisting with the CCTF's efforts. We have left comprehensive documents for a transition to future students should they be needed. As for the CCTF, we anticipate several future challenges and goals.

We hope that components of the CCTF continue after the pandemic. If the CCTF joins with the Pamlico County DRC, there will be a need for long-term, recurring funds. The leadership of the DRC is confident in their ability to obtain these funds, but we believe that future students could assist with this. The Twilio Impact Fund of up to $150,000 would be a phenomenal opportunity to explore, as their application criteria fit the goals of both the CCTF and DRC.

Complete adaptation to a natural disaster preparation and response organization is outside our scope. Hurricane season is several months away and recommendations such as using Twilio text messaging for emergency alerts will not be able to be tested by all current students in our team.

One achievable recommendation from our interim report and suggested segmenting mailing lists to send targeted information tailored to specific groups in Pamlico County. As mentioned earlier in this report, the Twilio text messaging code needs to be revamped to allow for this possibility. Spanish-speaking residents could

receive information in Spanish and churches could receive church-specific COVID-19 advice. While the opportunities are endless, this too is outside our present scope.

Finally, we have yet to accomplish broad, direct information delivery to Pamlico County residents. The CRN uses organizational contacts to distribute information to their members. This is great letting trusted voices deliver information and initiating productive conversations. However, our surveys have repeatedly found that this information distribution rarely happens at its fullest potential and is unreliable. Despite this, our surveys indicate that the CCTF is a trusted voice in Pamlico County. The CCTF could establish pathways to send information directly to the majority of Pamlico County residents. Text messagings, email newsletters, social media, and print products could get the word out in a more reliable way while still maintaining trust.

Acknowledgements

We are hugely grateful for the following individuals who aided our team's efforts:

- **Dr. Diana Silimperi** and **Dr. Sumedha Ariely**, Partners for Pamlico Leaders
- **Cathy Cresswell,** Community Response Network Team Leader
- **Marjorie Dufek**, Communications Director, Editorial Team Leader
- **Kathryn Garcia**, Outgoing CRN Action Team Leader
- **Cathy Cresswell,** Incoming CRN Action Team Leader
- **CCTF Organizational Coordinators and Contacts**
- **Bob Fuller,** Pamlico County DRC Leader
- **Ellen Blackmon**, Masketeer Action Team Leader
- **Dr. Sharon Stephenson**, Medical Surge Action Team Leader
- **Reverend Douglas Pearsall**, Youth Action Team Leader
- **John Bollinger**, Fulbright Scholar
- **Dr. Arthur Garson, Jr.**, Chairman of Grand-Aides
- **Kim Brearley**, CFO of ThinkMD
- **Rebecca Skala**, FPMgr of MusoHealth
- **Julia Fuller**, Project Manager of Dimagi
- **John Hui**, CEO of Twiage

Without the valuable time, insight, and guidance from these individuals, we would not have been able to accomplish our three main objectives. We thank you all for your important contributions.

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