

Advice-Oriented Messages for Asthma: Using Mind Genomics to Learn and Understand Patient-Relevant Issues in a “Just-in-Time” Way

Howard R Moskowitz^{1,2*}, Sunaina Saharan³, and Stephen D Rappaport⁴

¹Tactical Data Group, Stafford, VA, USA.

²Mind Genomics Associates, Inc., White Plains, NY, USA.

³Government Medical College, Patiala, Punjab, India.

⁴Stephen D. Rappaport Consulting, LLC, Norwalk, CT, USA.

*Correspondence:

Howard R. Moskowitz, Tactical Data Group, Stafford, VA, USA, and Mind Genomics Associates, Inc., White Plains, NY, USA.

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ABSTRACT

Through a combination of generative artificial intelligence and experimental design of ideas (Mind Genomics), the paper shows how to identify the messages about asthma that are relevant to people and make suggestions that people can follow. The study, with 101 respondents, shows the path by which a topic (asthma) can be identified, how artificial intelligence generates questions and ideas in minutes and hours, and how a study that is run in a day identifies what messages resonate in the minds of people that describe them and represent their actions that can be done easily. The paper shows the contribution of clustering to developing mind-sets of people with radically different ways of responding to the same message. The approach, doable in less than 24 hours at low cost, is suggested as a new feature in the education of medical professionals.

Keywords

Asthma Messaging, Generative AI, Medical Education Innovation, Mind Genomics.

Abbreviations

BDV: Binary Dependent Variables; IDT: Index of Divergent Thought; OLS: Ordinary Least Squares; RT: Response Time; RTEL: Response Time corrected for the number of elements.

Introduction

Asthma is a growing respiratory condition. Understanding how people respond to information about asthma management helps to increase the effectiveness of prevention and care, respectively [1-3]. This study, using the emerging science of Mind Genomics, focuses on the emotional response of people to messages about asthma—the responses being that of identifying with the message (the messages “fit” or do not “fit” me) and evaluating the feasibility of following any directive in the messages (easy to follow vs. hard to follow).

The literature of asthma deals with the physical and psychological

aspects of the disease. The emerging focus on the patient in the holistic sense and the appreciation of the need to work with the patient as a person opens up the opportunity to explore the nature of messaging [4-6]. This paper focuses on the reaction of the person, whether or not an asthma sufferer, to “advice-type” messages. The use of language couched as advice is prevalent in medicine, yet only recently has messaging been considered as critical, as something to be fine-tuned. With today’s world moving increasingly towards electronic messaging, and with the decreasing time that a medical professional can give to a patient, getting the messaging “right” is critical [7]. Rather than depending on the subtle cues transmitted to the patient by the professional, it is increasingly important to understand how to frame the messages when these subtle cues are simply unavailable [8].

The study aims to uncover the most relevant and impactful messages for managing asthma, allowing health educators and practitioners to tailor their communications to better reach and engage their target audience. This personalized approach can lead to more effective asthma management and improved health outcomes for individuals with the condition.

The Emerging Science of Mind Genomics

Mind Genomics is an emerging science focusing on the “world of the everyday” – specifically, the criteria that people use to evaluate information of the ordinary type. Mind Genomics integrates methods from psychology, neuroscience, and data analysis to reveal the underlying patterns of thought and decision-making associated with particular topics. Rather than ask people directly in qualitative research (e.g., focus groups, depth interviews, or even observational), we use a simple method that provides the necessary data, and which cannot be “gamed.” The approach creates a bank of topic-relevant messages called elements, mixes these messages according to a statistical plan called experimental design, presents the combinations (vignettes) to respondents, obtains ratings, and then, through statistics, deconstructs the response into the contribution of the different messages [9-11].

The process might seem convoluted. Could one not get the same information about asthma or any other topic by asking people questions using the survey? The answer is maybe. There are two issues to be considered: the first is that people want to be “correct.” Again and again, researchers come to the realization that the respondent tries to be consistent, often looking for clues about what might be the correct answer. This bias is not the same as open cheating but rather a predilection of people. The Mind Genomics layout of vignettes, easy-to-read combinations of messages, gets rid of that problem, making it impossible to guess the “right answer.”

The second and more severe issue is that when researchers ask people to look at one idea at a time, the idea has no connection to reality. People are always better at evaluating stories, vignettes, and slices of life. The Mind Genomics approach creates those slices of life which are easy to evaluate. The researchers present them to the respondent. The respondent evaluates them with very little difficulty, and the results emerge. The respondent does not have to intellectualize, nor does he have to think of an idea such as a piece of advice in total isolation. Rather, there is a context, a situation, even though the ideas or elements are presented in a way that a writer would call “not particularly felicitous.” The respondent can search through the vignette, virtually without being conscious of the search, and respond accordingly. Respondents find this situation easy, almost like traversing a highway, where the actions are virtually automatic and the judgments are correct, albeit not at the top of one’s mind during the drive. Figure 1 shows an example of a vignette from this study.

Mind Genomics helps researchers gain a deeper understanding of how individuals perceive information by exploring cognitive processes, analyzing responses, identifying preferences, detecting biases, predicting behaviors, and uncovering insights. One of the major benefits of Mind Genomics lies in its capacity to uncover unique clusters or mind-sets among participants as derived from their responses. Through the application of clustering techniques, the researchers successfully categorized individuals based on their similar rating patterns, uncovering various perspectives on

asthma. This segmentation enables one to customize messaging according to these mind-sets, making communication more impactful and better suited to the need to connect with a variety of audiences [12,13]. Practical applications of Mind Genomics in various industries include market research, product development, advertising campaigns, brand positioning, customer segmentation, and communication strategies [14,15].

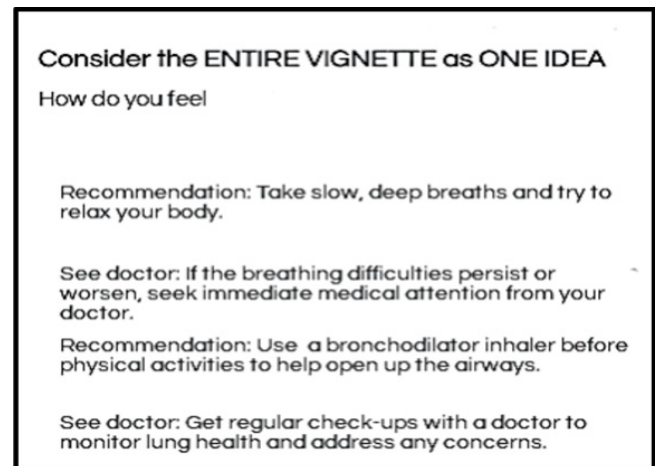


Figure 1: Example of a vignette showing the format of presentation.

Applying Mind Genomics to the Understanding of Messaging for Asthma

In this investigation of asthma, we focus on what types of messages are perceived to describe people and what types of advice are perceived to be easy to follow.

The Mind Genomics process follows a series of well-choreographed steps. The next section of this paper presents these steps, illustrating them with the empirical inputs created for this study [16]. It is important to recognize that the inputs for the study emerged both from the way researchers think about the problem and from the collaborative use of generative AI, namely ChatGPT 3.5, as a coach and system to generate information ideas [17]. Thus, the paper could be rightfully written by both a human being and AI in collaboration, with the human being doing the steering, but with AI doing a great deal of the creation of the materials and insights [18]. In fact, one might view this paper as one of the beginning efforts where the human researcher is augmented by artificial intelligence in a way that makes artificial intelligence a true collaborator.

The first steps create the raw materials. Figure 1 showed that the test stimulus for the respondent comprises of combinations of messages presented in a spare format. The typical Mind Genomics exercise requires the researcher to generate four questions that tell a story and, for each question, to generate four separate answers. The purpose of the question is simply to help generate the answers. It is the answers, or more correctly, the combination of answers, as presented to the respondent, which will constitute the test material.

Figure 2 shows the initial request to provide the questions. The left panel shows the blank spaces ready to be filled by user-generated questions. The right panel shows the four questions.

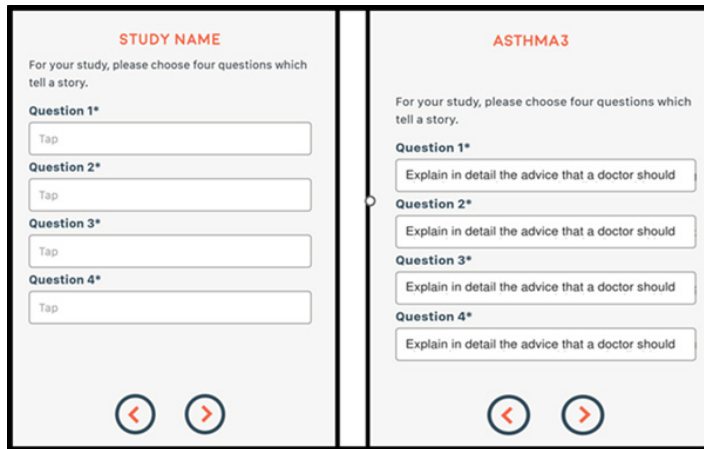


Figure 2: The BimiLeap request to the researcher to provide the four questions about asthma (left panel), and the four questions generated by AI (right panel).

The reality of research is that few people are really taught to think creatively. When requested in the study to come up with four different questions that tell a story, many researchers become uncomfortable often “freezing” unable to move forward. One possible reason might be that people are not taught in school to ask questions in critical thinking. They are taught to answer questions, but the idea of asking a relevant question seems to be something beyond something special. There are no courses where one learns to ask questions, at least not right now, although certainly in the future, these courses should emerge.

Use the BimiLeap Idea Coach to help formulate your four questions. Simply type in a short description of your idea, product, or whatever you are creating this study for and click submit. The Idea Coach will return up to 15 questions. You can use these questions as is, edit them, or write in your own.

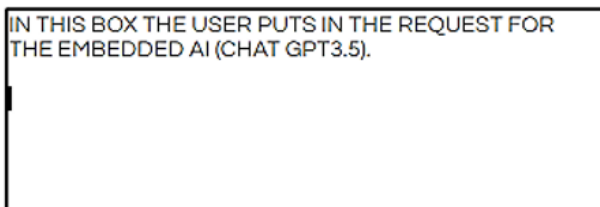


Figure 3: Screenshot of the Idea Coach. The user types in the request to

AI in the box provided.

To solve that problem, the researchers have incorporated artificial intelligence in terms of what is called Idea Coach, as shown in Figure 3. Idea Coach is accessed through a simple interface, a box where the researcher can type the request, such as, “Give me 15 questions regarding asthma,” or “What the doctor should ask?” When this is done, the artificial intelligence in the Mind Genomics platform (BimiLeap.com) emerges with a variety of questions, thus taking the pressure off the researcher and allowing the researcher to go forward [17,19,20].

Table 1 shows the output from four iterations of Idea Coach, with each iteration taking approximately 15-20 seconds to do. The table reveals the abundance of questions produced by AI. The table shows the output of four iterations. The top of each iteration shows the instructions (prompt) provided to AI. The four iterations were produced within 90 seconds total, and were made available both during the set-up, and afterwards in the Idea Book emailed to the researcher after the set-up is complete.

The same approach is used when the user is requested to generate four answers to a question (see Figure 4). As noted above, the task to provide answers to questions seems to be less onerous than the task to generate a set of four questions about a topic, with these questions created to “tell a story.” Figure 4 shows the request for four answers for a question. The left panel shows the question at the topic while the right panel shows the four questions finally selected and inserted into the study.

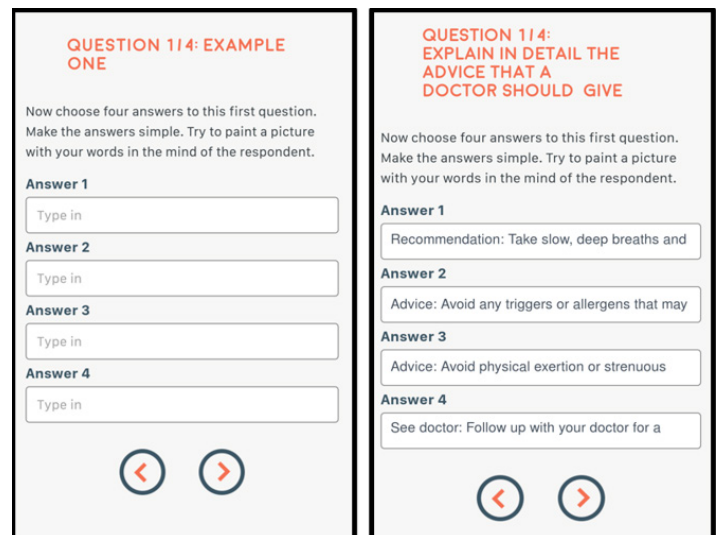


Figure 4: The request for four answers for a question.

Table 2 shows the four edited questions and the 15 answers to each question. To create the information shown in Table 2, the user simply needs to request 15 answers to the questions. The question was already selected, and so the Idea Coach screen was automatically filled in, rather than requiring the user to type into Idea Coach. Table 2 shows the four user-edited questions. The editing is done to ensure that the Idea Coach emerges with simple,

Table 1: Four sets of 15 questions generated by Idea Coach.

Instructions Provided to Idea Coach

I am interested in finding out what to ask and what to prescribe to a patient who has asthma. Please help me figure out the exact words that a doctor should ask a patient. Make the question no longer than 15 words, make the question understandable to a 12-year-old person and make the question in the form of advice.

Four Iterations, Each Generating 15 Questions, Emerging from Idea Coach (AI)

Note to reader: The AI only generates the questions with no memory, iteration to iteration. The user has to “wordsmith” the question to ensure that the answer(s) to the question are in the form of an elaborated, stand-alone phrase. That phrase adds context to the answer, making it meaningful in the Mind Genomics experiment.

Question Set 1

1. Are you experiencing shortness of breath or difficulty breathing? If so, you should see a doctor.
2. Do you have a persistent cough or wheezing? Consult a healthcare professional for further evaluation.
3. Have you noticed chest tightness or pain? Seek medical advice to determine the cause.
4. Have you been waking up at night due to coughing or difficulty breathing? Make sure to speak with a doctor.
5. Are you frequently coughing or feeling breathless during physical activity? It's important to see a healthcare provider.
6. Do you have a family history of asthma? Discuss this with a doctor for proper evaluation.
7. Have you experienced frequent respiratory infections? Seek medical advice for a possible diagnosis of asthma.
8. Are you frequently exposed to smoke or other environmental irritants? Consult a doctor regarding potential asthma triggers.
9. Do you feel better when taking asthma medication or using an inhaler? See a healthcare professional for asthma management.
10. Do you avoid certain activities or environments due to difficulty breathing? Speak with a doctor for guidance.
11. Have you ever been diagnosed with asthma? If not, seek medical evaluation for possible condition.
12. Are you allergic to certain substances such as pollen, dust, or pet dander? Consult a healthcare provider about potential asthma triggers.
13. Have you noticed a decrease in your lung function or peak flow readings? Make sure to see a doctor for evaluation.
14. Does your breathing difficulty worsen at specific times of the year or in certain locations? Seek medical advice for appropriate asthma management.
15. Are you experiencing wheezing or shortness of breath after exposure to cold air? Consult a doctor for further evaluation and guidance.

Question Set 2

1. Is it hard for you to breathe or do you often feel like you can't catch your breath?
2. Do you cough a lot or have a persistent cough that doesn't go away?
3. Do you feel your chest tighten or have trouble exhaling fully?
4. Do you wheeze or make whistling sounds when you breathe?
5. Do you notice any triggers like exercise, allergies, or certain environments that make your breathing worse?
6. Have you been using any prescribed inhalers or medications to help with your breathing?
7. Have you been exposed to any smoke or strong smells that have affected your breathing?
8. Are you waking up at night due to difficulty breathing or feeling out of breath?
9. Do you experience any chest pain or discomfort when you have trouble breathing?
10. Do you often feel tired or weak because of your breathing difficulties?
11. Are you getting shortness of breath during physical activities or exercise?
12. Has your breathing affected your ability to participate in your favorite sports or hobbies?
13. Did you ever have to visit the hospital or emergency room due to your breathing problems?
14. Are you allergic to any specific substances such as dust, pollen, animals, or certain foods?
15. How long have you been experiencing these breathing issues, and have they been getting worse over time?

Question Set 3

1. Is it difficult for you to breathe sometimes? If so, how often does this happen?
2. Do you have a tight feeling in your chest? If yes, when does it usually occur?
3. Have you ever experienced wheezing or a whistling sound when you breathe?
4. Do you often cough, particularly during exercise or at night?
5. Do you notice any triggers that make your breathing worse, such as pollen or animals?
6. Tell me if you've had any chest pain or discomfort recently.
7. Have you missed school or sports activities due to breathing difficulties?
8. Do you use any medication or inhalers for your breathing?
9. Have you ever visited the emergency room or been hospitalized because of breathing issues?
10. How does your breathing affect your ability to play or participate in physical activities?
11. Have you ever experienced any allergic reactions or hay fever symptoms?
12. Do you have any family members with asthma or allergies?
13. Do you feel short of breath when lying down or during sleep?
14. Have you had any recent colds or respiratory infections?
15. Have you noticed any improvement or worsening of your symptoms after using a certain medication or treatment?

Question Set 4

1. Do you experience difficulty breathing during physical activities or exercise?
2. Are you frequently coughing, especially at night or early in the morning?
3. Do you often feel a tightness in your chest or have trouble speaking due to shortness of breath?
4. Have you noticed any wheezing or whistling sound when you breathe?
5. Do allergens, such as dust, pollen, or pets, trigger your breathing problems?
6. Do you have a family history of asthma or other respiratory conditions?
7. Have you ever been hospitalized or visited the emergency room due to asthma symptoms?
8. Do certain weather conditions, like cold air or humidity, worsen your asthma?
9. Are there any specific activities or places that trigger your asthma symptoms?
10. Have you tried any asthma medications or treatments before? If yes, which ones?
11. Do you currently use an inhaler or any other asthma medication for symptom relief?
12. Are your asthma symptoms interfering with your daily activities or school performance?
13. Do you experience any other allergic reactions, like itchy eyes, sneezing, or runny nose?
14. Are you aware of any factors or situations that help alleviate your asthma symptoms?
15. Have you noticed any changes in your asthma symptoms recently? If yes, please describe...

Table 2: Suggested answers to questions.

Question 1 of 4: Explain in detail the advice that a doctor should give when a patient says, “It is hard for me to breathe.” or “I cannot catch my breath.” Make the answer no longer than 15 words and make the answer understandable for a 12-year-old person.

1. Take slow, deep breaths and try to relax your body.
2. Sit down and place your hands on your belly, taking deep breaths in through your nose.
3. Avoid any triggers or allergens that may make it difficult to breathe.
4. Use a rescue inhaler if you have one, as prescribed by your doctor.
5. Seek immediate medical help if you’re experiencing a severe difficulty in breathing.
6. Stay away from smoke or polluted areas that may worsen your breathing.
7. Use a humidifier or take a warm shower to help relieve breathing difficulties.
8. Avoid physical exertion or strenuous activities until your breathing improves.
9. Ensure proper ventilation in your living space to prevent poor air quality.
10. Try taking small sips of water to stay hydrated and keep your airways moist.
11. Practice breathing techniques like pursed-lip breathing and diaphragmatic breathing.
12. Keep your head slightly elevated with an extra pillow while lying down.
13. Maintain a healthy weight and exercise regularly to improve lung function.
14. Take allergy or asthma medications as prescribed by your doctor to manage your symptoms.
15. Stay calm and avoid panicking as stress can worsen breathing difficulties.

Question 2 of 4: Explain in detail the advice that a doctor should give when a patient says, “I keep waking up at night due to difficulty breathing or feeling out of breath.” Make the answer no longer than 15 words and make the answer understandable for a 12-year-old-person.

1. It is important to tell a doctor if you’re having trouble breathing or feel breathless at night.
2. The doctor will ask questions to understand your symptoms better.
3. They might examine your chest and listen to your heart and lungs with a stethoscope.
4. They may suggest doing a lung function test to check how well your lungs are working.
5. It is possible they will recommend doing a sleep study to understand what’s happening at night.
6. They might ask you about any other symptoms you’re experiencing or if you have allergies.
7. They may ask if you snore loudly or if anyone notices you stop breathing while asleep.
8. The doctor might want to know if you have a family history of breathing problems or sleep disorders.
9. It is important to let them know about any medications or treatments you’re currently taking.
10. They might suggest making lifestyle changes like quitting smoking or losing weight if necessary.
11. The doctor may prescribe medication to help open up your airways and improve breathing.
12. They might recommend using a device like a humidifier or air purifier in your bedroom.
13. The doctor may suggest elevating your head with an extra pillow while sleeping.
14. It is important to follow any advice or treatment plan the doctor gives to improve your breathing.
15. Don’t hesitate to reach out to the doctor if the breathing difficulties persist or worsen.

Question 3 of 4: Explain in detail the advice that a doctor should give when a patient says, “My breathing affects my ability to play or participate in physical activities.” Make the answer no longer than 15 words and make the answer understandable for a 12-year-old-person.

1. It is important to listen to your body and not push yourself too hard during physical activities.
2. Breathing difficulties can be managed with proper treatment and lifestyle changes.
3. Consult a doctor to evaluate your breathing and determine any underlying medical conditions.
4. Your doctor may recommend exercises to strengthen your lungs and improve breathing.
5. Make sure to warm up properly before engaging in physical activities.
6. Pace yourself and take breaks when needed to catch your breath.
7. Avoid activities in environments with poor air quality or triggers that affect your breathing.
8. Stay hydrated to help keep your airways moist and reduce breathing difficulties.
9. Consider using a rescue inhaler or other medication prescribed by your doctor for immediate relief.
10. It is essential to have an action plan in case of a severe breathing emergency.
11. Discuss any concerns or questions with your doctor openly and honestly.
12. Follow your doctor’s instructions for managing your breathing difficulties.
13. Ask about techniques such as deep breathing or pursed-lip breathing to aid in better airflow.
14. Join activities or sports that provide accommodations for individuals with respiratory conditions.
15. Remember that your health and well-being are paramount, so don’t be discouraged and stay positive.

Question 4 of 4: Explain in detail the advice that a doctor should give when a patient says, “I have a family history of asthma or other respiratory conditions.” Make the answer no longer than 15 words and make the answer understandable for a 12-year-old person.

1. Ask the patient about specific family members who have asthma or respiratory conditions.
2. Explain that having a family history of asthma might increase their risk of developing it.
3. Advise the patient to be aware of any symptoms related to asthma or respiratory conditions.
4. Explain that early detection and treatment is important if they experience any symptoms.
5. Suggest monitoring lung function regularly, especially if there is a family history of respiratory conditions.
6. Encourage the patient to maintain a healthy lifestyle with regular exercise and a balanced diet.
7. Recommend avoiding exposure to allergens and irritants that may trigger respiratory symptoms.
8. Advise the patient to practice good hygiene and avoid smoking or being around secondhand smoke.
9. Explain the importance of getting flu shots and other vaccinations to prevent respiratory infections.
10. Suggest exploring breathing exercises or relaxation techniques to manage any respiratory symptoms.
11. Explain that in severe cases, a doctor might prescribe medications to manage respiratory conditions.
12. Recommend staying informed about the latest research and developments in asthma and respiratory health.
13. Discuss the benefits of joining support groups or organizations related to respiratory conditions.
14. Encourage regular check-ups with a doctor to monitor lung health and address any concerns.
15. Reassure the patient that having a family history of asthma doesn’t mean they will definitely develop it, but being aware and taking precautions is important.

Table 3: Final questions and four answers to each question (elements).

	Question A: Explain in detail the advice that a doctor should give when a patient say, “It is hard for me to breathe.” or “I cannot catch my breath.” Make the answer no longer than 15 words and make the answer understandable for a 12-year-old person.
A1	Recommendation: Take slow, deep breaths and try to relax your body.
A2	Advice: Avoid any triggers or allergens that may make it difficult to breathe.
A3	Advice: Avoid physical exertion or strenuous activities until your breathing improves.
A4	See doctor: Follow up with your doctor for a thorough evaluation of your breathing difficulties.
	Question B: Explain in detail the advice that a doctor should give when a patient says, “I am waking up at night due to difficulty breathing or feeling out of breath.” Make the answer no longer than 15 words and make the answer understandable for a 12-year-old person
B1	Advice: Make sure your bedroom is well-ventilated and free from allergens like dust and pet dander.
B2	See doctor: If the breathing difficulties persist or worsen, seek immediate medical attention from your doctor.
B3	See doctor: Tell your doctor about any other symptoms you’re experiencing or if you have allergies.
B4	See doctor: Tell your doctor about any medications or treatments you’re currently taking.
	Question C: Explain in detail the advice that a doctor should give when a patient says, “My breathing affects my ability to play or participate in physical activities.” Make the answer no longer than 15 words and make the answer understandable for a 12-year-old-person.
C1	Recommendation: Use a rescue inhaler or other medication prescribed by your doctor for immediate relief.
C2	Recommendation: Join activities or sports which provide accommodations for individuals with respiratory conditions.
C3	Recommendation: Use a bronchodilator inhaler before physical activities to help open up the airways.
C4	Recommendation: Consider lifestyle changes, such as quitting smoking or improving indoor air quality.
	Question D: Explain in detail the advice that a doctor should give when a patient says, “I have a family history of asthma or other respiratory conditions.” Make the answer no longer than 15 words and make the answer understandable for a 12-year-old person.
D1	See doctor: Tell the doctor about specific family members who have asthma or respiratory conditions.
D2	Advice: Early detection and treatment are important if you experience any symptoms.
D3	See doctor: Get flu shots and other vaccinations to prevent respiratory infections.
D4	See doctor: Get regular check-ups with a doctor to monitor lung health and address any concerns.

meaningful phrases. The first of each iteration is the question selected, which is followed by 15 answers to that specific question. In the end, the process generates a set of four questions and four answers for each question, with the “work” divided between AI and the human researcher. Table 3 shows the final set of answers (elements). Note the editing of the questions to drive the AI to provide stand-alone phrases. Also note that the answers each have two parts. The front of the phrase gives the reader a hint about what type of message will be given. The back of the phrase is the relevant information. In this way, the respondent can skim through the vignette and get a fast impression of the message. Figure 1 shows the simplicity that this approach brings.

Creating Vignettes According to an Experimental Design

The actual test stimuli that the respondent will see and evaluate are known as vignettes. We saw an example of a vignette in Figure 1.

The vignette is a combination of elements. In the world of Mind Genomics, the vignettes are created according to an underlying experimental design. The experimental design specifies the exact composition of the vignette in terms of which element numbers appear in each vignette. The elements themselves can vary, but the experimental design specifies the composition of the combinations that will be presented to the respondent during the Mind Genomics “experiment.”

Mind Genomics works by what is called a permuted experimental design [21]. The underlying experimental design calls for 24 specific combinations. Each combination corresponds to a vignette. Mathematically, the composition of each vignette is fixed to ensure that the results can be analyzed properly by regression modeling and by clustering [22].

The strategy used by Mind Genomics to create the vignettes follows these eight steps:

1. The experimental design specified the composition of each vignette. For example, a vignette might have A1, B2, C3, D4. Another vignette might be specified as having A4, no B’s, C1, no D’s.
2. The experimental design ensures that all 16 elements appear equally often, specifically, five times in 24 vignettes.
3. No vignette ever has fewer than two elements, nor more than four elements.
4. A vignette can have, at most, one element or answer to a question.
5. The vignettes are “incomplete.” That is, there are a number of vignettes with only two elements or three elements. That is deliberate, allowing the 16 elements to be statistically independent of each other.
6. Each respondent evaluates a different set of combinations, but the underlying structure is the same. This strategy ends up covering a lot of the underlying “design space.”
7. The approach to doing that is called permutating the design. As an example, for one person, A1 is a certain element, and A2 is a certain element. A3 is a certain element. A4 is a certain element. When permuting, thus, A1 now becomes A3. A2 now becomes A4. Before retaining the permuted design, also known as the “daughter” design, we ensure that the design works in terms of regression modeling. We now have a new set of combinations to test with a respondent, with the combinations structurally the same but the actual combinations different. In effect, we are looking at a new part of the design space. With several hundred of such permuted designs, we cover a great deal more of the design space.
8. The use of individual experimental designs means that one can

apply statistical methods such as regression analysis to the data from one person. This ability to analyze deeply down to the level of one respondent will create the potential for productive clustering of the results, based upon the regression outputs at the individual level.

Mind Genomics can be metaphorically considered to be the “MRI of the Mind.” The experimental design is the same, but the specific combinations differ. The benefits of such are very simple. One does not have to know the answer ahead of time. The approach allows researchers to explore and cover a large range of opportunities, of alternatives. So, researchers really use Mind Genomics to explore rather than to confirm. There is no need to spend time overthinking. Researchers should just do the experiment right away. The researchers know that eventually, they are going to find what works and what does not work. So, it changes the research mind.

Applying Mind Genomics to Study How People Respond to Messages About Asthma

The actual study begins with an invitation to the respondent to participate. The respondents were colleagues and friends. The respondents who agreed to participate were directed to a link. The link opened up the Mind Genomics experiment.

The study began with a statement that the information would be private. Mind Genomics automatically anonymizes the data in any experiment, unless the study is specifically set up with the provision to identify the respondent. The respondent read a short orientation introducing the topic and began the study. The first task was to complete a self-profiling questionnaire about “who the respondent is,” etc. Table 4 shows the composition of the study for the self-profiling classification questions, first for the total panel, and second for the two “mind-sets” emerging from the study. Our focus is on the distribution of the 101 respondents for the total panel. Thus far, Table 4 is simply “information.” There is little insight to be gained from knowing the composition of the study.

Table 4: Self-profiling classification from the respondents.

	Total	MS1	MS2
Total	101	44	57
Male	54	24	30
Female	47	20	27
I have asthma	37	17	20
Friends who have asthma	27	11	16
No connection with asthma	14	8	6
Interest in learning about asthma	Total	1	2
No	27	7	20
Yes	69	36	33
Do not know	5	1	4

After the respondent completed the self-profiling questionnaire, the respondent was oriented about the study and then evaluated through 24 different vignettes. Table 5 shows the orientation and the rating scale to be used. It is important to note that in the Mind Genomics studies, the researcher does not spend a great deal of

time orienting the respondent, except for issues involving the law. The operating philosophy is that the respondent should use the material in the vignette to make a judgment. The orientation is simply meant to tell the respondent key information.

Table 5: Respondent orientation and five-point, two-sided rating scale.

Assume for a moment that you are a person who may have asthma. You go to your doctor for a check-up and the doctor tells you the information below. How do you feel?
 How do you feel:
 1-It is not me AND it is hard for me to follow.
 2-It is not me BUT it is easy for me to follow.
 3-I cannot answer.
 4-It is me BUT it is hard for me to follow.
 5-It is me AND it is easy for me to follow.

Transforming the Data to Prepare for Regression Analysis and Clustering

The scale shown in Table 5 combines two scales: the first dealing with identification (me, not me) and the second one dealing with ease of following (easy to follow, hard to follow). The objective of the Mind Genomics study is to relate the presence/absence of the 16 elements to these two dimensions, me/not me and easy to follow/hard to follow.

The next step in the Mind Genomics analysis converts the rating scale into a set of unidimensional scales, which take on only one of two values, 0 or 100, respectively. These can be called Binary Dependent Variables (BDV). It will be the BDVs that will be analyzed later by Ordinary Least Squares (OLS) Regression Analysis. Table 6 shows the transformation. After the transformation is completed, a vanishingly small random number, less than 10^{-5} , is added to the newly created BDVs. By adding this random number to each newly created BDV, the researchers ensure that the values of the BDV have some minimal variability. The happy result is that the regression analysis will never encounter a situation where there is no variation in the dependent variable, a situation which causes the regression analysis to abort. The prophylactic addition of the small random number means that the regression analysis will always work.

Table 6: Transformation of rating scale values to the BDV.

BDV	BDV Name	Rated 1	Rated 2	Rated 3	Rated 4	Rated 5
R5x	ME & Easy to follow	0	0	0	0	100
R1x	Not ME & Hard to follow	100	0	0	0	0
R54 x	ME	0	0	0	100	100
R52x	Easy to follow	0	100	0	0	100
R21x	Not ME	100	100	0	0	0
R41x	Hard to follow	100	0	0	100	0

When the respondent rated the vignette, the BimiLeap program recorded the rating in the database and added the time elapsed between the appearance of the vignette on the screen and the assignment of the rating. This time is called Response Time (RT). The RT value was further used to create a new dependent variable, RTEL, defined as the response time corrected for the number of

elements in the vignette. After the BimiLeap program recorded the rating and computed the response time, it proceeded immediately to the next vignette. This automatic step reduced the respondent fatigue, requiring the respondent simply to read the vignette and assign the rating.

Estimating the Regression Equation for the BDV and for Time Variables (RT, RTEL)

Regression analysis relates the presence or absence of each of the 16 elements to the dependent variable. In the researchers' case, the dependent variable is either one of the BDVs shown in Table 6 or the response time (RT or RTEL). The regression procedure is appropriate and valid in a statistical sense because each respondent evaluated 24 different combinations created by an experimental design. The experimental design ensures that the variables are statistically independent of each other. Consequently, the relation between the elements and the rating can be established using OLS, ordinary least squares regression [23]. The vignettes evaluated by each individual respondent conform to the permuted design, allowing us to estimate these regression models at the group level, or even at the individual respondent level.

The researchers' regression analysis is called "dummy variable" regression because all they know about the independent variables or the elements, whether they appear in a vignette or whether they are absent from the vignette. The independent variables take on the value 0 when the element is absent from the vignette and the value 1 when the element is present in the vignette. This is called "dummy variable modelling." The equation is expressed as: $Dependent\ Variable = k_1A1 + k_2A2 \dots K_{16}D4$. The model does not have an additive constant. All of the explanatory power of the model, our regression equation, resides in the values of the coefficients [24,25]. Table 7 shows the coefficients for the total panel. One can estimate the likelihood of statistical significance of the coefficients by running the regression analysis with an additive constant, finding out the statistical significance level of a coefficient, and then determining the corresponding coefficient value when the same regression model is estimated, but without an additive constant. For these data, the coefficient value of 21 can be taken as statistically significant.

The Key BDV in Table 7 is R54, Describes ME

When we focus on R54 (as seen on Table 7), Describes ME, we see that only two elements really generate statistical significance, at least for the total panel:

B3	<i>See doctor: Tell your doctor about any other symptoms you're experiencing or if you have allergies.</i>
B4	<i>See doctor: Tell your doctor about any medications or treatments you're currently taking.</i>

When we look at the response time, it is appropriate to look at the dependent variable RTEL, the response time corrected for the number of elements. Our focus is on the higher scoring coefficients, 0.3 or higher. These are the elements that maintain the respondent's attention even if the respondent may not necessarily be aware of their holding power.

B1	<i>Advice: Make sure your bedroom is well-ventilated and free from allergens like dust and pet dander.</i>
B4	<i>See doctor: Tell your doctor about any medications or treatments you're currently taking.</i>
C3	<i>Recommendation: Use a bronchodilator inhaler before physical activities to help open up the airways.</i>
B3	<i>See doctor: Tell your doctor about any other symptoms you're experiencing or if you have allergies.</i>
B2	<i>See doctor: If the breathing difficulties persist or worsen, seek immediate medical attention from your doctor.</i>
C4	<i>Recommendation: Consider a lifestyle changes, such as quitting smoking or improving indoor air quality.</i>

Key Subgroups - Sufferers vs Non-Sufferers of Asthma, and Mind-Sets

The use of individual-level experimental designs means that it is possible to create models or equations for any group of people in the population. In the self-profiling classification, the respondents were asked whether they suffered from asthma or not. It is thus possible to create a model or an equation for all the respondents who said that they have no asthma versus the respondents who said that they do have asthma. This is straightforward and simply requires the researchers to sort the data into the two groups.

The creation of mind-sets is a different matter. By way of introduction, a hallmark of Mind Genomics is the search for and the discovery of groups of individuals who generate similar patterns of coefficients for a specific topic. These groups are called mind-sets. A mind-set can be operationally defined as a group of people who, for a specific topic, show similar patterns of coefficients when they participate in a Mind Genomics study. The similarity of patterns of coefficients means that, at least at this level of granularity, the people in one mind-set think alike, whereas they think differently from the way people in another mind-set do. Again, the focus is on the granular level—the specifics of the topic. What is important to remember is that we are dealing with emergent groups—groups defined by momentary behavior, viz., response patterns to messages about a topic.

Creating these mind-sets ends up being simply a matter of k-means clustering of the 16 coefficients [26]. The reader is referred to these other papers for a more detailed exposition. For this study, it suffices to note that the k-means analysis produced two mind-sets, and then three mind-sets. An inspection of the output from the k-means clustering showed that the pattern of coefficients created by the mind-sets was easier for the two-cluster or mind-set solution while being harder for the three-cluster or mind-set solution.

Table 8 presents the strong performing elements for the Binary Dependent Variable R54x, "Describes ME". Strong performing is defined as a coefficient for R54x of 21 or higher, corresponding to a coefficient that would be statistically significant. In turn, Table 9 shows the actual coefficients for the Total Panel and for the four subgroups, asthmatic versus non-asthmatic, and Mind-Set 1 versus Mind-Set 2.

Table 7: Coefficients for the total panel. The key dependent variable is R54x, Describes ME. The table is sorted by the magnitude of coefficient for R54x.

	Result from Total Panel The Key Dependent Variable is R54 Describes ME	R54x	R52x	R21x	R41x	R5x	R1x	RT	RIEL
	Does it describe ME?	Yes		No		Yes	No		
	Is it easy to FOLLOW?		Yes		No	Yes	No		
B3	See doctor: Tell your doctor about any other symptoms you're experiencing or if you have allergies.	21	17	6	10	13	2	0.9	0.3
B4	See doctor: Tell your doctor about any medications or treatments you're currently taking.	21	20	6	6	15	1	0.8	0.3
A4	See doctor: Follow up with your doctor for a thorough evaluation of your breathing difficulties.	19	17	7	9	12	1	0.7	0.2
B1	Advice: Make sure your bedroom is well-ventilated and free from allergens like dust and pet dander.	19	21	9	7	12	0	1.0	0.3
A1	Recommendation: Take slow, deep breaths and try to relax your body.	18	20	6	4	13	-1	0.8	0.2
A2	Advice: Avoid any triggers or allergens that may make it difficult to breathe.	18	15	6	8	10	1	0.8	0.2
C2	Recommendation: Join activities or sports which provide accommodations for individuals with respiratory conditions.	18	19	8	7	14	3	0.7	0.2
D1	See doctor: Tell the doctor about specific family members who have asthma or respiratory conditions.	18	14	6	10	11	3	0.7	0.2
B2	See doctor: If the breathing difficulties persist or worsen, seek immediate medical attention from your doctor.	17	17	6	6	12	1	0.9	0.3
A3	Advice: Avoid physical exertion or strenuous activities until your breathing improves.	16	19	8	5	13	1	0.6	0.2
C3	Recommendation: Use a bronchodilator inhaler before physical activities to help open the airways.	16	19	9	7	12	3	0.8	0.3
C1	Recommendation: Use a rescue inhaler or other medication prescribed by your doctor for immediate relief.	15	19	10	7	11	3	0.6	0.2
C4	Recommendation: Consider lifestyle changes, such as quitting smoking or improving indoor air quality.	15	17	8	6	11	2	0.8	0.3
D3	See doctor: Get flu shots and other vaccinations to prevent respiratory infections.	15	14	6	7	9	1	0.5	0.1
D4	See doctor: Get regular check-ups with a doctor to monitor lung health and address any concerns.	15	14	6	8	10	3	0.7	0.2
D2	Advice: Early detection and treatment are important if you experience any symptoms.	13	11	6	8	8	3	0.6	0.1

Table 8: Strong performing elements for "DESCRIBES ME" by subgroup.

	1. Strong performers for self-described Non-Asthmatic - None
	2. Strong performers for self-described Asthmatic - Almost all
B4	See doctor: Tell your doctor about any medications or treatments you're currently taking.
B1	Advice: Make sure your bedroom is well-ventilated and free from allergens like dust and pet dander.
B3	See doctor: Tell your doctor about any other symptoms you're experiencing or if you have allergies.
D1	See doctor: Tell the doctor about specific family members who have asthma or respiratory conditions.
B2	See doctor: If the breathing difficulties persist or worsen, seek immediate medical attention from your doctor.
C3	Recommendation: Use a bronchodilator inhaler before physical activities to help open the airways.
A1	Recommendation: Take slow, deep breaths and try to relax your body.
C2	Recommendation: Join activities or sports which provide accommodations for individuals with respiratory conditions.
A2	Advice: Avoid any triggers or allergens that may make it difficult to breathe.
A3	Advice: Avoid physical exertion or strenuous activities until your breathing improves.
C1	Recommendation: Use a rescue inhaler or other medication prescribed by your doctor for immediate relief.
D3	See doctor: Get flu shots and other vaccinations to prevent respiratory infections.
A4	See doctor: Follow up with your doctor for a thorough evaluation of your breathing difficulties.
	3. Strong performers for Mind-Set 1 - Doctor is in control
B1	Advice: Make sure your bedroom is well-ventilated and free from allergens like dust and pet dander.
B3	See doctor: Tell your doctor about any other symptoms you're experiencing or if you have allergies.
B4	See doctor: Tell your doctor about any medications or treatments you're currently taking.

D4	See doctor: Get regular check-ups with a doctor to monitor lung health and address any concerns.
D1	See doctor: Tell the doctor about specific family members who have asthma or respiratory conditions.
D3	See doctor: Get flu shots and other vaccinations to prevent respiratory infections.
	4. Strong performers for Mind-Set 2 - Respondent is in control
A4	See doctor: Follow up with your doctor for a thorough evaluation of your breathing difficulties.
A1	Recommendation: Take slow, deep breaths and try to relax your body.
A2	Advice: Avoid any triggers or allergens that may make it difficult to breathe.
A3	Advice: Avoid physical exertion or strenuous activities until your breathing improves.
C2	Recommendation: Join activities or sports which provide accommodations for individuals with respiratory conditions.

Table 9: Coefficients for R54x (Describes ME), for total panel and for four key subgroups. The table is sorted by the value of the coefficients for Total Panel.

	Results from Key Subgroups (Asthma, Mind-sets) The Key Dependent Variable is R54 = Describes ME	Total	Asthma - No	Asthma - Yes	Mind-Set 1	Mind-Set 2
B3	See doctor: Tell your doctor about any other symptoms you're experiencing or if you have allergies.	21	19	26	26	17
B4	See doctor: Tell your doctor about any medications or treatments you're currently taking.	20	16	29	25	17
A4	See doctor: Follow up with your doctor for a thorough evaluation of your breathing difficulties.	19	18	21	12	25
B1	Advice: Make sure your bedroom is well-ventilated and free from allergens like dust and pet dander.	19	14	27	28	11
A1	Recommendation: Take slow, deep breaths and try to relax your body.	18	16	23	10	24
A2	Advice: Avoid any triggers or allergens that may make it difficult to breathe.	18	15	22	12	23
C2	Recommendation: Join activities or sports which provide accommodations for individuals with respiratory conditions.	18	15	23	14	21
D1	See doctor: Tell the doctor about specific family members who have asthma or respiratory conditions.	18	14	26	23	14
B2	See doctor: If the breathing difficulties persist or worsen, seek immediate medical attention from your doctor.	17	12	24	20	14
A3	Advice: Avoid physical exertion or strenuous activities until your breathing improves.	16	12	22	10	22
C3	Recommendation: Use a bronchodilator inhaler before physical activities to help open up the airways.	16	12	24	19	14
C1	Recommendation: Use a rescue inhaler or other medication prescribed by your doctor for immediate relief.	15	11	22	17	14
C4	Recommendation: Consider lifestyle changes, such as quitting smoking or improving indoor air quality.	15	13	19	14	16
D3	See doctor: Get flu shots and other vaccinations to prevent respiratory infections.	15	11	22	22	10
D4	See doctor: Get regular check-ups with a doctor to monitor lung health and address any concerns.	15	13	18	23	10
D2	Advice: Early detection and treatment is important if you experience any symptoms.	13	13	14	17	10

Table 10: Calculation of the IDT for the study based on extracting two and then three mind-sets.

IDT based upon R54x, Describes ME	Total Panel	Mind-Set 1 of 2	Mind-Set 2 of 2	Mind-Set 1 of 3	Mind-Set 2 of 3	Mind-Set 3 of 3
Base (number of respondents in this group)	101	44	57	30	33	38
Sum Total of Squares of All Positive Coefficients	4801	5953	4694	6237	5444	4569
Average of All Positive Coefficients (sum coefficients/base)	48	135	82	208	165	120
Number of respondents in the column (in the subgroup)	101	44	57	30	33	38
Weight = Proportion of the respondents in the subgroup	0.33	0.15	0.19	0.10	0.11	0.13
Weighted Total (Weight x Sum Total of Squares of All Positive Coefficients)	1584	893	892	624	599	594
Final Score = sum of weighted total	5186					
IDT = Square root of final score	72					

Table 11: Insights for the two mind-sets generated by Aim based on the meanings of the strong performing elements (coefficients 21+).

Mind-Set 1 of 2 - Top

Create a label for this segment: “Health Maintenance and Preventive Measures for Respiratory Health”

Describe this segment: Based on the given attributes, it appears that this segment of the research study focuses on providing advice and recommendations related to maintaining a healthy respiratory system and preventing respiratory conditions. The suggestions primarily involve seeking medical attention and advice, including informing the doctor about symptoms, allergies, medications, treatments, and family history of respiratory conditions. Additionally, the segment suggests getting vaccinations, regular check-ups with a doctor, and maintaining a well-ventilated and allergen-free bedroom.

Describe the attractiveness of this segment as a target audience: This segment of the total sample of a research study is highly attractive as a target audience. The advice given suggests that these individuals are conscious about creating a healthy living environment and are proactive in taking measures to prevent allergies and respiratory conditions. Furthermore, their willingness to visit a doctor and share information about their symptoms, allergies, medications, treatments, and family history indicates that they are proactive in seeking medical advice and treatment. Their interest in regular check-ups and vaccinations also suggests a commitment to maintaining good lung health. Overall, this segment exhibits a high level of self-care and responsibility towards their respiratory well-being, making them an ideal target audience for products, services, and interventions related to respiratory health.

Explain why this segment might not be attractive as a target audience: This segment might not be attractive as a target audience because they are already taking necessary precautions for their respiratory health. They are advised to maintain a well-ventilated bedroom, inform their doctor about any symptoms, allergies, medications, and family medical history, as well as receive vaccinations and regular check-ups. As a result, this segment is likely already aware of the importance of respiratory health and actively taking steps to address it. Therefore, targeting them with additional information or products may not yield significant results or satisfy their needs.

List what is missing or should be known about this segment, in question form:

1. Have participants in the research study been diagnosed with any respiratory conditions or asthma?
2. Are participants currently experiencing any symptoms of respiratory issues?
3. Do participants have any allergies, and if so, what are they specifically allergic to?
4. Have participants been previously exposed to environmental factors that could affect their lung health?
5. Are participants taking any medications or undergoing any treatments that could impact their respiratory health?
6. Are there specific triggers or situations that worsen participants' respiratory symptoms or conditions?
7. Have participants received flu shots and other vaccinations to prevent respiratory infections?
8. Are there any underlying medical conditions or comorbidities that could affect participants' lung health?
9. Are participants regularly engaging in physical activities or exercises that could impact their respiratory health?
10. Have participants experienced any recent changes in their respiratory health or lung function?

List and briefly describe attractive, new, or innovative products, services, experiences, or policies for this segment:

1. Air purifiers: A new and innovative product could be an advanced air purifier specifically designed to filter out allergens, dust, and pet dander from the bedroom. This could provide a clean and allergen-free environment for individuals concerned about respiratory health.
2. Allergen-proof bedding: Another attractive product could be hypoallergenic bedding that is specifically designed to prevent the buildup of allergens such as dust mites. These bedding materials would provide a cleaner and healthier sleep environment for individuals with respiratory conditions or allergies.
3. Mobile health apps: A new service could come in the form of mobile health apps that track and monitor lung health. These apps could provide personalized recommendations, reminders for medications, and alerts for changes in respiratory conditions. This would allow individuals to easily manage their health and receive timely intervention if needed.
4. Telemedicine for respiratory health: An innovative service could be telemedicine consultations specifically tailored for respiratory health concerns. This would allow individuals to have virtual appointments with doctors to discuss symptoms, receive advice on managing their condition, and get prescriptions or treatment recommendations without having to visit a physical clinic.
5. Asthma and allergy-friendly experiences: Hotels, restaurants, and public spaces that create allergy-friendly environments could attract this segment. These spaces would implement measures like advanced air filtration systems, allergy-free menu options, and dedicated areas for individuals with respiratory conditions. This would accommodate the specific needs of this segment and provide them with enjoyable experiences without compromising their health.
6. Workplace policies for respiratory health: Companies could implement policies and initiatives aimed at promoting respiratory health. This could include providing regular breaks for fresh air, ensuring proper ventilation in the workplace, offering wellness programs that focus on lung health, and providing support for employees who have respiratory conditions or allergies.
7. Overall, the key idea for attractive new or innovative products, services, experiences, or policies for this segment is to prioritize and cater to respiratory health needs, with a focus on prevention, management, and creating environments that promote clean and allergen-free spaces.

This segment would be interested in the following messages:

1. Advice: Make sure your bedroom is well-ventilated and free from allergens like dust and pet dander.
2. See doctor: Tell your doctor about any other symptoms you're experiencing or if you have allergies.
3. See doctor: Tell your doctor about any medications or treatments you're currently taking.
4. See doctor: Tell the doctor about specific family members who have asthma or respiratory conditions.
5. See doctor: Get flu shots and other vaccinations to prevent respiratory infections.
6. See doctor: Get regular check-ups with a doctor to monitor lung health and address any concerns.

Mind-Set 2 of 2 - Top

Create a label for this segment: Recommendations and Advice for Managing Breathing Difficulties

Describe this segment: This segment of the research study focuses on addressing and providing recommendations for individuals experiencing breathing difficulties. The participants in this segment are advised to take slow, deep breaths, relax their bodies, and avoid any triggers or allergens that may worsen their breathing. They are also advised to refrain from engaging in physical exertion or strenuous activities until their breathing improves. Furthermore, participants are encouraged to follow up with their doctors for a comprehensive evaluation of their breathing difficulties. Additionally, the segment suggests that individuals with respiratory conditions may benefit from joining activities or sports that offer accommodations specifically tailored for their needs. Overall, this segment aims to help individuals manage their breathing difficulties and improve their overall respiratory health.

Describe the attractiveness of this segment as a target audience: The target audience described in the attributes seems to be individuals who are experiencing breathing difficulties or respiratory conditions. They may find this segment attractive as it offers recommendations and advice on managing their breathing problems. The recommendation to take slow, deep breaths and relax the body suggests a focus on relaxation techniques that can help improve breathing. The advice to avoid triggers and allergens indicates an understanding of potential factors that can exacerbate breathing difficulties and suggests ways to prevent them. The suggestion to avoid physical exertion until breathing improves may be seen as practical advice for individuals struggling with respiratory conditions. The recommendation to join activities or sports that accommodate respiratory conditions implies the segment's recognition of the need for inclusive and accessible options for individuals with breathing difficulties. The call to follow up with a doctor for a thorough evaluation highlights the importance of seeking professional guidance for managing respiratory problems. Overall, the

segment appears to prioritize the well-being and improvement of the target audience's breathing difficulties, making it potentially attractive to individuals seeking support and guidance in this area.

Explain why this segment might not be attractive as a target audience: This segment might not be attractive as a target audience because it seems to consist of individuals who are experiencing breathing difficulties or respiratory conditions. This could indicate that they may already have health concerns or limitations that can affect their ability to participate in certain activities or engage in physical exertion. This segment may require additional accommodations or treatments, which could potentially pose challenges or limitations for marketers or businesses targeting a wider range of individuals without these specific health concerns. Additionally, the need for a thorough evaluation by a doctor suggests that these individuals may require medical attention or ongoing care, which could create further complications for targeting them as a specific audience.

List what is missing or should be known about this segment, in question form:

1. Are there any specific triggers or allergens that should be avoided?
2. How long should one avoid physical exertion or strenuous activities?
3. What specific breathing difficulties are being experienced?
4. Has the individual been diagnosed with any underlying respiratory conditions?
5. What accommodations are available for individuals with respiratory conditions in the activities or sports mentioned?

List and briefly describe attractive new or innovative products, services, experiences, or policies for this segment:

1. Portable Air Purifiers: A compact and portable air purifier that can be carried around to filter out allergens, pollutants, and triggers from the air. It would ensure clean and fresh air for individuals with breathing difficulties wherever they go.
2. Breath-tracking Wearables: A wearable device that tracks and analyzes an individual's breathing patterns. This innovative product would provide real-time feedback on breathing techniques and alert the user if their breathing becomes irregular or compromised.
3. Virtual Breathing Rehabilitation Programs: An online platform or app that offers virtual breathing rehabilitation programs. These programs would be specifically designed for individuals with respiratory conditions, providing personalized exercises and techniques to improve lung capacity and overall breathing.
4. Respiratory-friendly Home Design Services: Architectural and interior design services that focus on creating homes that are conducive to respiratory health. This may include features like proper ventilation systems, hypoallergenic materials, and dust control measures to create a safe and healthy living environment.
5. Breathing Support Groups: Online or in-person support groups that connect individuals with respiratory conditions. These groups would provide a platform for sharing experiences, information, and emotional support, creating a sense of community for those facing similar challenges.
6. Respiratory Accessibility Initiatives: Policies and initiatives that aim to increase accessibility for individuals with respiratory conditions in public spaces, workplaces, and transportation. This could include providing designated areas for resting or breathing exercises, introducing respiratory-friendly workplaces, and ensuring proper ventilation in public buildings.
7. Breathing Apps: Mobile applications that offer guided breathing exercises, relaxation techniques, and mindfulness practices. These apps could be customized for individuals with respiratory conditions, helping them manage stress, anxiety, and improve overall breathing patterns.
8. Allergy-Tracking and Alert Systems: Smart devices or apps that monitor allergen levels in the environment and send alerts to individuals with respiratory conditions. This would allow them to avoid high-allergen areas and take necessary precautions to avoid triggers.
9. Respiratory Health Education Programs: Comprehensive educational programs aimed at increasing awareness about respiratory conditions, their causes, and management strategies. These programs would be targeted at both individuals with respiratory conditions and the general public, to promote understanding and empathy.

Which messages will interest this segment? The segment that these messages may interest are individuals who are experiencing breathing difficulties or have respiratory conditions.

From Table 8, we see that the results make intuitive sense when we look at the self-description of non-asthmatic versus asthmatic but are far more interesting when we look at mind-sets. When we look at asthmatic versus non-asthmatic, we get a sense of generalities. It makes sense that asthmatics would find all of these messages or elements to be self-descriptive. At the same time, we see little granularity in the mind of the respondent. There is no deeper meaning hinted at. Moving to the mind-sets, which are not based on health but rather emerge from the pattern of responses, we see a far more interesting story. We see individuals who feel that the doctor is in control, versus individuals who feel that they are in control. Researchers deal with this issue in the topic of "locus of control" [27].

The Index of Divergent Thought (IDT): How Well Did the Study Satisfy Conflicting Objectives?

A Mind Genomics study attempts to satisfy two objectives that fight each other. The first objective is to identify elements whose coefficients are as high as possible on a criterion measure such as R54x, Describes ME. The greater the number of elements out of the 16 that generate high coefficients, the more the study satisfies this first criterion. For this criterion, having a study where all 16 elements have coefficients of 21 or higher would be best.

There is a problem, however, by having all elements generate strong coefficients, say 21-25. There are no clear mind-sets. We would have a difficult time finding mind-sets. All the messages do well. We cannot find a meaningful "story." Ideally, we should have two (or more) groups, one group with high coefficients for a certain type of element, the other group with low coefficients for these same elements. For other elements, the pattern reverses. In the end, the mind-sets emerge clearly. Things are even better when the story is clear.

We introduce the statistic we call the IDT, Index of Divergent Thought, whose calculation is shown for this study in Table 10. The IDT requires that we create two mind-sets, and then three mind-sets. We need not give the mind-sets a name. We determine the coefficient for each element for each mind-set and for Total Panel. Simulations of data suggest that an IDT of 70 is close to ideal, with enough elements performing strongly for each mind-set, but not all.

The IDT does not speak to the issue of interpretability of the mind-sets. That issue involves the use of judgment, hence, left to the researcher. The IDT simply shows how well the data satisfies the two opposing criteria. The data here generate an IDT of 72 close to perfect in terms of technical criteria.

Using Generative AI to Provide Insights from the Strong Performing Elements of Each Mind-Set

Our final analysis presents verbatim the output from the results book as provided by generative AI and done after the study (see Table 11). AI is instructed for each mind-set and for each group identified in the study to go through the strong performing elements of coefficient 21 or higher and to answer a variety of questions about those elements, trying to draw together a pattern. Rather than summarizing what AI has done, the remainder of this paper presents the AI summarization of the results for Mind-Sets 1 and for Mind-Sets 2. Note that this type of information provides additional insight to the researcher and allows AI to go the next step in becoming a research partner or, at least, a research coach. The standard process is for this type of analysis to be done for each of the subgroups in the study, whether they are subgroups by age, subgroups by gender, subgroups by asthma versus no asthma, and so forth. The analysis is extensive, automatic, and is not meant to be used but rather meant to be a source of inspiration for the next steps.

Discussion and Conclusions

The Mind Genomics platform, BimiLeap.com, opens up a new vista in understanding the minds of patients as well as that of the general public with regard to medical conditions. Within few hours, it is possible to use artificial intelligence to help one understand topics, probing the interaction between patients and doctors, using the Mind Genomics platform to select questions, edit them, and run actual studies. The demonstration here, requiring a relatively short time, reveals the potential of increasing our knowledge worldwide at a low cost and in a way that is actionable.

Generative artificial intelligence coupled with people as respondents can provide entirely new schemata for working with patients. Rather than having to worry about having years of experience, the novice medical professional can do one, two, or three of these studies as preparation. The setup of the study might require a day or less and using either one's own patients, colleagues, friends, or paid panelists from organizations such as Lucid and Cint organizations specializing in providing respondents for these types of studies at relatively low cost. Perhaps the most important outcome of a study like this is the possibility of incorporating these exercises into medical education. Today's very low cost for these types of studies, coupled with easy availability of respondents and rapid turnaround, allows Mind Genomics to become the new Just-In-Time teacher for topics. As the student works their way through the topic and the experiment, one can only imagine the insights that would emerge, and the powerful learning occurring as the medical professional becomes deeply involved in the process.

As we close this discussion, one can imagine what might happen if these studies are automatically deposited in a worldwide available registry. This makes it possible for the medical profession to share the information and for automated technology to comb through the registry with AI, summarizing the knowledge and creating readable materials for public consumption.

Perhaps the most intriguing possibility is the emergence of "Just-In-Time" knowledge by young medical professionals. Imagine a young professional who is told to learn about a certain type of patient with a certain disease. It might well be that medical education could incorporate an approach such as this, where one part of the preparation is for the person to actually use artificial intelligence to create the core messages and then run a study with some real people and get a sense of what's happening. In just hours, the medical professional will have some experience with the nature of the patient or the disease to be encountered. It remains now for a measurement of the (hopefully) improved interaction with the patient, and the better outcome.

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