To: U.S. House of Representatives Committee on Science, Space, & Technology
Eddie Bernice Johnson, Chairwoman
Frank Lucas, Ranking Member

Cc: Elizabeth Benham (NIST)

More Than A Mile Behind
America and the Metric System

From: Linda Anderman, former Los Alamos National Laboratory public servant (26 years, retired), Los Alamos, NM
milebehind@gmail.com

Date: Submitted on October 10, 2022, in honor of National Metric Week (The week in which 10/10 falls)

Dear Ms. Johnson and Mr. Lucas:

I respectfully submit the following for consideration:

Please note that on Wednesday, October 12, I plan to share this concern with major, national media.

On January 1, 2023, the United States Will Adopt a New "Survey Foot." Why? And How Expensive Is This Change When the World Already Has the Metric System?

Section #1

Intersections between metric system adoption (or lack thereof) and the House Subcommittee on Science, Space, & Technology as it relates to its current "Congressional Oversight Plan (pdf)"

Public Accountability: I have reason to believe that the United States government does not currently know how much our lack of metric system adoption (S.I.) costs our country as we attempt to maintain two utterly incompatible measurement systems. Most of the world is already using the metric system (S.I.). The "experiment" that John Quincy Adams worried about in 1821(pdf) ended very long ago, and the metric system won. Almost every place but here.

Safety & Security: The medicine dosing errors alone should be enough to get people's attention.

Whistleblowers: I am alerting the U.S. government of the potential waste of vast amounts of government/taxpayer dollars as it relates to our lack of metric system adoption, including implications for its citizens' and visitors' health and safety.

GAO & OIGs: An interface with at least the Government Accountability Office (GAO) may be necessary to "get our arms around this" topic from financial and legislative perspectives if the Subcommittee is so inclined to research these subjects.

STEM Education: Adopting the metric system would likely change math education, potentially making it easier for those on the lowest rungs of our socioeconomic ladders to learn numerical concepts without additional outside coaching. Proficiency with numbers opens access to many career paths for our future leaders—from whatever community they might emerge. We could also make math less scary for small children. (Common Core standards for metric/U.S. customary units education are grades 2-5).

EXECUTIVE SUMMARY

Due to various reasons over hundreds of years (pdf), the United States has yet to fully adopt metric system units (S.I.) despite 95 percent of the rest of the world having done so. This "dropped ball" endangers our health (due to medication and other errors). It is also a "time suck" as we cast around (usually on Google) to help us to convert back and forth between units of measure, and we're needlessly complicating math learning for our students/future leaders.

The author requests a Congressional hearing to help determine if the United States is on solid footing concerning our measures, from this day moving forward.

Section #2

Initial Documentation

From the New York Times, August 18, 2020

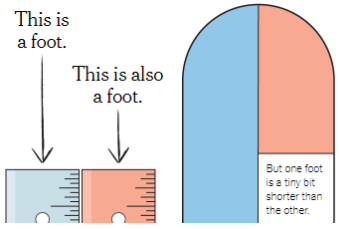
SCIENCE

The New York Times

America Has Two Feet. It's About to Lose One of Them.

For decades, U.S. metrologists have juggled two conflicting measurements for the foot. Henceforth, only one shall rule.

Give this article



It is my awareness of this new survey foot that leads me to ask two questions of our federal government:

Why are we still redefining feet when the metric system (or S.I. as it is identified around the globe) has been available to us for about 200 years?

I consider these current efforts to institute a new, specialized survey foot an enormous waste of time and taxpayer monies. As a former Los Alamos National Laboratory employee, it was engrained that every taxpayer dollar is sacred…or pretty close to it.

Therefore, I ask:

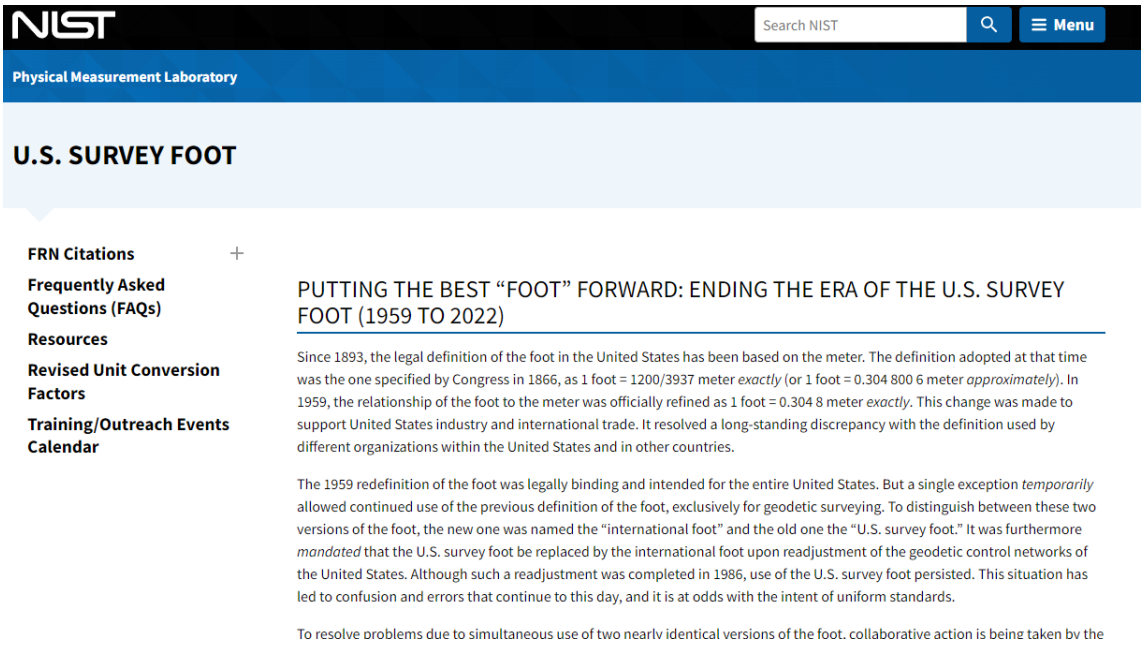
Why do we continue redefining measures that hail from the Roman days (mile, oz, lb, etc.) when the metric system's sleek and much more modern standards are readily available?

According to the National Institute of Standards and Technology (NIST), we've had this particular survey foot since 1959. How many times will we redefine our measures until we figure out these reiterations are worthless? Can we afford this "extra" work?

Furthermore, I ask:

How much will it continue to cost us in health, safety, education, commerce, and international scientific standing within the world to continue on our current trajectory?

I believe these questions are worthy of answers, if for no other reason, than to know where we stand as a country concerning the metric system and ease of our daily measurement activity.

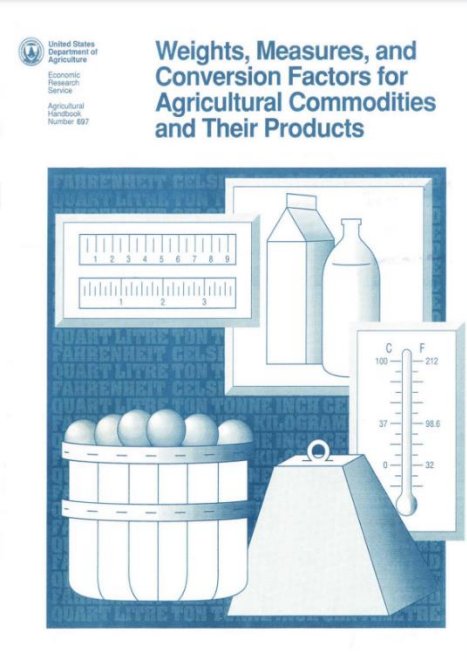


For most people, this survey foot change will be completely invisible, so few people are aware of this transition. However, if you plan to engage with any large project (new buildings or complexes) or extremely long distances (like from "sea to shining sea"), that little, itty, bitty, tiny difference can start to add up.

I consider that we constantly trip over our current, awkward measures; (as when we have to look up how many teaspoons there are in a tablespoon), we stumble when we realize we've taken the wrong amount of medicine, and sometimes, (because many doses are based on body mass) getting pounds and kilograms confused could kill you.

Commerce

Let's start here:

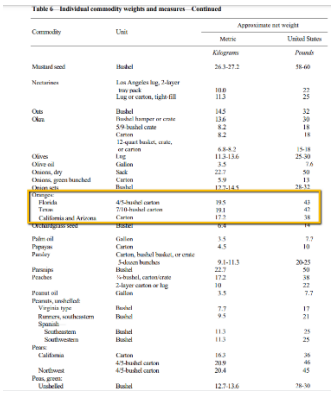


As this Subcommittee's oversight seems somewhat related to the Department of Commerce (based on a hearing I watched earlier this year), I'd like to start with commerce and then expand to include federal agencies such as the Department of Education and various agencies involved with public health issues, including the Centers for Disease Control, National Institutes of Health, etc. on this metric system adoption issue

(See below)

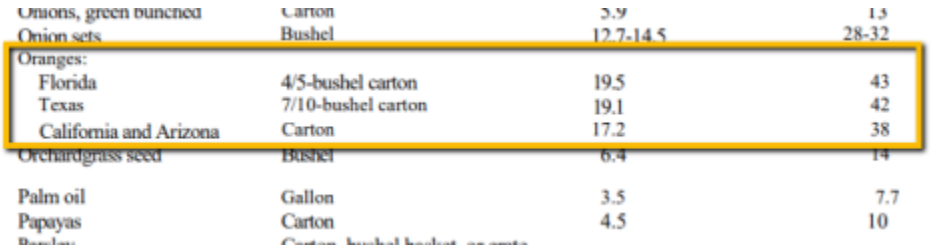
While the measures for oranges may have regional variations and long histories to blame, there is no reason to put out a publication that lists page after page of unit conversations and definitions. (The report has 77 pages in all. Last printed in 1992, how much will it cost to update it again?) Can we afford to stay on this path?

But, of course, this is just the tip of the iceberg.



There are about 77 pages for all kinds of kilogram/U.S. pounds equivalents in this agricultural report. Three different measures for oranges? Really?

Is this helpful or a relic?



Onions, green bunched	Carton	5.9	13
Onion sets	Bushel	12.7-14.5	28-32
Oranges:			
Florida	4/5-bushel carton	19.5	43
Texas	7/10-bushel carton	19.1	42
California and Arizona	Carton	17.2	38
Orchardgrass seed	Bushel	6.4	14
Palm oil	Gallon	3.5	7.7
Papayas	Carton	4.5	10

Public Health

Our "hundred-year" COVID pandemic made public health matters the most urgent since the pandemic of 1918. More than ever, science and the scientific method need to prevail.

While full adoption of the metric system is no panacea, unified and consistent measures used within the practice of medicine can only help, not hurt. Many federal agencies rely on U.S. customary/metric units to communicate with each other (NOAA, NIH, CDC, NSF, etc.) and the public. Uniform units more aligned with the rest of the world can help everyone better communicate vital information, particularly in times of crisis.

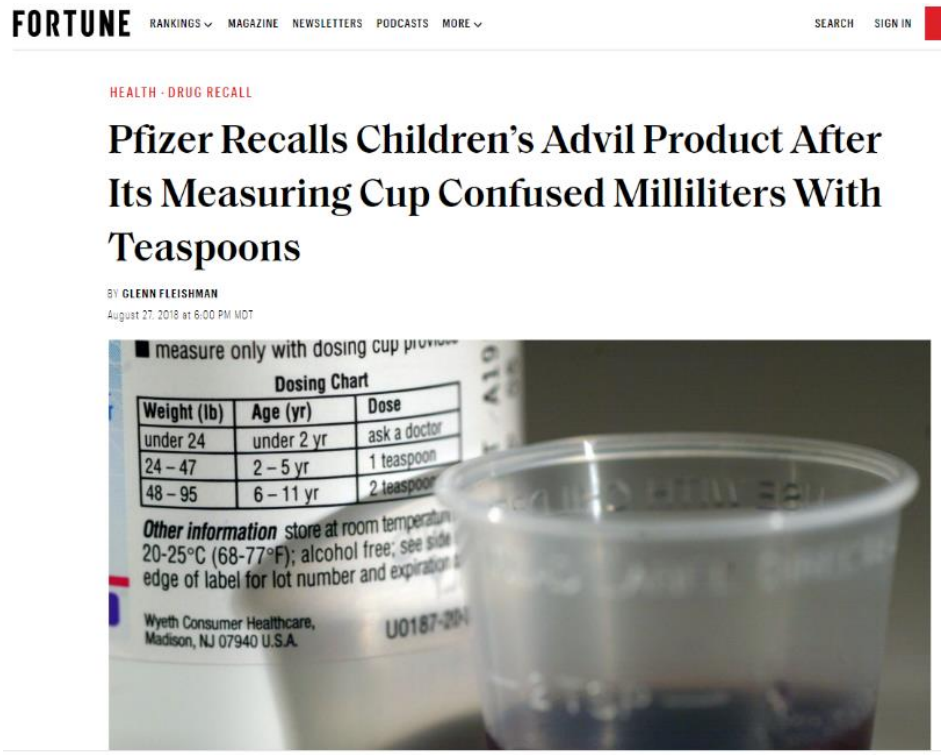
Science and medicine are based on the metric system, yet when these medical professionals communicate with the American public, they must speak in U.S. customary units. This constant switching back and forth between units can (and does) confuse.

Can we afford to kill people due to our lack of metric system adoption?

What is the best way to avoid conversion errors? Don't convert.

(Note: Most solid medicines are dosed almost exclusively in grams already. That's not a problem.)

From Fortune, 2018:

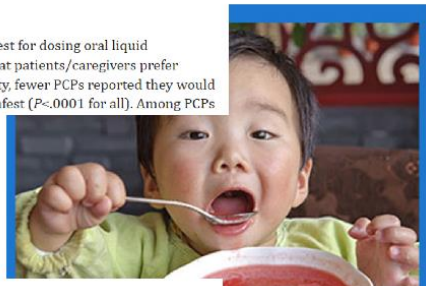


Dosing mistakes can be life-threatening! Avoid it if possible. The metric system will help us get this right.

Results:

Three-fifths of PCPs (59.0%) reported that using mL alone is safest for dosing oral liquid medications; however, nearly three-quarters (72.0%) thought that patients/caregivers prefer instructions that include spoon-based units. Within each specialty, fewer PCPs reported they would prescribe using mL alone than reported that using mL alone is safest ($P<.0001$ for all). Among PCPs

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6714557/



CONCLUSIONS:

Findings support a milliliter-only standard to reduce medication errors.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4187234/

NCPDP recommendations for standardizing dosing in metric units (mL) on prescription container labels of oral liquid medications, version 2.0 FREE

American Journal of Health-System Pharmacy, Volume 78, Issue 7, 1 April 2021, Pages 578–605, https://doi.org/10.1093/ajhp/zxab023

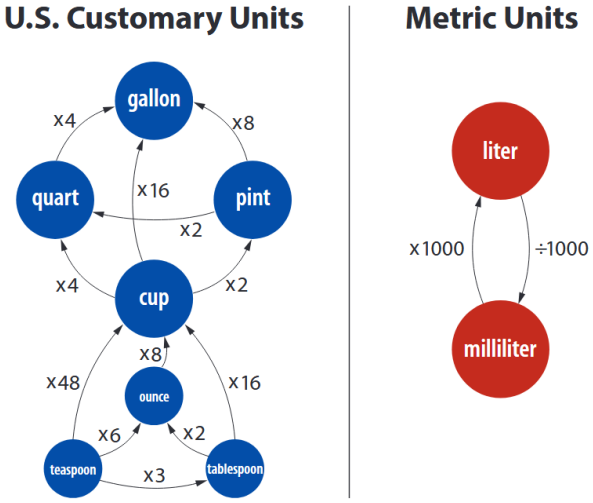
Published: 27 February 2021

NCPDP = National Council for Prescription Drug Programs

https://www.cdc.gov/patientsafety/features/safe-medicine-children-Infographic.html

Education

I'm not sure that I need much more than this:



However, not only are we (under Common Core standards) teaching this awkward collection of units alongside the metric system, but when you're working with decimalized units of less than one, you eliminate uncommon denominators (see below). Even Wall Street dropped fractions back in 2001.

Good-paying jobs usually use numbers. Let's help our children

From the Occupational Outlook Handbook: "Math Occupations":

> *Overall employment in math occupations is projected to grow 29 percent from 2021 to 2031, much faster than the average for all occupations; this increase is expected to result in about 82,000 new jobs over the decade. In addition to new jobs from growth, opportunities arise from the need to replace workers who leave their occupations permanently. About 30,600 openings each year, on average, are projected to come from growth and replacement needs.*

Median pay for 2021 for these jobs: $82,360 to $105,900

Now, ask yourself the following question: Which of these two math problems would you rather solve?:

$$\begin{array}{r} 4.45 \\ +\ 2.23 \\ \hline \end{array} \qquad \begin{array}{r} 5\ 1/5 \\ +\ 2\ 7/8 \\ \hline \end{array}$$

Most people select the first math problem because there are no uncommon denominators. And if you ask any middle-school student or teacher, they'll tell you fractions/uncommon denominators are a nightmare.

Says *Scientific American*, 2017:

THE SCIENCES

Fractions: Where It All Goes Wrong

Why do Americans have such trouble with fractions—and what can be done?

By Robert S. Siegler on November 28, 2017

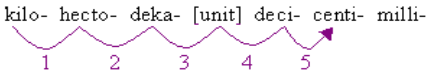
[Please note: To the best of my knowledge, fractions are necessary for algebra and scientific notation. If we get our students there willingly, that sounds like success to me.]

Then, consider how much easier it is to convert between units as shown on the PurpleMath site*:

What is an example of converting between differently prefixed metric values?

- **Convert 12.54 kilometers to centimeters.**

How many jumps is it from "kilo-" to "centi-"? I'll count off:.



It's five jumps, to the right. So I move the decimal point five places to the right, filling in the extra space with zeroes:

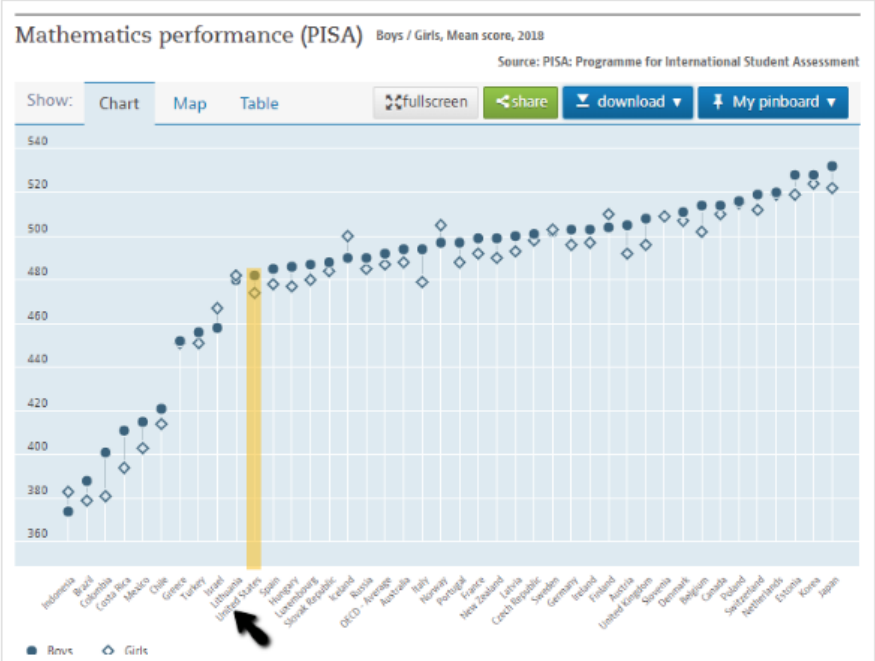
(You don't have to make a loopy arrow like I did, but the loops help you keep track of the steps that you're counting, and make it *really* easy to see where to add the zeroes, if you need to.)

In this case, after moving the decimal point and adding the zeroes, my answer is:

12.54 km = 1 254 000 cm

In addition, our international math scores could use some help

The PISA scores come from the Programme for International Student Assessment



— (Data released December 2019) I added the highlight to show just how far behind we are. https://www.oecd.org/pisa/PISA%202018%20Insights%20and%20Interpretations%20FINAL%20PDF.pdf

Section #3

In conclusion (a humble request):

I would like to request a Congressional hearing on the subject matter of our lack of metric system adoption and propose a gap analysis focused on:

- A comprehensive review of all current legislation that relates to communicating measurement units, whether in the U.S. customary or metric system and to include H.R. 596, from 1866 (pdf), the 1975 Metric Conversation Act, and potentially all iterations of the Fair Labeling and Packaging Act as it relates to the public and federal government reporting requirements.

- A determination of cost for the "line item" for NIST to carry out this redefinition of the new "survey foot" so we as a country can understand potentially unnecessary costs in the future.

- Assurance that all the correct parties from interested federal agencies are involved in these efforts as needed/required.

I will make myself available to answer any questions from the Subcommittee members.

I can supply the Subcommittee with a list of names for potential witnesses on some of these topics, if it so chooses.

One last thing:

When you think about all the problems in the world (war, illness, environmental disasters), once we fix our metric system problem, we never have to fix it again. No country that has switched to the metric system has switched back.

Thank you for your attention.

Sincerely,

Linda A. Anderman