

Operation MINI (Micronutrient Need Intervention)

Emily Adams
Walker School
Marietta, Georgia

Scott Braswell
Garfield High School and the University of Washington
Seattle, Washington

In collaboration with Sarah Cusick¹ and Heather Carter²

¹ National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention

² National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention

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

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Summary

This lesson is designed for a high school biology, food science, or anatomy class and emphasizes the real-world applications of human nutrition. Student groups will play the part of aid organizations competing for funds to assist a fictitious village that has experienced a natural disaster and is now in a food crisis. They will research various aspects of micronutrient deficiencies and the logistics involved in delivering emergency rations to a village in crisis. They will then work in groups to develop and present an intervention plan. To complete these activities, students should have prior knowledge of macronutrients (carbohydrates, proteins, and fats) and how they help the body to function.

Learning Outcomes

- The student will be able to explain the roles vitamin A, iron, and iodine play in a healthy body.
- The student will be able to describe the symptoms of vitamin A, iron, and iodine deficiencies.
- The student will be able to interpret and analyze tabular data.
- The student will be able to develop an intervention based on their research and discuss potential problems with that intervention.

Materials

1. At least two different food labels of iodized salt – one copy per group
2. Photocopy of pretest – one per student
3. Overhead projector to display scenario introduction (optional)
4. Photocopy of Operation MINI webquest – one per student
5. Computers with Internet access
6. Photocopy of posttest – one per student

Total Duration

4 hours, 5 minutes

Procedures

Teacher Preparation

Make photocopies for each student of the pretest, posttest, and webquest. Reserve space for use of computers with Internet access, if necessary. Review the student handouts. Assign students to the three “expert” groups: standard nutrition, micronutrient deficiency, and food logistics. Assign one person from each expert group to form “grant writing teams” (each group will contain an expert from the three previous groups). Review the “Centers for Disease Control and Prevention’s IMMPaCt” website to familiarize yourself with the basics of micronutrient deficiencies and some of the interventions that have been done to reduce the negative health outcomes. Additionally, for more information about cooperative learning and the jigsaw method, review the “Doing CL – Jigsaw” website.

Web Resources

Title: Centers for Disease Control and Prevention's IMMPaCt – International Micronutrient Malnutrition Prevention and Control Program

URL: www.cdc.gov/nccdphp/dnpa/impact/index.htm

Description: This CDC website has information about various micronutrient deficiencies and describes various micronutrient interventions that are occurring throughout the world.

Title: Doing CL - Jigsaw

URL: www.wcer.wisc.edu/archive/cl1/cl/doingcl/jigsaw.htm

Description: This website from the National Institute of Science Education explains how the jigsaw method of cooperative learning works in the classroom. It provides an example of how the process works and explains the goals and benefits of this pedagogy.

Introduction

Duration: 30 minutes

Before beginning the lesson, give students the pretest to assess their prior knowledge. Go over the answers as a class.

After the pretest, read the “Scenario Introduction” to the class. Alternatively, display the “Scenario Introduction” on an overhead projector. Tell students that the Centers for Disease Control and Prevention has asked their class for help in developing an appropriate nutrition intervention for several villages hit by a tsunami. However, CDC has only enough money to award one “grant.” Therefore, groups will be asked to compete for the funds.

Place students in their “expert” groups and explain how the jigsaw method will work. Assign each group one topic: standard nutrition, micronutrient deficiency, or food logistics. The standard nutrition group will research information on basic nutrition and nutrition interventions. The micronutrient deficiency group will look at the role of some micronutrients in nutrition, consequences of a deficiency in these micronutrients, and issues involved in preventing micronutrient deficiencies and general malnutrition. The food logistics group will research information on some of the logistics involved in developing and implementing a nutrition intervention and identify which foods could make up a ration. Groups will research a particular aspect of a nutritional crisis through the webquest, with each member of each group becoming an expert in their assigned topic. After this research, students will form new groups—“grant writing teams.” Each grant writing team will have one member from each expert group. Students will teach the rest of their team members about the topic they explored in their expert group. Once each member of the grant writing team has explained his or her expert topic, the teams will plan their intervention. Allow for clarification questions.

Web Resources

Title: Doing CL - Jigsaw

URL: www.wcer.wisc.edu/archive/cl1/cl/doingcl/jigsaw.htm

Description: This website from the National Institute of Science Education explains how the jigsaw method of cooperative learning works in the classroom. It provides an example of how the process works and explains the goals and benefits of this pedagogy.

Supplemental Documents

Title: Scenario Introduction

Description: This document describes a request for assistance from a local government. The letter describes a village that has experienced a natural disaster and is now in a food crisis.

Title: Pretest – Operation MINI

Description: This 9-question, multiple-choice pretest assesses students' prior knowledge of this topic.

Title: Pretest Answer Key – Operation MINI

Description: This document provides the answers to the student pretest, along with information about the correct answers that can be used to discuss the students' responses.

Step 2

Duration: 60 minutes

Proceed to the computers and hand out the three webquests—"Operation MINI Webquest: Standard Nutrition," "Operation MINI Webquest: Nutritional Deficiencies," and "Operation MINI Webquest: Food Logistics." Allow the expert groups to work together to answer their questions. Move around the expert groups to answer questions and assist students with difficulties. Any work not completed in class may be assigned as homework, or you may provide an additional day with the computers. These subjects can be very complex; however, students should gain a general understanding of their assigned topic. Additionally, although each webquest lists multiple resources for the particular expert group, the web resources can be shared among all three groups.

Web Resources

Title: United States Department of Agriculture's National Nutrient Database for Standard Reference

URL: www.nal.usda.gov/fnic/foodcomp/search/

Description: This U.S. Department of Agriculture website allows users to search for information on the nutritional content of particular foods. It will be used by the Standard Nutrition group to conduct its webquest research.

Title: Preventing and controlling micronutrient deficiencies in populations affected by an emergency

URL: www.unicef.org/nutrition/files/Joint_Statement_Micronutrients_March_2006.pdf

Description: This pdf document—a joint statement by the World Health Organization, World Food Program, and UNICEF on preventing micronutrient deficiencies—will be used by the Standard Nutrition group to conduct its webquest research.

Title: United Nations Children Fund (UNICEF) – Nutrition in emergencies

URL: www.unicef.org/nutrition/23963_nutritioninemer.html

Description: This UNICEF website provides information on what goes into providing nutrition assistance in an emergency. This website will be used by the Standard Nutrition group to conduct its webquest research.

Title: Food and Agriculture Organization of the United Nations. Annex 6 – requirements for effective fortification in food aid programmes

URL: www.fao.org/docrep/w2840e/w2840e0d.htm

Description: This website of the United Nations' Food and Agriculture Organization provides detailed information about the development and use of fortified foods. It will be used by the Standard Nutrition group to conduct its webquest research.

Title: UNICEF – Nutrition: The big picture

URL: www.unicef.org/nutrition/index_bigpicture.html

Description: This website UNICEF website gives a general description of malnutrition. It will be used by the Micronutrient Deficiencies group to conduct its webquest research.

Title: UNICEF: Bringing science to bear

URL: www.unicef.org/sowc98/sowc98c.pdf

Description: This document from UNICEF provides information about sources of vitamin A. It will be used by the Micronutrient Deficiencies group to conduct its webquest research.

Title: UNICEF – Nutrition: What are the challenges?

URL: www.unicef.org/nutrition/index_challenges.html

Description: This UNICEF website gives information about the challenges of preventing malnutrition. It will be used by the Micronutrient Deficiencies group to conduct its webquest research.

Title: UNICEF – Nutrition: Nutrition security and emergencies

URL: www.unicef.org/nutrition/index_emergencies.html

Description: This UNICEF website talks about the issues involved in responding to nutrition emergencies. It will be used by the Micronutrient Deficiencies group to conduct its webquest research.

Title: FANTA provides technical guidance to develop an emergency

URL: www.foodaid.org/pdfdocs/foodforum/2001Q1/fantaq101.pdf

Description: USAID's Food and Nutrition Technical Assistance Project interviews a maternal and child specialist on developing food supplements for emergency situations. This pdf will be used by the Food Logistics group to conduct its webquest research.

Title: USAID commodities reference guide – section II: food commodity fact sheets

URL: www.usaid.gov/our_work/humanitarian_assistance/ffp/crg/sec2.htm

Description: This USAID website provides information on different food commodities and their properties, including shelf life, nutrient content, and packaging. It will be used by the Food Logistics group to conduct its webquest research.

Title: USAID primer: what we do and how we do it

URL: www.usaid.gov/about_usaid/PDACG100.pdf

Description: This USAID document provides information on how the agency responds to a food crisis. It will be used by the Food Logistics group to conduct its webquest research.

Title: USAID press release: USAID disaster assistance response team (DART) deploys to Liberia

URL: www.usaid.gov/press/releases/2003/pr030806.html

Description: This USAID press release provides information on how USAID has responded to a disaster in Liberia. It will be used by the Food Logistics group to conduct its webquest research.

Supplemental Documents

Title: Operation MINI Webquest: Standard Nutrition

Description: This document contains the web links and questions for the Standard Nutrition expert group's webquest.

Title: Operation MINI Webquest: Micronutrient Deficiencies

Description: This document contains the web links and questions for the Micronutrient Deficiencies expert group's webquest.

Title: Operation MINI Webquest: Food Logistics

Description: This document contains the web links and questions for the Food Logistics expert group’s webquest.

Title: Operation MINI Webquest: Standard Nutrition Answer Key

Description: This document contains the answers and additional background information for the Standard Nutrition expert group’s webquest.

Title: Operation MINI Webquest: Micronutrient Deficiencies Answer Key

Description: This document contains the answers and additional background information for the Micronutrient Deficiencies expert group’s webquest.

Title: Operation MINI Webquest: Food Logistics Answer Key

Description: This document contains the answers and additional background information for the Food Logistics expert group’s webquest.

Step 3

Duration: 60 minutes

Assign the “experts” to grant writing teams. If desired, provide a particular order for the experts to teach each other. Give the teams 45 minutes to teach each other the topics they have researched. Again, circulate among the groups to make sure students are on task and sharing correct information.

Now that all students have learned about all three topics, administer the posttest. Grade the tests as a class and discuss changes in responses from the beginning of the lesson.

Supplemental Documents

Title: Posttest – Operation MINI

Description: This 9–question, multiple-choice posttest assesses students’ acquired knowledge of this topic.

Title: Posttest Answer Key – Operation MINI

Description: This document provides the answers to the student posttest, along with information about the correct answers that can be used to discuss the students’ responses.

Step 4

Duration: 50 minutes

With students in their grant writing teams, hand out the “Intervention Guide” worksheet and the “Intervention Plan Template.” Explain that they will use what they have learned and shared with each other to develop an intervention plan for one of the villages discussed in the introductory scenario and in the “Intervention Guide.” Stress that this is a time to use their collective knowledge of each subject and to be creative in their intervention plans. Allow approximately 45 minutes in class for teams to develop their interventions. If students need more time, they can complete the assignment as homework. For students who choose to focus on the village that has an iodine deficiency, provide them with food labels taken from iodized salt containers. A sample food label with the amount of iodine listed has been provided in the “Iodine Food Label” document. All other groups will be able to find the micronutrient content of foods using the “United States Department of Agriculture’s National Nutrient Database for Standard Reference” web resource.

Web Resources

Title: The United States Department of Agriculture’s National Nutrient Database for Standard Reference

URL: www.nal.usda.gov/fnic/foodcomp/search/

Description: This U.S. Department of Agriculture website allows users to search for the nutritional content of particular foods. It will be used by the Standard Nutrition group to conduct their webquest research.

Supplemental documents

Title: Intervention Guide

Description: This worksheet provides additional detail about the villages discussed in the introductory scenario and poses questions to help students in developing their own crisis intervention.

Title: Intervention Plan Template

Description: This worksheet provides a template for students to fill out with the basic information on their intervention.

Title: Iodine Food Label

Description: This document provides a sample food label that lists the iodine content in salt.

Conclusion

Duration: 45 minutes

Once all teams have finished their intervention plans, hand out the presentation rubric and instruct students to prepare a short presentation of their intervention for the class. Give groups 5–10 minutes to present their intervention and answer any questions. After the presentations, choose the intervention that will be awarded the “grant” from CDC, or ask the class vote. Allow time for students to ask questions and reflect on the lesson.

Supplemental documents

Title: Group Presentation Rubric

Description: This rubric covers all the aspects of the intervention plan and the student presentation. It is an assessment tool for the teacher and a guide for the students.

Assessment

Students will be evaluated via the pretest in the Introduction and the posttest in Step 3. Student groups will be evaluated via the Group Presentation Rubric in the Conclusion. If desired, the students’ research in the webquest may be assessed in Step 2.

Modifications

Extensions

This activity could be extended by providing the groups with a specific country that is currently in the news. Have the groups research more deeply into the country’s culture, geography, and political landscape. Alternatively, different groups could be assigned different countries. Students could also study micronutrient deficiencies in the United States and contrast them with other countries. They could then develop a plan for both locations.

Web Resources

Title: Food and Agriculture Organization of the United Nations

URL: www.fao.org/

Description: The stated goal of this organization is to help build a world without hunger. The webpage includes a “newsroom” of current global malnutrition issues.

Title: UNICEF – Nutrition

URL: www.unicef.org/nutrition/

Description: This is UNICEF’s webpage about child nutrition. The Press Centre link provides information about current crises and about the agency’s global efforts.

Other Modifications

For lower levels, this activity could be modified by shortening the webquest or only focusing on one of the three micronutrients discussed.

For higher levels, once student groups have completed their intervention plan, provide them with a new obstacle—a hurricane, civil unrest, mudslide, disease outbreak, etc.—that requires them to modify their intervention plans.

Education Standards

National Science Education Standards

LIFE SCIENCE, CONTENT STANDARD C:

As a result of their activities in grades 9–12, all students should develop understanding of

- **The cell**
- Molecular basis of heredity
- Biological evolution
- Interdependence of organisms
- Matter, energy, and organization in living systems
- Behavior of organisms

SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES, CONTENT STANDARD F:

As a results of activities in grades 9–12, all students should develop understanding of

- **Personal and community health**
- Population growth
- Natural resources
- Environmental quality
- **Natural and human-induced hazards**
- **Science and technology in local, national, and global challenges**

State Standards

Georgia Biology Standards

SCSh3. Students will identify and investigate problems scientifically.

a. Suggest reasonable hypotheses for identified problems.

b. Develop procedures for solving scientific problems.

c. Collect, organize, and record appropriate data.

d. Graphically compare and analyze data points and/or summary statistics.

Georgia Anatomy and Physiology Standards

SAP4. Students will analyze the physical, chemical, and biological properties of process

systems as these relate to transportation, absorption, and excretion, including the cardiovascular, respiratory, digestive, excretory, and immune systems.

- a. Describe the chemical and physical mechanisms of digestion, elimination, transportation, and absorption within the body to change food and derive energy.
- b. Analyze and explain the relationships between the respiratory and cardiovascular systems as they obtain oxygen needed for the oxidation of nutrients and removal of carbon dioxide.
- c. Relate the role of the urinary system to regulation of body wastes (i.e., water-electrolyte balance, volume of body fluids).
- d. Examine various conditions that change normal body functions (e.g., tissue rejection, allergies, injury, diseases, and disorders) and how the body responds.**
- e. Describe the effects of aging on body systems.

Operation MINI Pretest

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Directions: For each question, circle the best answer.

1. Which of the following is a contributing factor of malnutrition?
 - a. Unsafe water
 - b. Frequent disease
 - c. Insufficient protein
 - d. All of the above

2. Which of the following is NOT an important strategy in preventing malnutrition?
 - a. Providing safe public transportation systems
 - b. Protecting the rights of women and girls
 - c. Providing access to health care services
 - d. Understanding the local culture

3. Which of the following is a major role of iron in the human body?
 - a. It is critical to the functioning of the thyroid gland
 - b. It is an essential mineral required for bone development
 - c. It is involved in the formation of nerve cells
 - d. It is involved in the manufacture of hemoglobin

4. What is a common consequence of iron deficiency in the body?
 - a. Blindness
 - b. Fatigue
 - c. Brain damage
 - d. Muscle weakness

5. Which of the following is a major role of iodine in the human body?
 - a. It is critical to the functioning of the thyroid gland
 - b. It is essential for immune system function
 - c. It is involved in the formation of nerve cells
 - d. It is involved in the manufacture of hemoglobin

6. Which of the following is a major role of vitamin A in the human body?
 - a. It is critical to the functioning of the thyroid gland
 - b. It is essential for immune system function
 - c. It is involved in the formation of nerve cells
 - d. It is involved in the manufacture of hemoglobin

7. What is a consequence of vitamin A deficiency in the body?
 - a. Blindness
 - b. Fatigue
 - c. Brain damage
 - d. Muscle weakness

8. What is food fortification?
 - a. Adding nutrients to existing foods
 - b. Combining natural foods for a balanced meal
 - c. Removing fat from food rations
 - d. All of the above

9. Which of the following could be a logistical problem in delivering food during an emergency situation?
 - a. Lack of clean water
 - b. Local roads in disrepair
 - c. Civil unrest
 - d. All of the above

Operation MINI Pretest Answer Key

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Directions: For each question, circle the best answer.

1. Which of the following is a contributing factor of malnutrition?
d. All of the above (1)
According to UNICEF, common factors of malnutrition include insufficient protein, energy, and micronutrients; frequent infections or disease; poor care and feeding practices; inadequate health services; and unsafe water and sanitation.
2. Which of the following is NOT an important strategy in preventing malnutrition?
a. Providing safe public transportation systems (1)
According to UNICEF, adequate diet, proper prevention and treatment of medical problems, and the protection of rights of women and girls are all strategies that can prevent malnutrition.
3. Which of the following is a major role of iron in the human body?
d. It is involved in the manufacture of hemoglobin (1)
According to UNICEF, iron is involved in the manufacture of hemoglobin; it is also required for several enzymes necessary for muscle, brain, and immune system function.
4. What is a common consequence of iron deficiency in the body?
b. Fatigue (1)
According to UNICEF, iron deficiency can result in fatigue, shortness of breath and dizziness, and an increased risk of hemorrhage and sepsis during childbirth. Iron deficient women may have babies who suffer from infections, weakened immunity, learning disabilities, impaired physical development, and in severe cases, death.
5. Which of the following is a major role of iodine in the human body?
a. It is critical to the functioning of the thyroid gland (1)
According to UNICEF, iodine is critical to the formation and the functioning of the thyroid gland, which regulates growth and metabolism.
6. Which of the following is a major role of vitamin A in the human body?
b. It is essential for immune system function (1)
According to UNICEF, vitamin A is necessary for immune system function.
7. What is a consequence of vitamin A deficiency in the body?
a. Blindness (1)
According to UNICEF, vitamin A deficiency can result in blindness and increased risk of death from measles, diarrhea, and acute respiratory infections.
8. What is food fortification?
a. Adding nutrients to existing foods (2)
According to the FAO, food fortification supplements common foods like flour, cooking oil, and sugar with essential micronutrients.
9. Which of the following could be a logistical problem in delivering food during an emergency situation?
c. All of the above

A variety of logistical problems could affect food delivery during an emergency, including issues with transportation, food storage, preparation, water supplies, waste, weather, civil unrest, and cultural concerns.

References

1. UNICEF. Nutrition – the big picture [online]. [cited 2006 Jul 21]. Available from URL: http://www.unicef.org/nutrition/index_bigpicture.html.
2. Food and Agriculture Organization of the United Nations. Annex 6 – requirements for effective fortification in food aid programmes. 1995. [cited 2006 Jul 21] Available from URL: <http://www.fao.org/docrep/w2840e/w2840e0d.htm>.

Scenario Introduction

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This is a fictional scenario.

Several small coastal villages were wiped out by a tsunami. Coastal inhabitants were forced inland by the disaster when their homes were destroyed and water supplies were tainted with saltwater.

The villagers normally survive as nomadic herders, and the village activities revolve around rearing livestock—mainly goats and sheep that are eaten for meat and also kept for milk and cheese. Having lost more than 50% of their herds, however, they are trying desperately to make up for lost resources.

Villagers normally supplement herding with some rain-fed agriculture. Their primary food crops include the root vegetables cassava and yams. In addition, they normally have access to plantains bartered from a neighboring region. The roads and footpaths used for local commerce are almost certainly washed-out.

According to local officials, the populations at greatest risk are thought to be children under 5 and pregnant or lactating women. Estimates of the affected population between 5,000 and 10,000.

Operation MINI Webquest: Standard Nutrition

Operation MINI (Micronutrient Need Intervention)
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Directions: The Centers for Disease Control and Prevention has asked you to research some basic nutrition information and then share it with your colleagues. This information, along with information your colleagues will bring on micronutrient deficiencies and food logistics, could be helpful as you begin working in your grant writing teams to develop an intervention for one of the affected villages.

Use the following websites to answer the questions provided. Answers do not need to be in complete sentences, but they do need to contain sufficient information. Remember—you are responsible for teaching your colleagues/classmates!

Please go to www.nal.usda.gov/fnic/foodcomp/search/ to learn about the nutrient composition of different foods. Become familiar with how to use this search engine so you can interpret the nutrient (macro and micro) information for indigenous foods. Note: To convert from milligrams (mg) to micrograms (μg), multiply the mg quantity by 1,000. To convert from micrograms (μg) to milligrams (mg), divide the μg quantity by 1,000.

1. For example, type in "cassava," a common African vegetable. In one cup of raw cassava, how many milligrams of iron are present?

How many micrograms of iron would be in your sample (1 cup) of cassava?

2. How many grams of protein are in 100 grams of cooked tilapia?
3. Choose one of your favorite foods. Tell what it is and how much protein, carbohydrates, fats, iron, and vitamin A (retinol and beta-carotene) it contains in one serving.

Name of food	
Protein	
Carbohydrates	
Fats	
Iron	
Vitamin A (retinol and beta-carotene)	

Now that you have explored the nutritional content of various foods, it is time to learn about the nutrition an individual needs each day to stay healthy. Please go to http://www.unicef.org/nutrition/files/Joint_Statement_Micronutrients_March_2006.pdf and refer to Table 1 on page 2 of the document.

4. Please fill in the values for the recommended nutrient intake for pregnant women and young children for iron, vitamin A, and iodine.

	Iron	Vitamin A	Iodine
Pregnant women			
Young children (6–59 months)			

Please go to www.unicef.org/nutrition/23963_nutritioninemer.html to learn more about food emergencies.

5. What are the types of nutritional assistance?
6. Give examples of foods used in supplemental and therapeutic feeding.

Please go to www.fao.org/docrep/w2840e/w2840e0d.htm to learn about the different types of emergency food fortification (adding nutrients to enrich foods) used by different international relief organizations. Scroll down until you see the heading “Blended Foods.”

7. For each of the following food types, note what nutrients the foods can be fortified with and (if provided) under what types of circumstances these foods are often used: blended foods (CSB), processed cereal, vegetable oil, high-protein biscuits, dried skim milk powder, salt, and whole grains.
8. Scroll down a little bit further to “Costs and Nutritional Impact of Fortification of Food Aid” and determine 1) how expensive food fortification is, 2) under what types of circumstances fortification would be necessary, and 3) whether or not these programs appear to be successful.

Operation MINI Webquest: Standard Nutrition Answer Key

Operation MINI (Micronutrient Need Intervention)
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Directions: The Centers for Disease Control and Prevention has asked you to research some basic nutrition information and then share it with your colleagues. This information, along with information your colleagues will bring on micronutrient deficiencies and food logistics, could be helpful as you begin working in your grant writing teams to develop an intervention for one of the affected villages.

Use the following websites to answer the questions provided. Answers do not need to be in complete sentences, but they do need to contain sufficient information. Remember—you are responsible for teaching your colleagues/classmates!

Please go to www.nal.usda.gov/fnic/foodcomp/search/ to learn about the nutrient composition of different foods. Become familiar with how to use this search engine so you can interpret the nutrient (macro and micro) information for indigenous foods. Note: To convert from milligrams (mg) to micrograms (μg), multiply the mg quantity by 1,000. To convert from micrograms (μg) to milligrams (mg), divide the μg quantity by 1,000.

1. Type in “cassava,” a common African vegetable. In one cup of raw cassava, how many milligrams (mg) of iron are present?

0.56 mg (1)

How many micrograms (μg) of iron would be in your sample (1 cup) of cassava?

560 μg (1)

2. How many grams of protein are in 100 grams (g) of cooked tilapia?

26.15g (1)

3. Choose one of your favorite foods. Tell what it is and how much protein, carbohydrates, fats, iron, and vitamin A (retinol and beta carotene) it contains in one serving.

Accept all complete answers. A sample food is provided. (1)

Name of food	Pretzels, hard, plain, salted (1 oz)
Protein	2.93 g
Carbohydrates	22.61 g
Fats	0.75 g
Iron	1.47 mg
Vitamin A (retinol and beta-carotene)	0 μg (retinol) 0 μg (beta-carotene)

Now that you have explored the nutritional content of various foods, it is time to learn about the nutrition an individual needs each day to stay healthy. Please go to www.unicef.org/nutrition/files/Joint_Statement_Micronutrients_March_2006.pdf and refer to Table 1 on page 2 of the document.

- Please fill in the values for the recommended nutrient intake for pregnant women and young children for the micronutrients we are studying: iron, vitamin A, and iodine.

According to UNICEF (2),

	Iron	Vitamin A	Iodine
Pregnant women	27.0 mg	800 µg	250 µg
Young children (6–59 months)	5.8 mg	400 µg	90 µg

Please go to www.unicef.org/nutrition/23963_nutritioninemer.html to learn more about food emergencies.

- What are the types of nutritional assistance?

According to Dr. Marjatta Tolvanen from UNICEF, there are three types of food response. The first is general food distribution by the World Food Program. The second, in the event of a prolonged conflict or natural disaster, is typically targeted food aid for pregnant and breastfeeding women and children under 5 years; however, it can be considered for any group that might be vulnerable. The third is a medical response, therapeutic feeding, used in cases of severe malnutrition, clinically evident as marasmus, where the child is severely emaciated, or kwashiorkor, where the child has swelling of the face, feet, and limbs. These children are at a very high risk of death. (3)

- Give examples of food used in supplemental and therapeutic feeding.

According to Dr. Marjatta Tolvanen from UNICEF, “Foods given to these severely malnourished children, such as therapeutic milk, must be very finely-tuned so that they can be consumed by children with weakened bodies. Essential vitamins and minerals are added in the right proportions. Unimix, used in supplementary feeding, is a vitamin and mineral fortified product of 70% corn and about 25% soya protein. It makes a porridge that has 400 calories per 100 grams of flour.” (3)

Please go to www.fao.org/docrep/w2840e/w2840e0d.htm to learn about the different types of emergency food fortification (adding nutrients to enrich foods) used by different international relief organizations. Scroll down until you see the heading “Blended Foods.”

- For each of the following food types, note what nutrients the foods can be fortified with and (if provided) under what types of circumstances these foods are often used: blended foods (CSB), processed cereal, vegetable oil, high-protein biscuits, dried skim milk powder, salt, and whole grains.

According to the Food and Agriculture Organization (FAO):

Corn soya blend (CSB) – vitamins A, D, E, C, and B6, thiamin, riboflavin, niacin, folic acid, pantothenic acid, vitamin B12, calcium, phosphorous, zinc, iron, and iodine. (See Table 2) This and other blended foods have most frequently been used for supplemental feeding in mothers and young children. It is now considered a viable option for refugees and other individuals in nutritional emergencies. (4)

Processed cereal (wheat flour, corn meal, bulgur, rice, and soy-fortified cereals) – iron, calcium, thiamin, niacin, riboflavin, and vitamin A. Generally used in food-for-work programs, maternal and child health programs, and emergency relief. (4)

Vegetable oil – vitamin A. Can be used for emergency programs and maternal and child health programs. (4)

High protein biscuits – 60%–80% of the RDA of essential vitamins and minerals per 100 grams. (4)

Dried Skim Milk Powder – vitamin A and D (4)

Salt – iodine (4)

Whole Grains – not recommended because of various disadvantages, including increased cost (4)

8. Scroll down a little bit further to “Costs and Nutritional Impact of Fortification of Food Aid” and determine 1) how expensive food fortification is, 2) under what types of circumstances fortification would be beneficial, and 3) whether or not these programs appear to be successful.

According to the Food and Agriculture Organization (FAO):

1) Costs of fortification are estimated at less than 2.5% and 5.0% of the value of processed cereal and blended foods, respectively. This includes only the cost of the nutrients themselves, not the blending or shipping process or other expenses. (4)

2) Fortification is an option when naturally available foodstuffs cannot provide the range of essential nutrients, or in refugee programs. Supplementation for high-risk groups may still be needed. For example, it is recognized that fortified foodstuffs cannot be expected to provide the levels required to meet the increased nutrient needs of pregnant and lactating women. The role that fortified foods plays in preventing and controlling micronutrient deficiencies may be direct, through increased consumption of micronutrient-rich foods, or indirect, through transfer of income to poor people. In refugee feeding programs, fortification can play an important role reducing the risk of micronutrient deficiencies (Henry and Seaman, 1992; Toole 1992). (4)

3) Few impact studies have been conducted, although it is generally recognized that providing increased levels of micronutrients known to be limited in the diets of recipients will contribute to improved micronutrient status. Recently, fortification of maize meal with niacin helped to control pellagra in Malawi (Toole,

1994). To estimate the micronutrient contribution made by fortified foods, calculations have been made based on nutrient content of various enriched and fortified foods consumed in recommended amounts within a locally available diet (Beaton, 1995; Combs, 1994; Toole, 1994). Calculations indicate that fortified blended foods help meet the recommended nutrient allowances for targeted groups (young children, pregnant and lactating women, and refugees) for essential nutrients that would otherwise be limiting in a cereal-based diet. Information on actual food intakes is limited however, and it is recognized that fortified foods targeted to various vulnerable groups are shared among other family members or may be traded. (4)

References

1. USDA Agricultural Research Service. Nutrient data laboratory. [cited 2006 Jul 21]. Available from URL: <http://www.nal.usda.gov/fnic/foodcomp/search/>.
2. World Health Organization, World Food Program, and the United Nations Children Fund. Preventing and controlling micronutrient deficiencies in populations affected by an emergency. [cited 2006 Jul 21]. Available from URL: http://www.unicef.org/nutrition/files/Joint_Statement_Micronutrients_March_2006.pdf.
3. UNICEF. Nutrition in emergencies. [cited 2006 Jul 21]. Available from URL: http://www.unicef.org/nutrition/23963_nutritioninemer.html.
4. Food and Agriculture Organization of the United Nations. Annex 6 – requirements for effective fortification in food aid programmes. 1995. [cited 2006 Jul 21]. Available from URL: <http://www.fao.org/docrep/w2840e/w2840e0d.htm>.

Operation MINI Webquest: Micronutrient Deficiencies

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

Directions: The Centers for Disease Control and Prevention has asked you to research some information on nutrition deficiencies and then share it with your colleagues. This information, along with information your colleagues will bring on standard nutrition and food logistics, could be helpful as you begin working in your grant writing teams to develop an intervention for one of the affected villages.

Use the following websites to answer the questions provided. Answers do not need to be in complete sentences, but they do need to contain sufficient information. Remember—you are responsible for teaching your colleagues/classmates!

Please go to www.unicef.org/nutrition/index_bigpicture.html to learn about malnutrition and micronutrients.

1. Why is malnutrition termed the “invisible emergency?”
2. Malnutrition results from many different factors. What are the main factors?
3. Why does the body require micronutrients?
4. Complete the table below. Indicate each micronutrient’s function in the body, common food sources, and outcomes of its deficiency. Use the “Bringing Science to Bear” document at www.unicef.org/sowc98/sowc98c.pdf. (Hint: Look for vitamin “Spotlights” throughout the document).

Micronutrient	Function	Outcome of Deficiency	Common food sources
Iodine			
Iron			
Vitamin A			

5. What are some of the key tools to help prevent malnutrition? How do you think each of these contribute to good nutrition?

Please go to www.unicef.org/nutrition/index_challenges.html to learn about the challenges of preventing malnutrition.

6. How does inadequate maternal nutrition and care affect nutritional status?
7. How does improper infant and child feeding affect a child's nutritional status?
8. How does our ability to respond to nutritional needs in emergencies affect a child's nutritional status?
9. How does HIV/AIDS affect nutrition?

Please go to www.unicef.org/nutrition/index_emergencies.html to learn about the issues involved in responding to nutrition emergencies.

10. How can emergencies like conflicts or natural disasters lead to malnutrition?
11. We can decrease micronutrient malnutrition by fortifying foods. However, there are some difficulties associated with food fortification. Explain one of them.

Operation MINI Webquest: Micronutrient Deficiencies Answer Key

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

Directions: The Centers for Disease Control and Prevention has asked you to research some information on nutrition deficiencies and then share it with your colleagues. This information, along with information your colleagues will bring on standard nutrition and food logistics, could be helpful as you begin working in your grant writing teams to develop an intervention for one of the affected villages.

Use the following websites to answer the questions provided. Answers do not need to be in complete sentences, but they do need to contain sufficient information. Remember—you are responsible for teaching your colleagues/classmates!

Please go to www.unicef.org/nutrition/index_bigpicture.html to learn about malnutrition and micronutrients.

1. Why is malnutrition termed the “invisible emergency?”
According to UNICEF, its effects are often hidden. (1)
2. Malnutrition results from many different factors. What are the main factors?
According to UNICEF, insufficient protein, energy, and micronutrients; frequent infections or disease; poor care and feeding practices; inadequate health services; and unsafe water and sanitation can contribute to malnutrition. (1)
3. Why does the body require micronutrients?
According to UNICEF, the body needs micronutrients in minute amounts to manufacture enzymes, hormones, and other substances required to regulate growth, development, and the functioning of both the immune and the reproductive systems. (1)
4. Complete the table below. Indicate the micronutrient’s function in the body, outcome of its deficiency, and common food sources. Use the “Bringing Science to Bear” document at www.unicef.org/sowc98/sowc98c.pdf. (Hint: Look for vitamin “Spotlights” throughout the document).

According to UNICEF,

Micronutrient	Function	Outcome of Deficiency	Common food sources
Iodine	Iodine is needed by the thyroid gland for normal mental and physical development. (2)	Iodine deficiency is the single most important cause of preventable brain damage and mental retardation. It also significantly raises the risk of stillbirth and miscarriage for pregnant women. Iodine deficiency is commonly and visibly associated with goiter. (2)	Iodized salt is the best source of iodine. Sea fish and some seaweed also contain iodine, although sea salt does not. (2)
Iron	The body needs iron to make hemoglobin, the protein in red blood cells that carries oxygen. Iron is also a component of the	Iron deficiency anemia lowers immunity and reduces the physical and mental capacities of populations. In infants and	Iron is found in liver, lean meats, eggs, whole-grain breads, and

	many enzymes needed for the proper functioning of brain, muscle, and immune system cells. (2)	young children, even mild iron deficiency anemia can harm intellectual development. Iron deficiency anemia in pregnancy is an important cause of maternal death, increasing the risk of hemorrhage and sepsis during childbirth. Infants born to mothers with iron deficiency anemia often suffer from low birth weight and iron deficiency anemia themselves. (2)	molasses. (2)
Vitamin A	Vitamin A is needed for effective immune system functioning and protects the integrity of epithelial cells.(2)	Vitamin A deficiency puts children at higher risk for infection and makes many infections worse. It is also the most important cause of blindness among children in developing countries.(2)	Vitamin A is found in breast milk, liver, eggs, butter, and whole cow's milk, green leafy vegetables, orange and yellow fruits, and red palm oil. (2)

5. What are some of the key tools to help prevent malnutrition? How do you think each of these contribute to good nutrition?

According to UNICEF, adequate diet (provides enough macronutrients and micronutrients), proper prevention and treatment of medical problems, and the protection of rights of women and girls (wherever females are discriminated against, there are increased rates of malnutrition) are key tools. (1)

Please go to www.unicef.org/nutrition/index_challenges.html to learn about the challenges of preventing malnutrition

6. How does inadequate maternal nutrition and care affect nutritional status?

According to UNICEF, the low status of women, poor maternal nutrition, inadequate prenatal care, and the disproportionate burden of physical labor born by mothers are some of the greatest barriers to improving nutritional status. When there is discrimination against women, there is also poor nutrition, regardless of economic growth. (3)

7. How does improper infant and child feeding affect a child's nutritional status?

According to UNICEF, many mothers do not continue breastfeeding for the recommended 2 years or longer. Instead, they replace breast milk with substitutes. Formula feeding is costly and does not provide the same nutrition as breast milk. It can be dangerous, particularly in areas with unsafe water supplies. (3)

8. How does our ability to respond to nutritional needs in emergencies affect a child's nutritional status?

According to UNICEF, in emergencies, child malnutrition increases drastically and kills most rapidly. Most children do not die because of conflicts or natural disasters. Rather, they die because of resulting food shortages, lack of safe water, inadequate health care, and poor sanitation and hygiene. In these situations, the vast majority of children suffer a deadly combination of measles, diarrhea, respiratory infections, and severe malnutrition. Breastfeeding, which offers

protection for young children, becomes even more vital under these conditions. (3)

9. How does HIV/AIDS affect nutrition?

According to UNICEF, children whose parents have died from HIV/AIDS and children who live with infected family members have a much greater chance of going hungry. While there is about a 5%-15% chance that a mother with HIV will transmit the virus during breastfeeding, the risks of not breastfeeding can be even greater. Mothers must be given advice about their feeding options. Children with HIV or those whose parents have died from HIV/AIDS are at high risk of malnutrition and need special attention. (3)

Please go to www.unicef.org/nutrition/index_emergencies.html to learn about the issues involved in responding to nutrition emergencies.

10. How can emergencies like conflicts or natural disasters lead to malnutrition?

According to UNICEF, most children do not die because of conflicts or natural disasters. Rather they die because of resulting food shortages, lack of safe water, inadequate health care, and poor sanitation and hygiene. Most children die from measles, diarrhea, respiratory infections, and severe malnutrition. Micronutrient deficiencies can easily develop or become worse during an emergency. This happens for many reasons. People lose their means of income and food crops are lost. Food supplies cannot get through on damaged roadways. Diarrhea diseases break out, and people lose nutrients or are unable to absorb them. And infectious diseases lower the appetite while increasing the need for micronutrients to help fight illness. (4)

11. We can decrease micronutrient malnutrition by fortifying foods. However, there are some difficulties associated with food fortification. Explain one of them.

According to UNICEF, foods fortified with micronutrients may not meet all of the needs of certain groups at higher risk for malnutrition—pregnant women, lactating women, and children from 6 to 59 months of age. (4) Accept all other reasonable and supported answers.

References

1. UNICEF. Nutrition – the big picture [online]. [cited 2006 Jul 21]. Available from URL: http://www.unicef.org/nutrition/index_bigpicture.html.
2. UNICEF. Bringing science to bear [online]. [cited 2006 Aug 18]. Available from URL: <http://www.unicef.org/sowc98/sowc98c.pdf>.
3. UNICEF. Nutrition – what are the challenges? [cited 2006 Jul 21]. Available from URL: http://www.unicef.org/nutrition/index_challenges.html.
4. UNICEF. Nutrition – safeguarding nutritional rights in emergencies. [cited 2006 Jul 21]. Available from URL: http://www.unicef.org/nutrition/index_emergencies.html.

Operation MINI Webquest: Food Logistics

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

Directions: The Centers for Disease Control and Prevention has asked you to research some information on food logistics and then share it with your colleagues. This information, along with information your colleagues will bring on standard nutrition and micronutrient deficiencies, could be helpful as you begin working in your grant writing teams to develop an intervention for one of the affected villages.

Use the following websites to answer the questions provided. Answers do not need to be in complete sentences, but they do need to contain sufficient information. Remember—you are responsible for teaching your colleagues/classmates!

Please go to www.foodaid.org/pdfdocs/foodforum/2001Q1/fantaq101.pdf and read about USAID's Food and Nutrition Technical Assistance (FANTA) project's efforts to develop an emergency food ration.

1. How do the nutritional needs of individuals in emergency situations compare with those of individuals in more stable conditions?
2. What are some of the logistical problems with providing appropriate nutritional food in an emergency situation, particularly in isolated areas?
3. What are some requirements for an emergency ration that could be used globally?
4. What is BP5? What are its benefits and its downsides?

Please go to USAID's Food for Peace website, www.usaid.gov/our_work/humanitarian_assistance/ffp/crg/sec2.htm, to learn about the shelf life, packaging, and nutritional values for a variety of foods.

5. Fill in the table that follows based on the three foods listed. Also, predict whether these foods can be eaten "as-is" or if they need to be cooked.

	Does this food contain:					
	Vitamin A	Iron	Iodine	Packaging	Shelf life	Preparation prediction
Black beans						
Corn soy blend (CSB)						

Rice (bagged, bulk)						
Fortified refined vegetable oil						

Please go to www.usaid.gov/about_usaid/PDACG100.pdf and read pages 26–27, “Responding to crises.”

6. What are some of the things USAID does after responding to a crisis with regard to food and food safety? Hypothesize why these tasks are important.

7. In the Sudan crisis example, what types of emergency relief did USAID provide? Which of these do you think would be important in the crisis assigned to you?

Please go to www.usaid.gov/press/releases/2003/pr030806.html to read a press release from USAID about the deployment of a Disaster Assistance Response Team (DART) in Liberia.

8. What is the role of a DART and how might one be helpful in your emergency?

Operation MINI Webquest: Food Logistics Answer Key

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

Directions: The Centers for Disease Control and Prevention has asked you to research some information on food logistics and then share it with your colleagues. This information, along with information your colleagues will bring on standard nutrition and micronutrient deficiencies, could be helpful as you begin working in your grant writing teams to develop an intervention for one of the affected villages.

Use the following websites to answer the questions provided. Answers do not need to be in complete sentences, but they do need to contain sufficient information. Remember—you are responsible for teaching your colleagues/classmates!

Please go to www.foodaid.org/pdfdocs/foodforum/2001Q1/fantag101.pdf and read about USAID's Food and Nutrition Technical Assistance (FANTA) project's efforts to develop an emergency food ration.

1. How do the nutritional needs of individuals in emergency situations compare with those of individuals in more stable conditions?
According to Caroline Grobler-Tanner, these individuals often have greater nutritional needs than those in stable conditions. (1)
2. What are some of the logistical problems with providing appropriate nutritional food in an emergency situation, particularly in isolated areas?
According to Caroline Grobler-Tanner, common problems include difficulty in acquiring, storing, and delivering food aid such as grain, flour, beans, and special blended foods during the first stages of an emergency. (1)
3. What are some requirements for an emergency ration that could be used globally?
According to Caroline Grobler-Tanner, an emergency food ration must be packed with nutrients, must stand alone, and must be suitable for all ages and cultures. It would be similar to an energy bar that you buy in a health food store, but specifically made to meet the needs of people in an emergency situation. It would be much cheaper, require no preparation, have a long shelf life, and be easy to handle, transport, and distribute. (1)
4. What is BP5? What are its benefits and its downsides?
According to Caroline Grobler-Tanner, BP5 it is a Norwegian "power bar" originally designed for use in life boats. It is highly nutritious and requires no preparation. However, it does not taste good, and it makes people thirsty. (1)

Please go to USAID's Food for Peace website, www.usaid.gov/our_work/humanitarian_assistance/ffp/crg/sec2.htm, to learn about the shelf life, packaging, and nutritional values for a variety of foods.

5. Fill in the table that follows based on the three foods listed. Also predict whether these foods can be eaten "as-is" or if they need to be cooked.

According to USAID (2),

	Does this food contain:			Packaging	Shelf life	Preparation prediction
	Vitamin A	Iron	Iodine			
Black beans	Yes	Yes	No	50kg woven bag	Minimum of one year	Needs to be cooked
Corn soy blend (CSB)	Yes	Yes	Yes	25kg paper bag	Minimum of one year	Needs to be cooked
Rice (bagged, bulk)	No	Yes	No	50kg woven bag	Minimum of two years	Needs to be cooked
Fortified refined vegetable oil	Yes	Yes (minimal)	No	4-L tins, 20-L steel pails, or 208-L steel drums	Minimum of one year	Accept reasonable answer (can be eaten uncooked)

Please go to www.usaid.gov/about_usaid/PDACG100.pdf and read pages 26–27, “Responding to crises.”

6. What are some of the things USAID does after responding to a crisis situation with regard to food and food safety? Hypothesize why these tasks are important.

According to USAID, the following are important parts of their response:

- **Having experts on the ground right after a disaster hits to assess damage and needs**
- **Providing immediate relief to disaster victims**
- **Providing cash for work in mass employment programs after disasters to get local markets functioning and to improve livelihoods of families affected by disasters**
- **Improving the lives of poor and hungry people by supporting programs that address the underlying causes of poverty and malnutrition. (3)**

Student answers will vary. Accept all reasonable answer to why these components are necessary.

7. In the Sudan crisis example, what types of emergency relief did USAID provide? Which of these do you think would be important in the crisis assigned to you?

USAID provided humanitarian aid valued at \$200.7 million in 2004. This aid included health assistance, water and sanitation programs, emergency relief supplies, and more than 185,000 metric tons of food. (3)

Accept any reasonable answers about which types of relief would be important in the scenario used in class.

Please go to www.usaid.gov/press/releases/2003/pr030806.html and read the press release from USAID about the deployment of a Disaster Assistance Response Team (DART) in Liberia.

8. What is the role of a DART and how might one be helpful in your emergency?

According to USAID, a DART is a team of disaster relief specialists. The team quickly studies the emergency, identifies needs and decides which are most urgent, manages onsite relief activities, recommends response actions, and coordinates with the affected country and with other response organizations. The

teams are typically sent out after disasters that do a lot of damage. DARTs have been sent out world-wide, including to Iraq after the recent conflict, to affected populations in Angola's 27-year civil war, and to communities affected by the drought throughout Ethiopia. (4)

Accept any reasonable answers as to how a DART would be useful for the scenario used in class.

References

1. Grobler-Tanner C. FANTA provides technical guidance to develop an emergency ration bar. [cited 2006 Jul 21]. Available from URL: <http://www.foodaid.org/pdfdocs/foodforum/2001Q1/fantaq101.pdf>.
2. USAID. USAID commodities reference guide – section II: food commodity fact sheets. 2006. [cited 2006 Jul 21]. Available from URL: http://www.usaid.gov/our_work/humanitarian_assistance/ffp/crg/sec2.htm.
3. USAID. USAID primer: what we do and how we do it. 2006. [cited 2006 Jul 21]. Available from URL: http://www.usaid.gov/about_usaid/PDACG100.pdf.
4. USAID. USAID press release: USAID disaster assistance response team (DART) deploys to Liberia. 2003. [cited 2006 Jul 21]. Available from URL: <http://www.usaid.gov/press/releases/2003/pr030806.html>.

Operation MINI Posttest

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

Directions: For each question, circle the best answer.

1. Which of the following is a contributing factor of malnutrition?
 - a. Frequent disease
 - b. Insufficient protein
 - c. Unsafe water
 - d. All of the above

2. Which of the following is NOT an important strategy in preventing malnutrition?
 - a. Protecting the rights of women and girls
 - b. Providing safe public transportation systems
 - c. Understanding the local culture
 - d. Providing access to health care services

3. Which of the following is a major role of iron in the human body?
 - a. It is an essential mineral for bone development
 - b. It is involved in the manufacture of hemoglobin
 - c. It is critical to the functioning of the thyroid gland
 - d. It is involved in the formation of nerve cells

4. What is a common consequence of iron deficiency in the body?
 - a. Fatigue
 - b. Blindness
 - c. Muscle weakness
 - d. Brain damage

5. Which of the following is a major role of iodine in the human body?
 - a. It is essential for immune system function
 - b. It is involved in the manufacture of hemoglobin
 - c. It is critical to the functioning of the thyroid gland
 - d. It is involved in the formation of nerve cells

6. Which of the following is a major role of vitamin A in the human body?
 - a. It is essential for immune system function
 - b. It is involved in the manufacture of hemoglobin
 - c. It is critical to the functioning of the thyroid gland
 - d. It is involved in the formation of nerve cells

7. What is a consequence of vitamin A deficiency in the body?
 - a. Fatigue
 - b. Blindness
 - c. Muscle weakness
 - d. Brain damage

8. What is food fortification?
 - a. Removing fat from food rations
 - b. Adding nutrients to existing foods
 - c. Combining natural foods for a balanced meal
 - d. All of the above

9. Which of the following is a logistical problem in delivering food during an emergency situation?
 - a. Civil unrest
 - b. Lack of clean water
 - c. Local roads in disrepair
 - d. All of the above

Operation MINI Posttest Answer Key

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

Directions: For each question, circle the best answer.

1. Which of the following is a contributing factor of malnutrition?
d. All of the above (1)
According to UNICEF, common factors of malnutrition include insufficient protein, energy, and micronutrients; frequent infections or disease; poor care and feeding practices; inadequate health services; and unsafe water and sanitation.
2. Which of the following is NOT an important strategy in preventing malnutrition?
b. Providing safe public transportation systems (1)
According to UNICEF, adequate diet, proper prevention and treatment of medical problems, and the protection of rights of women and girls are all strategies that can prevent malnutrition.
3. Which of the following is a major role of iron in the human body?
b. It is involved in the manufacture of hemoglobin (1)
According to UNICEF, iron is involved in the manufacture of hemoglobin; it is also required for several enzymes necessary for muscle, brain, and immune system function.
4. What is a common consequence of iron deficiency in the body?
a. Fatigue (1)
According to UNICEF, iron deficiency can result in fatigue, shortness of breath, and dizziness and an increased risk of hemorrhage and sepsis during childbirth. Iron deficient women may have babies who suffer from infections, weakened immunity, learning disabilities, impaired physical development, and in severe cases, death.
5. Which of the following is a major role of iodine in the human body?
c. It is critical to the functioning of the thyroid gland (1)
According to UNICEF, iodine is critical to the formation and the functioning of the thyroid gland, which regulates growth and metabolism.
6. Which of the following is a major role of vitamin A in the human body?
a. It is essential for immune system function (1)
According to UNICEF, vitamin A is necessary for immune system function.
7. What is a consequence of vitamin A deficiency in the body?
b. Blindness (1)
According to UNICEF, vitamin A deficiency can result in blindness and increased risk of death from measles, diarrhea, and acute respiratory infections.
8. What is food fortification?
b. Adding nutrients to existing foods (2)
According to the FAO, food fortification supplements common foods like flour, cooking oil, and sugar with essential micronutrients.
9. Which of the following is a logistical problem in delivering food during an emergency situation?
d. All of the above

A variety of logistical problems could affect food delivery during an emergency, including issues with transportation, food storage, preparation, water supplies, waste, weather, civil unrest, and cultural concerns.

References

1. UNICEF. Nutrition – the big picture [online]. [cited 2006 July 21]. Available from URL: http://www.unicef.org/nutrition/index_bigpicture.html.
2. Food and Agriculture Organization of the United Nations. Annex 6 – requirements for effective fortification in food aid programmes. 1995. [cited 2006 July 21] Available from URL: <http://www.fao.org/docrep/w2840e/w2840e0d.htm>.

Intervention Guide

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

As you heard earlier, a tsunami has destroyed several villages. Three different villages with three different nutritional needs have requested assistance from the Centers for Disease Control and Prevention (CDC). CDC has provided the following brief descriptions of these three villages.

Village 1: People in this area have seen a recent increase in iodine deficiency among men, women, and children. They have relied on shipments of fortified salt from nonprofit organizations in the past, but with the recent tsunami, the fortified salt has been unable to reach the village because of road conditions. However, a neighboring village's supply of iodized salt was not destroyed. They are willing to trade the iodized salt for several of the village's livestock.

Village 2: This village has seen an increase in vitamin A deficiency among children. Before the tsunami, children were consuming vitamin A-rich foods daily. In the past, nonprofit organizations have given vitamin A drops to local health workers to distribute to children, but the money has run out and there is no way for these organizations to fund another intervention or access the village.

Village 3: This village has seen an increase in iron deficiency among pregnant women and children. Before the tsunami, this village had had access to meat and other iron-rich sources of food. However, the tsunami destroyed their livestock. This village does have an abundant source of rice that was not damaged during the tsunami. Unfortunately, the village does not have access to fuel to cook the rice. Several neighboring villages have offered to trade some of their livestock for the rice; however, the roads are not passable for at least another couple of months.

As a group, choose a village and micronutrient to focus on for this particular intervention.

Which village are you going to focus on? _____

What micronutrient are you going to focus on? _____

Standard Nutrition:

Based on the micronutrient you are focusing on, list two foods that could be part of a ration that would provide adequate micronutrient content. The two foods do not need to have adequate nutrient content on their own, but they should have enough when added together. Go to www.nal.usda.gov/fnic/foodcomp/search/ to find out the amount of micronutrients in each of your chosen foods.

Note: For this particular assignment, you may use foods that might not be available in these villages. However, if this were a real scenario, you would be limited to foods available, accessible, and culturally accepted in these villages. Additionally, if you choose village 1, both foods must be iodized salt, and your teacher will provide you with information on the amount of iodine found in salt.

Food 1: _____

Food 2: _____

	Iodine	Vitamin A	Iron (mg)
Food 1: Amount present			
Food 2: Amount present			
Total amount from both food 1 and food 2			
Total amount required	90 µg for children	400 µg (or 400 RAE) for children	27.0 mg for pregnant women

Please list the amount of protein, carbohydrates, and fat present in your two foods.

	Carbohydrate	Fat	Protein
Food 1:			
Food 2:			

Given what you know about the village, its micronutrient status, and the foods available, would you recommend supplemental feeding? (Yes or No)

Micronutrient Deficiency:

1. Name two possible health outcomes that could arise if this deficiency is not corrected.
2. Within this village, who would you recommend targeting with a food intervention? Why?
3. Is there any other information that you would want to know about the people in this village?

Food Logistics

4. Please list three logistical issues you might face if you were implementing a food intervention plan for this village.

5. Suppose this village does not have access to any fuel and the proposed ration requires cooking. What would you recommend instead?

Intervention Guide – Answer Key

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

As you heard earlier, a tsunami has destroyed several villages. Three different villages with three different nutritional needs have requested assistance from the Centers for Disease Control and Prevention (CDC). CDC has provided the following brief descriptions of these three villages.

Village 1: People in this area have seen a recent increase in iodine deficiency among men, women, and children. They have relied on shipments of fortified salt from nonprofit organizations in the past, but with the recent tsunami, the fortified salt has been unable to reach the village because of road conditions. However, a neighboring village's supply of iodized salt was not destroyed. They are willing to trade the iodized salt for several of the village's livestock.

Village 2: This village has seen an increase in vitamin A deficiency among children. Before the tsunami, children were consuming vitamin A-rich foods daily. But the tsunami destroyed their crops of root vegetables and yams. In the past, nonprofit organizations have given vitamin A drops to local health workers to distribute to children, but the money has run out and there is no way for these organizations to fund another intervention or access the village.

Village 3: This village has seen an increase in iron deficiency among pregnant women and children. Before the tsunami, this village had access to meat and other iron-rich sources of food. However, the tsunami destroyed their livestock. This village does have an abundant source of rice that was not damaged during the tsunami. Unfortunately, the village does not have access to fuel to cook the rice. Several neighboring villages have offered to trade some of their livestock for the rice; however, the roads are not passable for at least another couple of months.

As a group, choose a village and micronutrient to focus on for this particular intervention.

Which village are you going to focus on? _____

What micronutrient are you going to focus on? _____

Standard Nutrition:

Based on the micronutrient you are focusing on, list two foods that could be part of a ration that would provide adequate micronutrient content. The two foods do not need to have adequate nutrient content on their own, but they should have enough when added together.

Note: For this particular assignment, you may use foods that might not be available in these villages. However, if this were a real scenario, you would be limited to foods available, accessible, and culturally accepted in these villages. Additionally, if you choose village 1, both foods must be iodized salt, and your teacher will provide you with information on the amount of iodine found in salt.

Student answers will vary. The following are possible answers for each village/micronutrient deficiency selected. Accept all reasonable answers.

Village 1: Iodine (children)

Food 1: 1/4 teaspoon of salt, table

Food 2: 1/8 teaspoon of salt, table

Village 2: Vitamin A (children)

Food 1: 1/2 of a medium carrot (raw)

Food 2: 1/4 of a small sweet potato (cooked, with skin, no salt)

Village 3: Iron (pregnant women)

Food 1: 1 cup spinach, canned, drained solids

Food 2: 3/4 cup General Mills Whole Grain Total

According to USDA's Nutrient Data Laboratory (1),

	Iodine (µg)	Vitamin A (µg)	Iron (mg)
Food 1: Amount present	67.5 µg (2)	257 RAE (carrot)	4.92 mg (spinach)
Food 2: Amount present	33.7 µg (2)	144 RAE (sweet potato)	22.35 mg (Total cereal)
Total amount from both food 1 and food 2	101.2 µg (2)	401 RAE	27.27 mg
Total amount required	90 µg for children	400 µg (or 400 RAE) for children	27.0 mg for pregnant women

Please list the amount of protein, carbohydrates, and fat present in your two foods.

According to USDA's Nutrient Data Laboratory (1),

	Carbohydrate	Fat	Protein
Food 1: Table salt	0 g (2)	0 g (2)	0 g (2)
Food 2: Table salt	0 g (2)	0 g (2)	0 g (2)
Food 1: Carrots	2.92 g	0.07 g	0.28 g
Food 2: Sweet potato	3.11 g	0.02 g	0.3 g
Food 1: Spinach	7.28 g	1.07 g	6.01 g
Food 2: Total cereal	22.50 g	0.72 g	2.66 g

Given what you know about the village, its micronutrient status, and the foods available, would you recommend supplemental feeding? (Yes or No)

Student answers will vary. Accept all reasonable answers.

Micronutrient Deficiency:

1. Name two possible health outcomes that could arise if this deficiency is not corrected.
Student answers will vary. According to UNICEF, the following are possible health outcomes related to iodine deficiency, vitamin A deficiency, and iron deficiency.

Village 1 (Iodine/children): mental retardation and goiter (3)

Village 2 (Vitamin A/children): blindness and decreased ability to fight off diseases/infections (3)

Village 3 (Iron/pregnant women): maternal death, reduction of mental and physical capacity (3)

2. Within this village, who would you recommend targeting with a food intervention? Why?
Student answers will vary. Accept all reasonable answers. Possible answers could include:

Village 1 (Iodine): Would recommend targeting women, men, and children because they are the ones with an iodine deficiency.

Village 2 (Vitamin A): Would recommend targeting children because they seem to be the ones most at risk for vitamin A deficiency.

Village 3 (Iron): Would recommend targeting pregnant women because they seem to be the ones most at risk for iron deficiency.

3. Is there any other information that you would want to know about the people in this village?
Student answers will vary. Accept all reasonable answers. Possible answers could include: Are there any other food sources available? Do they have access to clean water? Do they have access to fuel?

Food Logistics

4. Please list three logistics you might face if you were implementing a food intervention plan for this village.

Student answers will vary. Accept all reasonable answers.

Possible answers could include:

- **Damaged roads**
- **Lack of food storage**
- **Lack of systems in place to distribute food once it arrives**
- **Finding food that is culturally acceptable**
- **Finding food that doesn't require cooking**
- **No available means of transporting food**

5. Suppose this village does not have access to any fuel and the proposed ration requires cooking. What would you recommend instead?

Student answers will vary. Accept all reasonable answers. Possible answers could include:

- **Find a food source that doesn't require cooking**
- **Find a way to provide fuel**

Reference

1. USDA Agricultural Research Service. Nutrient data laboratory. [cited 2006 Jul 21]. Available from URL: <http://www.nal.usda.gov/fnic/foodcomp/search/>.
2. Food label-iodine content.

3. UNICEF. Bringing science to bear [online]. [cited 2006 Aug 18]. Available from URL: <http://www.unicef.org/sowc98/sowc98c.pdf>.

Intervention Plan Template

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

Group Members: _____

Class Period: _____

Directions: Once you have filled out your Intervention Plan Guide, please fill out the basic information about your intervention. Work as a group to make these decisions.

Intervention Name:

Target population	
Targeted micronutrient deficiency	
Type of food intervention chosen	
Proposed food rations	
Storage requirements or considerations	
Fuel requirements	
Possible means of distribution	
Any other factors of concern or additional notes	

Iodine Food Label

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

Nutrition Facts	
Serving Size 1/4 tsp (1.5g)	
Servings Per Container 566	
Amount Per Serving	
Calories 0	
% Daily Value*	
Total Fat 0g	0%
Sodium 590mg	25%
Total Carbohydrate 0g	0%
Protein 0g	
Iodine 45%	
Not a significant source of calories from fat, saturated fat, cholesterol, dietary fiber, sugars, vitamin A, vitamin C, calcium and iron.	
*Percent Daily Values are based on a 2,000 calorie diet.	

Group Presentation Rubric

Operation MINI (Micronutrient Need Intervention)
Emily Adams and Scott Braswell, CDC's 2006 Science Ambassador Program

Your presentation on your intervention plan will be graded based on the following:

CATEGORY	4	3	2	1
Content/ Accuracy	Students have based their intervention plan on information from all three experts.	Students have based some of their intervention plan on information from all three experts.	Students have based almost none of the intervention plan on information from all three experts.	Students have not based their intervention plan on information from all three experts.
Creativity	Students have been very creative in their intervention plan.	Students have been creative in their intervention plan.	Students have been somewhat creative in their intervention plan.	Students have not been creative in their intervention plan.
Knowledge Gained	Students could answer all the questions about their micronutrient deficiency and how their plan would address it.	Students could answer some of the questions about their micronutrient deficiency and how their plan would address it.	Students could answer a few of the questions about their micronutrient deficiency and how their plan would address it.	Students could not answer any of the questions about their micronutrient deficiency and how their plan would address it.
Impact	Students' presentation made a big impact with the teacher/student audience.	Students' presentation made an impact with the teacher/student audience.	Students' presentation made somewhat of an impact with the teacher/student audience.	Students' presentation made no impact with the teacher/student audience.

A portion of the above rubric was created using Rubistar, available at <http://rubistar.4teachers.org/index.php>.