

# Introduction to Health; Environment + Genes + Choices = YOUR HEALTH!

## Brief Description

This is an introductory lesson to a Health course that introduces students to the relationship between the Environment, Genetics and Choices to individual health. It also introduces them to the six components of one's health and how they are influenced by the Health equation.

**Duration of the lesson:** 2+ days

## Learning Objectives

Students will be able to:

- EALR 2.1: Understand dimensions and indicators of health.
- EALR 2.3: Understands the concepts of prevention and control of disease.
- EALR 2.4: Acquires skills to live safely and reduce health risks.
- EALR 3.1: Understands how family, culture and environmental factors affect personal health.

## Materials:

- *Circle within a Circle* worksheet questions (one per table group)
- *Your Money or Your Life* worksheet (one per student)
- *Your Money or Your Life Socratic Seminar* worksheet (one per student)
- *Your Money or Your Life Outcomes* (individualize each outcome and put them in an envelope = 9 total)
- *Family Tree* rubric (one for each student)
- *Family Tree* template (one for each student)

## Instructional Activities

### 1. Circle within a Circle Activity

- Divide the class in half. Instruct each group to stand up in an open space, forming a circle within a circle, so that every person in the inside circle is facing someone in the outside circle.
- Have students introduce themselves to each other and using the Circle within a Circle question list, ask the first question and have them discuss it with the person they are standing in front of.
- After about a minute, tell the students in the outside circle to take one step towards their left, so they are facing someone new. Have them introduce themselves to the new person and ask the second question on the Circle within a Circle list and have them discuss it with each other.
- Repeat this process until all questions have been discussed.
- Have students return to their seats.

### 2. Brainstorm: What is in the environment? What is in genetics? How do we make choices?

- In groups of 4, or table groups, have the Circle within a Circle questions and the blank Components of Health venn diagram worksheet available for each group.
- Have students discuss how each of the questions relates to the first question: "What age do you want to be when you die?"

They should see their answers correlate to how long they want to live.
- Have students brainstorm which questions are associated with each other and separate them into three categories. Have them brainstorm a word or phrase that represents each category as it relates to their overall Health and longevity. Have students complete the venn diagram and share their thoughts as a class.
- Discuss the equation
$$\text{Environment} + \text{Genes} + \text{Choices} = \text{Health}$$
as it relates to what will be learned in the semester of Health.

### 3. Your Money or Your Life Socratic Seminar Activity (ATHENA)

- Explain to students that they will be using a Socratic Seminar style of learning to promote discussion and critical thinking about issues of genetics and environmental factors as they relate to choices.
- Separate students into small groups of 4 or 5 and designate them equally into groups "A" or "B." Hand out the *Your Money or Your Life* worksheet to each group member and the *Your Money or Your Life Socratic Seminar* worksheet. Have them label their worksheets whether they are group "A" or group "B."

## High School Health

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- Have a group "A" team up with a group "B." Explain to the class that group "A" will be the participants of the seminar first, and group "B" will be the evaluators first. Here are the rules:
    - Participants will:
      - ✓ Respectfully participate in the discussion of the questions presented for their designated group after the reading.
      - ✓ Write notes for themselves based on the discussion.
    - Evaluators will:
      - ✓ Not speak to other participants or group members.
      - ✓ Use the *Your Money or Your Life Socratic Seminar* worksheet to record questions and feedback for Participants.
      - ✓ Provide feedback after the Participants' discussion is over within the allotted time frame.
  - 1. Provide 10 minutes for everyone to read *Part I* silently and record their thoughts on the discussion questions provided for them.
  - 2. After everyone is done, group "A" will be given 5 minutes to orally discuss the questions for Part I as a group. Group "B" will listen and record their thoughts on the *Socratic Seminar* worksheet.
  - 3. Group "B" will be given 5 minutes to provide feedback and ask questions to group "A."
  - 4. Repeat the process with *Part II*, this time group "B" are the Participants and group "A" are the Evaluators.
  - After the seminar is over, hand each group a "possible outcome" slip and have one person from each group share with the class.
  - Discuss the following questions as a class:
    - Do you think someone could really face this kind of choice? Any examples?
    - Does anyone know someone who has faced any choices like this where they live, work, go to school or play?
    - Are there things society can do to prevent dilemmas like the one Frank faced?
  - Have a discussion on why health decisions like this are so difficult and emphasize to students that these implications and possibilities are the reason why there are so many possible answers when it comes to making decisions regarding your health. This semester we will be looking at six areas of your health: social, emotional, physical, spiritual, intellectual and vocational. These components are influenced by genetics, the environment and choices.
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## High School Health

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- Have each student write down a dilemma that their peers may face or have faced around any of the four major units: Sexuality, Mental Health, Drugs, and Consumerism and Nutrition. Have students share their ideas with the class and discuss how it may impact one or more areas of one's health.

#### **4. Family Tree Research Project and Brochure Assessment**

- Have students begin thinking about their own family. Explain the Family Tree rubric and using the family tree template, have students begin filling in what they know about their family.
- If possible, provide students a day with computer carts to help them with their research (about 3-4 days later).

#### **Accommodations:**

Follow IEP and 504 Accommodations for individual students.

#### **Resources:**

NIEHS Center for Ecogenetics and Environmental Health, University of Washington.

ATHENA: The Academy for Teaching About Health and Environment Associations

Barb Velategui, Tori Marcum, *Newport High School & ATHENA participants*

# Circle within a Circle Questions

1. What age do you want to be when you die?
2. What are your three greatest stressors?
3. At what age do you feel it is appropriate to begin using drugs?
4. Are any medical issues common in your family?
5. Have you ever ingested a substance that has made you sick?
6. In a typical week how often do you eat fast food?
7. What is your typical behavior around seat belt use?
8. Where have you lived other than [*name your town*] and how was it different there?
9. What is a physical trait that is common in your family?
10. In a typical week how many minutes do you spend exercising?

# Health Equation



# **Your Money or Your Life**

## *An Exploration of the Implications of Genetic Testing in the Workplace*

### **Activity Instructions**

This Role Play Activity is designed to promote discussion and critical thinking about the issues of genetic testing and pesticide exposure. While much of the information included in the activity is real and accurate, the people and places are, for the most part, fictional.

The activity is designed to be carried out with a group of 4 or more participants. It can be used with middle and high school students as well as adults. The facilitator should be familiar with the basic principles of public health, environmental health and genetic testing and should have read all the activity materials beforehand.

#### **Before the Event:**

Make the following number of copies of the handouts:

- a. Your Money or Your Life, Part I and Part 2 - 1 copy for each participant and for each leader. It works well to print Parts 1 and 2 back-to-back on a single page.
- b. Each participant will receive one of the five Outcomes so you can make fewer copies of these pages. Print one copy of the Outcomes for those choosing to take the test and one copy of the Outcomes for those choosing NOT to take the test for every 4 participants.

Cut the 5 Outcomes on each page apart. Place the 5 Outcomes for those choosing to take the test together in an envelope marked "TEST". Place the 5 Outcomes for those choosing NOT to take the test together in an envelope marked "NO TEST".

If there are several leaders, prepare a set of TEST and NO TEST envelopes for each leader.

#### **At the Event:**

Each participant should have a writing surface and a pen or pencil. Sitting in table groups will allow for small group discussion.

Introduce the activity by saying that this is a role play about a man who is trying to support his family. He has to make some hard choices about his job.

Give each participant the page, "Your Money or Your Life". Ask them to look at Part 1 and not to read Part 2 on the flip side until the whole group has had a chance to complete and discuss Part 1.

Invite participants to read Part 1 in table groups by having each person read a paragraph aloud. Or ask for volunteers to read one paragraph to the whole group while others follow along.

Ask clarifying questions of the whole group to make sure everyone understands the text.

Ask participants to complete the Discussion Questions for Part 1. They may discuss the questions with their table group.

When all participants are finished with Part 1, go through their answers to the Discussion Questions. There are several answers to each question; make sure several possible answers are

## **Your Money or Your Life**

### *An Exploration of the Implications of Genetic Testing in the Workplace*

named. For the 3<sup>rd</sup> question, ask several participants what job they would pick and why. Then poll the group to see how many chose the pesticide applicator job and how many chose the clerk job. Invite a few participants to share something that surprised them or was new information for them.

Invite the participants to turn the page over to Part 2. As with Part 1, read Part 2 aloud by table groups or ask for volunteers who will read one paragraph each to the whole group.

Ask clarifying questions to make sure everyone understands the text.

As with Part 1, ask participants to complete the Discussion Questions for Part 2. They may discuss the questions with their table group.

When all participants are finished with the Part 2 Discussion Questions, go through the first two questions with the whole group. There are several answers to each question; make sure several possible answers are named.

Now take the Outcomes Envelopes. Ask for a volunteer to stand and give their answer to Question 3 to the whole group, and to explain why. Then invite the volunteer to take one Outcome from the TEST or NO TEST envelope according to their answer. Ask them to read the outcome to themselves while you ask for another volunteer to answer Question 3 and explain why. Invite that volunteer to take an Outcome from the appropriate TEST or NO TEST envelope and read it to themselves. If both volunteers had the same answer, either to take the genetic test or not to take the test, ask whether someone answered differently. Ask that person to share their answer and why, and let them take an Outcome from the appropriate envelope.

Carry the envelopes to every participant and ask them to choose an Outcome according to how they answered Question 3. If there are several leaders, each leader should have a TEST and a NO TEST envelope. Leaders can circulate to the table groups, invite participants to answer Question 3 in table groups. When a participant gives their answer, invite them to choose an Outcome from the appropriate envelope.

Reconvene the large group and invite participants to read their outcome, first reporting whether they decided that Frank got the genetic test or didn't get the test. Invite several people to report until the whole group has listened to several possible outcomes.

Close with a discussion about the health risks of being exposed to pesticides and Frank's hard choice to earn enough money to support his family, or to protect himself from being exposed to pesticides.

Ask whether participants think someone could really face this kind of choice, and invite them to give examples. Do participants face any choices like this where they live, work, go to school, or play? Are there things society can do to prevent dilemmas like the one Frank faced?



# **Your Money or Your Life**

## *An Exploration of the Implications of Genetic Testing in the Workplace*

### **PART 1**

Until recently, Frank Lee had a great job that paid him well and still allowed him to spend time with his wife and two young children. Two months ago Frank lost his job and the family could no longer afford the house they were renting. Isabel, Frank's wife, had worked in retail before the children came along, but the cost of childcare was so high that it made more sense for her to be a stay at home parent, at least until both children were old enough to be in school full-time. After considering their options, the Lees decide to move to the city of Farmville where housing is more affordable and the schools are good. But Frank needs a job, and fast!

Soon after they arrive, Frank reads about two job openings at the largest employer in town, Fancy Fruit Farms. The first is a job as a pesticide applicator and pays \$20.00 an hour. The job requires spending eight hours a day applying the pesticide Chlorpyrifos (CP) to crops by hand. Special training in the safe application of pesticides is provided, as is protective equipment to be worn while working.

In addition to the pesticide applicator job, Fancy Fruit Farms is also looking for a clerk to work in the office. This job includes tasks such as ordering seeds, agricultural chemicals, and equipment for the company. The clerk job pays only \$8.00 an hour.

There are no other jobs currently available in Farmville and the family cannot afford to move again. Frank applies for both jobs, and is interviewed. The manager is impressed by Frank's enthusiasm and qualifications. He tells him that he can have whichever job he prefers. Frank knows that working with pesticides can be dangerous and that too much exposure to pesticides can cause health problems. But, the advertisement said there would be safety training and protective equipment provided. Frank also is aware that the clerk job pays only \$8.00 an hour – too little to support his family.

### **Discussion Questions for Part 1**

What are Frank's options?

What factors might influence his decision?

If you were Frank, which job would you pick?

# **Your Money or Your Life**

## *An Exploration of the Implications of Genetic Testing in the Workplace*

### **PART 2**

Before making his decision, Frank decides to visit the Better Business Bureau and get more information on Fancy Fruit Farms. He learns that the Department of Agriculture inspected Fancy Fruit Farms in 2006 and discovered that it was applying more CP to its crops than the regulations allowed. They issued a “notice of correction” and threatened to revoke or suspend Fancy Fruit Farms’ license to use CP if they didn’t fix the problem. As a result, Fancy Fruit Farms reduced the amount of CP they were using. They also had all pesticide applicators attend a safety course and required them to wear gloves while working. The Department of Agriculture reevaluated Fancy Fruit Farms after they had made these changes, and decided that they could continue to operate and use CP.

Frank also visits the Farmville Department of Health and learns about some interesting new research. Researchers have recently discovered that there is a gene that influences how the body reacts when exposed to CP. This gene is called PON1. There is a variation of the PON1 gene that makes people more likely to get sick if they are exposed to CP. People with this variation of the gene are more likely to experience muscle weakness, loss of coordination, and other serious health affects associated with too much CP exposure. Based on these findings, The Department of Health has recommended that Fancy Fruit Farms begin testing anyone who applies for a job as a pesticide applicator to find out whether they have this variation of the PON1 gene. Any new applicants who test **POSITIVE** for the variation will not be hired as pesticide applicators. Those currently employed as pesticide applicators will be given the option of taking the test, but won’t be required to do so.

After speaking with the manager at Fancy Fruit Farms, Frank discovers that they will officially begin administering the PON1 test the week after he will be hired, so he does not have to be tested. They give him the option, however, of having the test if he chooses. He is warned that if he opts to take the test and is **POSITIVE** for the PON1 gene variation, he will not be allowed to take the pesticide applicator job. If this happens, the only job open to him would be the clerk job that pays \$8.00 an hour. If he decides NOT to take the test, or if he takes the test and is **NEGATIVE**, he is still eligible for either job.

### **Discussion Questions for Part**

What could happen to Frank if he decides to take the genetic test?

What could happen to Frank if he decides **NOT** to take the genetic test?

Should Frank get the genetic test? Why or why not?

## **Your Money or Your Life**

### *An Exploration of the Implications of Genetic Testing in the Workplace*

#### **Outcomes for those choosing to take the test** (Cut into strips and place into an envelope marked “TEST”)

##### **You tested **POSITIVE** for the PON1 gene variation**

Frank tests positive for the PON1 variation and is not allowed to take the job applying pesticides. Instead, he takes the only other job available, the clerk job at Fancy Fruit Farms. He makes only \$8.00 an hour and soon can't afford to pay the rent on the new house. Frank and his family have to move into a tiny 2-bedroom apartment where they all share rooms and can barely afford groceries each week.

**T1**

##### **You tested **POSITIVE** for the PON1 gene variation**

Frank tests positive for the PON1 variation, and can't take the job applying pesticides. Instead, he takes the only other job available, the clerk job at Fancy Fruit Farms. Because he works hard at his job, he is promoted to a management position only a few weeks after being hired. The management position pays \$25.00 an hour and Frank and his family live long, happy, and healthy lives.

**T2**

##### **You tested **NEGATIVE** for the PON1 gene variation**

Frank tests negative for the PON1 variation and decides to take the job applying pesticides. He decides that the safety class and glove use will protect him from exposure. He spends several years applying pesticides and doesn't get sick. At work, he is asked to join a committee that helps develop safety plans to keep those working with pesticides as safe as they can be.

**T3**

##### **You tested **NEGATIVE** for the PON1 gene variation**

Frank tests negative for the PON1 variation and decides to take the job applying pesticides. He decides that the safety class and glove use will protect him from exposure. However, a few months after starting work Frank realizes that he is having symptoms associated with high exposure to CP. When the Department of Health returns for a second inspection, they find that the safety measures are not adequate and that some of the workers have been exposed to unsafe levels of CP. As a result, Fancy Fruit Farms is forced to close, and Frank loses his job.

**T4**

# **Your Money or Your Life**

## *An Exploration of the Implications of Genetic Testing in the Workplace*

### **Outcomes for those choosing NOT to take the test** (Cut into strips and place into an envelope marked “NO TEST”)

#### **You chose not to take the test for the PON1 gene variation**

Frank decides to take the job applying pesticides at his own risk. He works for several years, makes enough money to support his family, and even earns a promotion. In his new position, Frank teaches people how to apply pesticides safely, because safe application of pesticides is what kept him from getting sick. (If he had taken the test, Frank would have tested **POSITIVE** for the PON1 gene variation.)

**N1**

#### **You chose not to take the test for the PON1 gene variation**

Frank decides to take the job applying pesticides because he doesn't believe that genes could really make him more likely to get sick from working with pesticides. After working for one year applying pesticides, Frank realizes that he is having trouble breathing and he seems to be losing some of his muscle coordination. He remembers learning that these symptoms can be caused by exposure to too much CP. Frank visits the doctor and is told that he can no longer work applying pesticides at Fancy Fruit Farms or his symptoms may get worse. As a result Frank quits his job, and decides he should have gotten that genetic test after all. (If he had taken the test, Frank would have tested **POSITIVE** for the PON1 gene variation.)

**N2**

#### **You chose not to take the test for the PON1 gene variation**

Frank doesn't know his PON1 status and decides he needs the additional money that comes with the job applying pesticides. After a few months of applying pesticides without always following the company's safety guidelines, Frank gets sick and is sent to the hospital. Frank ends up dying in the hospital several weeks later from respiratory failure due to acute CP exposure, leaving his family with large, unpaid medical bills. (If he had taken the test, Frank would have tested **POSITIVE** for the PON1 gene variation.)

**N3**

## **Your Money or Your Life**

### *An Exploration of the Implications of Genetic Testing in the Workplace*

#### **You chose not to take the test for the PON1 gene variation**

Frank doesn't know his PON1 status and decides that he needs the additional money that comes with the job applying pesticides. Besides, no one can make him take a test! He works hard for several weeks and doesn't get sick. However, because small children are more susceptible to the harmful effects of exposure to CP, one of Frank's daughters becomes very ill. Frank continues to work applying pesticides, and doesn't realize that it's the pesticide residue on his work clothes that is making his daughter sick. Each night he puts his wet clothes by the heater to dry. His daughter gets sicker and sicker. Eventually she is hospitalized and diagnosed with CP poisoning. (If he had taken the test, Frank would have tested **NEGATIVE** for the PON1 gene variation.)

**N4**

#### **You chose not to take the test for the PON1 gene variation**

Frank doesn't want to know his PON1 status since he knows he needs the additional money that comes with the pesticide applicator job. He goes through safety training, wears his gloves while applying pesticides, and works for several years without getting sick. When a new agricultural company moves to town, Frank leaves his job at Fancy Fruit Farms for a new and better job that pays him \$30.00 an hour. (If he had taken the test, Frank would have tested **NEGATIVE** for the PON1 gene variation.)

**N5**



# FAMILY TREE:

## ENVIRONMENTAL AND GENETIC ANALYSIS OF THE PAST, PRESENT, AND YOUR FUTURE

- 1) **Tree:** Research the environmental and genetic medical conditions present in your family. Use the attached template to organize medical information about each family member.

Include in your tree:

- Yourself, siblings, parents, grandparents, great parents or farther if you can. If you do not live with your genetic family, you may record the people you currently live with.
- Include the date of birth (DOB) and the date of death (DOD), or if the person is still alive, write "present".
- Include all medical conditions for each family member (i.e. heart disease, high blood pressure, high cholesterol, specific cancers, allergies, diabetes, asthma, drug/alcohol addiction, down syndrome, mental health conditions, etc). \*\*
- For all deceased family members, **highlight** the cause of their death.

*\*\* Please note this information is for your education only. This information is not shared with anyone and is based solely on learning about the environmental and genetic factors that might influence your health.*

- 2) **Analysis:** Create an informational brochure for you and your family based on the equation "Environment + Genetics + Choices = Health." Choose one prominent medical condition that your research uncovered about your family, or if you find limited medical conditions within your family tree, explain the connection between being healthy and the equation.

**Cover (page 6): Introduction** to the medical condition

**Inside (page 1):** What kinds of **Environmental** factors correlate to your family's health?

**Inside (page 2):** How strong of a role does **Genetics** play in this medical condition?

**Inside (page 3):** What **Choices** are currently being made or have been made that put family members at greater risk for this medical condition?

**Inside (page 4): Application-** What can you and/or your family do right now to reduce the risk of the medical conditions within your family's background or maintain the pattern of good health? Your researched suggestions must clearly state what lifestyle factors have been proven to decrease your risk of that medical condition.

*Example:* a pattern of colon cancer will be reduced by eating a diet that includes 15-25 grams of fiber per day (not dietary fiber supplements), increase intake of ACE vitamins, stop smoking, reduce alcohol intake, work day-shifts, and get annual colon screenings within 10 years prior of a relative being diagnosed.

**Back (page 5): Family Homework-** Share this brochure with 2 family members and have them record one piece of information that was helpful for their health and have them sign their name.

**Resources-** Bibliography in MLA format on research

Great Grandparent  
DOB-DOD  
Medical Issues

Great Grandparent  
DOB-DOD  
Medical Issues

Great Grandparent  
DOB-DOD  
Medical Issues

Great Grandparent  
DOB-DOD  
Medical Issues

Great Grandparent  
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Grandparent  
DOB-DOD  
Medical Issues

Grandparent  
DOB-DOD  
Medical Issues

Grandparent  
DOB-DOD  
Medical Issues

Grandparent  
DOB-DOD  
Medical Issues

Parent/Guardian  
DOB-DOD  
Medical Issues

Parent/Guardian  
DOB-DOD  
Medical Issues

YOU!  
DOB  
Medical Issues

Sibling  
DOB-DOD  
Medical Issues

Sibling  
DOB-DOD  
Medical Issues

Sibling  
DOB-DOD  
Medical Issues

Sibling  
DOB-DOD  
Medical Issues



# Family Tree Grading Rubric /50

<b>Tree</b> (10pts)	1-3 Incomplete- Info, difficult to understand	3-6 Minimal info on either environ. or genetic issues, little clarity on family	7-8	9-10 Exceeds standards- easy to follow, very thorough info, beyond expectation						
 <b>Brochure:</b>										
<b>Introduction</b> (10pts)	1-3 Incomplete discussion of medical issue	3-6 Basic detail on medical condition	7-10 Exceeds standards- Complete description of medical condition from multiple sources							
<b>Environment</b> (5 pts)	1 Incomplete- Environmental factors lacks detail, grammatical errors	2	3 Basic info on environmental factors, fairly organized	4	5 Exceeds standards- thorough analysis, proof of research & detailed examples					
<b>Genetics</b> (5 pts)	1 Incomplete info on genetics role to the health issue	2	3 Basic genetic connection to the medical condition	4	5 Exceeds standards- easy to follow, very thorough information, well written					
<b>Choices</b> (10 pts)	<b>&amp; Application</b> 1 Lack of effort & detail on life choices link to medical issue	2	3 Meets standards, but limited detail on family choices	4	5	6	7 Exceeds standards- thorough analysis of choices that impact the risks for the medical condition and family relationship	8	9	10
<b>Family</b> <b>Communication</b> (5 pts)	1 Incomplete- no helpful information or family communication	2	3 and helpful information & signature	4 Followed rubric, fair organization, some detail information & signature	5	Exceeds standards- has helpful feedback information & signatures from 2 family members				
<b>Bibliography</b> (5 pts)	1 Incomplete- No bibliography Or not cited correctly	2 One source	3 Followed rubric, in MLA format, 2-3 sources	4	5 Exceeds standards- in MLA format, used multiple sources					