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DOES A "NO PRESERVATIVES" CLAIM MEAN A BETTER NUTRI-SCORE? JUICES, NECTARS AND JAM FROM A SUPERMARKET IN KAZAKHSTAN

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Abstract: Some food packs sold in Kazakhstan carry the line "no preservatives", and studies in other countries show that "free-from" claims make products look healthier, so this paper asks whether products with this claim have a better Nutri-Score (updated algorithm) than similar products, and whether on juices and nectars the claim says more than the law already requires. Of eight products the author photographed on 9 and 10 November 2026, four were in the scope of Nutri-Score and showed the claim (two nectars, a 100% orange juice and a jam); because their labels give no sugars, saturated fat or salt, they were scored under written assumptions and compared in the same way with 33 similar products from the Open Food Facts database, tagged as sold in Russia because none from Kazakhstan were found. In the main estimate no claim product was in a better class than most similar products: the nectars scored below the median (11.5) of 12 comparison nectars but were in class E like 11 of them, the jam was in class D like all 15 comparison jams, and the juice scored 8 (class D) against a median of 4.5 for six comparison juices. With lower assumed sugars the nectars could rank better, while the juice stayed worse under every assumption, and with four products the permutation test ($p = 0.55$) can detect only a large difference. Under the technical regulation TR TS 023/2011 juices and nectars may be preserved only by physical methods, so on them the claim states what every juice and nectar must already be.

Keywords: no preservatives, free-from claims, Nutri-Score, food labelling, fruit juice, Open Food Facts, Kazakhstan

1. Introduction

Front-of-pack claims about what a food does not contain have become common. A review of the "clean label" trend describes how food makers have come to tell buyers that an ingredient or additive is absent, and notes that there is no common, objective definition of such labels [1, p. 58]. The same review finds that "free from" artificial additives products differ from organic and natural products in what drives buyers, and asks policy makers to work toward a uniform definition or regulation of such claims and to reduce consumer misconceptions [1].

Such claims change how healthy a product looks. In an online survey of 1950 people in the United Kingdom, Sweden, Poland and France, products with a free-from label (lactose-free, gluten-free, GMO-free or palm oil-free) were rated healthier than identical products without the label [2]. Preservatives were not among the four labels tested. In four studies on fast-food restaurants, people underestimated the calories of main dishes and were more likely to choose higher-calorie side dishes, drinks or desserts when the restaurant claimed to be healthy [3]. A meta-analysis of 17

controlled studies found that health-related claims on pre-packaged foods increase choice or consumption (odds ratio 1.75, 95% CI 1.60-1.91), while noting that most studies were run in artificial settings and natural experiments show smaller effects [4].

A "no preservatives" line says nothing about sugar, fat or salt. To check whether products with the claim are better in composition, this paper uses Nutri-Score, the five-class label (A to E) published by Santé publique France. It counts energy, sugars, saturated fat, salt, protein, fibre, the share of fruit, vegetables and legumes, and, for beverages, the presence of non-nutritive sweeteners [5, 6]. It does not count preservatives. The official questions and answers allow an optional box on the back of the pack that explains the logo, but say that it may give only information on the elements of the calculation and must not show other information, for example on "additifs ou conservateurs" (additives or preservatives), that could suggest these are part of the score [6]. So Nutri-Score tests whether a product with the claim has a better nutrient profile, not whether preservatives are harmful. Here it serves only as a published yardstick for nutrient composition.

For juices the claim also meets a legal rule. Kazakhstan is a member of the Eurasian Economic Union (EAEU), where the technical regulations of the former Customs Union (TR TS) apply [7]. The regulation on juice products, TR TS 023/2011, states that juice may be preserved "only by physical methods, except treatment by ionising radiation", and says the same for fruit nectars [7].

The open database Open Food Facts holds labels for products in many countries, and was the first planned source for this study. Its labels are tagged by volunteers: on 18 November 2026 a search for products sold in Kazakhstan with the tag "no preservatives" returned 21 products, among them soft drinks and a chocolate bar [8], but a tag does not show whether the words are printed on the pack. For this reason the products with the claim in this paper were collected by the author, with the claim photographed on each pack.

The research question is: do packaged foods that carry a "no preservatives" claim, photographed in Kazakhstan, have a better Nutri-Score than similar products whose database records are not tagged with the claim, and on juices and nectars, does the claim tell the buyer anything that the regulation does not already require?

2. The author's expectations

The topic was one of three offered to the author by the supervisor on 6 November 2026. He marked it as the one he recommended, and she chose it the same day. Its description already asked whether such products are really healthier or whether the label is just marketing. On 7 November, before any calculation, he asked her two questions: whether products "without preservatives" are on average healthier than the rest, and why makers put this label on. She answered the same day: "I think that products without preservatives are about as harmful as products with preservatives; it depends on the full composition of the product, and this label is put there so that people buy their products thinking that this food is healthier, and choose them more often."

Two expectations follow from this answer. (E1) Products with the claim are about the same in nutrient composition as similar products, neither better nor worse. (E2) Makers print the claim so that the product looks healthier and is chosen more often. Only E1 can be checked with the data in this paper. Her guess compares products without preservatives with products that have them, and among juices and nectars that comparison cannot be made, because by law the comparison juices and nectars contain no preservatives either (Section 4.4). Only in jam are products without a listed preservative set against products that list one. Nothing here measures what buyers think or choose, so E2 stays a hypothesis. All quotations from the author in this paper were translated from Russian with the AI tool named at the end of the paper, under the supervisor's direction.

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3. Materials and methods

3.1. Sample

On 8 November 2026 the supervisor asked the author to find, at home or in the nearest shop, ten products whose packs say "без консервантов" or, in Kazakh, "консервантсыз" (no preservatives), and to photograph the claim and the nutrition table of each. She described her collection as follows (13 November 2026): "Spar. I looked for products among those that, in my view, should certainly be without preservatives: baby food, diet products, dairy products. In products such as [frankfurters] and sausages I briefly looked at the range and the ingredients, and there were preservatives everywhere. I photographed what logically should be without preservatives, for example dairy products and juices, in which by regulation there should be no preservatives. I looked across all shelves and photographed everything that carried such labels, since there are very few products with such labels in the supermarket, 9 November." The word in square brackets replaces an autocorrect error in the original message, as the author confirmed on 18 November 2026.

This account was written on 13 November, a day after she had seen the results and had learned about the juice regulation from the supervisor (Section 4.4). None of the photographs she sent shows a dairy product. She sent 16 photographs on 9 and 10 November 2026, the front and the back of eight products (Table 1). The twelve photographs of P1 to P6 show supermarket shelves; the four of P7 and P8, sent on 10 November, were taken at home, which the supervisor's request allowed. The sample is therefore not random. It is what one supermarket and one home had, in the categories where the author expected the claim, and its size is set by how few packs carried it.

3.2. Products in scope

Nutri-Score does not apply to food for infants and young children up to 3 years or to food for special medical purposes [5]. Three products were excluded on these grounds: P2, which its pack calls a specialised food product for dietary therapeutic and preventive nutrition and which was therefore treated as food for special medical purposes, and P4 and P8, which are infant foods from 4 and 6 months. P1 and P3 are labelled for children over 3 years and are therefore in scope. On the crispbread P7 the claim could not be seen: the line on the back that may contain it is cut off at the edge of the photograph. P7 was therefore left out. Four products with the claim remain, called claim products below: P1, P3, P5 and P6.

Table 1 – Products photographed by the author on 9-10 November 2026

ID	Product	Claim on the pack (translated)	Nutri-Score
P1	Fruktovy Sad peach-apple nectar with pulp	No colourings or preservatives	in scope (beverage; for children over 3)
P2	PediaSure Maloezhka, banana	Contains no colourings, preservatives, GMO or palm oil	excluded: treated as food for special medical purposes (pack: specialised product for dietary therapeutic and preventive nutrition)
P3	Dobry orange nectar	No colourings or preservatives (Russian front, Kazakh back)	in scope (beverage; for children over 3)
P4	Agusha apple juice with pulp	No added preservatives	excluded: infant food, from 4 months
P5	Makheev jam, forest berries	No preservatives	in scope (general food)
P6	Yan orange juice, 100%	No added sugar, colourings or preservatives (colourings in the Russian text only)	in scope (beverage)
P7	Shchedrye buckwheat crispbread	not visible on the photographs	no claim seen
P8	FrutoNyanya multigrain biscuits for children	No preservatives, colourings or GMO	excluded: infant food, from 6 months

Source: the author's photographs (P1 to P6 in a supermarket, P7 and P8 at home); claim texts translated from Russian. Scope from the Nutri-Score rules [5].

3.3. Nutri-Score version

The updated algorithm was used. It has been in force since 1 January 2024 in Germany, Belgium, Switzerland, the Netherlands and any other country that has not officially adopted Nutri-Score [6], and its point tables are given in Annex 1-B of the rules [5]. Juices and nectars are scored as beverages [6], jam as a general food. The score is the sum of negative points (energy, sugars, saturated fat, salt and, for beverages, non-nutritive sweeteners) minus positive points (protein, fibre and fruit, vegetables and legumes); for a general food with 11 or more negative points, protein is not subtracted [5]. A lower score is healthier. Beverages other than water fall into classes B (up to 2), C (3 to 6), D (7 to 9) and E (10 or more); general foods into A (0 or less), B (1 to 2), C (3 to 10), D (11 to 18) and E (19 or more) [5].

3.4. Missing label values

The labels state energy and carbohydrate, and some also protein and fat. None of the four claim products states sugars, saturated fat or salt, which the algorithm needs. Two results are therefore reported.

The first is a label-only range: every score compatible with what is printed, with undeclared protein, fat and fibre limited by the energy the stated nutrients leave unexplained. The ranges are wide: P1 from -3 to 31 (classes B to E), P3 from -3 to 30 (B to E), P6 from -2 to 28 (B to E) and P5 from -2 to 38 (A to E). The label alone does not fix a Nutri-Score class for any of the four.

The second is an estimate under written assumptions, applied in the same way to the claim products and to the comparison products. Sugars equal carbohydrates for juices, nectars and jam; since sugars cannot exceed carbohydrates, this is an upper value. Salt is 0 when it is not declared and no salt is listed in the ingredients; saturated fat is 0 when fat is 0 or not declared and no fat is listed; undeclared protein and fibre are 0. The fruit share is the minimum printed on the pack or, for a nectar without one, the legal minimum for that fruit in TR TS 023/2011 [7]. Jam is given no fruit points unless a fruit share is printed, for claim and comparison products alike; a jam with more than 40% fruit would gain 1 point (P5 would score 17, still class D).

As a check on the sugar assumption, the estimate was repeated with sugars equal to the 10th percentile (nearest-rank method) of the sugar to carbohydrate ratio. The ratio was taken from the downloaded records that declare both values and were either kept or excluded only for a "no preservatives" tag or the same brand line, by one rule for beverages and jams: 0.90 for beverages (11 records) and 0.78 for jams (8 records). The beverage estimate was run a second time with the lowest ratio among the 8 kept comparison beverages that declare both, 0.53. That value comes from a single nectar record with 6.3 g of sugars in 12 g of carbohydrate, which may be a data-entry error, and it alone sets this second run.

3.5. Comparison products

Comparison products were taken from Open Food Facts through its API on 12 November 2026 [8]. A search for products sold in Kazakhstan returned no products in any of the six categories used (orange juices, orange nectars, peach nectars, fruit nectars, jams and crispbreads), so products tagged as sold in Russia were used. The download gave 84 unique records. Groups were set from the ingredient list: 100% orange juice (no sugar among the ingredients), nectar (sugar among the ingredients) and jam. Sixteen records from the nectar searches could not be placed in a group (13 have no ingredient list and 3 list no sugar), which left 68 candidate records. Of these, 35 were excluded, each for one reason: the same brand line as a product in the sample (11), no ingredient list (8), no carbohydrate value (3), a "no preservatives" tag in any language (4), and, after the record was read, a different type of product (6), a data error (1) or possible food for children under 3 (2 nectars named "for baby food" whose age band could not be checked). Other brands of the same makers were kept. One exception was made to the brand rule: the two Makheev jams that list a

preservative were kept, because a product that lists a preservative cannot carry the claim, so they are the closest comparison for P5 (Table 4 shows the result without them). The 33 products kept are 6 juices, 12 nectars and 15 jams, of which 6 list a preservative among the ingredients and 9 do not.

In the main version (V1) the comparison products were scored only from the fields an EAEU label normally gives (energy, carbohydrate, fat and protein), with the same assumptions as the claim products. In a second version (V2) their declared sugars, saturated fat and salt were used where the record has them.

3.6. Comparison and test

For each claim product the difference between its score and the median score of its comparison group was taken: P6 against the juices, P1 and P3 against the nectars, and P5 against the jams that list a preservative. The pooled statistic is the mean of these four differences. A positive value means that the claim products score worse. A stratified permutation test computed this statistic for every possible assignment of the claim labels within each group (4,459 arrangements) and gives an exact two-sided p-value. With so few claim products, the smallest p-value the test can give is 0.002, reached only when the claim products are on average 2.5 points better than their group medians. All calculations were done by one script, which reads the label values and the downloaded records and writes every number reported below.

3.7. The legal rule

The text of TR TS 023/2011 was read from a copy published by a certification company [7], because the page of the Eurasian Economic Commission returned an error on 12 November 2026.

4. Results and discussion

4.1. Scores of the claim products

Under the assumptions of Section 3.4, the two nectars are in class E, the juice and the jam in class D (Table 2). None of the four reaches the classes A to C.

Table 2 – Label values and Nutri-Score points of the four claim products (estimate V1)

Product	Energy, kJ	Carbohydrate, g	Fruit share	Negative points	Fruit points	Score	Class
P1 nectar	200	12	at least 45%	13	2	11	E
P3 nectar	179	10.5	at least 50%	12	2	10	E
P5 jam	1156	68	not stated	18	0	18	D
P6 juice	217	12	100%	14	6	8	D

Note: values per 100 ml for beverages and per 100 g for jam, from the author's photographs. Negative points are energy plus sugars (sugars taken equal to carbohydrate); saturated fat and salt give 0 points. Protein and fibre give 0 points for all four.

The juice P6 scores worse than the comparison juices because its label gives 217 kJ and 12 g of carbohydrate per 100 ml. The six comparison juices give 150 to 188 kJ and 8.9 to 11.2 g. With 217 kJ, P6 passes the 210 kJ threshold and gets 4 energy points, one more than a juice of 151 to 210 kJ and two more than one of 150 kJ or less, and its estimated 12 g of sugars passes the highest sugar threshold for beverages, 11 g, giving the maximum of 10 points. The 6 points for 100% fruit do not make up for that.

4.2. Comparison with similar products

Table 3 compares each claim product with its group. The nectars P1 and P3 score 11 and 10, half a point and one and a half points below the median of 11.5 for 12 comparison nectars, but they are in class E like 11 of them. The jam P5 scores 18, against a median of 17 for both kinds of

comparison jam; all 15 comparison jams are in class D, including the 6 that list a preservative. The juice P6 scores 8 (D), higher than every comparison juice (3 to 7), and 5 of the 6 comparison juices are in class C.

Table 3 – Claim products and comparison products from Open Food Facts (estimate V1)

Group	Claim product: score, class	n	Median (range)	Classes of comparison products
100% orange juice	P6: 8, D	6	4.5 (3 to 7)	C 5, D 1
Nectar	P1: 11, E; P3: 10, E	12	11.5 (8 to 14)	D 1, E 11
Jam, preservative listed	P5: 18, D	6	17 (15 to 18)	D 6
Jam, no preservative listed	P5: 18, D	9	17 (15 to 18)	D 9

Source: Open Food Facts [8], products tagged as sold in Russia, downloaded on 12 November 2026; own calculations. A lower score is healthier.

The mean of the four differences between a claim product and its group median is +0.63 points, that is, slightly worse; averaged over the three groups instead of the four products, it would be +1.17. The exact permutation test gives p = 0.55. With four claim products the test can detect only a large difference: its smallest attainable p-value, 0.002, needs the claim products to be on average 2.5 points better than their group medians, and for a difference of about one point, as observed here, it has little power. The numbers in this section are therefore descriptive. Inside jam (all 15 comparison products in D) and nectar with added sugar (11 of 12 in E) the class hardly varies, so agreement in class is weak evidence on its own.

4.3. How much the results depend on the assumptions

Table 4 changes one assumption at a time. The sugar assumption matters most for the nectars. P3 lies at the boundary between D and E: with sugars at 90% of carbohydrate it moves to class D, and so do three more comparison nectars, so P3 is then in class D like 4 of the 12 comparison nectars and in a better class than the other 8, while P1 stays in E. For one comparison nectar the declared sugars (6.3 g of 12 g carbohydrate) instead of the assumption move it from 11 (E) to 6 (C), so the sugar assumption alone can shift a single product by two classes. That same record, possibly a data-entry error, sets the lowest ratio among the kept comparison beverages, 0.53. With that ratio most beverages move down one or two classes: P1 and P3 are in class C, the same as 6 comparison nectars and better than the other 6, and the juice P6 is in class C while all six comparison juices are in B. The main result, that no claim product is in a better class than most similar products, therefore holds for the main estimate; for the nectars it depends on the undeclared sugars, and the juice stays worse under every assumption.

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Table 4 – Sensitivity of the comparison to single assumptions

Analysis	What changes	Result
Lower sugars	Sugars set to 0.90 of carbohydrate for beverages and 0.78 for jams, for claim and comparison products alike	P3 moves from E to D, P1 stays E, P6 stays D; comparison nectars E 8, D 4 (were E 11, D 1); all comparison juices C; jams unchanged
Lower sugars, kept records only	Sugars set to 0.53 of carbohydrate for beverages, the lowest ratio among the 8 kept comparison beverages that declare both	P1, P3 and P6 in class C; comparison nectars C 6, D 5, E 1; all comparison juices B
Declared values (V2)	Comparison products use their declared sugars, saturated fat and salt	Nectars E 10, D 1, C 1; medians unchanged (juice 4.5, nectar 11.5, jam 17)
Fruit share	The 6 comparison nectars whose fruit share is not printed and whose legal minimum is 40% or less get the same 2 fruit points as P1 and P3	Nectar median 11; P1 equals the median, P3 is one point better; pooled difference +0.88
Same maker	Comparison nectars from the makers of P1 and P3 also removed	11 nectars, median 11; pooled difference +0.88
Same-maker jams removed	The two Makheev jams that list a preservative are left out	4 jams with a preservative, median 16.5; pooled difference +0.75
Excluded nectars kept	The two nectars for children whose age band could not be checked are put back	14 nectars, median 11.5; pooled difference +0.63

Note: the pooled difference is the mean of (claim score minus group median) over the four claim products; in the main version it is +0.63.

The fruit-share check shows a bias in the main version. Comparison nectars without a printed fruit share get the legal minimum for their fruit; for 6 of these 8 nectars it is 40% or less, which gives 0 fruit points, while P1 and P3 print 45% and 50% and get 2 points. When the six are given the same 2 points, the gap disappears for P1 and shrinks to one point for P3. For jam, the two Makheev jams that list a preservative score exactly as P5 does (18), so inside one maker's range the claim comes with no change in score; without them the median of the jams with a preservative is 16.5. In these jams the sugar content alone puts every product in class D, whether or not it lists a preservative.

Open Food Facts shows its own Nutri-Score grade on many records, written in lower case, and it often differs from the grades computed here: e against C for Solevita juice, e against D for Vifresh juice, and b against C (in V2) for the Sady Pridonya nectar. A likely cause, not checked here, is that the database uses its own estimate of the fruit share and the declared sugars. The grades used in this paper are recomputed by one method for claim and comparison products alike.

4.4. What the claim tells the buyer

Three of the four claim products are juices or nectars. For them TR TS 023/2011 allows preservation only by physical methods [7], so a juice or nectar without preservatives is the legal default, not a feature of one brand. The regulation lists only narrow exceptions, such as sulphur dioxide as a processing aid in grape juice and nitrogen or carbon dioxide used in packaging for temporary preservation [7]. Juice drinks, a different product type under the same regulation, are also limited to physical preservation but may contain other food additives [7]; none of the claim products is a juice drink. Jam is not covered by this regulation, and 6 of the 15 comparison jams do list a preservative. On jam, therefore, the claim marks a real difference in ingredients, but not in Nutri-Score: P5 and all comparison jams are in class D.

On 12 November 2026 the supervisor sent the author these results with his own summary: by Nutri-Score the products with the claim are not better than similar ones, three are in the same class and the Yan juice is even worse, and the numbers do not test whether preservatives are harmful or why makers print the claim. He added that this agreed with part of her guess, that the label does not make food healthier. In the same message he pointed out the regulation and asked her what had matched her guess and what had not, and why, in her view, a maker writes "no preservatives" on a juice if preservatives cannot be added to it anyway. (That earlier summary counted 16 comparison jams; one more jam, which carried the claim only as a tag in Ukrainian, was

excluded afterwards.) She answered (12 November 2026): "My guess was partly confirmed. I thought that products without preservatives are not healthier than the others, and that is how it turned out: three products were in the same class as similar ones, and the juice was even worse. Whether preservatives themselves are harmful and why the label is written, these numbers did not test, so that part remains a guess. It seems to me that on juice they write 'no preservatives' simply for advertising. Most people do not know that they cannot be added to juice anyway, so the label looks like a plus, although in fact all juices are like that."

Her first three sentences restate the supervisor's summary, including his remark that the result agrees with part of her guess, and the rule on juice preservation also came from him. Her own part is the explanation of the juice claim as advertising and the reason she gives for it, that most buyers do not know the rule. It answers his question and repeats the second part of her guess of 7 November. It fits the studies cited in Section 1: free-from labels make identical products look healthier [2], health-related claims increase choice in controlled studies [4], and the clean-label review calls for reducing consumer misconceptions about such claims [1]. It remains her hypothesis. This study has no data on what buyers in Kazakhstan know about the regulation or on what they buy.

4.5. Limitations

The claim group has four products, chosen by the author in the categories where she expected the claim, so it is not a random sample, and the results cannot be generalised to all products with the claim. Sugars, saturated fat and salt were assumed, not read, and the classes of the nectars depend on the sugar assumption. The comparison products come from a volunteer database and are tagged as sold in Russia, including imported brands; no Kazakhstan products were found in the six categories searched, and one comparison record may contain a data-entry error. Whether a comparison pack carries the claim was not checked, because a missing tag does not mean a missing claim. Nutri-Score does not count preservatives, so this study says nothing about whether they are harmful. The author's interpretation in Section 4.4 was written after she had read the supervisor's summary of the results, which already linked them to her guess. Finally, the text of TR TS 023/2011 was read from an unofficial copy, and it was not checked whether that copy includes every later amendment.

5. Conclusion

Four products with a "no preservatives" claim were compared, by an estimated Nutri-Score, with 33 similar products. In the main estimate no claim product was in a better class than most similar products: the two nectars scored slightly below the median of comparison nectars but stayed in class E with almost all of them, and the gap shrank or disappeared when the fruit share was scored alike; the jam was in class D like every comparison jam, with or without a listed preservative; and the 100% juice scored worse than all six comparison juices. For the nectars this result depends on the undeclared sugars: with lower assumed sugars they could be in a better class than most comparison nectars. The juice stayed worse under every assumption. For the nectars and the jam this is consistent with the first part of the author's expectation, although four products cannot confirm it. For juices and nectars the claim does not set one product apart from another, because the regulation requires all of them to be free of preservatives; the author reads it as advertising, which this study could not test. Whether buyers in Kazakhstan read it as a sign of a healthier product could be tested by a study of what they know about juice regulation and of what they choose.

Author contributions

Tasbulatova Zere chose the topic, the one of three the supervisor recommended; wrote her guess about the claim before any calculation, in answer to his two questions; searched the shelves of a supermarket and photographed the products with the claim there and at home (photographs sent on 9 and 10 November 2026); described how she collected them; and, after reading the supervisor's

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summary of the results, wrote her interpretation in her own words, of which the explanation of the juice claim as advertising is her own (Section 4.4). Kurakbay Myrzabek (scientific supervisor) proposed the topic and the task of photographing the products, chose the method and the comparison data, pointed out the juice regulation, wrote the summary of results sent to the author, directed the analysis and the writing of the text, and is responsible for them.

Use of generative AI

A generative AI tool (Claude, Anthropic) was used in November 2026 under the supervisor's direction. It read the source documents (the Nutri-Score rules and answers, the regulation and the cited studies), read the label values from the author's photographs, wrote the analysis script that downloaded and scored the Open Food Facts records and computed every number in this paper, proposed the exclusion of each comparison record with its reason, drafted the text, and translated the author's quotations from Russian. Every number derived from the data was copied into the text from the script's output. The AI tool is not an author of the paper. The supervisor takes responsibility for the calculations and the text.

Data availability

The comparison data are public in Open Food Facts [8]. The author's photographs, the table of label values, the comparison set with the reason for each exclusion and the analysis script are available from the supervisor on request.

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Conflicts of interest

The scientific supervisor works as a mentor in a paid university-admissions mentoring service used by the author's family; that mentoring includes support with this paper, which the author may use in university applications. There are no other conflicts of interest.

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