

# **Integrated Secondary Education and Research Project: Assessment of Lead Hazards in Communities in a New Mexico Border County**

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## **INTRODUCTION**

According to the Centers for Disease Control and Prevention (CDC), an estimated 250,000 children in the United States have blood-lead at or above levels at which the CDC recommends public health actions be initiated. Lead poisoning can affect nearly every system in the body even though no obvious symptoms are evident. Because Doña Ana is a border county, children in our area are at increased risk of potential exposure to lead due to imported goods, particularly Mexican candies and toys made in China. In addition, traditional pottery containing lead-based paint and glazes is often used for cooking, serving or storing foods and beverages in many Hispanic households.

The purpose of this project was to educate secondary school students on the health risks associated with lead, common sources of lead, the populations most at risk of lead poisoning, and the symptoms related to lead poisoning, by combining educational instruction with hands on research. An assessment of lead hazards in Doña Ana County was conducted to identify common sources of potential lead exposure. Furthermore, a comparison was made between the initial knowledge participating students had about lead and the knowledge gained as a result of students' involvement in this project. Additional data was compiled for the purpose of identifying the country of origin of lead-based items as well as background information of participating students.

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<sup>1</sup> *This project implemented in collaboration with the Office of Border Health, New Mexico Department of Health.*

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## METHODS

### *Study Design & Setting*

This education and research project was conducted at four school sites in Doña Ana County. The local schools that participated were Gadsden Middle School and Chaparral Middle School in the southern part of the county, Hatch Valley High School in the northern part of the county, and Sierra Middle School in the central part of the county. Two class sessions of 30-45 minutes were conducted. The first session consisted of a ten question evaluation, or Pre-Test of each student's initial knowledge about lead. The Pre-Test was available in both English and Spanish and included the following questions:

1. What is lead?
2. Is lead harmful to your health?  
 Yes     No     I don't know  
 If yes, explain.
3. Where is lead found? Check all that apply.  

<input type="checkbox"/> Jewelry	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Candies	<input type="checkbox"/> Toys
<input type="checkbox"/> Paint	<input type="checkbox"/> Ceramics	<input type="checkbox"/> Clothes	<input type="checkbox"/> Soda Cans
4. Does your family use traditional pottery to cook or serve food?  
 Yes     No     I don't know
5. If you answered yes to question 4, can this affect your health?  
 Yes     No     I don't know
6. Children with lead poisoning don't always look sick.  
 True                       False
7. Which foods can lower your risks of lead poisoning? Check all that apply.  

<input type="checkbox"/> Eggs	<input type="checkbox"/> Turkey	<input type="checkbox"/> Potato chips
<input type="checkbox"/> Cheese	<input type="checkbox"/> Cup cakes	<input type="checkbox"/> Corn
8. Who is most at risk of lead poisoning?  
 Babies & young children     Teens     Adults     Everyone
9. Lead is more dangerous to adults.  
 True                       False
10. How does lead enter the body? Check all that apply.  
 Objects containing lead that we put in our mouths  
 Lead dust in the air  
 Electro-magnetic waves from cell phones

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A PowerPoint presentation was also shown in the first session to inform participating students about the harmful effects of lead, common sources of lead and the relevance of this information to the United States/Mexico Border Region, symptoms of lead poisoning and lead poisoning prevention tips. A brochure was provided with a recap of the key points addressed in the PowerPoint presentation at the conclusion of the presentation. Both English and Spanish versions of the brochure were made available.

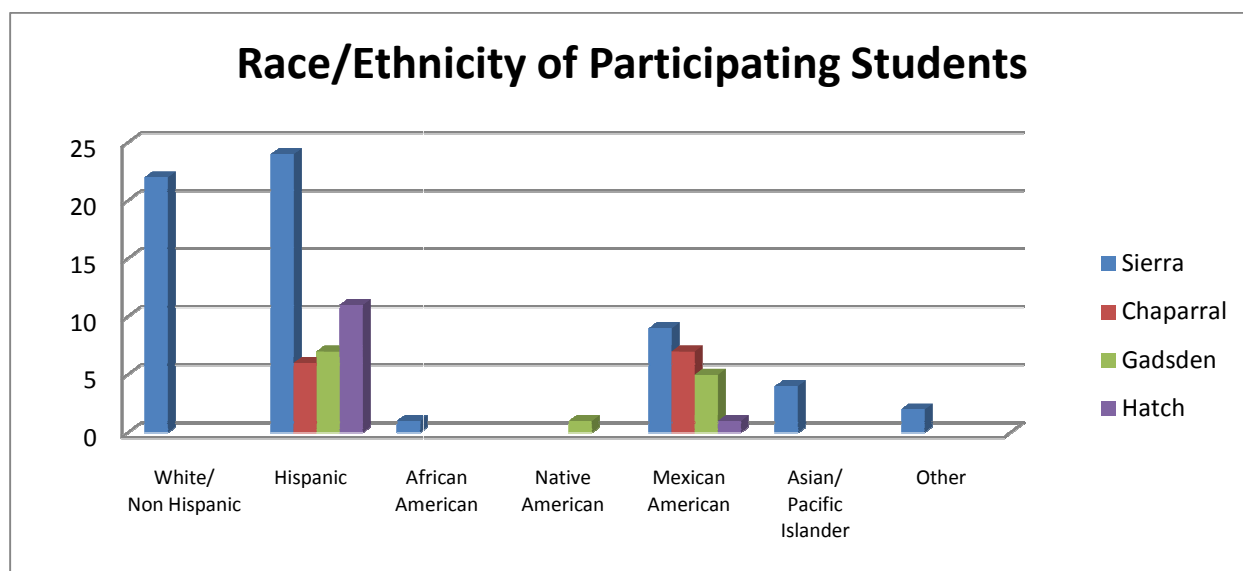
The second session consisted of a hands-on research activity where participating students learned to test items for the presence of lead using Lead Check® Test Swabs. A thorough explanation of the testing procedure was provided, as well as a lead testing activity sheet that was created in both English and Spanish for the purpose of this project. A Post-Test was administered following the explanation of the lead testing activity. The Post-Test consisted of the same questions asked in the Pre-Test in the first session of this project. The purpose of the Post-Test was to analyze and compare the change in knowledge of students who were part of this project from the beginning of the first session to the end of the second session. Participating students were then given a homework assignment which consisted of testing five items in their homes, school or community for the presence of lead and recording their results on their lead testing activity sheet. The students were then asked to return their lead testing activity sheets to their teacher so that the data could be analyzed.

Prior to implementation of this project in the classrooms, a focus group of 8 randomly selected students from Gadsden Middle school was formed. Topics discussed with the focused group included the length of the presentation, the clarity of information presented, and the appeal of supplemental materials. The presentation and activity as well as supplemental materials were then edited and updated to include ideas provided by the focus group.

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### ***Study Population***

A total of 126 students participated in this education and research project. These students were middle school or high school students from Doña Ana County between 13 and 16 years old. Participating students were in 7<sup>th</sup>-9<sup>th</sup> grade and attended Hatch Valley High School, Sierra Middle School, Gadsden Middle School, or Chaparral Middle School. As indicated in the chart below, the majority of students identified as Hispanic or Mexican American. Of all the participating area schools, Sierra Middle School had the most diversity in terms of race and ethnicity.



### ***Data Collection***

Data for this project was recorded on a lead testing activity sheet by participating students for the five items they chose to test. Information on the kind of item being tested as well as its origin was included on the worksheet. In order to simplify data analysis, six categories were created for students to choose from on their activity sheet. A “Tell Me About Yourself” section was included at the bottom of the activity sheet for the purpose of gathering information about the participating population and the ethnicity or race they most identified with. A zip code or town

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section was also provided for those students who might travel from neighboring towns to attend a particular school in another area. The directions for lead testing were added for reference.

## Lead Testing Activity Sheet

### Directions

- 1) Activate a LeadCheck Swab by crushing points "A" and "B" on the swab.
- 2) With the swab tip facing down, gently shake and squeeze the swab until the yellow liquid comes to the tip.
- 3) While squeezing gently, rub the swab on the test area for 30 seconds.

If the swab turns any shade of pink, the test is positive, and dangerous levels of lead are present. The darker the pink, the higher the concentration of lead.

**Warning: The chemicals inside the lead swabs can cause eye and skin irritation. They may be harmful if swallowed. WASH YOUR HANDS THOROUGHLY AFTER TESTING FOR LEAD. Lead check swabs contain an inner tube made with glass. Do not pull the inner tube out of its cardboard casing for any reason as this may result in the glass shattering.**

Item		Results (check one)			
<input type="radio"/> Ceramic	Origin _____	No Color (Negative)	Light Pink	Medium Pink	Dark Pink
<input type="radio"/> Toy	Origin _____				
<input type="radio"/> Window blinds	Origin _____				
<input type="radio"/> Candy	Origin _____				
<input type="radio"/> Paint on Wall					
<input type="radio"/> Other _____	Origin _____				
Item		Results (check one)			
<input type="radio"/> Ceramic	Origin _____	No Color (Negative)	Light Pink	Medium Pink	Dark Pink
<input type="radio"/> Toy	Origin _____				
<input type="radio"/> Window blinds	Origin _____				
<input type="radio"/> Candy	Origin _____				
<input type="radio"/> Paint on Wall					
<input type="radio"/> Other _____	Origin _____				
Item		Results (check one)			
<input type="radio"/> Ceramic	Origin _____	No Color (Negative)	Light Pink	Medium Pink	Dark Pink
<input type="radio"/> Toy	Origin _____				
<input type="radio"/> Window blinds	Origin _____				
<input type="radio"/> Candy	Origin _____				
<input type="radio"/> Paint on Wall					
<input type="radio"/> Other _____	Origin _____				
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<input type="radio"/> Window blinds	Origin _____				
<input type="radio"/> Candy	Origin _____				
<input type="radio"/> Paint on Wall					
<input type="radio"/> Other _____	Origin _____				
Item		Results (check one)			
<input type="radio"/> Ceramic	Origin _____	No Color (Negative)	Light Pink	Medium Pink	Dark Pink
<input type="radio"/> Toy	Origin _____				
<input type="radio"/> Window blinds	Origin _____				
<input type="radio"/> Candy	Origin _____				
<input type="radio"/> Paint on Wall					
<input type="radio"/> Other _____	Origin _____				

### Tell Me About Yourself

Name \_\_\_\_\_ School \_\_\_\_\_ Zip Code or Town \_\_\_\_\_

Race/Ethnicity

- White/Non Hispanic     Hispanic     African American  
 Native American     Mexican/American     Asian/Pacific Islander  
 Other

## RESULTS

The data collected from participating schools was compiled in a spreadsheet by category of item and the results of the lead test.

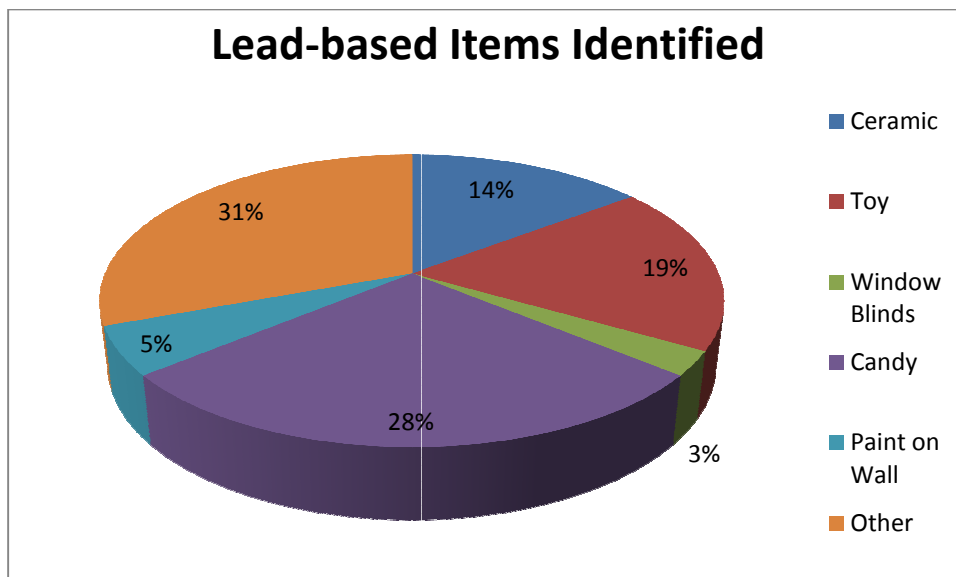
Item	Results			Dark Pink	Total
	Light Pink	Med. Pink			
Ceramic	7	2	2	11	
Toy	10	2	2	14	
Window Blinds	2	0	0	2	
Candy	13	6	2	21	
Paint on Wall	3	0	1	4	
<b>Other</b>					
Earring			1	1	
Salsa Valentina	1			1	
Pipe	1			1	
Paint on Glass	1			1	
Mug			1	1	
Dresser	1			1	
Battery			1	1	
Tin Soldier			1	1	
Brass Cup			1	1	
Belt Buckle	1			1	
Metal Cup		1		1	
Bowl		1		1	
Door Knob		1		1	
Door	1			1	
Tea Cup			1	1	
Soil in Backyard	2			2	
Fireplace Window		1		1	
Bullet	1			1	
Painting	1			1	
Water Spout			1	1	
Purse	1			1	
Metal	1			1	
<b>Total</b>	<b>47</b>	<b>14</b>	<b>14</b>	<b>75</b>	

Items Tested Per School

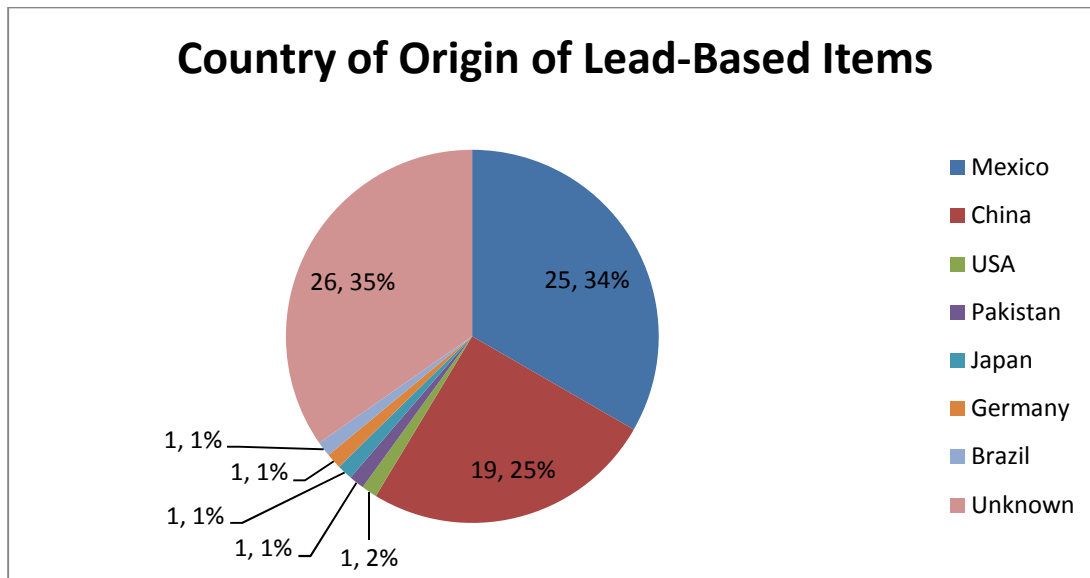
Gadsden	Chaparral	Sierra	Hatch	Total
65	61	310	60	<b>496</b>

Total Negative Results: 421 Total Positive Results: 75

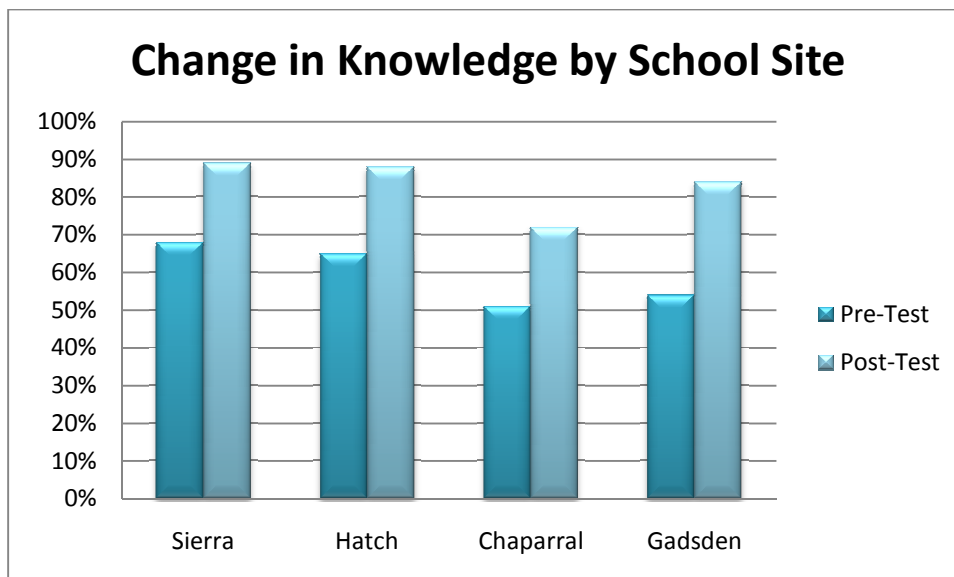
Lead-based items that were identified were isolated from the total results and categorized by type of item and percentage.



The country of origin of lead-based items was also identified and categorized by country and percentage. As indicated in the pie chart above, majority of items that tested positive for lead for which the country of origin was known came from Mexico or China. A large percentage of the items tested however did not have a country of origin printed on them. Many of the items tested were older toys or baby cribs that have been used extensively so that the country of origin was no longer legible or available. Other items did have a country of origin listed, but the students conducting the lead testing on that particular item simply forgot to record where the toy or item was made. Of those items testing positive for lead, a total of 65 percent were reported with their country of origin.



In addition to analysis of the data collected from items tested for lead, change in knowledge from the Pre-test to the Post-test were also assessed. Every participating school site experienced an increase in knowledge based on the analysis of test score averages. Sierra Middle School and Hatch Valley High School showed similar increases in knowledge as illustrated in the chart below.



## **DISCUSSION**

Supplemental brochures were provided to each student in either English or Spanish depending on their preference following the educational portion of this project. The brochures contain important information about the dangers of lead, common sources of lead, symptoms of lead poisoning and prevention tips to prevent lead poisoning. In addition, the brochure provided links to national and local lead poisoning prevention programs. The purpose of these brochures is to provide the parents of participating students with useful information on lead poisoning and sources of potential lead exposure.

Participating students identified with certain aspects of the lead presentation that was given on the first session of this project. In particular, they were able to identify with several Mexican candies that tested positive for lead in other studies. Many students admitted to eating various brands of the candies identified in the lead presentation on a regular basis and voiced concern over the risks that may be associated with consuming these treats. Several students tested a variety of Mexican candies to see for themselves what the results would be. As seen on the results presented, Mexican candies made up the largest percentage of positive results for lead of all of the provided categories.

Analysis of the initial knowledge of students about lead, in comparison to the knowledge gained after participation in this education and research project, showed an increase in knowledge in all four participating schools. The question on the Pre-Test and Post-Test most frequently missed was the question about the common sources of lead. Many students did not select jewelry or candy as an item where lead may be found. A significant decrease in the number of students who missed this question was observed in the Post-Test, indicating that participating students were

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more likely aware of the common sources of potential lead exposure following the educational presentation on lead.

## **BARRIERS & LIMITATIONS**

Several barriers were encountered during the implementation of this project. The most common was the malfunction of LeadCheck ® Swabs during the lead testing activity. Students were provided with an extra swab for testing practice in the classroom, and nearly every class had a few swabs that malfunctioned. Many of the swabs were not activated properly by students and this was the main reason they were not effective in testing.<sup>2</sup> Other students did not follow instructions accurately including one student who removed the outer casing of the swab and shattered the glass inner tube on the school desk. Students were asked to indicate malfunctioning of the swabs on their lead testing activity sheets when testing on their own.

Insufficient data was another limitation of this project. Some students recorded only partial information for the items they tested. For example, various students indicated that they had tested an item with a result that was positive for lead, but forgot to record the country of origin, making the analysis of the item's country of origin unfeasible. Other students indicated that they tested an item other than the categories provided, but did not provide a description of the item they tested or its origin. This made the analysis of such items very difficult. Lost data was also an issue, as several students lost their activity sheets or did not return their results in time to be included in the final data analysis. The four participating schools differed in the number of students who participated in this project and received a lead testing activity sheet, and the number of students who returned their completed lead testing activity sheet for analysis of the data. Gadsden Middle School had the lowest percentage of returned activity sheets. Only 68

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<sup>2</sup> Activation of swabs requires squeezing to break the seals of the reagents and then kneading the swab to get the liquid to the tip of the swab.

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percent of the participating students returned their activity sheets for analysis. This is in comparison to Hatch Valley High School which had 75 percent of activity sheets returned, Chaparral Middle School which had 81 percent of activity sheets returned and Sierra Middle School who returned 83 percent of their student lead testing activity sheets.

## **ACKNOWLEDGEMENTS**

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I would like to thank Paul Dulin, Director of the Office of Border Health of the New Mexico Department of Health, whose guidance and continual support made this project possible. I would also like to thank Andre Walker, Graphic Designer for the Office of Border Health, for her time and creativity on supplemental materials for this project. I would like to thank Dr. Sue Forster-Cox as well, for her help in the planning of this project. Last but definitely not least, I would like to thank the students and teachers of the participating schools for their amazing work and the valuable data they collected for this project. It would not have been possible without you.

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*Dr. Garcia & Ms. Tellez and the students from Gadsden Middle School*

*Mrs. Muela & Mr. Villalobos and the students from Chaparral Middle School*

All materials and LeadCheck ® Swabs were kindly donated by the Office of Border Health of the New Mexico Department of Health under its Environmental Health Program. For more information about Office of Border Health programs, visit [www.nmborderhealth.org](http://www.nmborderhealth.org).

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Hatch Valley High Students taking the Pre-Test on the first session of the lead education project.



Students testing for lead at Sierra Middle School.



A positive test for dangerous levels of lead in a Mexican Candy.



A student is interviewed by KFOX News about her participation in the lead education project.



Paul Dulin, Director of the Office of Border Health, chats with the media.



Paul Dulin answers questions and thanks students personally for their participation in the lead project.