The following is an example of how metals concentrations were reported to participating urban farms and gardens in the Safe Urban Harvests study.

We sampled soil, water, and produce from 104 urban farms and gardens during the 2017 growing season, and tested them for levels of heavy metals. We interpreted the results and shared confidential site-specific reports to each participating site prior to writing or publishing our study-wide summary report or scientific manuscripts.

We received the soil and water results sooner than the produce results. To disseminate results as soon as we received them, soil and water results reports were distributed in summer 2018 and produce results reports were distributed in summer 2019.

Along with sharing these individual reports, we also spoke with most site representatives and gave them recommendations regarding how to reduce exposure to contaminants.

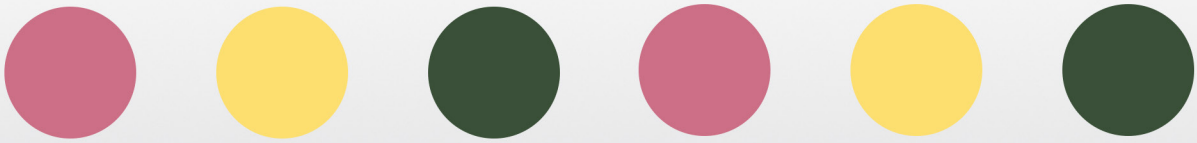
The following document represents an example of one individual site's produce results report. **This report does not reflect conditions at all sites.**

Produce results prepared for:

NAME REDACTED

ADDRESS REDACTED

Updated: [August 20, 2019 9:04 PM]



SAFE URBAN HARVESTS

JOHNS HOPKINS
CENTER *for* A LIVABLE FUTURE

If you have any questions about the information contained in this report, please contact the study team at: safeurbanharvests@jhu.edu or 410-223-1707.

For study updates, additional resources, and a final report of city-wide results, visit the Safe Urban Harvests Study website: https://www.jhsph.edu/clf/suh

SUMMARY

GOAL

The Safe Urban Harvests Study aimed to investigate how the levels of metals harmful to human health in fruits and vegetables grown on urban farms and gardens in Baltimore City compare to those in fruits and vegetables purchased from grocery stores and farmers market vendors in Baltimore City.

RESULTS

Our investigation found **no meaningful differences between the levels of metals in urban-grown fruits and vegetables as compared to those in fruits and vegetables from grocery stores or farmers markets.**

RECOMMENDATIONS

We are confident that consuming urban-grown fruits and vegetables presents no additional risks compared to those in fruits and vegetables from grocery stores and farmers markets. **Our findings suggest that there is no compelling reason to change dietary or purchasing patterns with regard to fruits and vegetables.**

Eating a diverse diet rich in fruits and vegetables has many recognized health benefits. Continuing to eat a variety of fruits and vegetables is important for your overall health. People may have specific dietary and nutritional needs based on their age, health status, and pre-existing health conditions. Please consult your physician or a dietitian if you have specific questions about your nutritional needs.

CONTEXT

Metals harmful to human health (e.g., arsenic, cadmium, and lead) exist in a wide variety of foods in the food supply. **No diet is—or can be—completely free of metals.**

Our investigation was not intended to compare the safety of different kinds of fruits and vegetables to each other. Thus, we do not compare the levels of metals measured in, for example, a carrot in contrast to a cucumber.

Your diet is only one way you may come into contact with metals harmful to human health (especially lead), and it is not the greatest source of contact. Exposure to these metals may also occur via drinking water or contact with metals in urban soils. Whenever possible, it is always a good idea to follow "General recommendations for reducing contact with metals in urban soils and produce" provided in this report.

CONTENTS

SAFE URBAN HARVEST STUDY OVERVIEW

WHAT IS THE SAFE URBAN HARVESTS STUDY?

The Safe Urban Harvests Study aims to measure metal contaminants in the soil, water, and produce from Baltimore's farms and community gardens.

WHY DID THE STUDY FOCUS ON METAL CONTAMINANTS?

Metals are a group of substances/elements that exist naturally in the earth but can be released into the environment by human activities. Some metals (e.g., arsenic, barium, cadmium, lead, nickel) are harmful and can make people sick. Other metals (e.g., calcium, copper, iron, magnesium, manganese, phosphorus, potassium, zinc) are considered essential for human and plant health and can be beneficial in certain amounts.

WHAT DOES THIS REPORT CONTAIN?

1. This report contains information about the levels of harmful and beneficial metals measured in any fruits and/or vegetables we collected from your site.
2. This report also compares the levels of those metals in fruits and/or vegetables from your site to metals in the same fruits and vegetables from other farms and gardens in the city, and from grocery stores and farmers markets in Baltimore sampled as part of the Safe Urban Harvests Study.
3. The report also compares the levels we measured in your produce to the best-available recommended limits for each metal (when they exist).

With this report, we are re-sending the report on your site's soil and irrigation water results. This report also includes information about low-cost or free ways to reduce contact with these metals harmful to human health while engaging in urban agriculture.

WHAT ISN'T INCLUDED IN THIS REPORT?

We did not collect information about gardeners' and farmers' health status, age, or the amount of produce they consume from their farms or gardens. **We, therefore, cannot answer questions about the safety and direct health impacts stemming from consumption of the produce items tested.**

We did not measure the levels of harmful and beneficial metals that may be present in other foods (e.g., grains, meats, dairy, or other produce items) you may also consume. We, therefore, cannot answer questions about how the levels of harmful metals in those foods compare to the levels we measured in produce, or make recommendations for specific foods to avoid or eat less frequently.

Additionally, we did not measure or otherwise attempt to determine the health benefits associated with consuming any of the produce items we tested. It is important to remember that **there are many demonstrated health benefits to growing and eating fruits and vegetables.** It's important to balance information about harmful metals in produce with these considerations when making decisions about your farm or garden and also about your diet.

HOW SHOULD THE RESULTS BE INTERPRETED?

The presence of harmful metals in fruits and vegetables does not necessarily indicate an immediate health risk for consumers of the food. It is important to consider the level of the metal measured, the amount and frequency of the item consumed, and the age and health status of the consumer.

There are not existing regulatory guidance values for all of the harmful metals in all of the items we tested at your site. We compared your produce results to the best available health-based maximum dietary intakes, but these do not exist for all of the metals we tested. If you have any questions, the study team is available to answer them.

Additional information is available on the Safe Urban Harvests Study website: https://www.jhsph.edu/clf/suh

PRODUCE RESULTS

We tested all produce samples for five metals harmful to human health and nine other elements that support plant growth and human health. For information about how produce samples were collected and analyzed, see "Methods: How samples were collected, analyzed, and interpreted."

In all produce samples, we measured the levels of five† metals harmful to human health:

arsenic	cadmium	nickel
barium	lead	

Based on all of the data from the Safe Urban Harvests Study, **there is no evidence of an immediate risk to consuming any of the produce samples tested.** Fruits and vegetables provide numerous health benefits and should remain an important part of a diverse and nutritious diet. However, there may be increased risks with higher levels of exposure over long periods of time. Exposure to these metals harmful to human health may also occur via drinking water or contact with metals in urban soils. Whenever possible, it is always a good idea to follow "General recommendations for reducing contact with metals in urban soils and produce" provided in this report.

There are currently no regulatory guidelines for harmful metals in produce in the US, and there is no clear line of what is considered "safe." There are, however, daily recommended limits (in other words, the amount you can consume in a day without a risk of getting sick).

To help interpret your produce results, we compared the amount of each metal in one cup of each produce item to the daily recommended limit. It is not unusual to find levels of metals in a cup of fresh produce—whether from urban farms or gardens, grocery stores, or farmers markets—greater than daily recommended limits. **Exceeding the daily recommended limit in a single day is not likely to pose an immediate health concern.**

In addition, in the following plots, we show how the levels of harmful metals in your produce samples compare to the levels measured in other samples purchased from grocery stores (both conventionally-produced and USDA Certified Organic) and from farmers market vendors in Baltimore.

For the levels of all metals measured in produce at your site, see the Appendix.

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* As we did with soil and water, we also measured chromium in the produce samples. Chromium in food, however, is not considered harmful to human health. See Information about other metals measured in Safe Urban Harvest Study for more details.

SITE OVERVIEW MAP

The map below shows where each produce sample was collected in relation to the site parts we used in your soil and water report.

PRODUCE SAMPLING LOCATIONS FOR NAME REDACTED, PART 3

The map below shows the produce sample locations in part 3 in finer detail.

PRODUCE RESULTS OVERVIEW FOR NAME REDACTED

A brief description and summary results for each produce sample is below.

Item	Description	Arsenic	Lead
Bean	A mixture of several beans or sugar snap peas collected from your site.	Not detected	Low level
Kale	A mixture of kale leaves collected from several plants on your site.	Low level	Low level
Squash	A mixture of several squash collected from your site	Not detected	Low level
Sweet Potato	A mixture of several sweet potatoes collected from your site.	Moderate level	Moderate level

ARSENIC

We detected arsenic in 367 out of 649 (57%) of all produce samples measured in the Safe Urban Harvests Study.

No produce samples measured in the Safe Urban Harvests Study had levels of arsenic high enough to pose an immediate health concern. Even if we detected arsenic in your fruits and/or vegetables, there is no immediate health concern to you from consuming them.

There are no established regulatory or safety standards for arsenic in produce in the United States. The US Environmental Protection Agency has established a maximum contaminant limit for arsenic in drinking water of 10 micrograms per liter. For the purposes of interpreting your results, we compared the amount of arsenic you would get from eating one cup of each fruit or vegetable to 1/10th of the amount allowed in drinking water. We believe this approach to be protective. Although we calculated this ourselves, we refer to this as a "daily recommended limit" for simplicity throughout the rest of the report.

It is not unusual to find levels of metals in a cup of fresh produce greater than daily recommended limits. **Exceeding the daily recommended limit in a single day is not likely to pose an immediate health concern.** There may, however, be increased risks with routinely exceeding the maximum daily limit over long periods of time. Because these metals do not have any nutritional benefits for humans, the lower the levels of the-metals in your food, the better.

Important points to remember

We selected this daily recommended limit to provide an interpretation of your produce results that is protective of your health. It is important to remember that you likely do not eat produce from your garden every day or consistently throughout the year. It is also important to remember that you likely do not eat the same fruits and vegetables every day.

These results represent a single sample of produce collected at one point in time. The amount of arsenic in your fruits and vegetables may vary slightly across your site, and over time. The amount of arsenic in produce you purchase from the grocery store and farmers markets varies as well.

In a typical day, you likely eat a variety of foods that may or may not contain arsenic. We did not measure the levels of arsenic in other foods you may eat, thus we cannot compare the levels of arsenic measured in your produce to other foods you may also consume.

If you would like to know more information about arsenic in the food supply, see https://www.fda.gov/food/metals/arsenic-food-and-dietary-supplements

How to read this plot:

Each dot represents one sample measured in the study.

The blue dot represents your sample.

The yellow dots represent other samples with detectable arsenic.

Light gray dots represent samples in which no arsenic was measured.

The horizontal axis groups the samples by where they were collected (e.g., urban farm or garden, grocery store, farmers market). The horizontal scattering of dots within each category is to help with visibility.

The vertical axis indicates how much one cup of the sample contributes to the daily recommended limit. For example, a value of 50% on the left axis means that consuming one cup of this sample contributes half of the amount.

ARSENIC RESULTS FOR NAME REDACTED

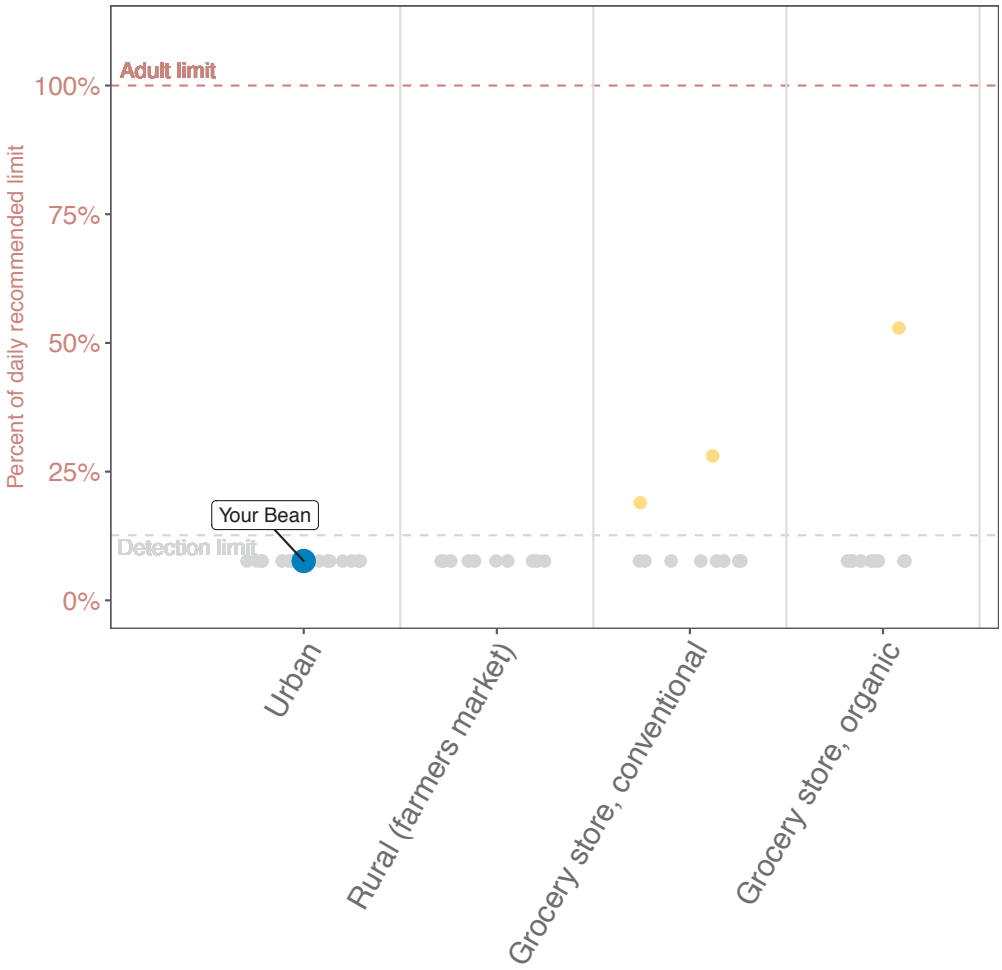
BEANS

We detected arsenic in 3 out of 49 (6%) bean samples measured in the Safe Urban Harvests Study.

We did not detect arsenic in your beans.

The following plot shows the level of arsenic measured in beans collected at Name Redacted compared to the levels in other samples we collected from other urban farms and gardens, and purchased from grocery stores and farmers markets in Baltimore.

Levels of arsenic measured in one cup of beans



How to read this plot:

Each dot represents one sample measured in the study.

The blue dot represents your sample.

The yellow dots represent other samples with detectable arsenic.

Light gray dots represent samples in which no arsenic was measured.

The horizontal axis groups the samples by where they were collected (e.g., urban farm or garden, grocery store, farmers market). The horizontal scattering of dots within each category is to help with visibility.

The vertical axis indicates how much one cup of the sample contributes to the daily recommended limit. For example, a value of 50% on the left axis means that consuming one cup of this sample contributes half of the amount.

ARSENIC RESULTS FOR NAME REDACTED

KALE

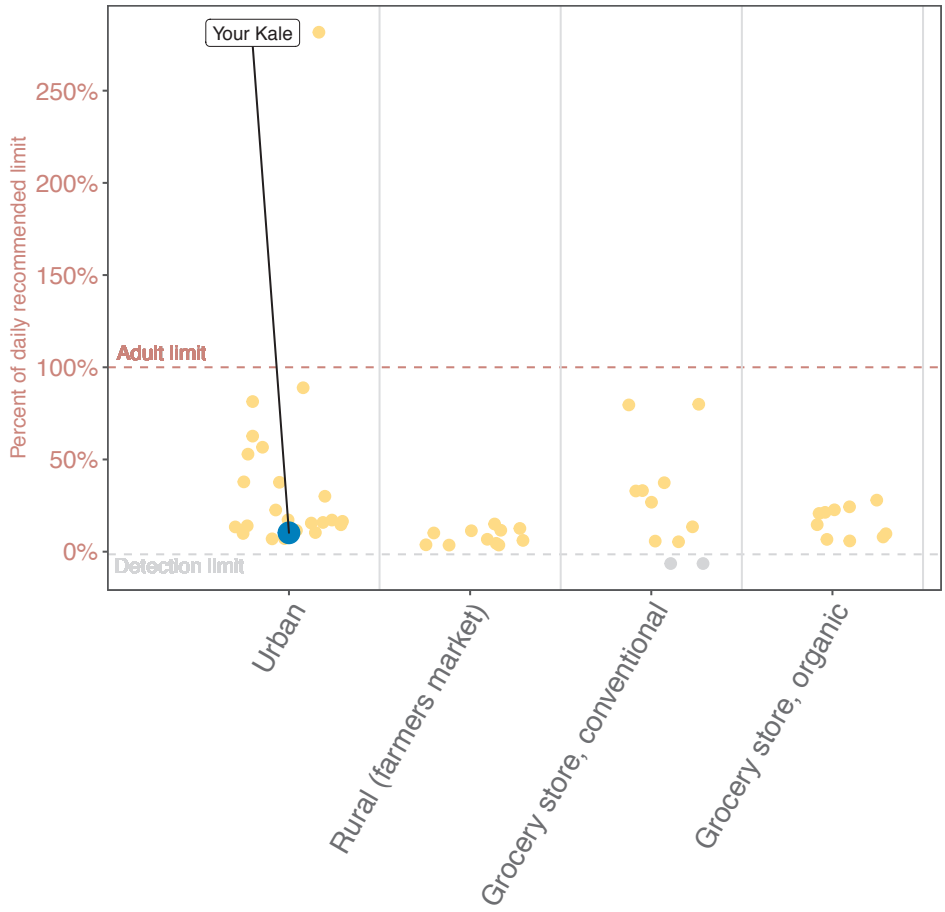
We detected arsenic in 55 out of 56 (98%) of all kale samples measured in the Safe Urban Harvests Study.

We detected a low level of arsenic in your kale.

Consuming one cup of the kale from your site could contribute 10% of the daily recommended limit for arsenic.

The following plot shows the level of arsenic measured in kale collected at Name Redacted compared to the levels in other samples we collected from other urban farms and gardens, and purchased from grocery stores and farmers markets in Baltimore.

Levels of arsenic measured in one cup of kale



How to read this plot:

Each dot represents one sample measured in the study.

The blue dot represents your sample.

The yellow dots represent other samples with detectable arsenic.

Light gray dots represent samples in which no arsenic was measured.

The horizontal axis groups the samples by where they were collected (e.g., urban farm or garden, grocery store, farmers market). The horizontal scattering of dots within each category is to help with visibility.

The vertical axis indicates how much one cup of the sample contributes to the daily recommended limit. For example, a value of 50% on the left axis means that consuming one cup of this sample contributes half of the amount.

ARSENIC RESULTS FOR NAME REDACTED

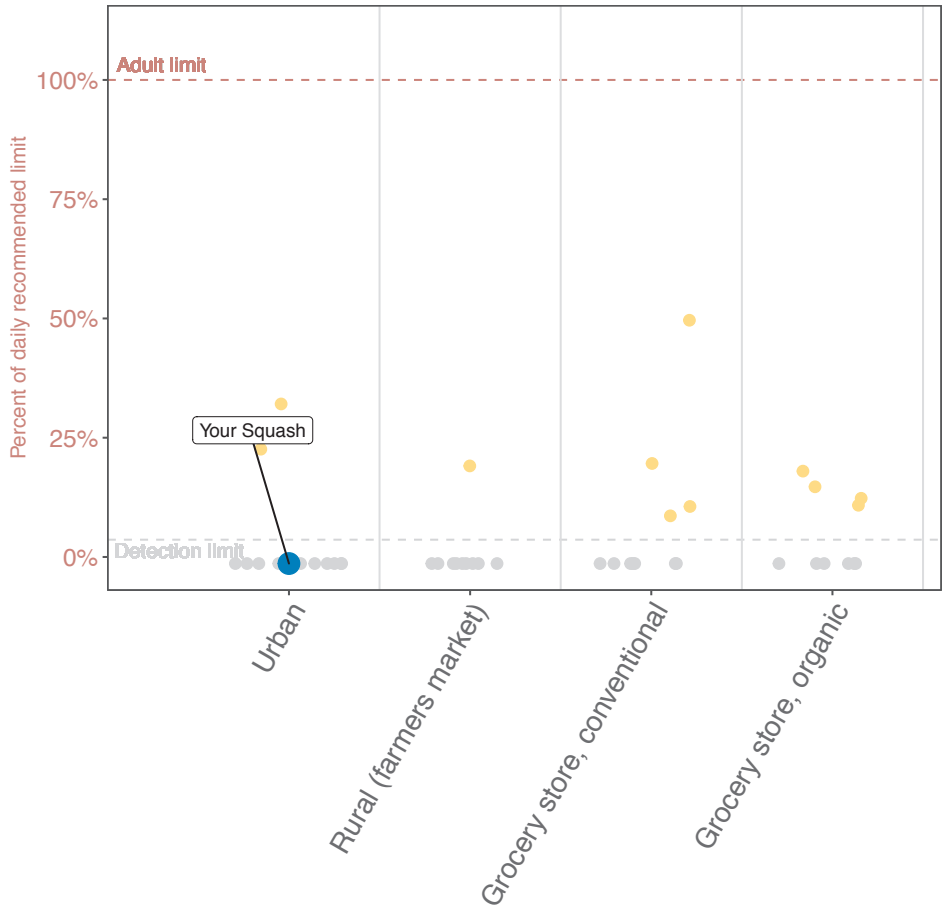
SQUASH

We detected arsenic in 11 out of 48 (23%) of all squash samples measured in the Safe Urban Harvests Study.

We did not detect arsenic in your squash.

The following plot shows the level of arsenic measured in squash collected at Name Redacted compared to the levels in other samples we collected from other urban farms and gardens, and purchased from grocery stores and farmers markets in Baltimore.

Levels of arsenic measured in one cup of squash



How to read this plot:

Each dot represents one sample measured in the study.

The blue dot represents your sample.

The yellow dots represent other samples with detectable arsenic.

Light gray dots represent samples in which no arsenic was measured.

The horizontal axis groups the samples by where they were collected (e.g., urban farm or garden, grocery store, farmers market). The horizontal scattering of dots within each category is to help with visibility.

The vertical axis indicates how much one cup of the sample contributes to the daily recommended limit. For example, a value of 50% on the left axis means that consuming one cup of this sample contributes half of the amount.

ARSENIC RESULTS FOR NAME REDACTED

SWEET POTATOES

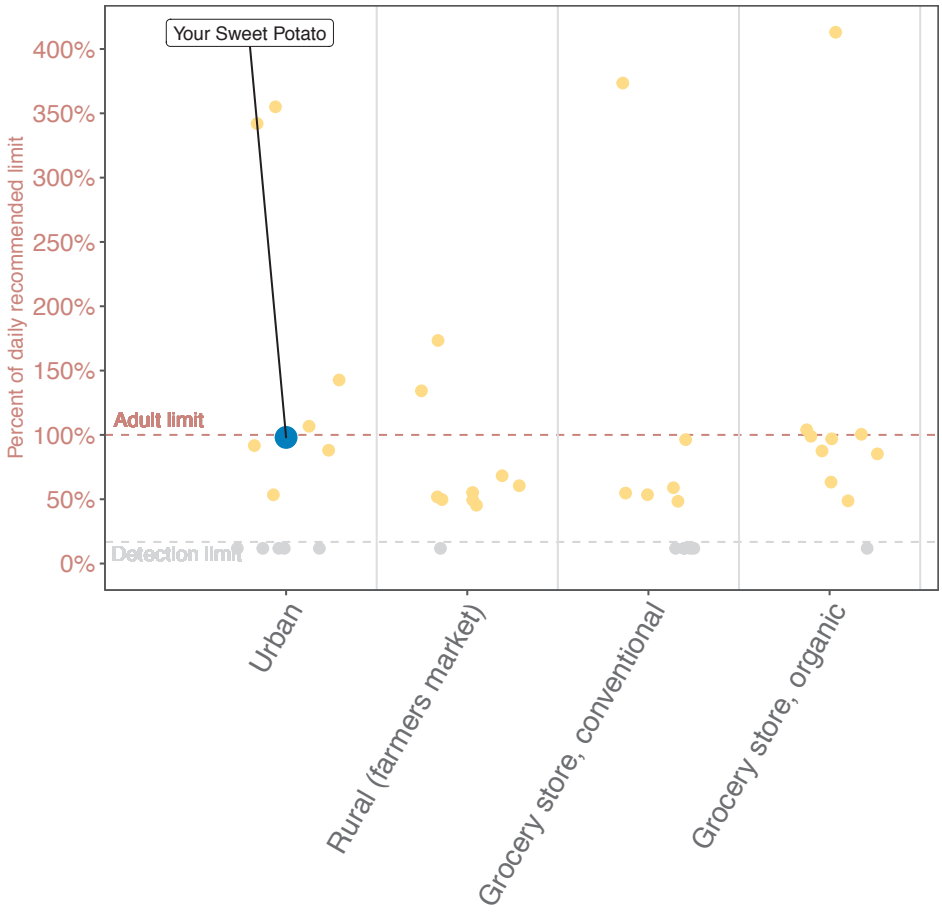
We detected arsenic in 33 out of 44 (75%) of all sweet potato samples measured in the Safe Urban Harvests Study.

We detected a moderate level of arsenic in your sweet potatoes.

Consuming one cup of the sweet potatoes from your site could contribute 98% of the daily recommended limit for arsenic.

The following plot shows the level of arsenic measured in sweet potatoes collected at Name Redacted compared to the levels in other samples we collected from other urban farms and gardens, and purchased from grocery stores and farmers markets in Baltimore.

Levels of arsenic measured in one cup of sweet potatoes



LEAD

We detected lead in 613 out of 649 (94%) of all samples measured in the Safe Urban Harvests Study.

No produce samples measured in the Safe Urban Harvests Study had levels of lead high enough to pose an immediate health concern. Even if we detected lead in your fruits and/or vegetables, there is no immediate health concern to you from consuming them.

Because no diet is completely free of lead, it is important to reduce contact with lead from other sources whenever possible. This includes reducing contact with lead in dust, soil, and drinking water (especially in buildings with lead-based paint or lead pipes)—which are the most significant causes of lead poisoning.

The US Food and Drug Administration has established a provisional daily recommended limit for lead in food. The daily recommended limit for adults is 12.5 micrograms per day and 3 micrograms per day for children under 6 years of age, but many people in the US regularly exceed this level. Because lead does not have any nutritional benefits for humans, the lower the level of the lead, the better.

To interpret the level of lead we measured in each sample, we compared the level of lead a person would ingest when eating one cup of each sample to the US FDA's daily recommended limit for both adults and children.

Important points to remember

The levels of lead we measured in your produce samples were 1000 times smaller (parts per billion) than the levels we measured in your soil (parts per million).

We selected this daily recommended limit to provide an interpretation of your produce results that is protective of your health. It is important to remember that you likely do not eat produce from your garden every day or consistently throughout the year. It is also important to remember that you likely do not eat the same fruits and vegetables every day.

These results represent a single sample of produce collected at one point in time. The amount of lead in your fruits and vegetables may vary slightly across your site, and over time. The amount of lead in produce you purchase from the grocery store and farmers markets varies as well.

These results represent the amount of lead in one cup of each fruit or vegetable. Children may eat less than one cup at a time or on a given day.

In a typical day, you likely eat a variety of foods that may or may not contain lead. We did not measure the levels of lead in other foods you may eat, thus we cannot compare the levels of lead measured in your produce to other foods you may also consume.

It is always a good idea to follow "General recommendations for reducing contact with metals in urban soils and produce" provided in this report.

If you would like to know more information about lead in the food supply, see https://www.fda.gov/food/metals/lead-food-food-wares-and-dietary-supplements

How to read this plot:

Each dot represents one sample measured in the study.

The blue dot represents your sample.

The yellow dots represent other samples with detectable lead.

Light gray dots represent samples in which no lead was measured.

The horizontal axis groups the samples by where they were collected (e.g., urban farm or garden, grocery store, farmers market). The horizontal scattering of dots within each category is to help with visibility.

The vertical axes indicate how much one cup of the sample contributes to the daily recommended limit. The left axis is the adult scale and the right axis is the child scale. For example, a value of 50% on the right axis means that consuming one cup of this sample contributes half of the amount of the recommended limit for children.

LEAD RESULTS FOR NAME REDACTED

BEANS

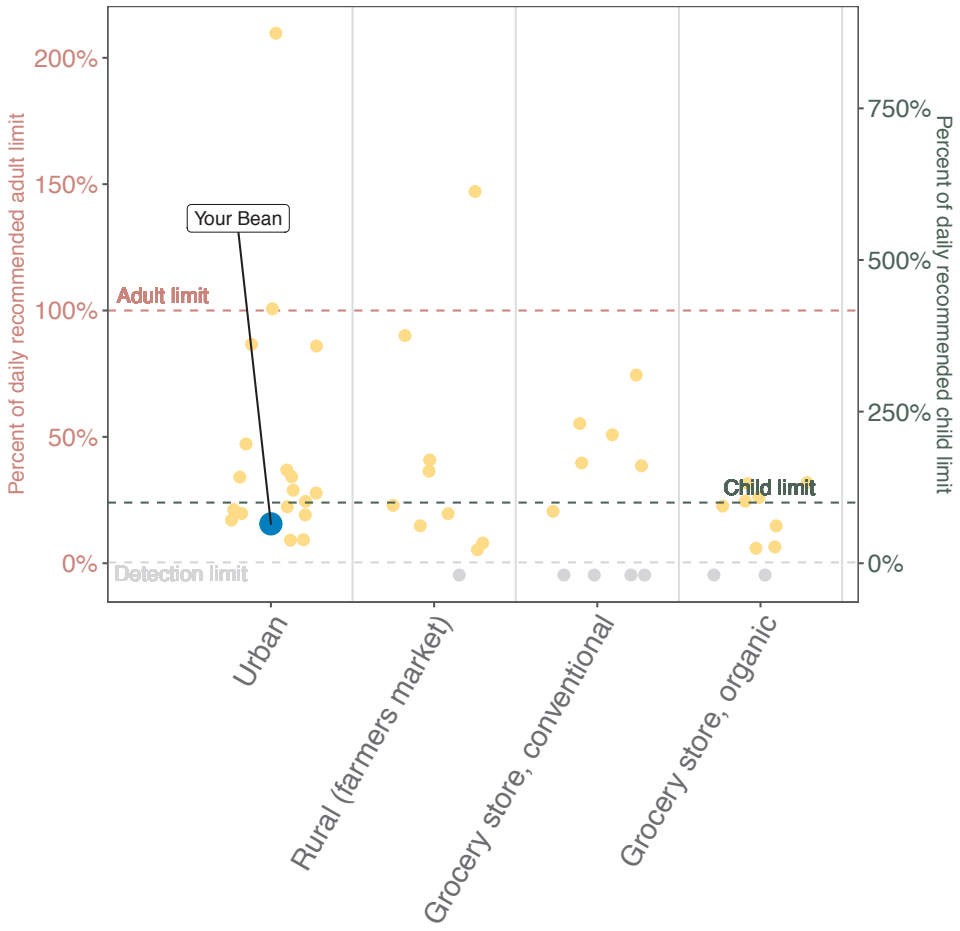
We detected lead in 42 out of 49 (86%) bean samples measured in the Safe Urban Harvests Study.

We detected a low level of lead in your beans.

Consuming one cup of the beans from your site could contribute 16% of the daily recommended limit for lead for adults and 65% of the daily recommended limit for children.

The following plot shows the level of lead measured in beans collected at Name Redacted compared to the levels in other samples we collected from other urban farms and gardens, and purchased from grocery stores and farmers markets in Baltimore.

Levels of lead measured in one cup of beans



How to read this plot:

Each dot represents one sample measured in the study.

The blue dot represents your sample.

The yellow dots represent other samples with detectable lead.

Light gray dots represent samples in which no lead was measured.

The horizontal axis groups the samples by where they were collected (e.g., urban farm or garden, grocery store, farmers market). The horizontal scattering of dots within each category is to help with visibility.

The vertical axes indicate how much one cup of the sample contributes to the daily recommended limit. The left axis is the adult scale and the right axis is the child scale. For example, a value of 50% on the right axis means that consuming one cup of this sample contributes half of the amount of the recommended limit for children.

LEAD RESULTS FOR NAME REDACTED

KALE

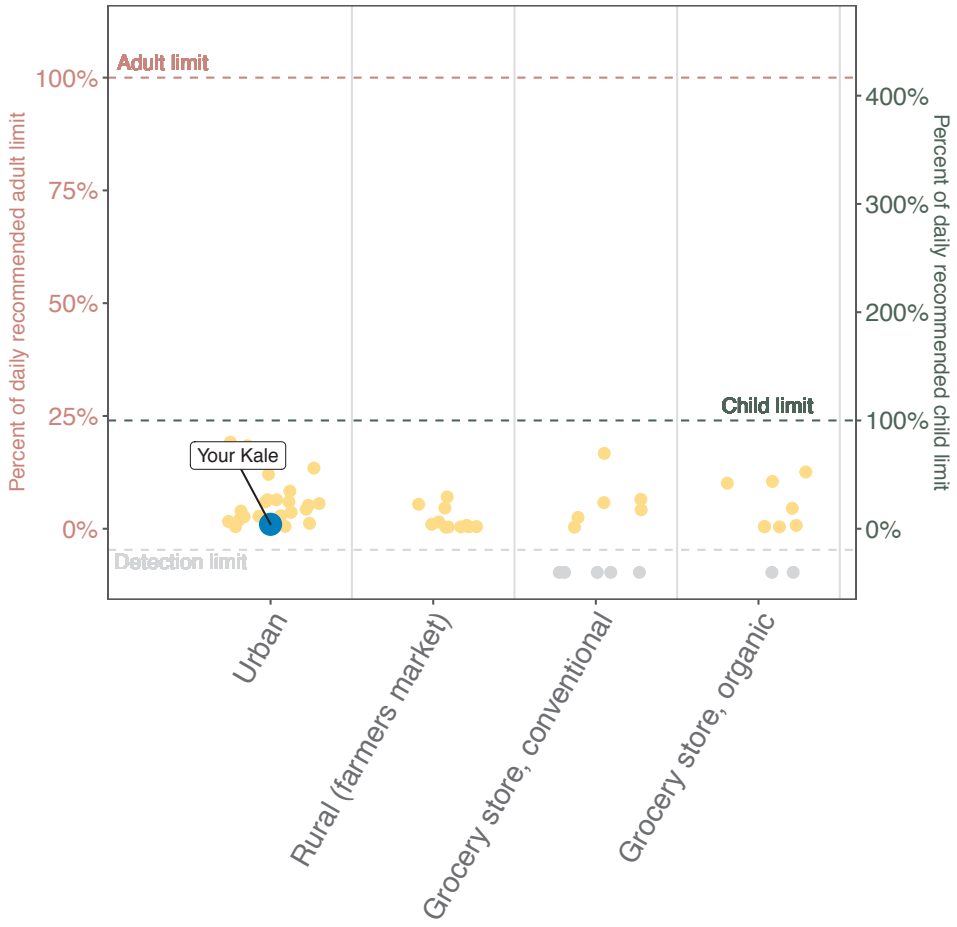
We detected lead in 50 out of 56 (89%) of all kale samples measured in the Safe Urban Harvests Study.

We detected a low level of lead in your kale.

Consuming one cup of the kale from your site could contribute 1% of the daily recommended limit for lead for adults and 4% of the daily recommended limit for children.

The following plot shows the level of lead measured in kale collected at Name Redacted compared to the levels in other samples we collected from other urban farms and gardens, and purchased from grocery stores and farmers markets in Baltimore.

Levels of lead measured in one cup of kale



How to read this plot:

Each dot represents one sample measured in the study.

The blue dot represents your sample.

The yellow dots represent other samples with detectable lead.

Light gray dots represent samples in which no lead was measured.

The horizontal axis groups the samples by where they were collected (e.g., urban farm or garden, grocery store, farmers market). The horizontal scattering of dots within each category is to help with visibility.

The vertical axes indicate how much one cup of the sample contributes to the daily recommended limit. The left axis is the adult scale and the right axis is the child scale. For example, a value of 50% on the right axis means that consuming one cup of this sample contributes half of the amount of the recommended limit for children.

LEAD RESULTS FOR NAME REDACTED

SQUASH

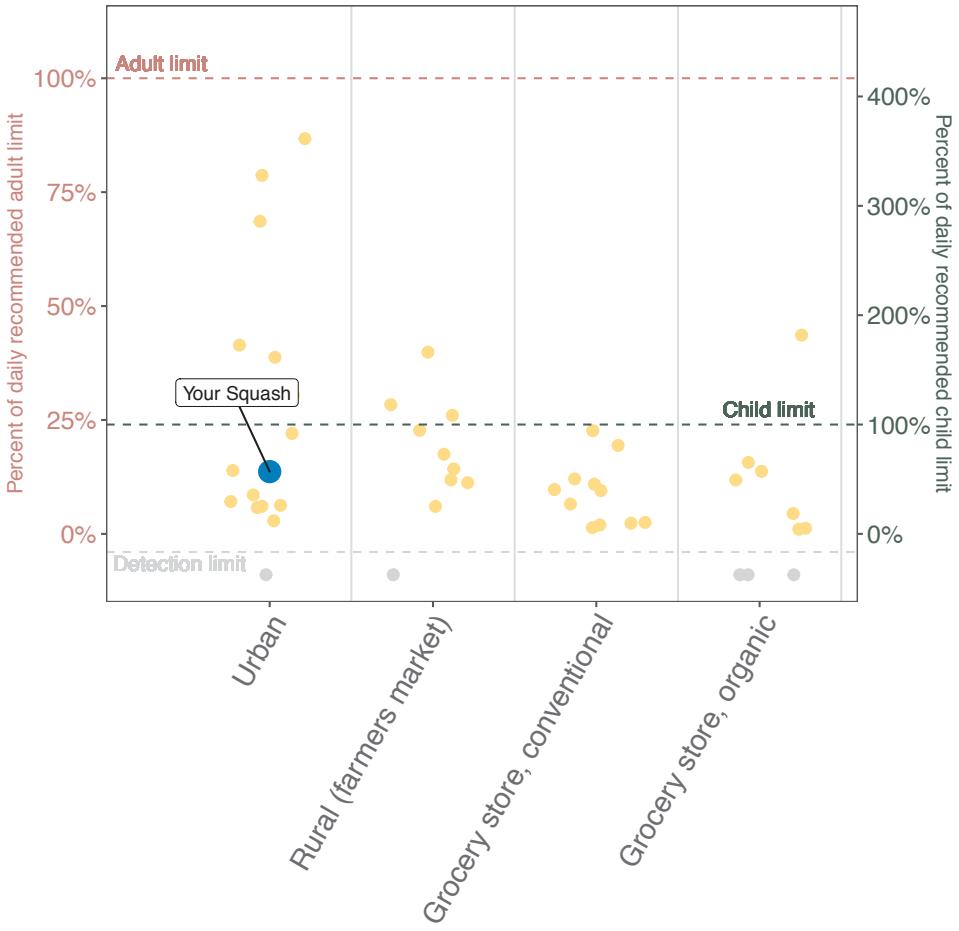
We detected lead in 43 out of 48 (90%) of all squash samples measured in the Safe Urban Harvests Study.

We detected a low level of lead in your squash.

Consuming one cup of the squash from your site could contribute 14% of the daily recommended limit for lead for adults and 57% of the daily recommended limit for children.

The following plot shows the level of lead measured in squash collected at Name Redacted compared to the levels in other samples we collected from other urban farms and gardens, and purchased from grocery stores and farmers markets in Baltimore.

Levels of lead measured in one cup of squash



How to read this plot:

Each dot represents one sample measured in the study.

The blue dot represents your sample.

The yellow dots represent other samples with detectable lead.

Light gray dots represent samples in which no lead was measured.

The horizontal axis groups the samples by where they were collected (e.g., urban farm or garden, grocery store, farmers market). The horizontal scattering of dots within each category is to help with visibility.

The vertical axes indicate how much one cup of the sample contributes to the daily recommended limit. The left axis is the adult scale and the right axis is the child scale. For example, a value of 50% on the right axis means that consuming one cup of this sample contributes half of the amount of the recommended limit for children.

LEAD RESULTS FOR NAME REDACTED

SWEET POTATOES

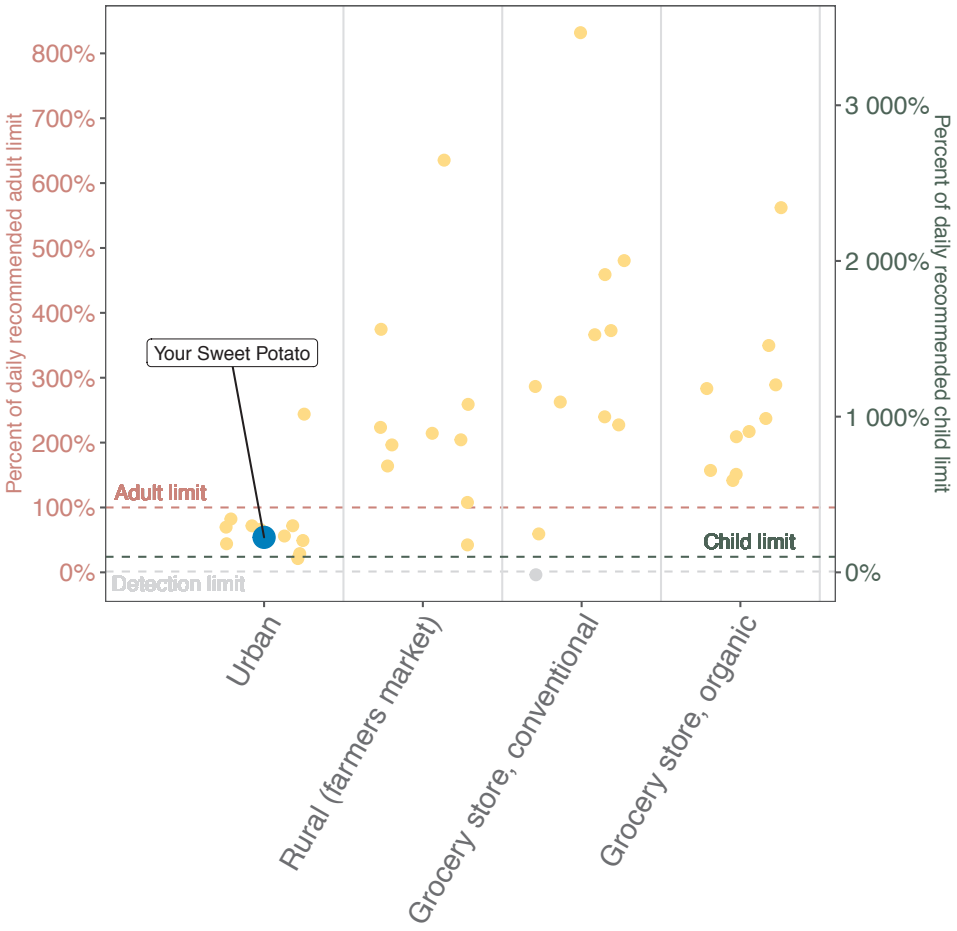
We detected lead in 43 out of 44 (98%) of all sweet potato samples measured in the Safe Urban Harvests Study.

We detected a moderate level of lead in your sweet potatoes.

Consuming one cup of the sweet potatoes from your site could contribute 54% of the daily recommended limit for lead for adults and 225% of the daily recommended limit for children.

The following plot shows the level of lead measured in sweet potatoes collected at Name Redacted compared to the levels in other samples we collected from other urban farms and gardens, and purchased from grocery stores and farmers markets in Baltimore.

Levels of lead measured in one cup of sweet potatoes



INFORMATION ABOUT OTHER METALS MEASURED IN SAFE URBAN HARVEST STUDY

BARIUM

We did not find high levels of barium in any urban samples. Specifically, there were no samples that had barium concentrations that exceeded the daily recommended limit for barium intake from consuming one cup. For your reference, the level of barium measured in your produce samples is reported in the Appendix.

CADMIUM

We did not find high levels of cadmium in any urban samples. Specifically, there were no samples that had cadmium concentrations that exceeded the daily recommended limit for cadmium intake from consuming one cup. For your reference, the level of cadmium measured in your produce samples is reported in the Appendix.

CHROMIUM

Chromium exists in two forms, one that is harmful, and one that is not. We expect that all of the chromium measured in your produce is the harmless trivalent (III) form, as opposed to the toxic hexavalent (VI) form. This is for two reasons: 1) The results of our additional soil analysis indicated that the chromium in soil was the harmless form; 2) The toxic form of chromium is generally found in water, and not food, so an upper limit for intake from food does not exist. In contrast, chromium (III) is an essential nutrient for humans and plays a critical role in insulin regulation. We believe that the chromium present in your produce is the harmless trivalent (III) form. For your reference, the level of chromium measured in your produce samples is reported in the Appendix. For more information about chromium in food, see: https://ods.od.nih.gov/factsheets/Chromium-HealthProfessional/

NICKEL

We did not find high levels of nickel in any urban samples. Specifically, there were no samples that had nickel concentrations that exceeded the daily recommended limit for nickel intake from consuming one cup. For your reference, the level of nickel measured in your produce samples is reported in the Appendix.

FREQUENTLY ASKED QUESTIONS ABOUT PRODUCE RESULTS

Should I be concerned about harmful metals in my food? What can I do to reduce my exposure to harmful metals?

Metals harmful to human health (e.g., arsenic, cadmium, and lead) are present in a wide variety of foods in the food supply. No diet is—or can be—completely free of metals.

Your diet is likely not the only way you may come into contact with metals harmful to human health, nor is it the greatest source of contact. Exposure to these metals may also occur via drinking water or contact with metals in urban soils. The most common sources of exposure to each metal are different.

The most common sources of **lead** exposure — and leading drivers of lead poisoning — are dust, soil, and drinking water (especially in buildings with lead-based paint and lead pipes). Given that **the levels of lead we measured in your produce samples were 1000 times smaller (parts per billion) than the levels we measured in your soil (parts per million)**, we recommend focusing on reducing your contact with lead in dust, soil, and water to reduce your exposure to lead.

The most common sources of **arsenic** exposure are rice, drinking water, apple juice, and wine. If you routinely consume these items, or consume them in high quantities, you may consider reducing your consumption or pursuing a more diverse diet.

Whenever possible, it is always a good idea to follow "General recommendations for reducing contact with metals in urban soils and produce" provided in this report.

There were not high levels of metals measured in my soil. Why am I seeing high levels in my produce?

The concentrations of metals in soil and produce grown in that soil are not necessarily related. Plants can take up metals not just from soil but also from airborne deposition or contaminated irrigation water. Plants may also preferentially accumulate certain metals from soil. There are also many factors that influence how much of the metals present in soils are available for plants to accumulate, including the plant species, soil pH, organic matter, and environmental conditions. For these reasons, we would not expect there to be a direct relationship between the concentration of metals in soil and produce grown in that soil.

Additionally, we used different guidance to evaluate soil compared to produce because the guidance values have different purposes for soil versus produce. Soil safety standards are set to protect gardeners and farmers who are interacting directly with soil for long periods of time and may inadvertently inhale or ingest soil. Recommended maximum dietary intake levels for metals from foods, meanwhile, are set to protect the health of consumers.

Are there certain foods or nutrients I should eat more of to reduce the impact of metals exposure?

It is difficult to identify specific foods or nutrients with a consistent and proven impact on reducing the impacts of metals exposure. Ultimately, consuming a diverse diet rich in fruits and vegetables has many recognized health benefits and is recommended by federal health agencies and nutrition experts. People may have specific dietary and nutritional needs based on their age, health status, and pre-existing health conditions. Please consult your physician or a dietitian if you have specific questions about your own nutritional needs.

How should I interpret the levels of beneficial metals measured in my produce samples?

The analytical method we used measures the total amount of each element present in each sample but does not distinguish the total amount that is present in the produce item and the amount that is directly beneficial to a human eating it. While we report the levels we found in Appendix table 2, these results should not be used to draw conclusions about the nutritional content of the items tested.

What are the next steps for the Safe Urban Harvests Study?

Providing confidential and site-specific results to individual farmers and gardeners has been our top priority thus far. We are now in the process of preparing a city-wide report of soil, irrigation water, and produce results which will be available on the Safe Urban Harvests website. We will also host community workshops this fall/winter to share these city-wide findings (https://jhsph.edu/clf/suh) with the broader Baltimore community.

To share the findings of the Safe Urban Harvests Study with other urban agriculture practitioners, scientists, and public health practitioners, we plan to publish our study findings in peer-reviewed scientific journals. After these manuscripts are published, they will be posted and archived on the Safe Urban Harvests Study website.

GENERAL RECOMMENDATIONS FOR REDUCING CONTACT WITH METALS IN URBAN SOILS AND PRODUCE

If you are concerned about exposure to metal contaminants in urban agriculture, here are some simple—and mostly free—steps you can take to reduce your exposure.

Change your behavior	What can you do, specifically?
Do not drink water out of rain barrels. While city water is safe, hoses can become contaminated so it's best not to drink from them either.	Bring a full water bottle with you when going to work on site.
	If a large group typically gardens together, consider bringing a large insulated beverage (e.g., "Igloo") cooler filled with water to the garden.
	If drinking municipal water from spigot, let it run at least ten minutes once before using at beginning of season, and at least 1-2 minutes before use each time after that.
Reduce skin contact with soil.	Wear gloves, closed-toed shoes, long pants, and long sleeves, especially when interacting with contaminated soil. Brush off/dump out soil that accumulates in gloves, shoes, and pockets before going indoors.
	Dust off any soil from your hands before leaving the site and wash your hands as soon as possible after gardening.
Do not allow children to eat soil or crawl on ground in garden.	Establish designated play areas that reduce soil contact. Choose grassy areas over soil, if possible.
Avoid bringing soil into your home.	Take shoes and dirty clothes off before entering your home.
	Keep tools on site or clean them before transporting home.
	When transporting plants (including harvested produce), remove as much soil as possible before putting them in bags, baskets, or vehicles.
	Avoid bringing pets on site.
Reduce exposure to contaminants on the surface of urban-grown fruits and vegetables.	Minimize consumption of produce on-site.
	Wash and peel urban-grown produce, especially root vegetables, in clean sink before consuming.
	Remove outer leaves of green leafy and cruciferous vegetables (e.g., broccoli, cauliflower) before eating.
Reduce exposure to contaminants in urban-grown fruits and vegetables.	Vary where you get your produce. For example, source some of your fruits and vegetables from other sources such as farmers markets, grocery stores, or other sites.

Make your farm or garden safer	What can you do, specifically?
Avoid build-up of harmful metals in the water.	Let municipal water run for ten minutes once at the beginning of season, and then for 1-2 minutes before use each time after that.
Avoid parts of the site known to be contaminated.	Don't grow edible plants in contaminated areas.
	Don't put compost piles on top of contaminated areas.
Avoid growing near known sources of pollution.	Avoid growing near busy roads, demolished buildings, industrial sites, and other known sources of pollution.
	If possible, grow in a place with less potential for water to drain onto site. For example, avoid growing downhill from a road, building, or downspout.
Grow exclusively in raised beds using imported soil.	Don't use treated wood, railroad ties, or vehicle tires to build raised beds.
	Try to buy compost, fertilizer or topsoil from vendors that test their materials for contaminants.
	Use landscaping fabric and/or build raised beds high enough to make sure plant roots do not reach contaminated soil.
Reduce the potential for dust	Use mulch on non-growing area soils (e.g., walkways) to prevent the "kicking up" of dust. Avoid mulches made from treated wood, if possible.

Some other thoughts:

Children, infants, and pregnant women are more vulnerable to some of these pollutants. Following some of these recommendations may be even more important for them.

The amount of exposure to harmful metals on site increases as you spend more time there. If you are concerned with exposure, take steps to maximize your time efficiency at the farm or garden.

THE ORIGIN OF AND CONCERNS WITH METALS IN URBAN SOIL

Metals are a group of substances/elements that exist naturally in all rural and urban soils on the earth. Metals can also be released into the environment by human activities, often causing higher levels of metals in urban soils than rural soils.

Some metals (e.g., arsenic, barium, cadmium, chromium, lead, and nickel) are harmful and can make people sick. Other metals (e.g., calcium, copper, iron, magnesium, manganese, phosphorus, potassium, and zinc) are considered essential for human and/or plant health and can be beneficial in certain amounts.

Most soils, water, and produce have some small amounts of harmful metals. There is no clear line of what is considered "safe". In most cases, there is no immediate health concern, but there may be increased risks with high amounts of exposure over long periods of time. If the amount of a metal is higher than a guidance value, it is wise to reduce contact with that soil, water, or produce item whenever possible. It is always a good idea to follow "General recommendations for reducing contact with metals in urban soils and produce" provided in this report.

The following picture shows some of the sources of metals. It also shows some ways that you might come into contact with them while working in the garden or eating urban-grown fruits and vegetables.

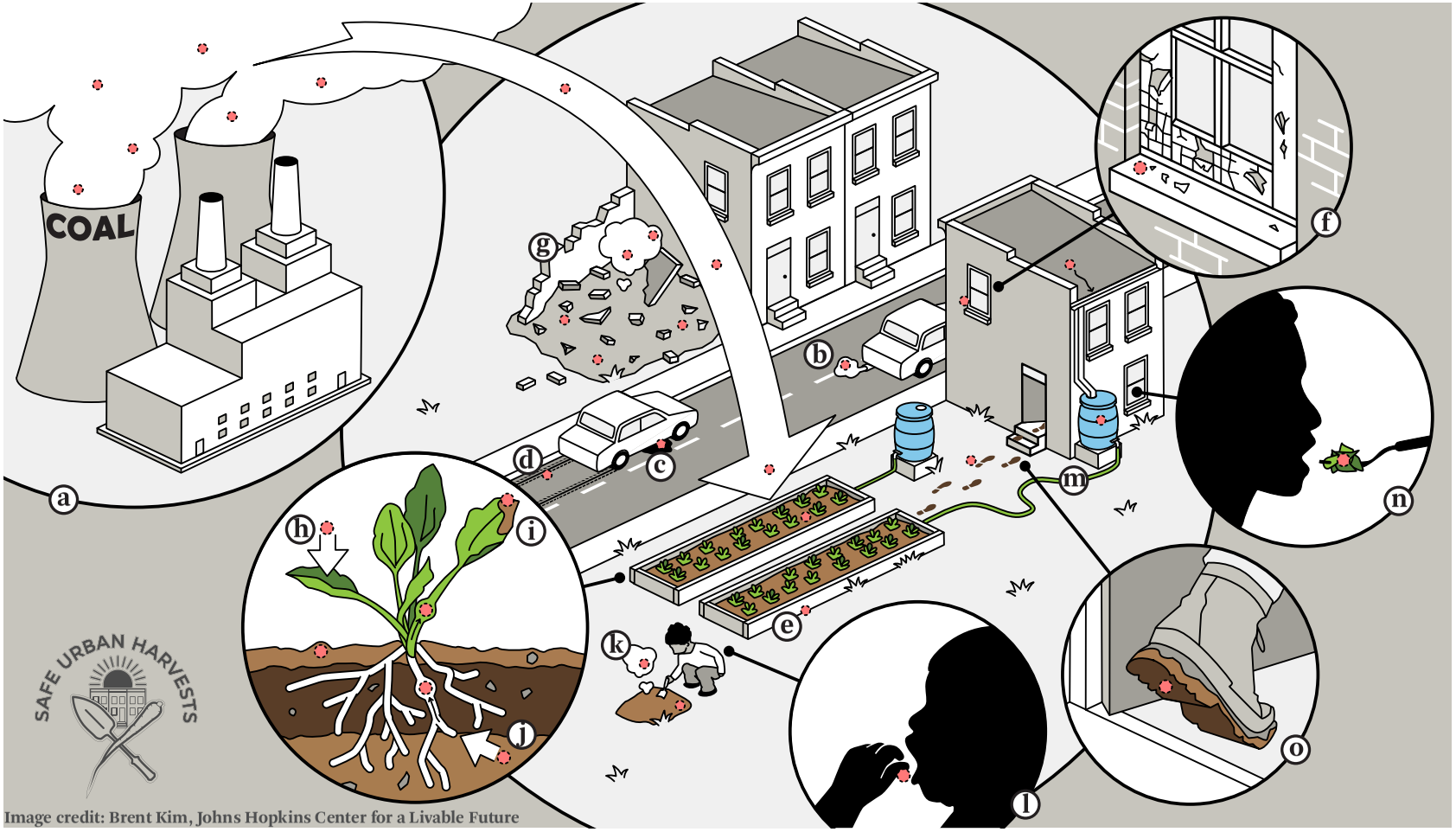


Image credit: Brent Kim, Johns Hopkins Center for a Livable Future

Where do harmful metals come from?

- Industrial sources, such as coal power plants (a)
- Vehicle exhaust (b), automotive fluids (c), and tire wear (d)
- Treated lumber (e), such as for raised beds
- Chipping lead paint (f)
- Demolition of old houses (g)
- Historic uses of leaded gasoline and certain pesticides

How can metals contaminate urban-grown fruits and vegetables?

- Airborne dust containing metals can settle on or stick to the outside of fruits and vegetables (h)
- Soil can stick to the outside of fruits and vegetables (i)
- Metals in contaminated soil can be taken up inside fruits and vegetables (j)

How can I come into contact with metals?

- Breathing or swallowing airborne dust (k)
- Unintentionally swallowing contaminated soil while working or playing in it (l)
- Drinking water from a contaminated irrigation source (m)
- Eating contaminated fruits or vegetables (n)
- Tracking soil into your home (o)
- Direct skin contact with contaminated soil

ADDITIONAL RESOURCES

The following documents are available on the Safe Urban Harvests Study website. They contain additional information about the study and resources for urban agriculture in Baltimore.

Methods: How samples were collected, analyzed, and interpreted

Meet our Safe Urban Harvests Study team

Grant and assistance opportunities for Baltimore community gardens and urban farms

Guide to testing soil for heavy metals

FAQ: Safety of soils and compost for sale and how they are regulated in MD

MORE INFORMATION ABOUT METALS

If you would like more information about the metals harmful to human health, please refer to the Agency for Toxic Substances and Disease Registry's Frequently Asked Questions factsheets ("ToxFAQs") for these metals. These factsheets describe the most common sources of exposure and the most severe health effects that may result from frequent contact with high levels of these metals. Please note that not all of the information in these factsheets is relevant to the urban agriculture context. Some information may only apply to high level exposures typical in industrial workplaces.

The factsheets are available at:

Arsenic: https://www.atsdr.cdc.gov/toxfaqs/tfacts2.pdf

Barium: https://www.atsdr.cdc.gov/toxfaqs/tfacts24.pdf

Cadmium: https://www.atsdr.cdc.gov/toxfaqs/tfacts5.pdf

Lead: https://www.atsdr.cdc.gov/toxfaqs/tfacts13.pdf

Nickel: https://www.atsdr.cdc.gov/toxfaqs/tfacts15.pdf

SAFE URBAN HARVESTS STUDY TEAM AND PARTNERS

For more information, please contact the Safe Urban Harvests partners who have additional experience and knowledge to support your efforts:

SAFE URBAN HARVESTS STUDY TEAM

For questions about the study purpose, methods, and results interpretation

Johns Hopkins Center for a Livable Future
111 Market Place, Suite 840, Baltimore, MD 21202
Keeve Nachman, Principal Investigator
knachman@jhu.edu
410-502-7576
https://www.jhsph.edu/clf/suh

SAFE URBAN HARVEST PARTNERS

Baltimore City Office of Sustainability
For questions about zoning for urban agriculture and growing food on public land

Abby Cocke, Environmental Planner
417 E. Fayette Street,
8th Floor, Baltimore, MD 21201
abby.cocke@baltimorecity.gov
410-396-1670
http://www.baltimoresustainability.org/projects/baltimore-food-policy-initiative/home-grown-baltimore/urban-agriculture-2/

Farm Alliance of Baltimore
For farms that are producing farm products for sale and donation to the public.

Mariya Strauss, Executive Director
2701 Saint Lo Drive, Baltimore, MD 21213
mariya@farmalliancebaltimore.org
410-736-8079
www.farmalliancebaltimore.org

Parks & People Foundation
For information about parks and green spaces in Baltimore

Valerie Rupp,
Corporate & Foundation Stewardship Director
2100 Liberty Heights Ave,
Baltimore, MD 21217
valerie.rupp@parksandpeople.org
(410) 448-5663
http://parksandpeople.org/

University of Maryland Extension — Baltimore City
For questions about growing practices, fertility, and soil science

Neith Grace Little, Extension Educator--Urban Agriculture
6615 Reisterstown Road,
Suite 201, Baltimore, MD 21215
nglittle@umd.edu
410-856-1850 ext. 123
http://extension.umd.edu/baltimore-city/urban-agriculture

APPENDIX

PRODUCE

Table 1. Harmful metals measured in produce collected at Name Redacted

	Arsenic		Barium		Cadmium		Lead		Nickel	
Recommended limit (μg/day)		1.04		16,000		8.0		12.5 (adult), 3 (child)		1000
	Concentration (ppb)	Amount per cup (μg)	Concentration (ppb)	Amount per cup (μg)	Concentration (ppb)	Amount per cup (μg)	Concentration (ppb)	Amount per cup (μg)	Concentration (ppb)	Amount per cup (μg)
Bean	<1.52	<0.15	332.1	33.21	<41.72	<4.17	19.48	1.95	95.65	9.56
Kale	5.06	0.11	2506.59	52.64	<48.17	<1.01	5.85	0.12	<80.29	<1.69
Squash	<0.84	<0.11	151.79	20.19	<23.04	<3.06	12.84	1.71	<38.41	<5.11
Sweet Potato	7.67	1.02	2016.77	268.23	<78.02	<10.38	50.71	6.74	<130.04	<17.3

Table 2. Other beneficial elements measured in produce collected at Name Redacted

	Calcium		Chromium		Copper		Iron		Magnesium	
Recommended amount per day*	1000mg		25(f); 35(m) mg		900 μg		18(f); 8(m) mg		320(f); 420(m) mg	
	Concentration (ppb)	Amount per cup (mg)	Concentration (ppb)	Amount per cup (mg)	Concentration (ppb)	Amount per cup (μg)	Concentration (ppb)	Amount per cup (mg)	Concentration (ppb)	Amount per cup (mg)
Bean	432530	43.25	<0.042	<0.0042	642.06	64.21	4206.63	0.42	146302.12	14.63
Kale	2791115.02	58.61	<0.048	<0.001	749.28	15.73	8775.32	0.18	301398.57	6.33
Squash	218419.04	29.05	<0.023	<0.0031	477.94	63.57	2210.66	0.29	108508.96	14.43
Sweet Potato	660757.5	87.88	<0.078	<0.01	731.23	97.25	4540.68	0.6	182806.63	24.31

	Manganese		Phosphorus		Potassium		Zinc	
Recommended amount per day*	1.8(f); 2.3(m) mg		700mg		2.3g		8 (f); 11(m) mg	
	Concentration (ppb)	Amount per cup (mg)	Concentration (ppb)	Amount per cup (mg)	Concentration (ppb)	Amount per cup (g)	Concentration (ppb)	Amount per cup (mg)
Bean	1076.01	0.11	350522.88	35.05	<0.17	<0.017	3378.59	0.34
Kale	3536	0.074	705963.43	14.83	<0.19	<0.004	5014.31	0.11
Squash	531.65	0.071	352303.84	46.86	<0.092	<0.012	2407.59	0.32
Sweet Potato	2644.8	0.35	515101.9	68.51	<0.31	<0.042	1990.23	0.26

* These numbers reflect the Institute of Medicine's Recommended Dietary Allowance (RDA) or Adequate Intake (AI) for females (f) who are not pregnant or lactating and males (m) between 19-50 years old. The RDA is the average daily level of intake sufficient to meet the nutrient requirements of nearly all (97%-98%) healthy people. An AI is established when evidence is insufficient to develop an RDA and is set at a level assumed to ensure nutritional adequacy. Note that the units of the RDA/AI vary by metal or electrolyte. For the full list of recommended intake of the beneficial elements by age and sex, see http://nationalacademies.org/hmd/~/media/Files/Agendas/Activity%20Files/Nutrition/DRI-Tables/6_%20Elements%20Summary.pdf?la=en. For the recommended intake of potassium by age and sex, see http://nationalacademies.org/hmd/~/media/Files/Agendas/Activity%20Files/Nutrition/DRI-Tables/9_Electrolytes_Water%20Summary.pdf?la=en.

For more resources on urban soil safety, visit: www.jhsph.edu/clf/urbansoilsafety