



HHS Public Access

Author manuscript

J Immigr Minor Health. Author manuscript; available in PMC 2017 May 12.

Published in final edited form as:

J Immigr Minor Health. 2015 February ; 17(1): 79–88. doi:10.1007/s10903-013-9928-z.

Development and Initial Testing of Messages to Encourage Tuberculosis Testing and Treatment Among Bacille Calmette-Guerin (BCG) Vaccinated Persons

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Abstract

Misperceptions surrounding the Bacille Calmette-Guerin (BCG) vaccine can lead some vaccinated individuals to resist being tested and treated for tuberculosis (TB). Educational messages to best explain the risk of TB to BCG-vaccinated, Hispanic persons were systematically developed and tested. First, TB program staff provided messages they considered effective. These were analyzed and validated by TB experts, and then presented in group interviews initially to foreign-born Hispanic persons with a TB diagnosis, and then persons without a prior TB diagnosis. Based on interviewees' feedback, preferred statements were used to develop one long and three short comprehensive messages. One-on-one interviews were conducted with Hispanic persons to assess the saliency of the comprehensive educational messages. Participants preferred messages that were gain or positively-framed and explained that BCG does not confer lifelong protection against TB. Participants confirmed the messages would likely have a positive impact on patient decisions to undergo TB testing and treatment.

Keywords

Tuberculosis; BCG vaccine; Health beliefs; Patient education; Message development

Introduction

Tuberculosis (TB) remains a leading cause of morbidity and mortality worldwide. In many regions the disease is feared, the cause and route of transmission is poorly understood, and

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

diagnosed persons live in shame. The stigma and misperceptions surrounding TB have been associated with patients: (1) denying they can become ill; (2) delaying seeking care; (3) failing to undergo or complete diagnostic testing; (4) refusing treatment for latent tuberculosis infection (LTBI); and (4) failing to complete treatment for active TB disease [1–8].

In 2011, foreign-born (FB) persons comprised 62 % of the 10,528 TB cases reported in the United States (US); 34 % of these cases were Hispanic or Latino [9]. Centers for disease control and prevention (CDC) surveillance data reveal that among the FB persons who develop active TB disease, approximately 31 % will do so within 4 years of their arrival in the US [9]. Thus, many immigrants become ill as they are becoming acculturated.

Research has demonstrated that when individuals are provided information that appears inconsistent with existing beliefs or behaviors, the resulting dissonance may lead some to purposefully avoid or ignore the new information [10]. Others may downplay the importance of the information, or add interpretations consistent with existing beliefs, behaviors, or personal characteristics [10]. These responses can lead people to develop a “biased optimism” that they will stay well despite their risks [11]. As such, healthcare providers are challenged to provide patient education in a manner that accommodates patients’ cultural understandings of disease, diminishes dissonance, and persuades these patients to follow medical recommendations [1, 2].

These challenges are compounded by the different approaches countries employ to control TB [2]. Countries such as the US and Canada test and treat people for LTBI, as well as those with active TB disease. In low to middle-income countries where TB is endemic, resources are primarily dedicated to treating those with active disease [2, 12]. These countries also vaccinate citizens against TB using the Bacille Calmette-Guérin (BCG) vaccine. Unlike vaccines in which one dose confers long-term protection, the protection offered by BCG is variable and incomplete [3–20].

Public health professionals regularly encounter reluctance or resistance to undergo TB testing and/or treatment among BCG-vaccinated persons. At times, this reluctance stems from erroneous beliefs that: (1) “positive” TB screening test results are solely caused by having been vaccinated with BCG, (2) BCG vaccine protects a person from becoming sick with TB throughout their entire life, and (3) if vaccinated, treatment for TB is not necessary [2, 21].

We report efforts to develop and characterize educational messages that would explain the risk of TB to BCG-vaccinated, foreign-born Hispanic persons, and mitigate the dissonance individuals experience relative to having undergone BCG vaccination and subsequently being informed they should be tested and treated for TB infection.

Methods

The project was executed in four phases. Prior to its initiation, the institutional review boards of the University of Florida and the Florida Department of Public Health reviewed and approved the protocol, recruitment materials, informed consent, and data collection forms.

Based on the misperceptions surrounding the BCG vaccine, we recognized a broad educational message was needed to explain: (1) BCG has a protective effect, yet TB bacteria may still reside in the body of vaccinated persons in the form of a latent infection; (2) prior vaccination is not the sole reason a person's tuberculin skin test or blood test is "positive"; and (3) TB bacteria can cause disease in vaccinated persons; accordingly, medication can be administered to prevent or cure TB disease. Thus, in Phase 1, TB program staff who work with a significant number of foreign-born patients, are recognized for their rapport with patients, and have a record of positive patient outcomes were identified and contacted. Project aims were explained and staff were asked to transcribe onto worksheets how they would explain why a belief is inaccurate, and persuade individuals who held inaccurate beliefs to get tested or treated for TB.

Submitted message statements were reviewed by TB experts to establish content validity. Messages were systematically analyzed and organized into seven thematic message statement groups. Statements were deleted if inaccurate or edited to improve reading ease. Investigators then selected statements most representative of each thematic group and strong from a theoretical perspective. Statements were translated from English to Spanish by two native Spanish speakers from Mexico, one of whom is a physician.

Phase 2 sought to discern the most persuasive statements in five of the seven thematic groups. Two semi-structured group interviews were conducted with six foreign-born Hispanic persons diagnosed with TB disease or latent TB infection. Participants were recruited through a State Tuberculosis Hospital and a County Health Department Tuberculosis Program, both in Florida. During group interviews, translated statements within each thematic group were presented using *MS PowerPoint*[®]. Participants' message preferences were captured using an interactive audience response system. Mailed surveys combined with phone interviews were conducted with an additional four persons.

In Phase 3, four semi-structured focus group interviews were conducted with Hispanic persons who worked with, or sought services from, a community organization serving migrant workers. Persons were ineligible to participate if they had a prior diagnosis of active TB disease or had been treated for LTBI. Participants selected the statements they considered most persuasive in five of seven thematic groups, and discussed reasons for their choices. Statements were again presented using *MS PowerPoint*[®]. Participants were provided worksheets that mirrored the slides, and asked to mark preferred statements. Participants were also asked to share opinions of message content. Phase 3 participants were also shown phase 2 participants' preferences and asked to comment on the phase 2 participants' choices. Data from the worksheets were entered into an *MS Access*[®] database, exported to *SPSS*[®], and analyzed. Phase 3 data were used to edit and combine statements from the thematic groups to create one long and three short comprehensive educational messages. Comprehensive messages were first created in English and then translated into Spanish.

Phase 4 aimed to assess the saliency of comprehensive educational messages with target audience members. One-on-one semi-structured interviews were conducted with eight Hispanic persons recruited through a community-based organization serving migrant

workers. None of the participants had a prior diagnosis of TB or LTBI. Participants were provided written copies of the four messages in Spanish. First, the long comprehensive message was read to the participant by the interviewer. Afterwards, participants were asked to report their thoughts as they listened to the message, explain the message in their own words, identify information that needed to be clarified, and share their opinions of the message's persuasiveness. After each of the three short comprehensive messages was read, participants were asked to identify the short message they liked best, provide the rationale for their choice, and share their opinions of the selected message. After listening to all four comprehensive messages, participants were asked if they had any questions about the need for a BCG-vaccinated person to get tested or treated for TB. Interview responses from each participant were assembled into an *MS Excel*[®] Spreadsheet for comparison and analyzed.

All interviews in Phase 2 through 4 were conducted in Spanish, audiotaped, transcribed in Spanish, and translated into English.

Results

Table 1 provides a demographic profile of participants in each phase of this project.

Results: Phase 1

Staff from five state TB programs provided messages in Phase 1. A total of 32 responses were collected related to the misperception that a positive TB test is due to BCG. Thirty responses were collected related to the misperception of lifelong protection, and 32 responses were collected related to treatment being unnecessary.

When message statements were reviewed to establish content validity, investigators and TB clinicians deleted statements that implied the vaccine's protection was complete for a period of time. Statements that specified when the vaccine's effect on skin testing subsided were also deleted, as the data do not support specific cut-points [22–25].

A review of message themes distinguished constructs from the Health Belief Model [26]; specifically: (1) perceived susceptibility of risk based on a person's characteristics, (2) perceived severity of the consequences of TB, (3) perceived benefits of actions to take to reduce personal risk of TB and correct misinformation that can pose barriers to action.

This analysis also found some messages were positively-framed and sought to focus attention on the gains, protection, or positive consequences of a recommended course of action. Other messages were negatively-framed and drew attention to losses or negative consequences from not following the recommended course of action.

Moreover, some message statements reflected one of two routes by which people can be persuaded as per the Elaboration Likelihood Model [27, 28]. The central route to persuasion entails prompting an individual to draw upon experience and knowledge to evaluate an issue. (Example: “*If the BCG vaccine provided lifetime protection, there would be very few cases of TB now.*”) Whereas, the peripheral route occurs when an individual is unable or unwilling to contemplate an issue, and makes a decision based upon the source of information or the impact the information has on the individual's affective state or attitudes [27, 28]. (Example:

“I know you care about yourself and your family. Do you really want to take the chance that you may have a disease that can kill you and spread it to your family and friends, as opposed to taking the treatment?”).

Finally investigators found similar message statements repeated across the three misperceptions. Accordingly, the message statements were consolidated into seven major thematic groups and subgroups (Table 2).

Messages statements that were representative of other statements in each thematic group and reflected various theoretical constructs were selected for presentation to participants in Phase 2 and 3. The decision was made to present statements from groups one to five (Table 2) to participants since: (1) TB testing and treatment information is relatively straightforward, and (2) groups one through five contained 41 message statements, thus we sought to avoid perfunctory responses from fatigued participants [29].

Results: Phase 2 and 3

After reviewing the selected message statements, there was consensus among Phase 2 participants that the messages in the five thematic groups had the capacity to garner people’s attention, enable understanding, and provide a clear rationale for TB testing and treatment, despite BCG vaccination.

Table 3 lists the English version of the message statements selected by Phase 3 participants as most salient in each thematic group. When asked why they preferred a particular statement, a few participants had difficulty articulating the specific reasons for their preferences beyond reiterating the statement in their own words, or declaring that their preferred statement *“makes sense”* or *“explains more clearly.”*

Additionally, some participants asked for information about how TB is transmitted, where to access TB testing, what TB testing entails, when and how often a person should be tested, TB symptoms, and whether allergies can cause a TB skin test to be mistakenly read as *“positive”*. Conversations revealed a few participants had undergone TB screening tests through their workplaces. While describing their experiences, it became evident some mistook the tuberculin skin test for a vaccination. Others, unaware of the bacterium’s capacity to establish a latent infection, expressed the belief that when they immigrated to the US, they had left the problem of TB behind. Many expressed appreciation for the knowledge acquired during the interviews.

Comprehensive Message Development

Multiple considerations were taken into account to develop the comprehensive messages tested in Phase 4; including message readability, the need to raise recipients’ perceived susceptibility to TB despite BCG vaccination, and perceived benefits of TB testing and LTBI treatment [30].

Message length was also contemplated. While Phase 2 and Phase 3 participants indicated an appreciation for descriptive information, putting information in context requires a longer message which may be overwhelming and dismissed as too complex. Conversely, shorter

messages with low literacy demands may not contain sufficient information to persuade recipients to initiate and complete multi-step diagnostic testing and lengthy treatment. Thus, both long and short messages were crafted and tested.

Message framing was a particularly significant consideration. Some studies have not found an advantage to using a particular frame to influence people's judgment and behavior [31]. Others have concluded that negative or loss-framed messages are advantageous when an advocated behavior is detection-oriented (e.g., testing for active TB disease or LTBI) and prevention-oriented behaviors are better promoted by positive or gain-framed messages (e.g., treatment for LTBI to prevent progression to active TB disease) [31]. The decision was made to employ both positively- and negatively-framed information into a long comprehensive message (Message A), and to develop three short messages. Of these, "Message B" was primarily negatively-framed; "Message C" was primarily positively-framed; and "Message D" included both positively and negatively-framed statements.

Results: Phase 4

The English-language version of Message A, message readability calculations, and the concepts participants reiterated when asked are presented in Table 4.

When asked their thoughts after listening to the message, half the participants indicated they contemplated their own or family members' susceptibility to TB. Others discussed increased perceptions of disease severity. The majority of participants were also able to clearly reiterate a number of the message's concepts when asked to explain the statements in their own words. However, one participant's response did display dissonance. After reiterating the benefit of the vaccine and "TB germs spread in the breath," the participant included the belief that TB could be transmitted by sharing eating utensils.

When asked to identify information that needed clarification: one participant suggested defining "immature immune system," another asked whether a person with LTBI could infect others, and two participants suggested including an explanation of how TB germs become airborne. One participant suggested the message explain who is at greater risk for becoming sick with TB disease.

When invited to state what they liked best about the message, participants indicated the: (1) explanation that the vaccine lowers a person's chance of developing severe forms of TB if the germs are inhaled, (2) advice that a person not take a chance with their health, and (3) encouragement to take treatment to protect loved ones.

When asked whether the message would persuade a BCG-vaccinated person to undergo TB testing and treatment: six participants expressed favorable opinions, one participant specified it would depend on the person, and one participant was not asked the question.

Among the short messages three participants preferred Message C, one participant liked D but reported they better understood C, three liked Message D, and one preferred Message B.

Message C (Table 4) is primarily a gain/positively-framed message. Participants appreciated the assertion about the vaccine's protection not lasting a lifetime is substantiated by the

statement that a significant amount of TB exists in countries that use BCG. Among the three participants who selected Message D (Table 4): two felt the message's explanations were clearer, and one indicated the information regarding testing was more distinct.

Discussion

Tuberculosis continues to be a major cause of death and disability globally [32]. The development of improved tools for the diagnosis and treatment of TB is vital. Immunologic tests, new drugs, and improved vaccines are also needed. However the basic biomedical approach to controlling and eventually eliminating TB is insufficient. The myths and misconceptions that surround the etiology, transmission, diagnosis, and treatment of TB are among the most effective means for stigmatizing patients, eroding their self-esteem, and impoverishing patients and their families. Moreover, these mistaken beliefs and misunderstandings alter peoples' behavior, engender secrecy, and can generate mistrust between patients and providers, all of which impede TB prevention and control efforts.

Generally, there is little guidance for framing patient education to accommodate cultural understandings of health and disease. Consequently, individuals who receive information that appears logically inconsistent with long-held beliefs and practices may experience dissonance, engage in avoidance behaviors, or modify misperceptions of their disease or condition so as to reconcile old information with new. This project attempted to address this issue by constructing and testing educational messages that address misperceptions surrounding the BCG vaccine. However our findings are limited; and as qualitative research, cannot be generalized.

The comprehensive educational messages were developed and evaluated with feedback from Hispanic persons only. Further testing is needed to ensure the messages are culturally appropriate for persons emigrating from countries in other regions that also use BCG. Additionally, evaluation is needed to ascertain whether these messages, or refined versions, have a positive impact on TB program indicators such as the rates people return to obtain TB test results, and initiation and completion of LTBI treatment. Evaluation efforts should assess birthplace, as persons from countries with a low TB burden or countries that do not employ BCG may not be persuaded to undergo testing using these messages.

In some jurisdictions, blood assays have replaced tuberculin skin tests (TST). While studies have found the sensitivity of the TST and some assays to be variable [33–35], patients may perceive a blood test as more credible, which could challenge some BCG misperceptions. This warrants further investigation.

Finally, the messages developed through this project are intended to assist TB program staff initially engage persons exposed to infectious cases in a dialogue, lessen initial hesitation to undergo screening tests or treatment, and actively listen to additional information. As such, they are not nuanced, nor do they address important issues such as: the probability of progressing from LTBI to TB disease; LTBI treatment adverse events; public health's aim of reducing TB incidence through LTBI detection and treatment; or the right to decline

treatment for LTBI. Additional supplementary messages addressing these topics should be delivered based on an individual's test results and risk factors.

Conclusions/Contribution to the Literature

Foreign-born, BCG-vaccinated Hispanic persons may be more likely to undergo diagnostic testing and treatment for LTBI when presented with positively-framed educational information that addresses the gains or protection garnered through these processes. Study participants, representative of this target audience, expressed preferences for messages that explain the protection from the vaccine wanes; encourage people to draw upon their knowledge of TB's prevalence despite widespread use of the BCG vaccine; and focus attention on obtaining positive outcomes for the individual and loved ones. The messages developed and tested through this project warrant additional refinement, testing, and evaluation.

Acknowledgments

This project was supported by a Social Behavioral Research Grant (SB-160793-N) from the American Lung Association and the American Lung Association of the Southeast. We are grateful to the TB professionals in Alabama, Florida, Illinois, South Carolina, and Virginia, as well as the clinicians, and individuals who participated in the interviews for their interest, time, and willingness to share their experiences, thoughts, and opinions—which are summarized in this report. We would like to also acknowledge the support provided by the TB Program at the Broward County Health Department in Ft. Lauderdale Florida; A.G. Holley State Tuberculosis Hospital (closed in 2012); the American Lung Association of Florida, Inc. South Area; and Farmworkers Self-Help Inc. in Dade City Florida for their assistance in recruiting participants and graciously allowing us to conduct interviews in their facilities; Dr. Paula Ham-sho-Diaz for her assistance translating messages; and Dr. Miriam Castillo-Gil for her diligence in transcribing and translating all interviews. Finally, we would like to express our sincere appreciation to our ALA project officer Elizabeth Lancet and Dr. Wanda Walton and Ms. Amera Khan of the CDC's Division of Tuberculosis Elimination for their support.

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Table 1

Demographic profile of participants in phases 1–4

	n (%)	n (%)	n (%)	n (%)
Phase 1 participants (n = 60) health department TB program staff				
Gender	Male	4 (7)	Female	55 (92)
Race	White	46 (77)	Black	9 (15)
Spanish, Hispanic, or Latino Ethnicity	Yes	8 (13)	No	52 (87)
Time worked with TB control program	5 years or more	29 (49)	1–4 years	14 (23)
Current job title	Nurse or nurse case manager	37 (62)	Other (Educator, disease intervention specialist, outreach worker, supervisor, program manager, public health prevention fellow, social worker)	23 (38)
Foreign-born clients in the past year	46 % or more	40 (67)	45 % or less	16 (26)
Region of the world the majority of foreign-born clients originate	Mexico, Central and South America	40 (67)	Southeast Asia	3 (5)
	Africa	3 (5)	Western Pacific	3 (5)
Phase 2 participants (n = 10) Hispanic persons previously diagnosed with TB or LTBI				
Gender	Male	7 (70)	Female	3 (30)
Age range	19–71 years	Average	40.1 years	0 (0)
Age groups	18–24 years	3 (30)	25–34 years	1 (10)
	55–64 years	0	65 or more years	2 (20)
Vaccinated with BCG as a child	Yes	8 (80)	No	1 (10)
Education	No formal education	1 (10)	1st to 6th Grade	0
Country of birth	Cuba	5 (50)	Mexico	2 (20)
	Uruguay	1 (10)	Guatemala	1 (10)
Time in the US	5 years	5 (50)	7 months to < 5 years	2 (20)
	6 months	3 (30)	No response	1 (10)
Phase 3 participants (n = 43) Hispanic persons without a prior TB diagnosis				
Gender	Male	10 (23)	Female	32 (75)
Age range	18–67 years	Average	37.9 years	1 (2)
Age groups	18–24 years	7 (16)	25–34 years	14 (33)
	55–64 years	5 (12)	65 or more years	2 (5)
	No response	1 (2)	35–44 years	10 (23)
	1 year College or Technical School	3 (30)	45–54 years	4 (9)
	Peru	1 (10)	No response	1 (2)

	n (%)	n (%)	n (%)	n (%)	n (%)	
Vaccinated with BCG as a child	Yes	28 (65)	No	4(9)	Unsure	11 (26)
Education	No formal education	3 (7)	1st to 6th Grade	23 (54)	7–12th Grade	16 (37)
Country of birth	Mexico	34 (79)	Argentina	2 (5)	Honduras	1 (2)
	US	5 (12)	Puerto Rico	1 (2)		
Time in the US	5 years	40 (93)	7 months to < 5 years	1 (2)	6 months	2 (5)
Phase 4 participants (n = 8) Hispanic persons without a prior TB diagnosis						
Gender	Male	2 (25)	Female	6 (75)		
Age range	27–56 years	Average: 0	35.9 years			
Age groups	18–24 years	1 (12.5)	25–34 years	4 (50)	35–44 years	2 (25)
	55–64 years	0	65 or more years	0	No response	1 (12.5)
Vaccinated with BCG as a Child	Yes	6 (75)	No	1 (12.5)	Unsure	1 (12.5)
Education	No formal education	0	1st to 6th Grade	3 (38)	7–12th Grade	4 (50)
Country of birth	Mexico	6 (75)	Honduras	1 (12.5)	US	1 (12.5)
Time in the US	5 years	6 (75)	7 months to < 5 years	2 (25)	6 months	0
						College or Technical School, 1 year or more
						1 (2)
						45–54 years
						0
						1 (12)
						1 year or more College or Technical School

Table 2

Message statement thematic groups and subgroups

Group	Group labels and sub-group labels
1.	In general, why BCG is given Where the vaccine is used Who is given the vaccine Why children are given the vaccine
2.	BCG helps to decrease the risk of developing severe forms of TB
3.	Why the vaccine is not completely effective/protection wanes
4.	Evidence the vaccine's protection wanes Incidence of TB around the world Testing outcomes The "Clinical Picture" (signs and symptoms of illness)
5.	Reasons for getting tested for TB The vaccine Know your test results What you gain from being tested What you can lose from not being tested
6.	The TB testing process and test results
7.	Treatment

Table 3

Educational information arranged by thematic group with messages statements selected as most salient by participants

Thematic groups and subgroups	Message statements	Participants who selected this statement (N = 43)
Group 1: "In general, why BCG is given"		
Introductory Statements: Where the vaccine is used and who are the recipients	BCG is used in countries where many people are sick with tuberculosis (TB). The vaccine is given to babies and small children.	N/A
<i>Participants were asked to select the best 2 of 4 messages choices.</i>	Because they can come into contact with persons with TB, and babies and small children have an immature immune system.	67.4 % (n = 29)
	Many more babies would die in the world if the BCG was not administered.	55.8 % (n = 24)
Group 2: "BCG decreases the risk of developing severe forms of TB"		
<i>Participants were asked to select the best 1 of 4 messages choices.</i>	BCG lowers the chance a person will develop severe forms of TB or die from TB, if they breathe in the TB germ.	37.2 % (n = 16)
Group 3: "The vaccine is not completely effective/protection wanes"		
Introductory statement: Acknowledge seminal misperception	Many people think the BCG vaccine will protect them from TB for their entire life.	N/A
The vaccine's effectiveness	The vaccine does not always prevent tuberculosis.	65.1 % (n = 28)
<i>Participants were asked to select the best 2 of 4 messages choices.</i>	Even with the BCG vaccine, you can still inhale the germ, and become infected.	62.8 % (n = 27)
Protection wanes <i>Participants were asked to select the best 1 of 3 messages choices.</i>	Protection from the vaccination does not last your entire life.	51.2 % (n = 22)
Summary statement:	So, people who have had the BCG vaccine can still get sick with TB.	N/A
Group 4: "Evidence that the vaccination's protection wanes"		
TB around the world/Global prevalence <i>Participants were asked to select the best 1 of 3 messages choices</i>	We still have a lot of TB disease in the world and mostly in the countries that do get BCG vaccine.	39.5 % (n = 17)
Testing outcomes <i>Participants were asked to select the best 1 of 2 messages choices</i>	We have tested other people from your country who were given the vaccine; their tests were negative. This demonstrates that a (your) positive reaction is a result of exposure to a case, not from the BCG vaccine.	48.8 % (n = 21)
Group 5: "Reasons for getting tested/treated for TB"		
What you can lose from not being tested <i>Participants were asked to select the best 2 of 5 messages choices</i>	Do not take a chance with your health. If the tests show the TB germs are in your body, take the treatment, because TB can kill you. Without treatment, you can spread the TB germs to your family and friends.	79.1 % (n = 34)
	I know you care about yourself and your family.	37.2 % (n = 16)
The vaccine <i>Participants were asked to select the best 2 of 6 messages choices</i>	Because BCG vaccination does not last a lifetime, it is important to your health that you be tested and treated.	48.8 % (n = 21)
	Knowing that the protection from BCG wears off, it is important to test to find out if the TB germs are in the body.	46.5 % (n = 20)
	Even if you were given the BCG vaccine when you were a child, you can become sick with TB if you breathe in TB germs.	46.5 % (n = 20)
Knowing your results <i>Participants were asked to select the best 2 of 4 messages choices</i>	"Knowledge is power," and we can protect ourselves from certain diseases by getting tested/or receiving therapy.	46.5 % (n = 20)

Thematic groups and subgroups	Message statements	Participants who selected this statement (N = 43)
What you gain from being tested <i>Participants were asked to select the best 2 of 6 messages choices</i>	The test is important. It will tell us if the TB germs are in your body and if you need medicine.	44.2 % (n = 19)
	If your tests show the germs are in your body, you need to be treated so you can be healthy and keep those you love safe from TB.	60.5 % (n = 26)
	Being tested will help you know if you need the preventative treatment.	51.2 % (n = 22)

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Table 4

Developed messages, participant reiterated concepts, and readability statistics

Message	Readability
<i>Long message A</i>	
<p>BCG is used in countries where many people are sick with tuberculosis (TB). Small children have an immature immune system. Because they may be exposed to persons with TB, the vaccine is given to babies and small children.</p> <p>Many people think the BCG vaccine will protect them from TB for their entire life. However, the vaccine does not always prevent tuberculosis.</p> <p>If a person breathes in TB germs, the vaccine helps lower the chance a person will develop severe forms of TB or die from TB. So, people who have had the BCG vaccine can still get sick with TB.</p> <p>We have tested other people from your country who were given the vaccine; their tests were negative. This shows a positive test is probably the result of contact with a person sick with TB disease, and not from the vaccine.</p> <p>Do not take a chance with your health. If the tests show the TB germs are in your body, take the treatment, because TB can kill you.</p> <p>With no treatment, you can get sick and spread TB germs to your family and friends. Get treated, stay healthy, and keep those you love safe from TB</p>	<p><i>English version</i></p> <p>Number of words: 195</p> <p>Number of sentences: 13</p> <p>Flesch Kincaid Grade level¹: 6.66</p> <p>Flesch Reading Ease²: 74.04 (Fairly Easy)</p> <p><i>Spanish version</i></p> <p>Fernandez-Huerta Reading Ease³: 93 (Very Easy)</p>
<i>Short message C</i>	
<p>We still have lot of TB disease in the world.</p> <p>Most of the TB is found in countries that use the BCG vaccine.</p> <p>If the vaccine protected a person for life, tuberculosis would not be a problem in the world. "Knowledge is power," and we can protect ourselves from disease.</p> <p>Knowing the protection from the vaccine wears off, it is important to be tested for TB.</p> <p>If your tests show TB germs are in your body, you need to be treated.</p> <p>Treatment will help you stay healthy and keep those you love safe from TB.</p>	<p><i>English version</i></p> <p>Number of words: 96</p> <p>Number of sentences: 7</p> <p>Flesch Kincaid Grade level¹: 5.86</p> <p>Flesch Reading Ease²: 77.47 (Fairly Easy)</p> <p><i>Spanish version</i></p> <p>Fernandez-Huerta Reading Ease³: 100 (Very Easy)</p>
<i>Short message D</i>	
<p>Many people think the BCG vaccine will protect them from TB for their entire life.</p> <p>If the BCG vaccine protected a person for life, TB would not be a problem in the world.</p> <p>People who have had the BCG vaccine can still get sick with TB.</p> <p>"Knowledge is power," and we can protect ourselves from disease.</p> <p>Knowing the protection from the BCG vaccine wears off, it is important to be tested for TB.</p> <p>Find out if TB germs are in your body, and if you need medicine.</p> <p>If your tests show TB germs are in your body, you need to be treated.</p> <p>Treatment will help you stay healthy and keep those you love safe from TB</p>	<p><i>English version</i></p> <p>Number of words: 116</p> <p>Number of sentences: 8</p> <p>Flesch Kincaid Grade level¹: 5.75</p> <p>Flesch Reading Ease²: 79.91 (Fairly Easy)</p> <p><i>Spanish version</i></p> <p>Fernandez-Huerta Reading Ease³: 97 (Very Easy)</p>

Readability calculated with an online software tool:—http://www.online-utility.org/english/readability_test_and_improve.jsp When asked to explain the message in their own words, 50 % or more of participants reiterated the statements in bold font

¹Flesch Kincaid grade level: rates text on a US school grade level

²The Flesch reading ease score: rates English text on a 100 point scale, a higher number indicates the document is easier to understand

³Fernandez-Huerta reading ease: an adaptation of the Flesch reading ease score, the Fernandez-Huerta readability formula calculates the readability of text in Spanish