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ORIGINAL RESEARCH

Changes in USDA food composition data for 43 garden crops, from 1950 to 1999 - Review of the evidence

Dott. A. Colonnese[1]

1 Nutritional Biologist, Italy

ONLINE ARTICLE

ARTICLE INFORMATION

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1. ABSTRACT

The analyzed study compared the nutritional composition data from the United States Department of Agriculture for 43 garden crops, primarily vegetables, between 1950 and 1999. After adjusting for water content, the authors observed statistically reliable average reductions in protein, calcium, phosphorus, iron, riboflavin, and vitamin C; the median decreases reported in the abstract ranged from 6% for protein to 38% for riboflavin.In "The Choice to Live in Health or Illness" by Dr. A. Colonnese and R. Panzironi, the publication contributes to the narrative that selection for higher yields may be associated with a lower concentration of certain nutrients in modern vegetables. Independent studies on historical data for fruits, vegetables, and grains detect signals consistent with this possibility, while a critical review emphasizes that comparing tables compiled in different eras does not allow for attributing the variations with certainty to soil depletion or a single agricultural practice. The most prudent conclusion is that there is evidence of changes in the density of some nutrients, but the causes, magnitude, and overall nutritional relevance require specific evaluations by crop and context.

MISSION

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Through articles, reviews, in-depth analyses and expert contributions, the Journal champions evidence-based medicine and science, fostering a correct interpretation of scientific data and countering misinformation. Every piece of content is developed with the aim of translating the complexity of research into understandable, useful and applicable information, while keeping intact the principles of accuracy, transparency and scientific independence.

Free from political, industrial and commercial influence, the journal stands as an authoritative and independent editorial space, dedicated to promoting scientific culture, professional development and the growth of health awareness among the public.

2. ANALYZED STUDY

The research question was whether the nutritional data published by the USDA for 43 garden crops had changed between 1950 and 1999. The hypothesis evaluated was that, across the set of foods considered, some nutrients might be present in lower concentrations in the more recent data.The research is relevant to the section "The Choice to Live in Health or Illness" by Dr. A. Colonnese and R. Panzironi because it directly compares different historical periods and detects an average reduction in protein and some micronutrients. Its specific contribution therefore concerns the segment of the narrative that describes a possible decrease in nutritional density, i.e., the amount of nutrients contained in a given amount of food.The study did not directly measure the soil, root absorption, agricultural yields, or plant growth rates. Therefore, it cannot prove that the soil supported a higher production volume nor establish a causal relationship between industrial agriculture and every variation detected. The authors proposed as the simplest explanation potential differences in the cultivated varieties, with possible trade-offs between yield and nutrient concentration.

3. MATERIALS AND METHODS OF THE ORIGINAL STUDY

This publication is a historical comparison of food composition data. The authors compared USDA values from 1950 and 1999 for 43 horticultural crops, primarily vegetables, across 13 nutrients and water content.To prevent variations in water content from making nutrients appear more or less concentrated, the data were adjusted for moisture content. For each food and nutrient, the ratio between the 1999 value and the 1950 value was calculated. A ratio of less than 1 indicates a lower value in 1999 compared to 1950. The authors then used the median and geometric mean to describe the group of 43 foods.To evaluate individual food-nutrient combinations, the standard errors of the 1999 USDA values and two hypothetical estimates of the standard error for the 1950 data were used. The standard error expresses the uncertainty associated with an estimate. The available abstract does not provide the full list of crops, the number of analytical samples underlying the individual USDA entries, the laboratories responsible for the historical analyses, the sample selection criteria, or further statistical details.

4. RESULTS

Considering all 43 crops together, the study found apparently statistically reliable decreases for six nutrients: protein, calcium, phosphorus, iron, riboflavin, and ascorbic acid, i.e., vitamin C. The median reductions reported in the abstract ranged from 6% for protein to 38% for riboflavin. For seven other nutrients, no statistically reliable changes emerged.The most important result for the book's section is directional: in the most recent data, the food group showed, on average, lower concentrations of certain proteins, minerals, and vitamins compared to the 1950 data. However, the available material does not report the specific percentage values for calcium, iron, and vitamin C cited in the book; therefore, these values cannot be directly verified from the provided abstract.When the authors examined each food and each nutrient separately, the majority of the ratios were not distinguishable from 1 with the available data. Depending on the estimate adopted for the uncertainty of the 1950 values, only 33% or 20% of the apparent ratios differed reliably from 1. Furthermore, about 28% of the statistically distinguishable ratios indicated an increase, not a reduction. This means that the signal was observable primarily at an aggregate level and did not demonstrate a uniform decline for every single vegetable or nutrient.

5. INTERPRETATION

In simple terms, the study suggests that some vegetables listed in the 1999 USDA tables were, on average, less concentrated in certain nutrients compared to the corresponding entries from 1950. This does not mean that modern fruits and vegetables lack nutritional value, nor that every contemporary variety contains fewer nutrients.The argument supported by the research discussed in the article is: historical comparison of horticultural foods average decrease of some nutrients in more recent data. The authors interpreted any real decreases as consistent with changes in cultivated varieties and a possible trade-off between high yield and nutrient concentration. A trade-off of this kind is often called the dilution effect: if the accumulation of carbohydrates and biomass increases more rapidly than the accumulation of minerals or proteins, the concentration of the latter

may decrease.This interpretation is not proof that the soil is depleted or that increased production is the sole cause. Food tables can differ over time due to variety, geographical area, season, ripeness, analytical procedures, and sample size. For this reason, the correspondence with the book's narrative is clear on an observational level, but the causal explanation requires additional experimental evidence.

6. INDEPENDENT CONFIRMING EVIDENCE

An independent analysis by White and Broadley compared historical data from the United Kingdom and the United States for edible horticultural products. In U.S. vegetables, they observed significant reductions in dry matter concentrations of calcium, copper, and iron; in fruits, copper, iron, and potassium decreased. The result directly confirms the part of the narrative regarding possible historical decreases of certain minerals in groups of fruits and vegetables. However, the authors clarified that the data were insufficient to demonstrate reliable changes in every single plant species and that the impact on the overall mineral intake of the diet could not be automatically inferred [1].Mayer and colleagues re-examined British tables from 1940, 1991, and 2019. In the aggregated analysis, all elements considered except phosphorus decreased between 1940 and 2019; the largest overall reductions concerned sodium, iron, and copper, while water content increased by 1%. This study reinforces the observation that historical differences in databases may show a lower concentration of minerals, including iron. However, the authors point to several possible explanations, including varieties, agronomic factors, and increased CO2, without identifying one as a proven cause [2].A more robust design for analyzing the possible link between yield and minerals was adopted by Fan and colleagues in wheat. The researchers analyzed 362 archival samples from a British agricultural experiment started in 1843. After the introduction of high-yield semi-dwarf cultivars from the late 1960s, the concentrations of zinc, copper, and magnesium in the grain decreased significantly in all studied lots; the most recent averages were 33-49% lower for zinc, 25-39% for copper, and 20-27% for magnesium compared to earlier cultivars. Soil concentrations, on the other hand, had remained stable or increased. The work therefore supports the mechanistic shift suggesting that selection for yield and biomass redistribution may contribute to the dilution of some minerals, at least in wheat and at that specific experimental site [3].Overall, these studies do not demonstrate a single chain of events valid for all vegetables, fruits, and cereals. However, they show that the trend observed in the original study is biologically plausible and that, in some contexts, it can be linked to cultivars and yields rather than a simple loss of minerals from the soil.

7. CONFLICTING EVIDENCE

A critical review by Marles challenges the interpretation that differences between food composition tables published in different eras demonstrate a generalized decline in minerals due to soil depletion. The review highlights that geographic origin, cultivar, stage of maturity, sampling methods, analytical techniques, and statistical treatment can change over time, making historical comparisons difficult to interpret.The author acknowledges that some high-yield varieties may exhibit lower mineral concentrations due to a dilution effect, but concludes that the available data do not justify a general claim of mineral depletion in fruits, vegetables, and grains. This evidence does not invalidate the observation of the original study, but it reduces the certainty with which it can be attributed to a single cause and invites a distinction between variations in concentration, the nutritional magnitude of the effect, and the actual overall quality of the diet [4].

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

The table distinguishes the historical comparison of the original study from independent verifications and the main relevant critical evidence.

Quadro comparativo

Reference	Study type	Population or model	Main result	Direction of evidence	Strength of evidence
Original study	Historical comparison of food tables	43 USDA horticultural crops, 1950 and 1999	Reliable average reductions for six nutrients; not uniform for every food	direct confirmation	moderate
[1]	Historical comparison of food databases	Fruits, vegetables, and nuts in the UK and USA	Calcium, copper, and iron decreased in US vegetables based on dry matter	direct confirmation	moderate
[2]	Historical comparison of food tables	Fruits and vegetables in the UK, 1940-2019	Aggregate reduction of all elements except phosphorus; iron reduced by 50%	direct confirmation	moderate
[3]	Experimental study with archival samples	362 wheat samples from a British agricultural experiment	Decrease in various minerals following high-yield semi-dwarf cultivars, without soil depletion	biologically consistent evidence	moderate
[4]	Critical review	Literature on fruits, vegetables, and cereals	Comparisons between historical tables alone do not prove soil depletion or generalized decline	discordant evidence	moderate

9. SINTESI EDITORIALE E CONCLUSIONI

CONCLUSIONS

The study analyzed provides observational support for the fact that, between 1950 and 1999, USDA tables for 43 garden crops reported lower average concentrations for certain proteins, vitamins, and minerals. Independent literature confirms that similar historical variations have also been detected in other sets of fruits, vegetables, and grains.The explanation based on dilution linked to higher varieties and yields is moderately supported, especially by experimental data in wheat. However, it is not proven that depleted soil, industrial agriculture, or early harvesting are the general cause of the differences reported in historical tables. The situation requires contemporary studies that compare different varieties grown under the same conditions, using identical analytical methods and repeated sampling.

Aggiornato al 17/11/2026. Questo contenuto riflette una sintesi divulgativa delle evidenze scientifiche al momento della pubblicazione e non sostituisce il parere medico.

10. TRANSPARENCY AND SCIENTIFIC RESPONSIBILITY

Artificial Intelligence was used solely as a tool for editorial and documentary support. All content, interpretations, bibliographic citations and conclusions have been verified, reviewed and approved by the author, who assumes full scientific responsibility for them.

The manuscript was also subjected to independent peer review prior to publication.

To ensure the greatest transparency, the complete history of

the article, including the dates of submission, revision, acceptance and publication, as well as information on the peer review process, is available on the dedicated Article History page.

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