Model the Chances
of Getting an Autoimmune Disease

Name: _____

Date: _____

Student quiz—Answer key

Word Bank (when appropriate, use these words in your short answers):			
Autoimmune	Environment(al)	Inheritance	Probability
DNA	Genetic(s)	Immune system	Variation

1. **Which of these things happens only if someone has an autoimmune disease?**
   a. white blood cells destroy themselves
   b. immune cells attack and eliminate invaders such as pathogens
   c. immune cells make antibodies that attack the person's own body cells
   d. the person's body makes too many antibodies

2. **A. Every person has a certain probability of developing an autoimmune disorder. Is this probability always the same for identical twins? Based on what you know about which factors contribute to the likelihood of getting an autoimmune disorder, choose your answer below. In section B explain in your own words why or why not.**
   a. Yes
   b. No

   B. Both twins have an identical genetic setup. This means that based on their genetic predisposition they should have the same likelihood of developing an autoimmune disease. However, susceptibility to autoimmune diseases is not only based on genetic factors. Environmental factors (such as lifestyle, diet, location, exposure to pollutants, nutrition, etc.) also matter, which means that depending on these, the probability of developing an autoimmune disease will be different for each twin.

   Extra information: The degree to which genetic and environmental factors influence each other varies depending on the disease and is still not fully understood.

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3. **A. Student Z's maternal grandmother (meaning Z's mom's mother) has an autoimmune disease. None of student Z's other grandparents have been diagnosed with an autoimmune disease. From the list below, which family member is most likely to develop an autoimmune disease? In section B explain why you chose this answer over the other ones.**

   a. Student Z's mother

   b. Student Z's father

   c. Student Z

   d. Student Z's grandfather

   B. If an autoimmune disease runs in a family, first-degree relatives are most likely to get the same autoimmune disease, as genetic information (such as harmful mutations) is passed from parents to offspring. This means student Z's mother would be most likely to get the disease. As student Z is a second-degree relative to his/her grandmother, he/she also has an increased likelihood of getting the disease but to a smaller extent. Student Z's father and grandfather are not directly related to his/her grandmother, so their likelihood of getting an autoimmune disease is dependent on their own family's genetic predisposition.

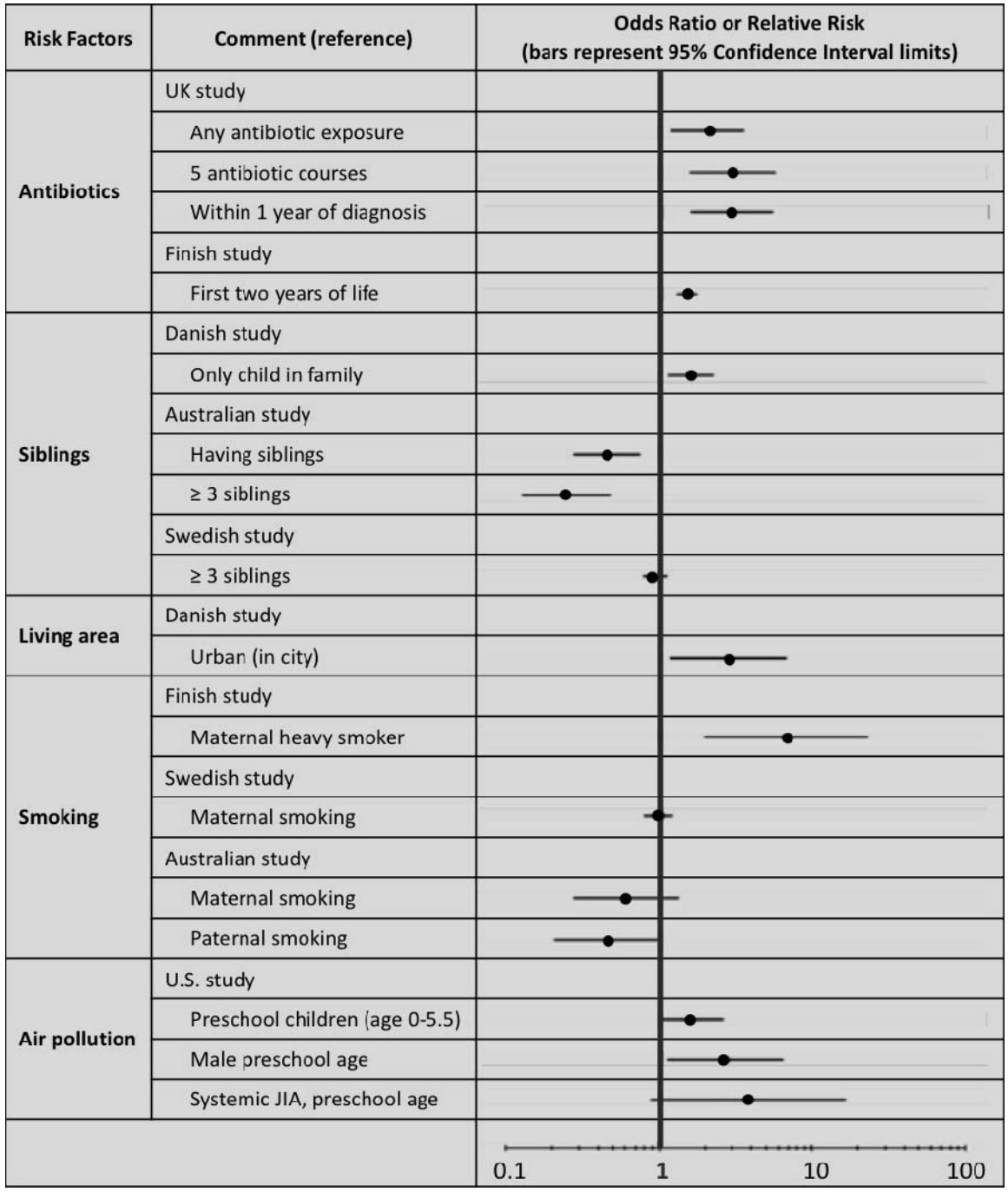
4. **The table on the next page shows possible environmental risk factors associated with Juvenile Idiopathic Arthritis (JIA), a specific type of autoimmune disease. Based on the data, which factors increase or decrease the risk of getting this disease? Enter each listed factor below.**

Factors that increase risk for JIA:	antibiotics, living in an urban environment, air pollution
Factors that decrease risk for JIA:	having siblings
Factors, where data is not conclusive:	smoking

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Risk Factors	Comment (reference)	Odds Ratio or Relative Risk (bars represent 95% Confidence Interval limits)
Antibiotics	UK study	
	Any antibiotic exposure	
	5 antibiotic courses	
	Within 1 year of diagnosis	
	Finish study	
	First two years of life	
Siblings	Danish study	
	Only child in family	
	Australian study	
	Having siblings	
	≥ 3 siblings	
	Swedish study	
	≥ 3 siblings	
Living area	Danish study	
	Urban (in city)	
Smoking	Finish study	
	Maternal heavy smoker	
	Swedish study	
	Maternal smoking	
	Australian study	
	Maternal smoking	
	Paternal smoking	
Air pollution	U.S. study	
	Preschool children (age 0-5.5)	
	Male preschool age	
	Systemic JIA, preschool age	
		0.1 1 10 100



For the purpose of this task, assume that risk is elevated when the mean value (•) is greater than one, and risk is reduced when it lies below one.

Source: Lisa G. Rider, MD, & Frederick W. Miller, MD, PhD (2017) Environmental Factors in Pediatric Systemic Autoimmune Diseases, *The Rheumatologist*