

CHILDHOOD ASTHMA AND RELATED SYMPTOMS AROUND THE SALTON SEA:

A Focus on Childhood Breathing Symptoms



School of Medicine
CENTER FOR HEALTH DISPARITIES RESEARCH



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Executive Summary

Introduction

This special report provides survey results about childhood breathing symptoms from a symptom-based survey that documented breathing, nose, and skin symptoms of children living around the Salton Sea. This is one of three special reports that focus on specific questions from the survey; two other special reports provide survey results on nose symptoms and skin symptoms. There are also more analyses of the survey results available in a report submitted to the Bureau of Reclamation (with findings from all survey questions) and a regional report (focused on specific geographies and advanced analyses).

The survey was conducted in the communities surrounding the Salton Sea: eastern Riverside County (i.e., that part comprising the Eastern Coachella Valley) and northern Imperial County (i.e., that part comprising the northern Imperial Valley). This project was funded by the Center for Health Disparities Research at UC Riverside (referred to as HDR@UCR) through a grant from the U.S. Bureau of Reclamation. HDR@UCR contracted with HARC, Inc., which conducted the survey, analyzed the data, and developed this report.

Methods

Results are from an address-based survey of households in eastern Riverside County and northern Imperial County. Households likely to have children were mailed a “survey package,” which included an invitation letter (in English and Spanish), a paper survey in English, a paper survey in Spanish, a pre-paid return envelope, and a \$2 bill as a pre-incentive that the recipient could keep regardless of whether they took the survey. Further, the invitation letter explained that the first 1,000 households to complete and submit the survey would receive a \$20 Visa card as compensation. In addition, a flyer with a URL link and QR code (to take the survey online) was mailed to an additional 18,000 households (regardless of whether they were likely to have children or not). These flyers likewise offered a \$20 Visa card.

The survey was launched on August 18, 2023, and the survey was closed on October 31, 2023. A total of 840 completed surveys were received.

Results

Demographics

A total of 93.8% of the children surveyed were Hispanic/Latino, a majority were boys (55.8%), and the average age was 12. Further, a majority (50.9%) of households were at or below the federal poverty level.

Asthma Diagnosis

A total of 20.6% of surveyed children have been diagnosed with asthma, and 79.4% have not been diagnosed with asthma. Asthma diagnoses among children varied statistically significantly between the sampled communities within eastern Riverside County (13.8%) and the sampled communities within northern Imperial County (27.1%).

Asthma Medication

Among children diagnosed with asthma, 67.7% take medication for their asthma, and 31.1% do not take medication for their asthma. Further, among children diagnosed with asthma, 2.0% have their asthma “not controlled at all,” 3.3% have their asthma “poorly controlled,” 24.2% have their asthma “somewhat controlled,” 43.8% have their asthma “well controlled,” and 26.8% have their asthma “completely controlled.”

Breathing Symptoms

Questions about breathing symptoms were asked regardless of whether the child had an asthma diagnosis. Further, the survey specified that “all questions are about problems that occur normally” when the child does not have a cold or the flu. A total of 28.9% of survey participants reported that their child has had wheezing or whistling in the chest at any time in the past.

Among those children with wheezing/whistling at any time, 66.1% have experienced this symptom in the last 12 months. Among children with wheezing symptoms in the last 12 months, 76.9% have had their speech limited to one or two words at a time between breaths because of their wheezing in the last 12 months. In addition, among these children with wheezing symptoms in the last 12 months, 54.1% had their wheezing interfere with daily activities “a little,” followed by 21.7% with “a moderate amount,” 16.6% with “not at all,” and 7.6% with “a lot.” Among these children with wheezing symptoms in the last 12 months, 42.0% have not had shortness of breath at all, 40.8% have had shortness of breath once or twice per week, and 17.2% have had shortness of breath once or more per day.

Geographic Analyses

Communities residing at the southern end of the Salton Sea demonstrated a significantly higher rate of asthma diagnoses in children, with a prevalence of 28.5%, compared to the northern end at 14.1%. The same pattern emerged for whether a child had ever experienced wheezing or whistling symptoms, where the southern end exhibited a significantly higher prevalence of 36.7%, compared to the northern end at 22.5%.

Conclusion

Most children surveyed come from underserved communities, with 93.8% identifying as Hispanic/Latino and over half living below the federal poverty level. About 20.6% have an

asthma diagnosis. This rate varies by region with 13.5% of children in eastern Riverside County and 27.8% of children in northern Imperial County having an asthma diagnosis. However, the percentage of those with symptoms (wheezing in the chest at any time in the past) is higher, with 28.9% reporting this symptom (21.4% in eastern Riverside County and 36.2% in northern Imperial County). These results suggest that the respiratory health burdens in these communities are greater than has been previously documented.

Introduction

This special report provides survey results about childhood breathing symptoms from a symptom-based survey that documented breathing, nose, and skin symptoms of children living around the Salton Sea. This is one of three special reports that focus on specific questions from the survey; two other special reports provide survey results on nose symptoms and skin symptoms. There are also more analyses of the survey results available in a report submitted to the Bureau of Reclamation (with findings from all survey questions) and a regional report (focused on specific geographies and advanced analyses).

The survey was conducted in the communities surrounding the Salton Sea: eastern Riverside County (i.e., that part comprising the Eastern Coachella Valley) and northern Imperial County (i.e., that part comprising the northern Imperial Valley). While it is understood that childhood asthma rates are higher than average in this region, asthma diagnosis or emergency department rates only tell part of the story. This survey aims to capture the prevalence of regional childhood asthma symptoms more accurately among both those who are diagnosed with asthma and those who are not diagnosed with asthma.

This project was funded by the Center for Health Disparities Research at UC Riverside (referred to as HDR@UCR) through a grant from the U.S. Bureau of Reclamation. HDR@UCR contracted with HARC, Inc., which conducted the survey, analyzed the data, and developed this report.

History of the Salton Sea

The Salton Sea is a large inland body of water, largely fed by excess irrigation water from the surrounding farm fields of the Imperial Valley (Imperial County) and the Coachella Valley (Riverside County), as well as runoff from the Mexicali Valley (Municipality of Mexicali, Baja California, Mexico). In recent years (due at least in part to water policy changes in the Colorado River Basin), the water flowing into the Salton Sea has been decreasing, resulting in the continuing receding of the shoreline and the subsequent exposure of dried lakebed, known as playa. This playa threatens to expose fine particulate matter into the air, as well as airborne toxins and microorganisms. The primary concern for the Salton Sea is thus not water but air—the increase of air pollution in the region and subsequent impacts on public health.

Air Quality

The Salton Sea region is already known for its poor air quality and high asthma rates. Existing data shows the rate of diagnosed childhood asthma in the Coachella Valley as 10.6%¹ and the rate of diagnosed asthma (among all ages) in Imperial County as 19.5%.² Imperial County is also

¹ HARC, Inc. 2022 Coachella Valley Community Health Survey. <http://www.harcddata.org>

² California Health Interview Survey (CHIS). 2022.

https://ask.chis.ucla.edu/AskCHIS/tools/_layouts/AskChisTool/home.aspx#/geography

known to have a high rate of emergency department visits due to asthma.³ These data, while indicating the prevalence of asthma, likely do not capture the full extent of asthma in the region, given that many families are low-income and have irregular access to medical care. This likely results in an under-diagnosis of asthma and possibly other ailments. The results of this survey support this assumption, as both diagnosed asthma rates and reports of asthma symptoms in the two studied regions (eastern Riverside County and northern Imperial County) are higher than diagnosed asthma rates reported previously.

³ 60.2 emergency department visits due to asthma per 10,000, among all ages. See Imperial County Public Health Department. 2019.
https://www.icphd.org/media/managed/medicalproviderupdates/HEALTH_STATUS_REPORT_2018_2019_final_.pdf

Methods

HARC and HDR@UCR drafted a survey with 42 questions, which was modeled on a standardized questionnaire from the Global Asthma Network, originating from the International Study of Asthma and Allergies in Childhood (ISAAC) program.⁴

Results are from an address-based survey of households in eastern Riverside County and northern Imperial County. HARC (via Ace Printing) mailed a “survey package,” which included an invitation letter (in English and Spanish), a paper survey in English, a paper survey in Spanish, a pre-paid return envelope, and a \$2 bill as a pre-incentive that the recipient could keep regardless of whether they took the survey. Further, the invitation letter explained that the first 1,000 households to complete and submit the survey would receive a \$20 Visa card as compensation. Ace Printing purchased a list of 6,941 households likely to have children and mailed the survey package to these households. In addition, a flyer with a URL link and QR code (to take the survey online) was mailed to an additional 18,000 households (regardless of whether they were likely to have children or not). These flyers likewise offered a \$20 Visa card.

The mailed instructions asked the adult in the household most familiar with the child to take the survey (the survey thus was often completed by the child’s parent or grandparent). If a household had more than one child, the survey questions concerned the oldest child under the age of 18 in the home.

The survey was launched on August 18, 2023, and the survey was closed on October 31, 2023. A total of 840 completed surveys were received. All paper survey results were entered into the online survey platform Sogolytics. The final results were downloaded, cleaned, and analyzed using SPSS (Statistical Package for the Social Sciences).

In this report, Pearson’s chi-squared tests were performed for geographic comparisons. These tests illustrate differences between sets of categorical data (for example, how asthma diagnosis may vary by another category such as location). The term “statistical significance” is used throughout the report (this term means that the analyses yielded a *p*-value of less than 0.05). If results are statistically significant during analyses, they are noted as being “significant” in the narratives of the report. If a result is significant, this means that the analyses provided evidence of a true difference between the comparisons being made; that is, significant differences in the survey data are likely to reflect real differences.

⁴ Ellwood, P., Asher MI., and the Global Asthma Network Steering Group. August 2015. Global Asthma Network Phase I Manual. <http://www.globalasthmanetwork.org>

Results

Demographics

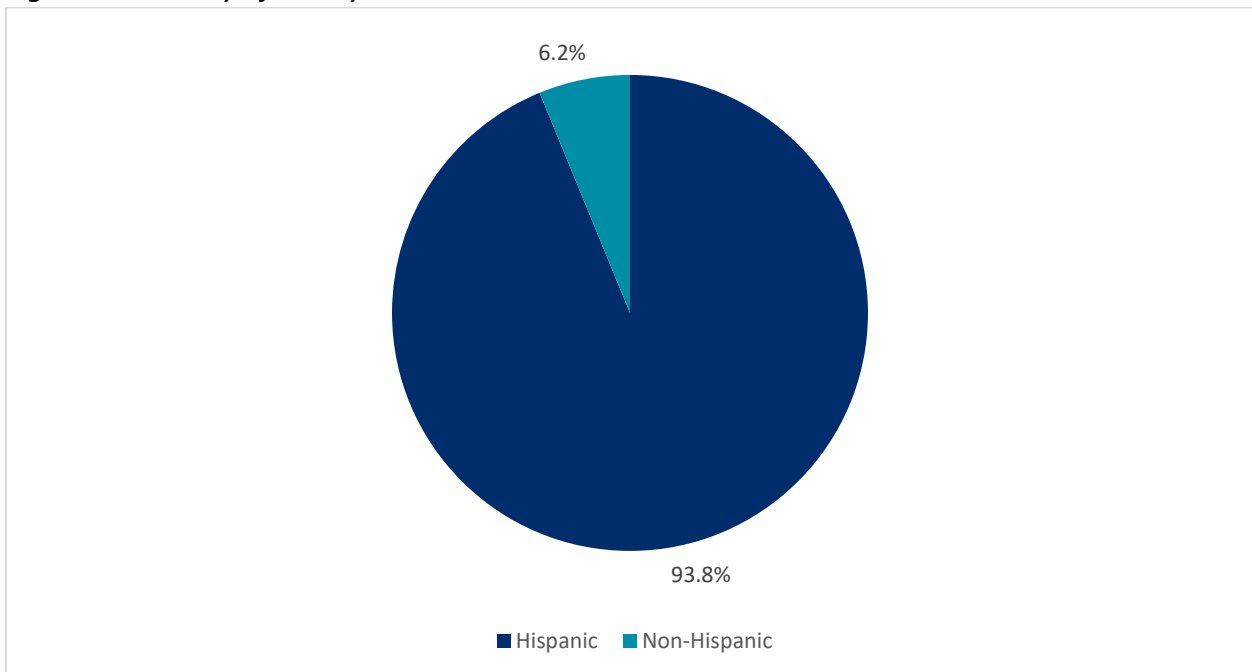
Age, Gender, Race, and Ethnicity

For the child for whom the survey was completed, ages ranged from less than one year old to 17 years old. The average age for surveyed children was 12 years old.

Survey participants were asked about the gender of the child. A total of 55.8% were boys, and 44.2% were girls.

Survey participants were asked about the race and ethnicity of the child. As illustrated below, 93.8% of the children surveyed were Hispanic/Latino.

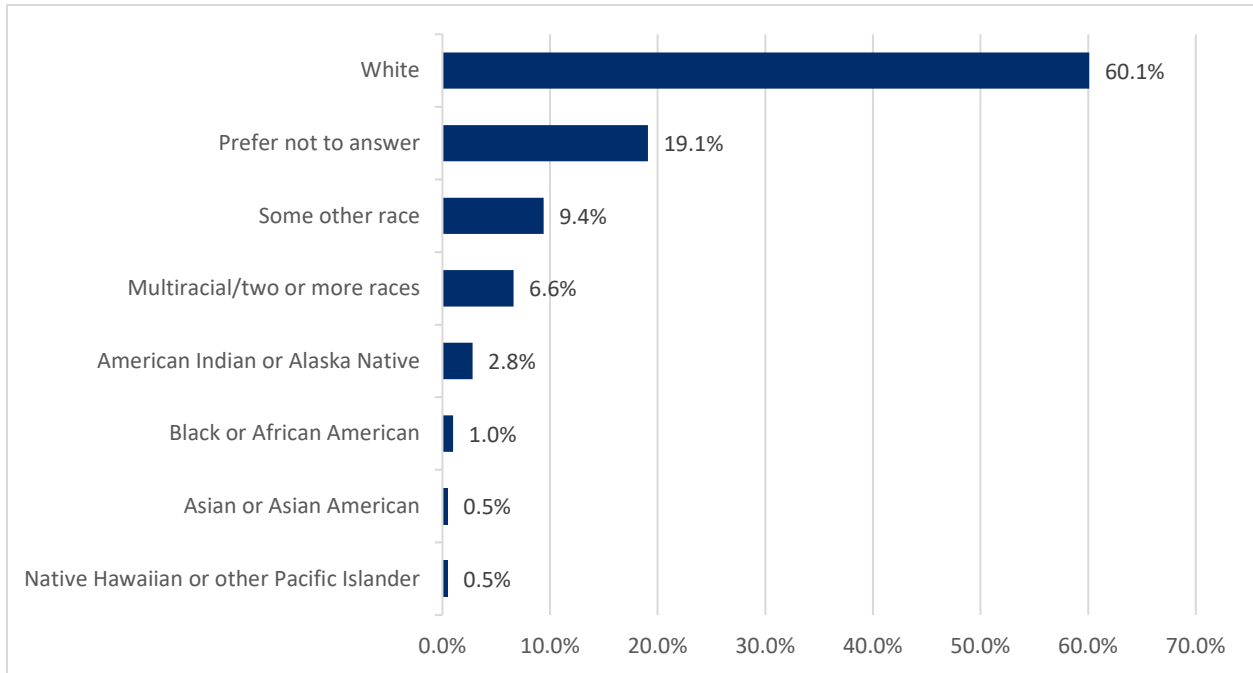
Figure 1. Ethnicity of Surveyed Children



Note: $n = 808$.

Survey participants were also asked about the race of the child and were told that “for the purposes of this survey, Hispanic is not a race.” As illustrated below, 60.1% identified as White, followed by 19.1% who “preferred not to answer,” 9.4% who identified as “some other race” and 6.6% who identified as multiracial/two or more races.

Figure 2. Race of Surveyed Children

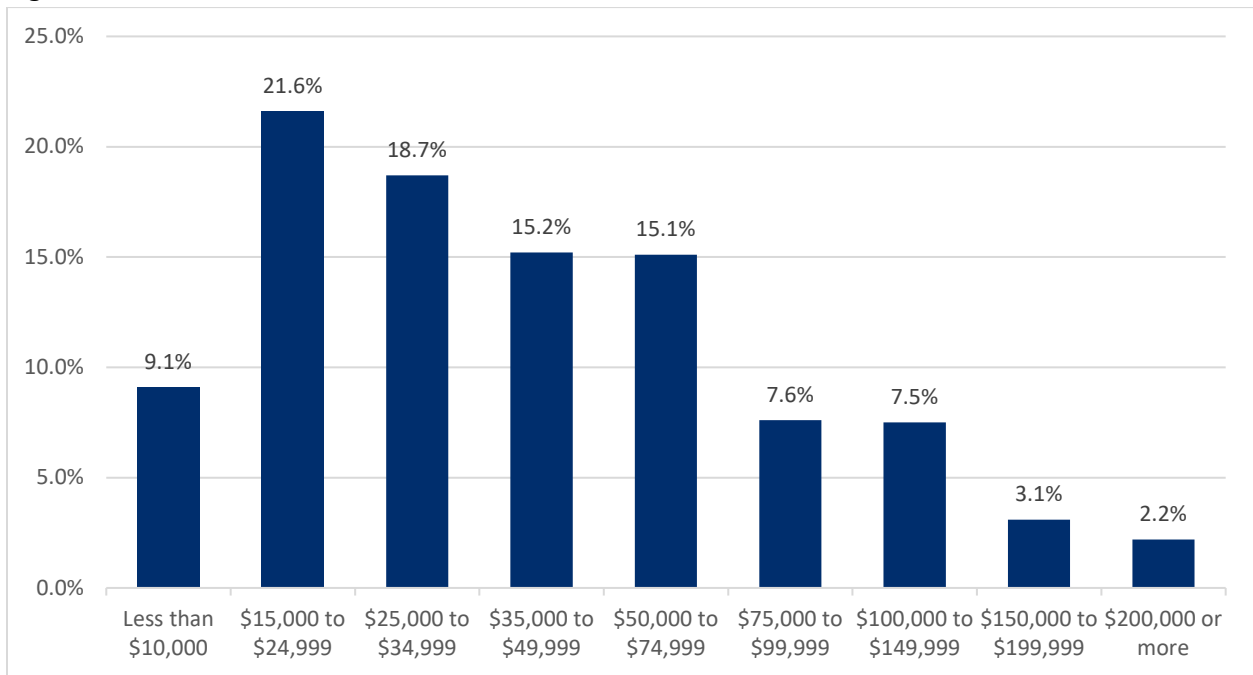


Note: $n = 787$.

Income and Poverty Level

Survey participants were asked what their household income was last year. As illustrated below, 21.6% of households made between \$15,000 and \$24,999, and 18.7% of households made between \$25,000 and \$34,999 last year. Nearly half (49.4%) of households made less than \$35,000 last year.

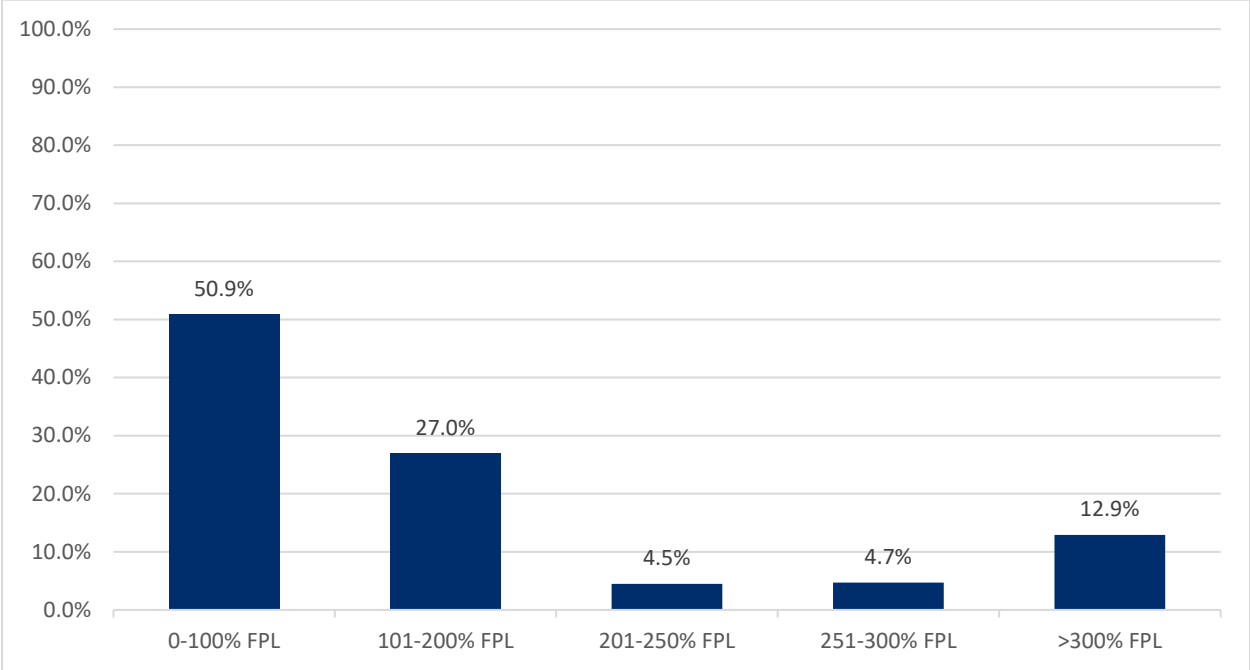
Figure 3. Household Income



Note: $n = 684$.

Household income was compared with household size to calculate the federal poverty level (FPL). As illustrated below, a majority (50.9%) of households were at or below the FPL (0-100% FPL), and 27.0% were 101-200% FPL.

Figure 4. Federal Poverty Level



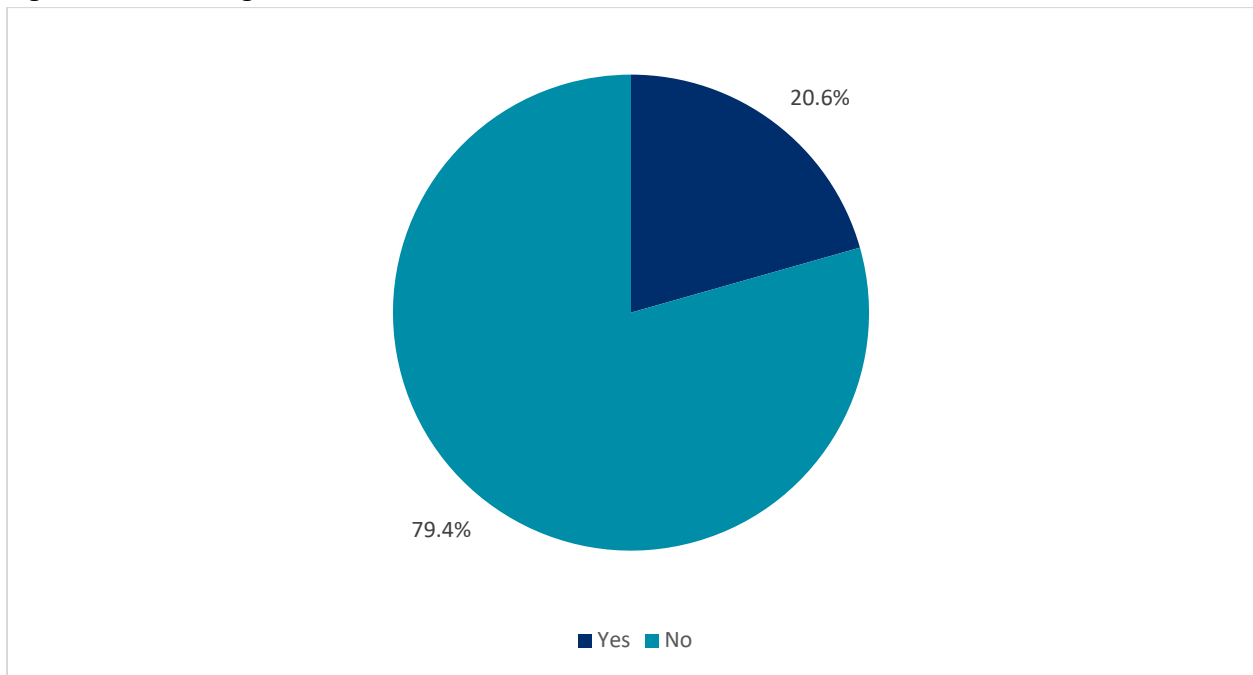
Note: n = 684.

Asthma Diagnosis and Treatment

Asthma Diagnosis

Survey participants were asked, “Has a doctor or other health professional ever told you that your child has asthma?” As illustrated below, 20.6% of children have been diagnosed with asthma, and 79.4% have not been diagnosed with asthma.

Figure 5. Child Diagnosed with Asthma?



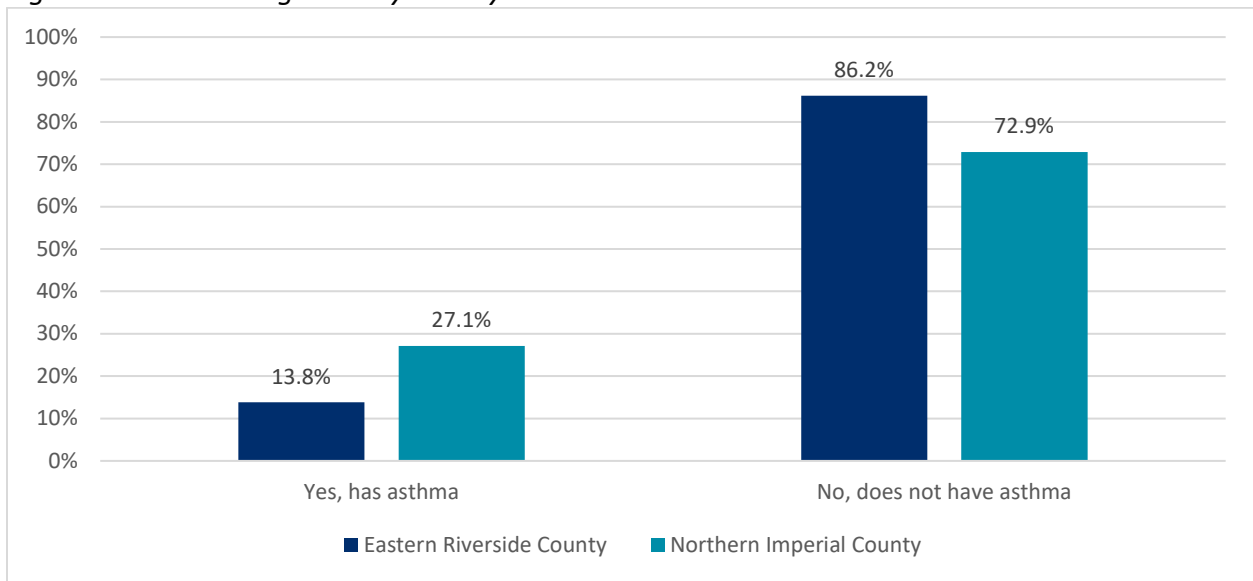
Note: $n = 802$.

Asthma Diagnoses by County

Asthma diagnoses among children vary statistically significantly [$\chi^2 (1, N = 801) = 21.856, p < .001$] between the sampled communities within eastern Riverside County (13.8%) and the sampled communities within northern Imperial County (27.1%), as illustrated in the figure below.

For reference, the City of Coachella, Mecca, North Shore, Oasis, Thermal, and Vista Santa Rosa are within eastern Riverside County, whereas the City of Brawley, Calipatria, Desert Shores, the City of Imperial, Salton City, Salton Sea Beach, and Westmorland are within northern Imperial County.

Figure 6. Asthma Diagnoses by County

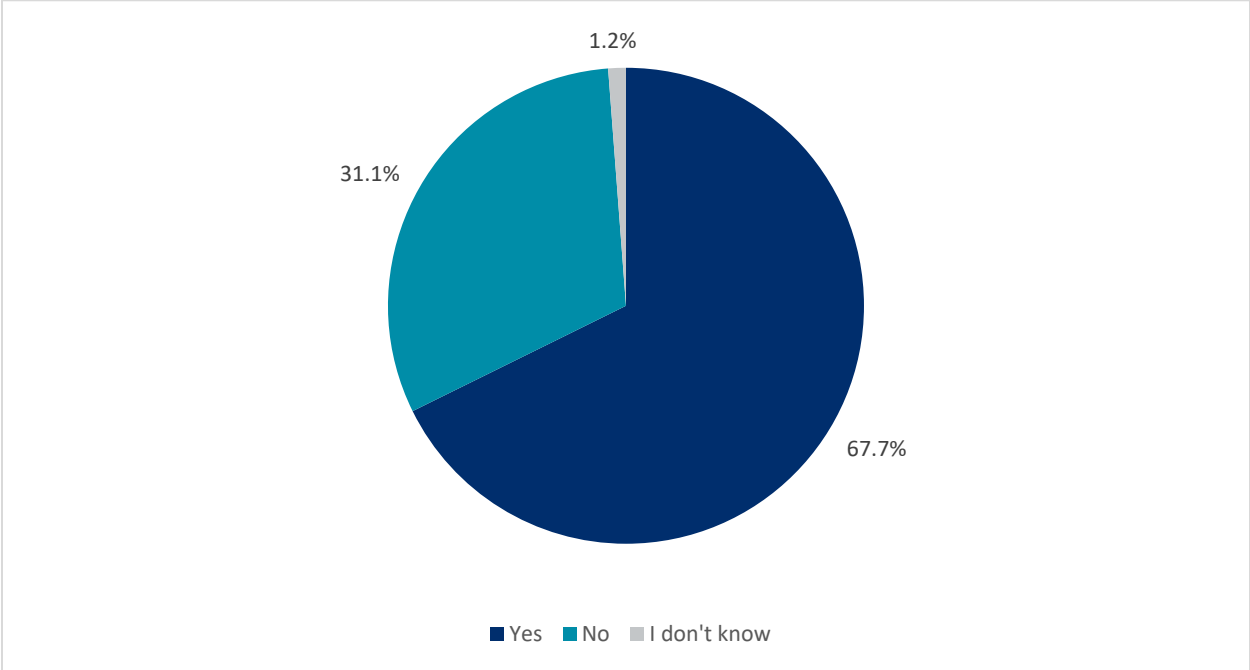


Note: Eastern Riverside County $n = 392$. Northern Imperial County $n = 409$.

Asthma Medication

Survey participants who said that their child has been diagnosed with asthma were asked, “Does your child take any medication for their asthma?” As illustrated below, among children diagnosed with asthma, 67.7% take medication for their asthma, and 31.1% do not take medication for their asthma.

Figure 7. Does the Child Take Any Medication for Their Asthma?

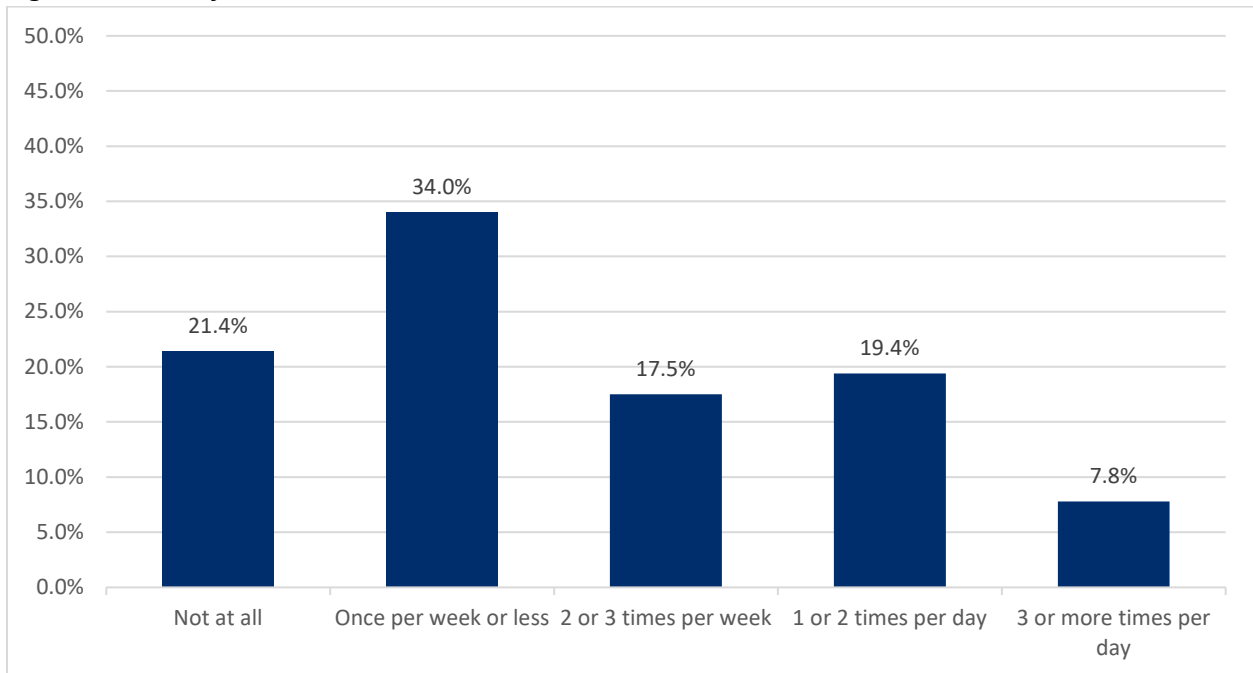


Note: n = 161.

Use of Inhaler/Nebulizer Medication

Survey participants who said that their child had been diagnosed with asthma and used medication for their asthma were asked, “In the past 4 weeks, how often has your child used their rescue inhaler or nebulizer medication (such as salbutamol)?” As illustrated below, among children diagnosed with asthma and who use medication for their asthma, 21.4% use this medication not at all, 34.0% use this medication once per week or less, 17.5% use this medication two or three times per week, 19.4% use this medication once or twice per day, and 7.8% use this medication three or more times per day.

Figure 8. How Often Used Rescue Inhaler/Nebulizer in the Past Four Weeks

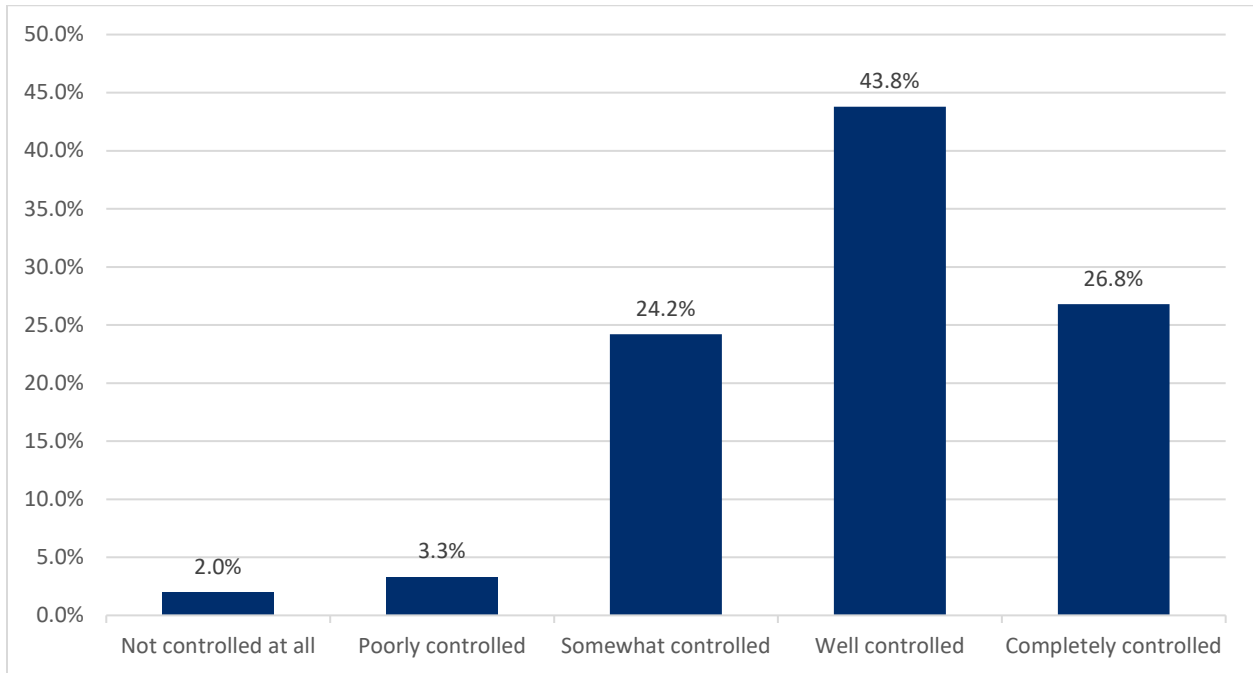


Note: $n = 103$.

Control of Asthma

Survey participants were asked, “How would you rate your child’s asthma control during the past 4 weeks?” As illustrated below, among children diagnosed with asthma, 2.0% have their asthma “not controlled at all,” 3.3% have their asthma “poorly controlled,” 24.2% have their asthma “somewhat controlled,” 43.8% have their asthma “well controlled,” and 26.8% have their asthma “completely controlled.”

Figure 9. Rating Child’s Asthma Control in the Past Four Weeks



Note: $n = 153$.

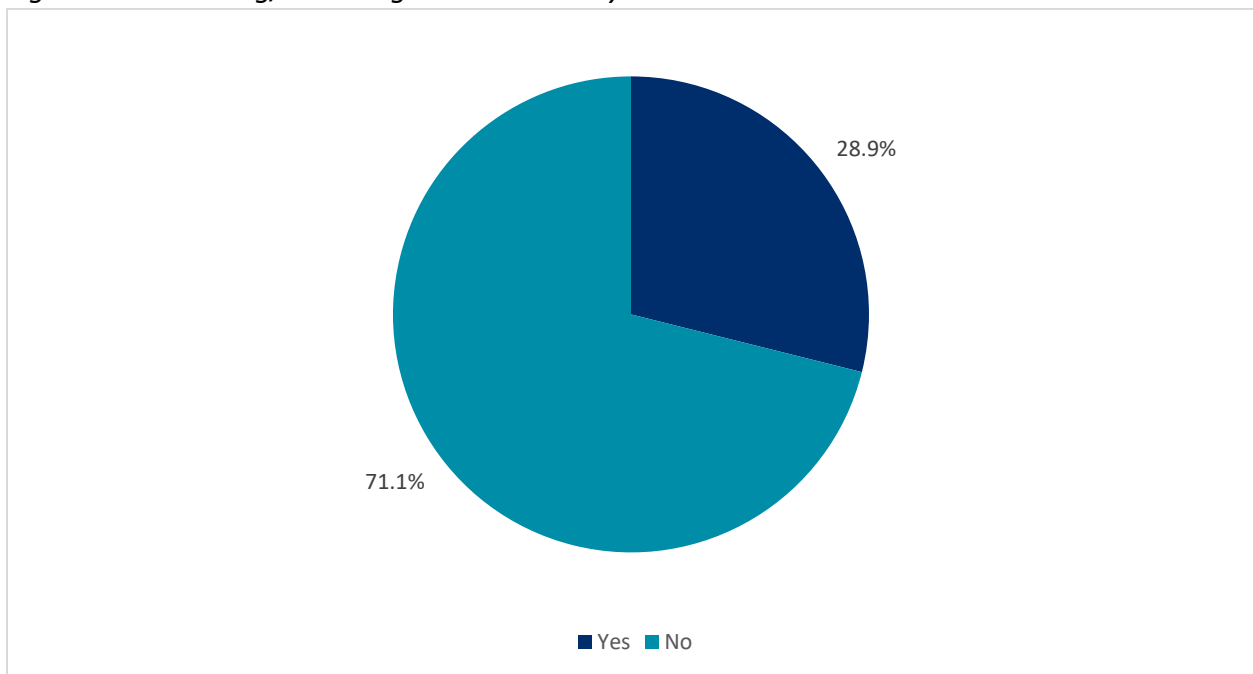
Breathing Symptoms

The survey had seven questions about the child's breathing symptoms. These questions about breathing symptoms were asked regardless of whether the child had an asthma diagnosis. Further, the survey specified that “all questions are about problems that occur normally” when the child does not have a cold or the flu.

Wheezing Symptoms at Any Time in the Past

Survey participants were asked, “Has your child ever had wheezing or whistling in the chest at any time in the past?” As illustrated below, 28.9% of survey participants reported “Yes,” their child has had wheezing or whistling in the chest at any time in the past.

Figure 10. Wheezing/Whistling in the Chest Any Time in the Past?

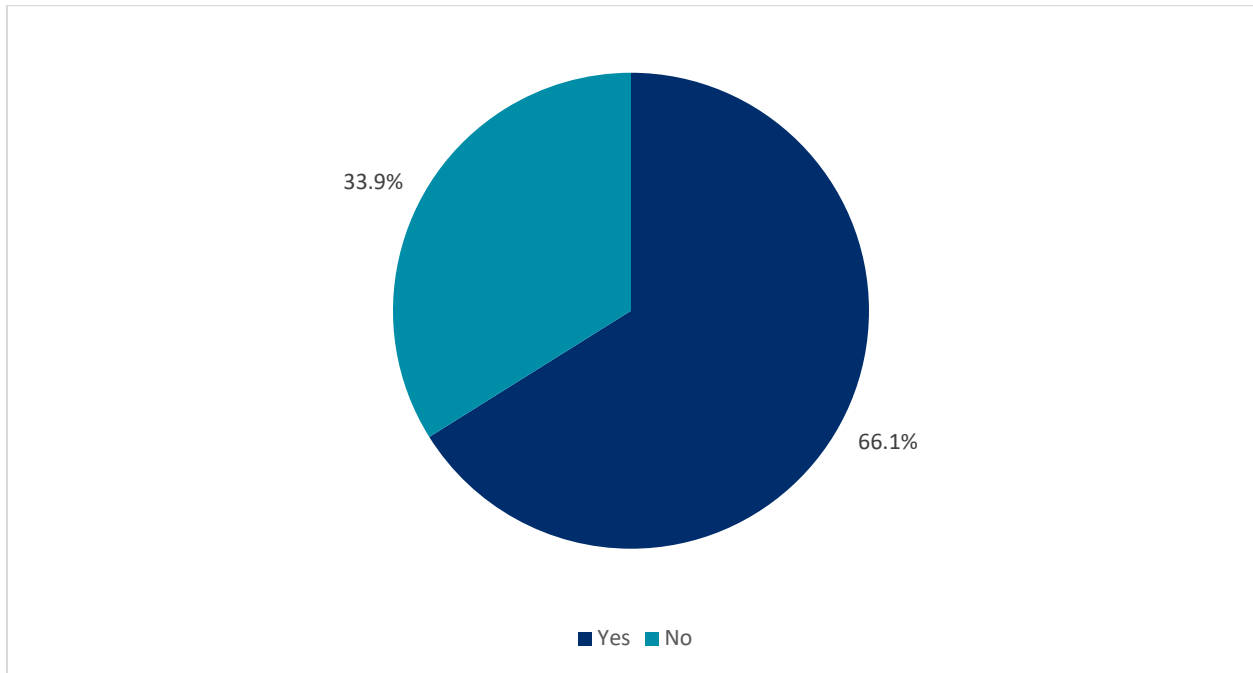


Note: $n = 831$.

Wheezing Symptoms in the Last 12 Months

Those who indicated that their child has had wheezing or whistling in the chest at any time in the past were then asked, “Has your child had wheezing or whistling in the chest in the last 12 months?” As illustrated below, 66.1% of these children (with wheezing/whistling at any time) have experienced this symptom in the last 12 months.

Figure 11. Wheezing/Whistling in the Chest in the Last 12 Months (Among Children with Symptoms)?

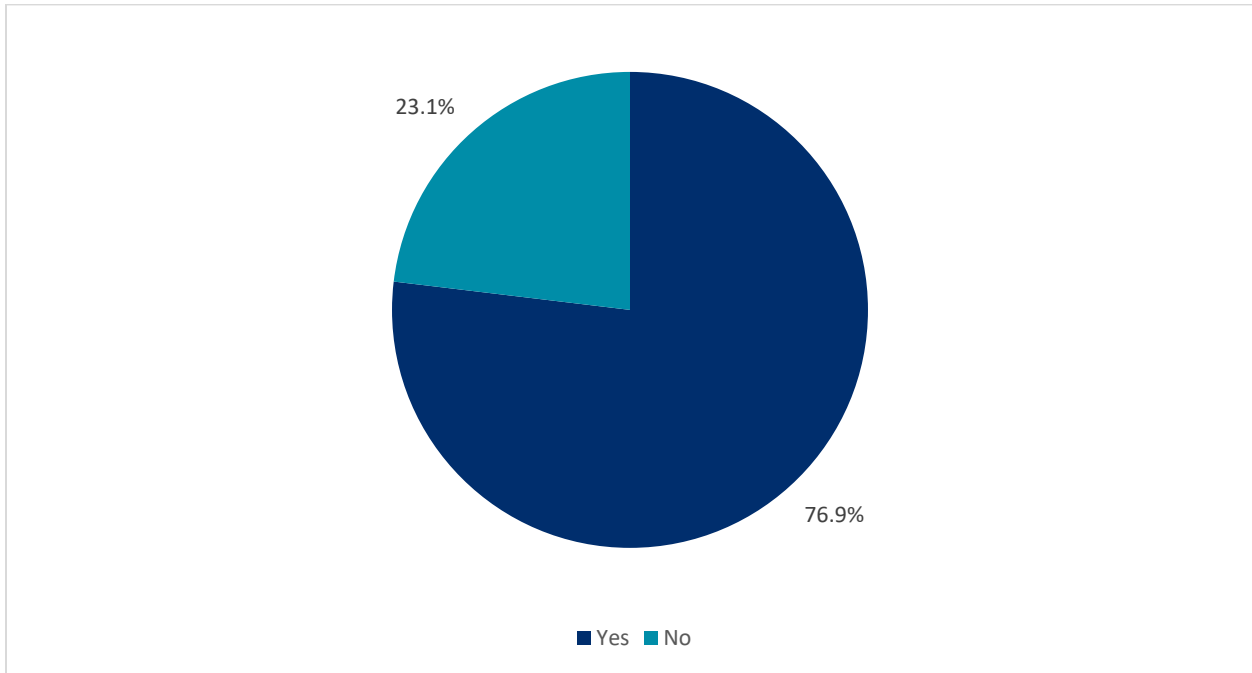


Note: $n = 239$.

Wheezing Interfering with Speech

Survey participants who said that the child has had wheezing or whistling in the chest in the last 12 months were also asked, “In the last 12 months, has wheezing ever been severe enough to limit your child’s speech to only one or two words at a time between breaths?” As illustrated below, among these children with wheezing symptoms in the last 12 months, 76.9% have had their speech limited to one or two words at a time between breaths because of their wheezing in the last 12 months.

Figure 12. Wheezing Limits Speech to One/Two Words at a Time Between Breaths?

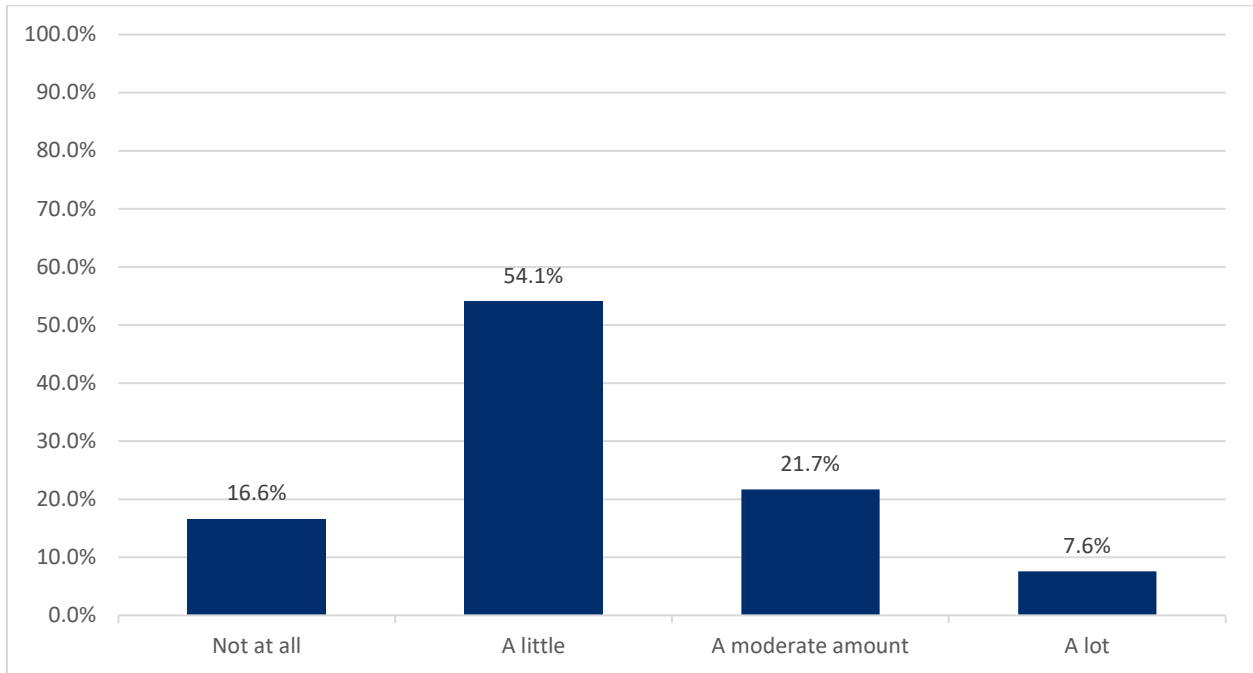


Note: $n = 156$.

Wheezing Interfering with Daily Activities

Survey participants who said that the child has had wheezing or whistling in the chest in the last 12 months were also asked, “In the last 12 months, how much did your child’s wheezing interfere with their daily activities?” As illustrated below, among these children with wheezing symptoms in the past year, 54.1% “a little,” followed by 21.7% for whom their wheezing interfered in daily activities “a moderate amount,” 16.6% “not at all,” and 7.6% “a lot.”

Figure 13. How Often Does Wheezing Interfere with Daily Activities

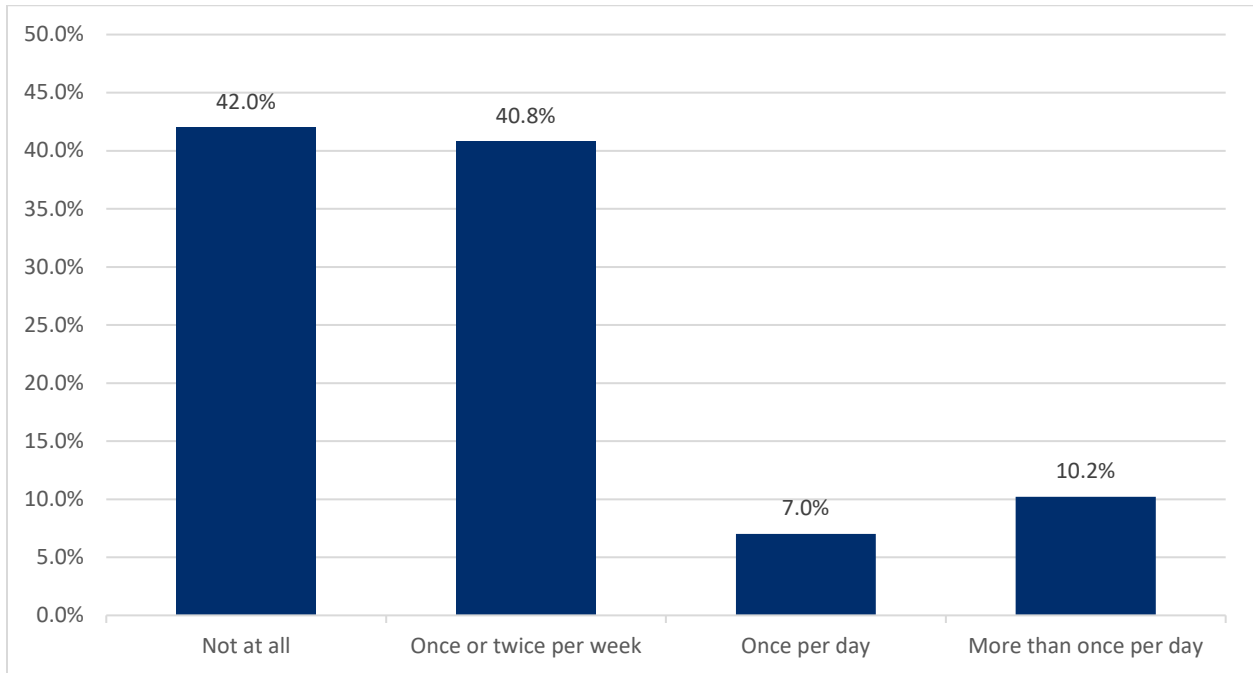


Note: $n = 157$.

Shortness of Breath

Survey participants who said that the child has had wheezing or whistling in the chest in the last 12 months were also asked, “In the past 4 weeks, how often has your child had shortness of breath?” As illustrated below, among these children with wheezing symptoms in the last 12 months, 42.0% have not had shortness of breath at all, 40.8% have had shortness of breath once or twice per week, and 17.2% have had shortness of breath once or more per day.

Figure 14. How Often Has Had Shortness of Breath



Note: $n = 157$.

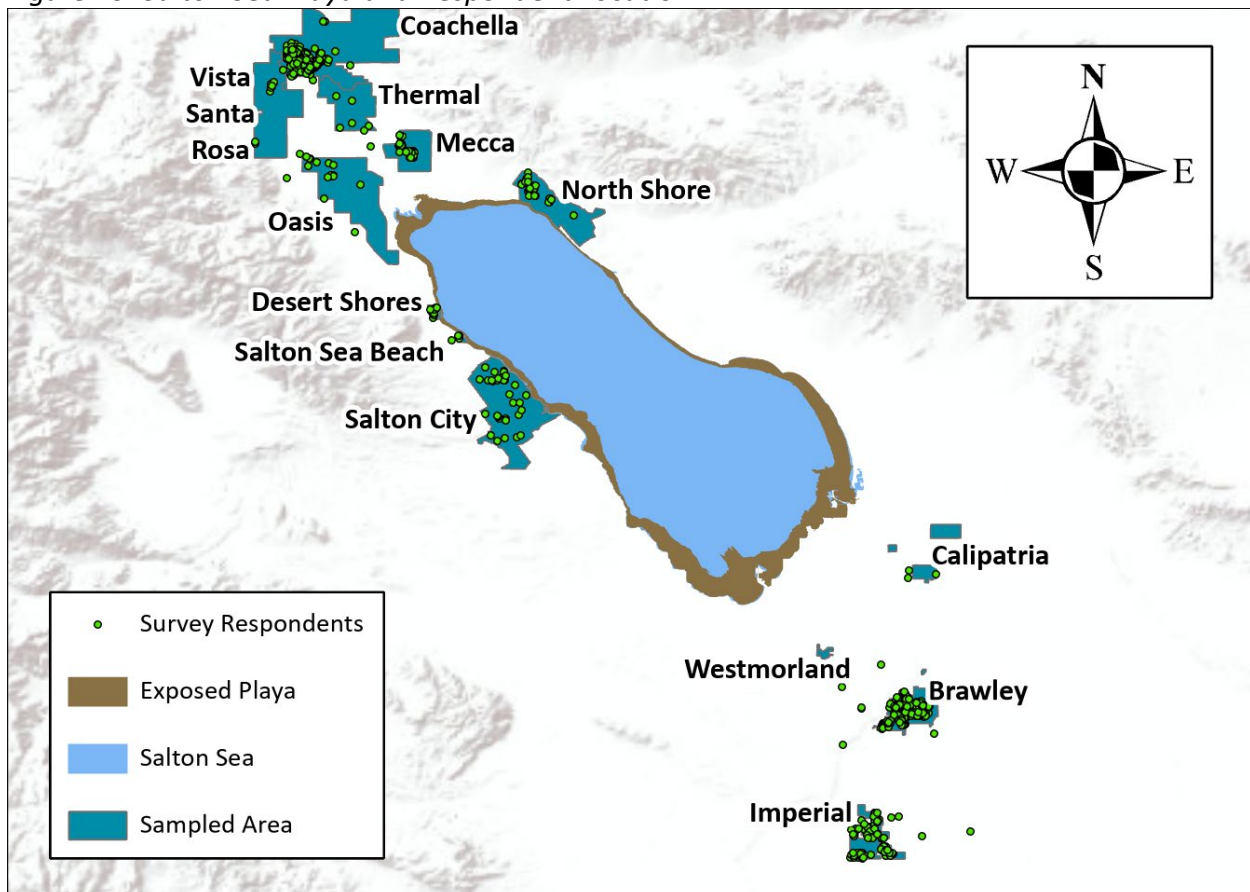
Geographic Analyses

Asthma Diagnoses and Ever Had Wheezing Symptoms by Proximity to Playa

With the Salton Sea shoreline receding, the dusty lakebed is becoming increasingly exposed, leaving the layer of sediment known as “playa.” As illustrated in the map below, the playa appears to be far more exposed around the southern portions of the Salton Sea. Given this observation, the southern communities (Brawley, City of Imperial, Calipatria, and Westmorland, which all fall into Imperial County) were compared to the northern communities (City of Coachella, Desert Shores, Mecca, North Shore, Oasis, Salton City, Salton Sea Beach, Thermal, and Vista Santa Rosa) around the Salton Sea, with respect to asthma diagnoses and symptomology.

Communities residing at the southern end of the Salton Sea demonstrated a significantly higher rate of asthma diagnoses in children, with a prevalence of 28.5%, compared to the northern end at 14.1% [$\chi^2 (1, N = 801) = 25.284, p < .001$]. The same pattern emerged for whether a child had ever experienced wheezing or whistling symptoms, where the southern end exhibited a significantly higher prevalence of asthma symptoms (36.7%) compared to the northern end (22.5%) [$\chi^2 (1, N = 830) = 20.122, p < .001$].

Figure 15. Salton Sea Playa and Respondent Location

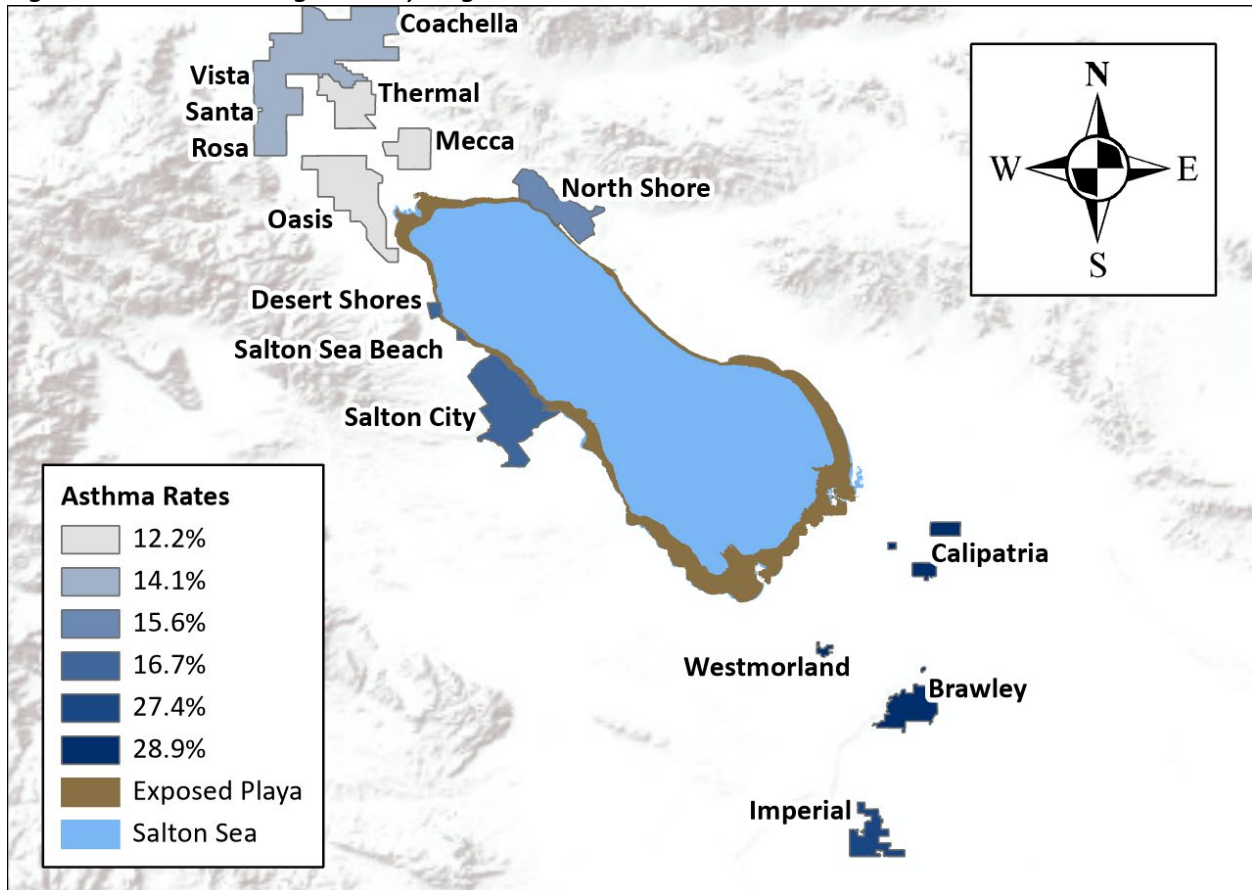


Asthma Diagnoses by Region

Places around the Salton Sea with close proximity to each other were merged for analyses by region. In other words, places with close proximity to one another were merged to examine how asthma and related symptoms may vary as a function of region. These regions are as follows: Region 1 (City of Brawley, Calipatria, and Westmorland), Region 2 (City of Imperial), Region 3 (Desert Shores, Salton City, and Salton Sea Beach), Region 4 (North Shore), Region 5 (Mecca, Oasis, and Thermal), and Region 6 (City of Coachella and Vista Santa Rosa).

Asthma diagnoses were compared across the aforementioned regions. As illustrated in the figure below, asthma rates significantly vary by region [$\chi^2(5, N = 801) = 25.836, p < .001$]. Specifically, the region including Brawley, Calipatria, and Westmorland has a child asthma rate of 28.9%, which is significantly greater than the regions of Mecca, Oasis, and Thermal (12.2%) and City of Coachella and Vista Santa Rosa (14.1%).

Figure 16. Asthma Diagnoses by Region

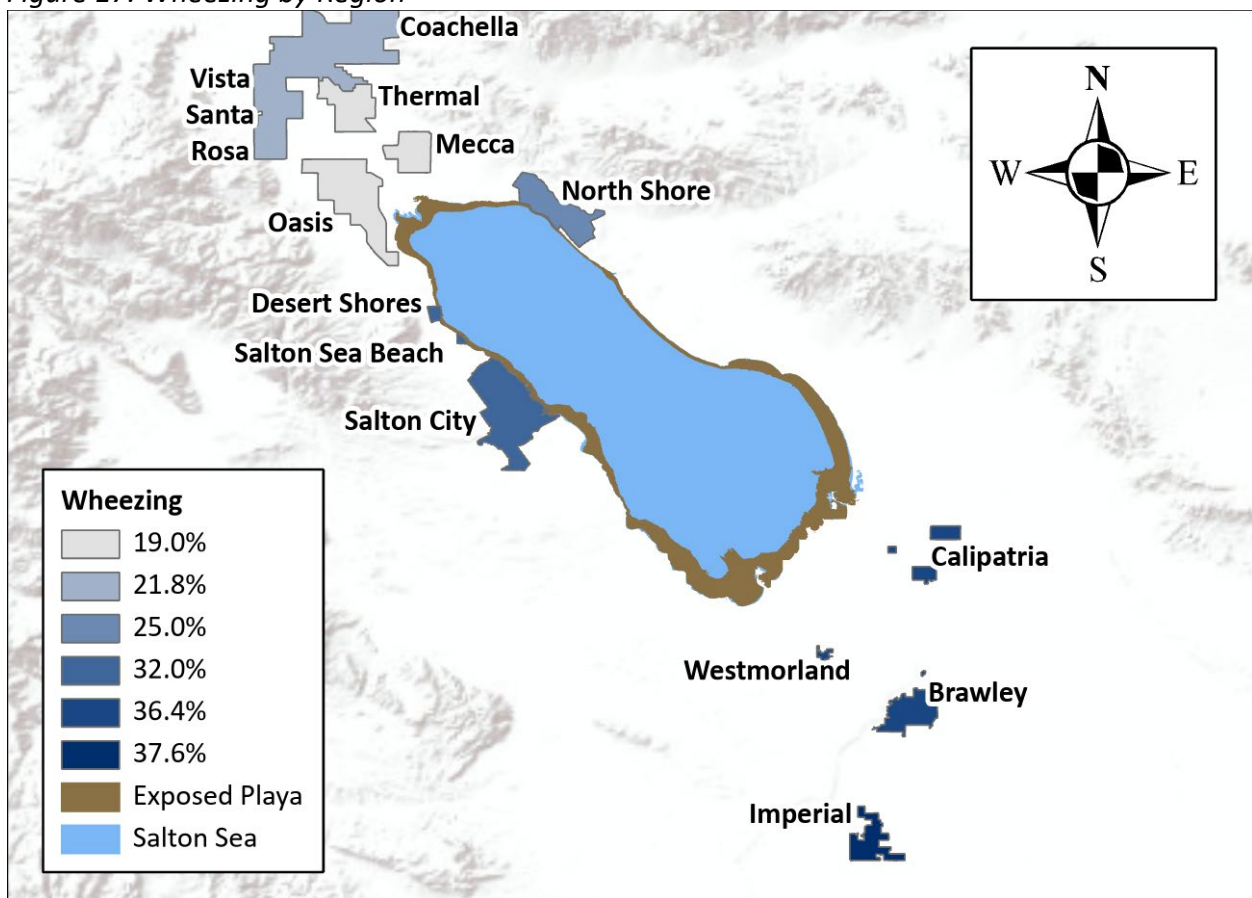


Note: Brawley, Calipatria, and Westmorland $n = 266$. City of Imperial $n = 95$. Desert Shores, Salton City, and Salton Sea Beach $n = 48$. North Shore $n = 32$. Mecca, Oasis, and Thermal $n = 98$. City of Coachella and Vista Santa Rosa $n = 262$.

Ever Had Wheezing Symptoms by Region

Wheezing symptoms varied significantly by region [$\chi^2(5, N = 830) = 23.126, p < .001$]. These were children who had ever experienced wheezing symptoms (rather than only those who had symptoms in the last 12 months). Specifically, the Brawley, Calipatria, and Westmorland region (36.4%) has a significantly higher rate of children who have had wheezing symptoms compared to the region of Mecca, Oasis, and Thermal (19.0%) and the region of the City of Coachella and Vista Santa Rosa (21.8%). Furthermore, the City of Imperial region (37.6%) has a significantly higher rate of children who have had wheezing symptoms compared to the region of the City of Coachella and Vista Santa Rosa (21.8%).

Figure 17. Wheezing by Region



Note: Brawley, Calipatria, and Westmorland $n = 272$. City of Imperial $n = 101$. Desert Shores, Salton City, and Salton Sea Beach $n = 50$. North Shore $n = 32$. Mecca, Oasis, and Thermal $n = 100$. City of Coachella and Vista Santa Rosa $n = 275$.

Conclusion

This survey of asthma and related symptoms has aimed to capture the prevalence of regional childhood asthma symptoms more accurately among both those who are diagnosed and those who are not diagnosed with asthma. The vast majority of children surveyed come from underserved communities, with over ninety percent identifying as Hispanic/Latino and over half living below the federal poverty level.

About 20.6% of children have an asthma diagnosis. This rate varies by region, with 13.8% of children in eastern Riverside County and 27.1% of children in northern Imperial County having an asthma diagnosis. However, the percentage of those with symptoms (wheezing in the chest at any time in the past) is higher, with 28.9% reporting this symptom. Further, both asthma diagnosis and symptoms (wheezing in the chest at any time in the past) are more likely to be found in communities near the south end of the Salton Sea rather than the north end. These results on asthma diagnosis and symptoms suggest that the respiratory health burdens in these communities are greater than has been previously documented.