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Assessment of Clarity of Images in COVID-19 Health Education Materials Among Diverse Communities in the United States

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Abstract

Given the need to provide clear communication to diverse audiences in the United States during public health emergencies, this assessment of images in COVID-19 communication materials identified ways to improve visual communication design. Qualitative interviews were conducted with 74 participants from various racial and ethnic backgrounds to gauge the clarity of images without associated text used in two infographics. Most images were understood by participants, but for each image at least some participants had an interpretation different from intended or only captured a portion of the message. Some images were interpreted by most or all participants as representing something other than intended. Participant recommendations were used to develop seven practical ways to improve image clarity: realistic graphics, exaggerated body position and actions, details to show image context and background, icons to encourage or discourage actions, symbols to show movement, consistency in recommended behavior in each image, and closely matching image to associated text. These elements can be applied in combination with existing health equity guiding principles for creating visual communication products before testing and validating products with intended audiences of different sociodemographic and cultural background to ensure appropriateness and clarity of images.

Keywords

visual communication; health communication; diverse community; health equity

It is imperative that educational products are easily understood by diverse communities, especially considering the increasing racial, ethnic, cultural, linguistic, and national origin diversity in the United States (U.S.) (Centers for Disease Control and Prevention [CDC],

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We have no conflicts of interest to disclose.

Declaration of Interest Statement

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the U.S. Centers for Disease Control and Prevention. The authors report there are no competing interests to declare.

2021; Jensen et al., 2021). Insufficient consideration of audience background when developing communication materials may result in misinformation, errors, confusion, or loss of credibility in the agency creating those products (CDC, 2023).

During public health emergencies, the CDC plays a critical role in creating and disseminating emergency risk communication resources for the U.S. public. CDC aims to develop materials that are timely, accurate, consistent, and actionable (Baur & Prue, 2014; CDC, 2021). Communication resources from CDC are made available online to public health organizations (CDC, 2018) for use, adaptation, and dissemination. Therefore, rapidly developing materials of the highest quality and for the broadest audiences is of importance for strategic partners across the United States.

In addition to reaching the general population, CDC addresses the need for tailored communication of critical messages for specific audiences. CDC developed the *Health Equity Guiding Principles for Inclusive Communication* to help public health professionals “ensure their communication products and strategies adapt to the specific cultural, linguistic, environmental, and historical situation of each population or audience of focus” within the United States (CDC, 2023). The *Guiding Principles* include best practices for choosing images that are culturally appropriate, clear, and inclusive. Additionally, CDC developed the *Guiding Principles for Global Communication*, (CDC, 2024a) which includes questions to consider when creating and using visual products that feature people when working with populations across the globe. The guiding principles for visual products (CDC, 2024b) promote diverse representation, cultural respect, and images that are connected to reality.

In present public health practice, the inclusion of visual aids is important for communicating health information, especially for people with low literacy, and has shown to influence audience attitudes, attention, recall, comprehension, perceptions of risk, physiological responses, and health behaviors (Haragi et al., 2019; King & Lazard, 2020; Mackert, et al., 2016; Mbanda et al., 2021). It is recommended that the diversity of end users be considered in the creation of health information materials, including visuals, to ensure clear communication and that materials are tested for comprehensibility and acceptance with intended audiences (CDC, 2021; Scheltema et al., 2018). A recent review of cultural and linguistic appropriateness of COVID-19 educational materials by CDC staff who were native speakers of another language, found that images and graphics in translated materials could be interpreted differently than originally intended and be culturally inappropriate for the intended audience. Out of 82 printed materials, reviewers found 37 instances of confusing or misleading images (Rubio et al., 2023).

Given the need for communication materials to communicate health information to general audiences, including people with low literacy and those that may encounter CDC messages in a language they do not understand, we assessed the clarity of images without text in educational materials with various diverse audiences in the United States as a part of CDC’s response to the COVID-19 pandemic. The goal was to identify ways to improve visual communication design for current and future public health emergencies.

Materials and Methods

This assessment used illustrations extracted from two infographics created by CDC during the COVID-19 pandemic, “Stop the Spread of Germs” and “Symptoms of Coronavirus (COVID-19)” (see Figure 1 and 2). These infographics were intended to inform the general U.S. population, which includes audiences of various races, ethnicities, literacy levels and cultural and sociodemographic backgrounds, during the emergency response to COVID-19. As of December 2021, they were the most recent, printable infographics on COVID-19 symptoms and transmission prevention topics.

Six illustrations were randomly selected from each of the infographics to individually assess their clarity without text by adults of varying ages, genders, races, ethnicities, and country of birth. Images and corresponding questions were split into four interview guides that were used in rotation at each interview location. Figure 3 is a sample of the guides. The guides were translated to Spanish by a professional translation service. The guides and images without captions were then printed and provided to interviewers. Two of the images contained minimal text that was not removed. Images from the Spanish infographic were used for Spanish language interviews.

Data was collected using individual intercept and group interviews between December 2021 and April 2022 with a goal of interviewing a diverse group of participants, up to 100 participants. Project staff aimed to be able to identify trends in image interpretations and settled on the goal number of participants based on feasibility factors, including the number of interviewers available during the data collection period. Intercept interviews were conducted by CDC staff in English and Spanish with a combination of convenience and purposive sample of 58 adults in San Diego County, California and the City of Miami, Florida, where project staff were located. The interviews were face-to-face, semi-structured, and took 10 to 12 minutes. In San Diego County, interviews were conducted at a health fair, COVID-19 vaccination events, and at various public locations. Interviews in Miami were conducted with attendees of a communication seminar, with members of a Haitian neighborhood center, and at a commercial plaza. A partner organization conducted group interviews in Spanish with three groups of five to six people, totaling 16 respondents in the City of Hidalgo, Texas.

Inclusion criteria for participants consisted of the ability to complete the verbal interview in English or Spanish and to be at least 18 years old. Interviewers obtained verbal informed consent from participants before beginning the assessment. No incentives were provided to participants. Interviewers maintained a log of demographic details and locations of data collection sites. In the later stage of data collection, sites and participants were purposively selected to ensure participants represented a diverse range of sociodemographic characteristics.

Using the script in the interview guide, interviewers verbally provided participants with the context of the images, specifying that they would be related to either COVID-19 symptoms or ways to prevent COVID-19. Participants were then shown the images, one at a time, and asked several open-ended questions about them. Questions varied by image and inquired

about the perceived meaning of the image, possible actions or symptoms being presented and, if applicable, about symbols or icons in the image. Interviewers then presented the complete infographic including captions and asked participants for their suggestions to make the meaning of the previously shown images clearer. Responses and additional comments were handwritten in the printed guides by the interviewers. After assessing the initial images and infographic, interviewers gathered demographic information from each participant and presented the option to assess three additional images from the other infographic. In each of the three group interviews, the interviewer documented the group's collective interpretations and suggestions for improvement and noted their demographic information individually. At the conclusion of the interviews, participants were thanked for their participation and given a copy of the infographics to reinforce COVID-19 symptom recognition and prevention knowledge.

CDC did not deem this activity to be research. The assessment was conducted consistent with applicable federal law and CDC policy.

Coding and Analysis

Coders transcribed interview responses from the interview guides into an Excel spreadsheet. To ensure accuracy, Spanish interview responses were translated to English by two bilingual CDC staff. We used a conventional content analysis approach to first review all responses to gain familiarity with the data and then inductively establish an initial list of codes for each interview question (Hsieh & Shannon, 2005). Where participants expressed multiple meanings for the images, each interpretation was coded separately. Additional comments made by participants were coded if they were considered an interpretation of or a recommendation to improve the image. Group interview responses were documented as group comments rather than individual responses, and therefore were coded once.

Intercoder reliability was assessed using Cohen's kappa to measure the agreement between two independent coders. The Cohen's kappa coefficient values ranged from 0.72 to 1, with an average score of 0.84 indicating an almost perfect agreement (McHugh, 2012). Coders collaboratively discussed differences in coding decisions and reached a consensus to finalize the set of coded responses.

Codes were examined based on participant characteristics such as race and ethnicity (including non-Hispanic/Latino African American or Black [referred to as African American], non-Hispanic/Latino White [referred to as White], non-Hispanic/Latino Asian, Hispanic or Latino of any race, and persons of other race/ethnicity), age, gender, (including male, female, and persons of other genders), language spoken at home, and education level (including preprimary/kindergarten and below, primary/1st-6th grade, lower secondary/7th-9th grades, upper secondary/10th-12th grades, associate degree or vocational technical institute, bachelor's degree, master or doctoral degree) with the aim of identifying any potential relationships or trends with the coded responses. By combining related codes, we were able to categorize participant responses into themes, which informed the development of features to consider for future educational material development.

Results

Demographic Characteristics

A total of 74 adults in San Diego County, California ($n = 37$), the City of Miami, Florida ($n = 21$) and three groups of farmworkers in the City of Hidalgo, Texas ($n = 5, 6$, and 5) participated in this assessment. Fifty-one individual interviews were conducted in English and seven in Spanish; all three group interviews were conducted in Spanish.

Of the 58 participants interviewed individually, 34% self-identified as Hispanic/Latino: 16% as Hispanic/Latino White, 3% as Hispanic/Latino African American, and 3% as Hispanic/Latino Asian (see Table 1). Thirty-two percent of non-Hispanic/Latinos self-identified as African American, 16% as Asian, 12% as White, and 2% as American Indian or Alaska Native. Fifteen percent of participants self-identified as another race or preferred not to answer. Fifty-three percent of participants were born in the United States, 10% in Mexico, and 10% in Haiti; the remaining participants were born in nine other countries. Over half of participants reported speaking only English at home, 16% Spanish only, 10% English and Spanish, and 13% English and another language. Less frequent were Haitian Creole (7%) and Vietnamese (2%) only speakers. More than half of participants (60%) were female. The largest group of participants (36%) had a bachelor's degree and 14% of participants had a 10th–12th grade education level. Participants ranged in age from 18–80 years, with a mean of 40.

All group interview participants were born in Mexico, self-identified as Latino, and spoke Spanish at home. Other languages mentioned were English, Tzeltal, and Q'anjob'a (indigenous languages spoken in Latin America). Most participants self-identified their race as Indigenous [to Latin America] (50%) or Moreno (brown-skinned) (38%), a term used by some Mexican people to define Black ethnic identity (De La Torre, 2013). Group participants were aged 18–45 years, with a mean of 30; 15 participants were male, and one was female. Sixty-nine percent of participants had an education level of kindergarten or below, 19% had a 1st–6th grade education level, and 13% had a 7th–9th grade education level.

Image Interpretations

Each of the four image groupings were assessed by 22 individual interview participants and by one of the three interview groups, except for images S4–S6, which was not assessed in a group interview. Only three group interviews were conducted, using three questionnaires, leaving the fourth set of images unused in this setting. The meanings of most (63%) of the images and symbols were understood by at least 70% of participants; however, there were seven images that frequently caused misinterpretation. There were no apparent relationships or patterns found between participant characteristics (education, age, race and ethnicity, language spoken at home, or country of birth) and interpretation accuracy. Tables 2 and 3 summarize participants' interpretations of each image and symbol assessed. Missing values were excluded, and number of responses varied by image.

Suggestions from Participants to Improve Image Clarity

When presented with the infographic containing images they assessed with corresponding captions, participants were asked for recommendations to improve the images. Forty-nine participants provided recommendations, even when they understood the intended meaning. Recommendations to improve the clarity of images from participants were coded and combined to create seven themes, listed in order of frequency. Representative quotes for each of the themes were selected and included below; image, gender and/or the race or country of birth are indicated in brackets.

Theme 1: Realism: Forty-one interviewees suggested the use of realistic characteristics, like facial features — particularly when the symptom or preventative action referred to a part of the body; and the addition of expressions to demonstrate pain, discomfort, or fatigue.

African American person: “They need more facial descriptions. This just looks like touching a shoulder, it doesn’t indicate pain.” (Image S4-muscle or body aches)

Female born in Haiti: “Put eyes on them — this conveys their facial expression...without it, it denies you a way to rapidly communicate feelings and emotions. Even babies pick up on facial features quickly.” (Image P5-stay home when you are sick except to get medical care)

Using realistic shapes, such as droplets to represent sputum versus lines, was also recommended. Other notable remarks included consistent skin tone on all parts of the body (image P4), more comfortable clothing that is worn while sick (image S5), and more natural arm positions (image P2).

Theme 2: Exaggeration: Thirty-four participants suggested that exaggerating body positions and actions of the people in the images would provide more of an impact. Participants indicated that people in images could look sicker if they had a thermometer in their mouth (image P5), distressed facial expression (referring to all images), and were shown experiencing multiple symptoms at a time.

Female born in Haiti: “Hunch the body over to give it a sicker look. This image means nothing to my community. We need dramatic visuals. We are already auditory based; we prefer audio so the visuals must be amped up.” (Image P5-stay home when you are sick except to get medical care)

African American female: “I think that for someone who can’t read or doesn’t speak the language, can she look sicker? She just looks like she is resting to me.” (Image P5-stay home when you are sick except to get medical care)

Female born in Vietnam: “People get diarrhea [as a] symptom but [she doesn’t have it] too bad because she is still standing.” (Image S5-vomiting)

Theme 3: Detailed Image Context and Background: Twenty-one participants expressed a need for additional visual context to support the message being communicated.

Male born in Uruguay: I didn't know this was related to being in public because the background is blue. Add [a] sun, sky, grass...could be indoor, so maybe a bank, school. Also maybe add more people... standing around, like in a library, more than three people.

(Image P3-when in public, wear a mask over your nose and mouth)

Female, born in Spain: Seems like a runny nose. [They need] a spoon, or a symbol to represent taste. In the other two images, I see the toilet (image S5) and the redness (image S4) to let me know what is going on. But in this image, it needs a symbol that relates to eating or drinking to show there is something to taste or smell...like coffee. It's strong and everyone should be able to smell it.

(Image S6-New loss of taste or smell)

Image P5 prompted similar comments for contextualizing the image such as adding signs on the door, a food delivery arriving, adding flowers in the yard, a fence, and car to make the home appear more like a home versus some of the participants' original interpretation of the structure being a clinic or hospital. Inclusion of details to make stand-alone images informative were also suggested.

American Indian or Alaska Native female: "Add... the temperature that is considered a fever." (Image S2-fever)

Theme 4: Use of Contrasting Icons to Denote Encouraged Versus

Discouraged Actions: Some icons in the infographics were clear to participants, for example the red circle with a line through it in image P4 was broadly interpreted as a prohibited or discouraged action. However, the red "x" over the nose of the person in image S6, who is experiencing a new loss of taste and smell, was not understood. Fourteen respondents suggested the use of icons to signify promoted versus discouraged behaviors, such as using a red "x" versus a green checkmark to indicate which behavior was recommended.

African American female: "Add a check mark to show that it's a good thing [that she is in bed]. Add an opposing image of her out [of her home] to show what is bad." (Image P5-stay home when you are sick except to get medical care)

Theme 5: Symbols to Show Movement: The use of symbols signifying movement was recommended by 10 interviewees. These were clear for participants when assessing lines representing a cough in image S1, and arrows representing a 6-foot distance in image P2. Lines to show shivering (image S3) or lines from an area on the body that was in pain (image S4) was suggested by several participants.

African American female: "If you didn't say this is related to COVID, I would say [this image] is of someone having a heart attack. Add squiggly lines around to [mean] chilly or cold." (Image S3-chills)

Theme 6: Closely Match Image to Associated Text: Some of the infographic captions for preventing COVID-19 included multiple steps or caveats in the recommendation, such as throwing away tissues in the trash and then washing hands (image P6). After seeing the images in the infographic with associated text, 10 participants suggested that individual images should be used to represent each part of a recommendation or using panels to show action. Similar comments were made for image P4.

Female born in Uruguay: “Add two more images like a trash can and washing hands to show the action.” (Image P6)

Female born in Haiti: “[The caption] should just say [‘don’t touch your eyes’] because the mask is already covering the mouth and nose. Or have three faces to show the images separately. This says, ‘don’t touch eyes and cover your mouth and nose,’ so give them eyes.” (Image P4)

Theme 7: Consistent Recommended Behavior in Each Image: Regarding images in the same infographic, eight participants preferred that all prevention measures be practiced in all the images.

Male born in Haiti: “‘Wear a mask,’ but unsure if they are maintaining social distancing. [I am] so confused.” (Image P3-when in public, wear a mask over your nose and mouth)

Male born in Haiti: “He should have a mask somewhere to show that he took his mask off to blow his nose or sneeze.” (Image P6-cover your cough or sneeze with a tissue, then throw the tissue in the trash and wash your hands)

Discussion

Health communication materials include factsheets, billboards, newspaper articles, photo novellas, television broadcasts, radio commercials, social media content, and public service announcements (Mbanda et al., 2021; Rural Health Information Hub, n.d.). These materials frequently use visuals, such as pictures, drawings, graphs, and diagrams, which can be effective tools for drawing more attention to written or spoken messages, making them easier to comprehend. Our brains are prepared and adept at processing visual information, which is the primary system for meaning creation, attitude formation, and behavior (Mackert, et al., 2016). Thus, it is important to use images that effectively communicate the intended message since people can interpret visuals in different ways, just as they do words (CDC, 2022a).

Much of the literature emphasizes the inclusion of visuals in health communication and focuses on recommendation for creating whole communication materials versus specific elements within images or illustrations. Additionally, recommendations and evidence for selecting illustrative visual content are often vague, such as suggesting the inclusion of “culturally appropriate” and “attractive” visuals without providing parameters of what that means or what evidence supports that recommendation (King & Lazard, 2020).

The objectives of this assessment were to establish the clarity and interpretation of images used in two representative CDC COVID-19 health communication materials by members of the diverse U.S. population and to identify ways to improve their clarity. Although images in this assessment were generally understood by participants when assessed without text, for each image at least some participants had an interpretation different from intended. Two symptom related images, “chills” and “new loss of taste or smell,” were interpreted by most (77%) or all participants as representing something other than what was intended. Several participants only captured a portion of the intended message for other images. In the “Stop the Spread of Germs” infographic, many participants (21%-100%) missed the calls to action, especially in the image promoting handwashing after disposing of tissue used to cover sneezes and coughs and wearing a mask while in public.

The images used in the infographics were simple, but not necessarily clear. Our findings, like those of Scheltema et al. (2018), align with ‘realism theory,’ suggesting that the more information contained within an image, the more information will be translated and acquired by the viewer. Another project by CDC that aimed to better understand the communication needs of Spanish speaking, Mexican-born, U.S.-Mexico border region residents about chikungunya and dengue, found that participants seemed to understand realistic images of mosquitoes better than icons or cartoon-like images, and there was a higher comprehension and a narrower range of interpretations of images depicting facial expressions (CDC, 2022b). Participants in our analysis similarly supported the use of facial expressions and exaggerated body postures to illustrate the severity of symptoms and actions in the infographics.

Our assessment showed that symbols and icons were mostly, but unevenly, effective in emphasizing messages. Some symbols, such as arrows or a circle with a line through it, were widely understood. Participants suggested that other easily identified iconography, like droplets, be added to relevant images to make the message clearer. However, there remained some differences in interpretations, suggesting that meanings of symbols are not always universally understood.

Even though we did not ask specific questions about cultural appropriateness, several participants offered that some images might not have been appropriate because of their cultural perspective. For example, subtle actions, such as a person crossing an arm over their chest to mean chills (image S3), will not have an impact on people from Haiti, when exaggerated gestures and additional details are needed; and some images may unintentionally portray practices more typical in other countries, such as taking a temperature in the armpit, as in image S3.

Implications

Our findings have potential implications for future research and theory in visual messaging and health communication. These results emphasize the importance of detailed visuals with appropriate and relevant context to ensure image clarity and effectiveness, as underscored by the realism theory (Scheltema et al., 2018). The nuanced response to symbols and icons calls for further investigations into confirming consistent meaning across diverse populations (Houts et al., 2006).

Testing images with diverse groups, particularly images in materials for the general population, is important to increasing comprehension and actionability of important public health messaging (CDC, 2021). Comprehensive and collaborative methodologies that include interviews or focus groups of people with varying ages, genders, and cultural and linguistic backgrounds can be implemented (Dutta, 2008) to assess the clarity of images without text. Community-based partner organizations working with diverse audiences can be consulted for interpretation and translation services, testing facilitation, and recruitment.

Future research should consider interviewing participants from additional linguistic, racial, and cultural backgrounds and broader geographic scopes for enhanced generalizability of our findings. Furthermore, different theoretical frameworks, such as cognitive load theory (Sweller, et al., 1998), or dual coding theory (Paivio, 1991), can be explored to expand on how effective health communication materials with visuals should be presented.

Additional testing of images across different topics could provide a richer understanding of their universal effectiveness. Moreover, recommendations formed from this assessment could be applied and tested in images about lesser-known topics to further validate their applicability.

Strengths and Limitations

Several factors contributed to the successful implementation of this project. Collaborating with community-based partners enabled project staff to identify events for and locations frequented by populations that we were interested in interviewing. These partnerships also created trust for the interviewers in such locations versus approaching community members in unaffiliated public places. Participating partners were supportive in suggesting and making connections between the project staff and other organizations that could assist. Sharing the project plan and asking for referrals allowed us to expand the reach of this assessment.

Moreover, having translated the interview guide and providing access to native Spanish speaking interviewers allowed us to speak with Spanish speakers who had limited English proficiency, which ensured inclusion and enhanced the data quality. Additionally, the use of open-ended interview questions was successful for capturing nuanced perspectives.

Despite the strengths of the methodology and the relatively large number and diversity of participants for a qualitative method, this assessment had several limitations. Foremost, at the time of the assessment most people were familiar with COVID-19 symptoms and prevention messaging and could have guessed or had previous knowledge of the images' intended meaning versus confirming the images' clarity of content that is new to the participant. Additionally, because of the diversity of the convenience sample, there were not enough participants in population categories to identify patterns by education, age, race and ethnicity, language spoken at home, or country of birth for any of the images. We also included results from both group and individual interviews, that, while supplementary, were not balanced for a comparison. Further, the assessment was only conducted in three geographic areas and in English and Spanish, which limits the generalizability of the findings. Participants that also spoke another language may have understood interview

questions or infographic text better and responded differently in interviews with materials in other languages.

Conclusion

To ensure images used in communication materials are understood by broadly diverse audiences in the United States, images should be understandable without text. This assessment revealed areas for improvement in images used during a public health response. While participants generally understood the images without text, some had different interpretations. Seven practical ways to improve image clarity and increase audience understanding were presented: 1) using realistic graphics, 2) exaggerated body position and actions, 3) using details to show image context and background, 4) using icons to encourage or discourage actions (as appropriate), 5) using symbols to show movement, 6) closely matching image to associated text, and 7) using consistent recommended behavior in each image. These themes can be applied by public health professionals in combination with CDC's principles for developing inclusive public health communication and visual products. This includes showing diverse representation, appropriate cultural settings and dress, and including the intended population of focus in the decision-making process (CDC, 2023).

This assessment also supports the testing of images used in educational materials for general audiences with diverse population groups. Such a process will help to ensure the clarity of meaning of vital health communication messages to protect the health of the increasingly diverse population. Feedback from this assessment can be applied to future health communication materials, particularly during public health emergencies.

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Figure 1.
CDC COVID-19 Infographic "Stop the Spread of Germs" in English with Assessment Images Labeled

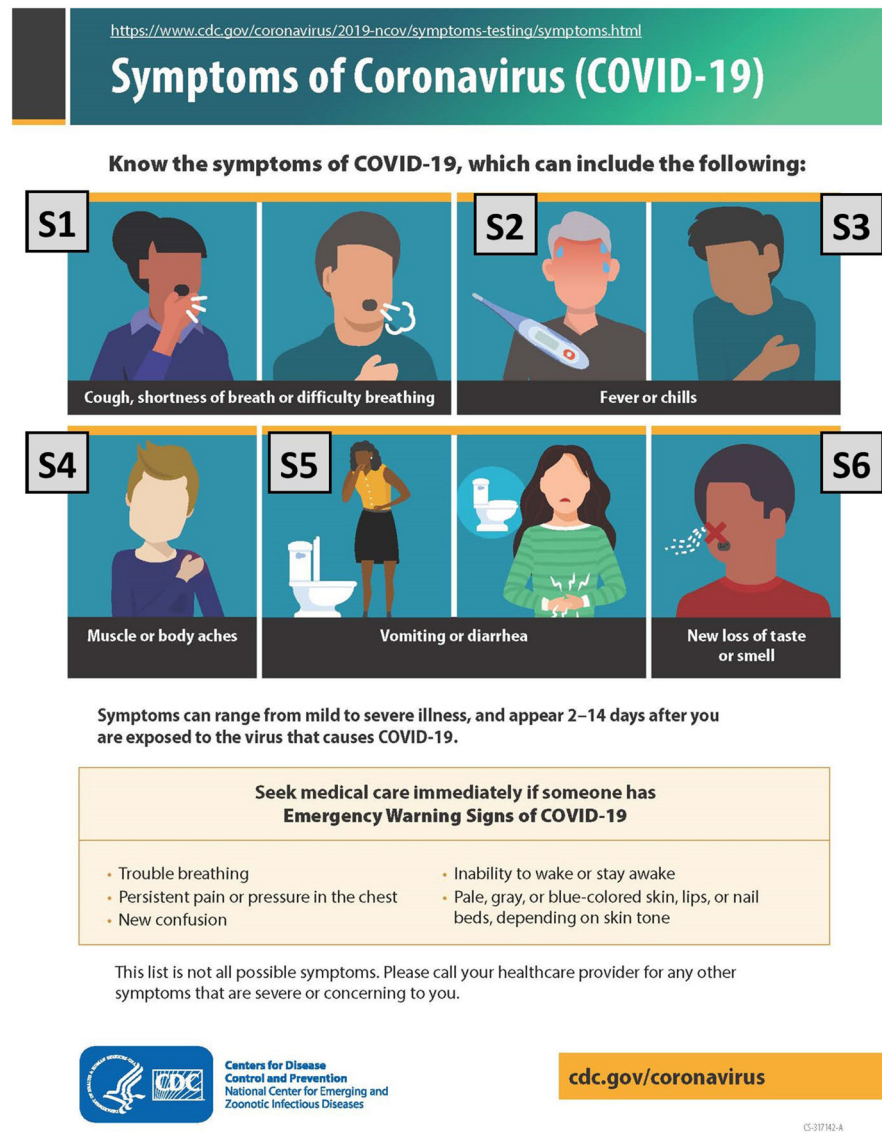


Figure 2.
CDC COVID-19 Infographic “Symptoms of Coronavirus” in English with Assessment Images Labeled

Interview Guide 2-English						
I am going to show you some images and ask your opinion about them. The images represent ways to stop the spread and protect yourself from getting COVID-19. Feel free to be completely honest about what you think about the images. Please keep in mind that there is no right or wrong answer. It is also OK to say "I don't know" or "I am not sure" if the meaning of the image is unclear to you.						
Location of interview	Date of interview	Interviewer name	Language of the interview			
			English	Spanish		
Image	Questions	Participant responses				
P4 	1. When you look at this image, what does it mean to you? What message do you think it is giving you? 2. Is this telling you to do something or not to do something? If yes, what? 3. What do you think the circle with the line across it means?	1. 2. 3.				
P5 	1. When you look at this image, what does it mean to you? What message do you think it is giving you? 2. Is this telling you to do something or not to do something? If yes, what?	1. 2.				
P6 	1. When you look at this image, what does it mean to you? What message do you think it is giving you? 2. Is this telling you to do something or not to do something? If yes, what?	1. 2.				
Pe 	Here is the infographic the three images are from. Take another look at the three images I just asked you about. Now that you see what they are meant to represent, 1. Is there anything you would add or change to the images we looked at to make the meanings clearer?	1.				
I have a few more questions before we finish the interview. I would like to ask about you, to be sure we are talking to people from many different backgrounds.						
How old are you?	What is your gender?	What is your highest level of education?	Are you of Hispanic or Latino origin?	What is your race?	What language do you speak at home?	In what country were you born?
-Specify: Prefer not to answer	☐ Male ☐ Female ☐ Other -Specify: Prefer not to answer	☐ Preprimary/Kindergarten and below ☐ Primary/1st-6th grade ☐ Lower secondary/7th-9th grades ☐ Upper secondary/10th-12th grades ☐ Associate degree or vocational technical institute ☐ Bachelor's degree ☐ Master or doctoral degree	☐ Yes -Specify: ☐ No Prefer not to answer	☐ White ☐ African American ☐ Asian - Specify: ☐ American Indian or Alaska Native ☐ Other -Specify: ☐ Prefer not to answer	☐ English ☐ Spanish ☐ Other - Specify: Prefer not to answer	-Specify: Prefer not to answer

Interview Guide 2-English (continued)		
Do you have more time and want to give your opinion on 3 more images?		
☐ No: Thank you for your time. Your feedback was very valuable. ☐ Yes: Continue the image assessment.		
Additional questions		
I am going to show you some images and ask your opinion about them. The images represent symptoms of COVID-19. Feel free to be completely honest about what you think about the images. Please keep in mind that there is no right or wrong answer. It is also OK to say “I don’t know” or “I am not sure” if the meaning of the image is unclear to you.		
Image	Questions	Participant responses
S4 	1. What do you think this person is doing? What symptom do you think this person has?	1.
S5 	1. What do you think this person is doing? What symptom do you think this person has?	1.
S6 	1. What do you think this person is doing? What symptom do you think this person has? 2. What does the red “x” mean to you?	1. 2.
Se 	Here is the infographic the three images are from. Take another look at the three images I just asked you about. Now that you see what they are meant to represent, 1. Is there anything you would add or change to the images we looked at to make the meanings clearer?	1.
Thank you for your time. Your feedback was very valuable.		

Figure 3.
Sample Interview Guide for the Assessment of Clarity of Images in COVID-19 Health Education Materials

Table 1

Sociodemographic Characteristics of Intercept Interview and Group Interview Participants of the Assessment of Clarity of Images in COVID-19 Health Education Materials Among Diverse Communities in the United States, January-April 2022

Characteristic	Intercept interview (n = 58)		Group interview (n = 16)	
	n	%	n	%
Age (years)				
18-34	26	45	12	75
35-49	15	26	4	25
50-64	11	19	0	0
65-80	6	10	0	0
Gender				
Male	22	38	15	94
Female	35	60	1	6
Prefer not to answer	1	2	0	0
Highest education level				
Pre-primary/kindergarten and below	0	0	11	69
Primary/1st-6th grade	0	0	3	19
Lower secondary/7th-9th grade	0	0	2	13
Upper secondary/10th-12th grades	8	14	0	0
Associate degree/vocational technical institute	14	24	0	0
Bachelor's degree	21	36	0	0
Master or doctoral degree	15	26	0	0
Language spoken at home				
English	31	53	0	0
Spanish	9	16	3	19
Other, English & Spanish	6	10	1	6
Other, Spanish & Q'anjob'al	0	0	1	6
Other, Spanish & Tzeltal	0	0	11	69
Other, Haitian Creole	4	7	0	0
Other, English & Haitian Creole	1	2	0	0
Other, English, Haitian Creole & French	1	2	0	0
Other, English & Tagalog	2	3	0	0
Other, English, Spanish & Japanese	1	2	0	0
Other, English & Telugu	1	2	0	0
Other, English & Vietnamese	1	2	0	0
Other, Vietnamese	1	2	0	0
Ethnicity				
Not Hispanic or Latino	20	34	0	0
Hispanic or Latino	38	66	16	100
Hispanic/Latino origin				
Argentinian	1	5	0	0
Cuban	1	5	0	0

Characteristic	Intercept interview (n = 58)		Group interview (n = 16)	
	n	%	n	%
Cuban & Dominican	1	5	0	0
Filipino	1	5	0	0
Mexican	13	65	16	100
Uruguayan	2	10	0	0
Not specified	1	5	0	0
Race				
African American/Black	21	36	0	0
American Indian or Alaska Native	1	2	0	0
Asian, Filipino	6	10	0	0
Asian, Indian	2	3	0	0
Asian, Vietnamese	3	5	0	0
White	16	28	0	0
Other, Haitian	1	2	0	0
Other, Hispanic/Latino	2	3	0	0
Other, Indigenous	0	0	8	50
Other, Mexican/Mexican American	3	5	1	6
Other, Moreno	0	0	6	38
Prefer not to answer	3	5	0	0
Country of birth				
Argentina	1	2	0	0
Cuba	1	2	0	0
Eritrea	1	2	0	0
Haiti	6	10	0	0
India	1	2	0	0
Mexico	6	10	16	100
Philippines	4	7	0	0
Spain	1	2	0	0
Sweden	1	2	0	0
Uruguay	2	3	0	0
United States	31	53	0	0
Vietnam	3	5	0	0

Table 2

Comprehension and Interpretation of Images and Symbols from the “Stop the Spread of Germs” Infographic by Diverse Communities in the United States

Image or symbol and intended message	Number of intercept interview participants and group ^a that understood image message as intended without text	Other interpretations	Number of participants and group that understood the call to action
P1e Get a COVID-19 vaccine. 	19 of 22 individuals - Group A	- Wear a mask [This person is] fully protected/safe to be around/ a responsible person - Not getting a vaccine is racist.	11 of 22 individuals - Group A
P2e Stay at least 6 feet (about 2 arm lengths) from other people. 	20 of 21 individuals - Group A	- Continue to/wear a mask - Even while social-distancing/vaccinated, you can still get COVID-19. - Keep a distance from sick/potentially sick people. - They are getting ready to fight.	15 of 19 individuals - Group A
P2e symbol Distance 	21 of 21 individuals - Group A		
P3 When in public, wear a mask. 	0 of 22 individuals 17 individuals and Group A understood as “wear a mask.”	- Wear a fashionable/creative mask - Woman running for president - Unity - COVID can affect anyone.	9 of 19 individuals (wear a mask)
P4 Do not touch your eyes, nose, and mouth. 	0 of 22 individuals 11 individuals understood as “do not touch your eye” 5 individuals understood as “do not touch your face”	- Wear/do not wear a mask. - Is crying - Cannot see - Do not use dirty hands. - Do not look at me. - Has a headache - Thinking of something important; there’s something she doesn’t understand.	16 of 22 individuals (Do not touch/rub your eyes/face with your hands.)

Image or symbol and intended message	Number of intercept interview participants and group ^a that understood image message as intended without text	Other interpretations	Number of participants and group that understood the call to action
P4 symbol 	18 of 22 individuals - Group B	- Danger/emergency - Stop	
Do not P5 	0 of 22 individuals 10 individuals understood as “stay/rest home if you are sick” or “isolate or quarantine”	- Stay in bed/at home and rest - Get a house - Someone stuck in a window - Relax/chill out/stay in bed late - Someone sick and in a hospital/clinic - Sick or pregnant and needs medical attention	12 of 22 individuals (Stay home/bed/isolate when you are sick.)
Stay home when you are sick, except to get medical care. P6 	0 of 22 individuals 10 individuals and Group B understood “use a tissue for a cough or sneeze” or “Cover your nose”	- Stay 6 feet apart from sneezy people. - Blow/clean your nose.	0 of 22 individuals 9 individuals and Group B (Use a tissue or cover your nose.)
Cover your cough or sneeze with a tissue, then throw the tissue in the trash and wash your hands.			

^aInterview group A ($n = 5$) assessed images P1-P3. Interview group B ($n = 6$) assessed images P4-P6.

Table 3

Comprehension and Interpretation of Images and Symbols from the “Symptoms of Coronavirus (COVID-19)” Infographic by Diverse Communities in the United States

Image and intended message	Number of intercept interview participants and group ^a that understood image message as intended without text	Other interpretations
S1 Cough 	• 20 of 22 individuals • Group C	• Sore throat • Watery eyes • Sneezing • Yelling • Someone with a headache/in pain
S1 symbol Cough 	• 21 of 22 individuals • Group C	• Saliva/phlegm • Germs/bacteria • Sound
S2 Fever 	• 21 of 22 individuals	• Chills • Overheating/out in the sun too long/tired from working
S3 Chills 	• 5 of 22 individuals	• Heart attack • Cheat pain/discomfort • Body aches • Arm pain • Soreness from receiving vaccination • Taking temperature in the armpit/fever • Coughing • Stroke • Broken heart
S4 Muscle or body aches 	• 6 of 22 individuals	• Arm/shoulder/joint pain • Soreness from receiving vaccination • Pinched nerve
S5 Vomiting 	• 22 of 22 individuals	• Stomachache/stomach pain • Diarrhea • Pregnancy
S6 New loss of taste or smell 	• 0 of 22 individuals	• Coughing/do not cough • Sneezing/do not sneeze

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Image and intended message	Number of intercept interview participants and group ^a that understood image message as intended without text	Other interpretations
		• Not covering cough/sneeze • Congestion/sinus infection/upper respiratory infection • Difficulty breathing • No nose • Prevent things from going into the nose • A mosquito is coming out of his mouth.
S6 symbol No [ability to smell/taste] 	• 5 of 22 individuals	• Stop • A warning/danger • Prohibited • Missing [a nose]

^aInterview group C (*n* = 5) assessed images S1-S3.

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